Longitudinal/Cross-Sectional Study of the Impact of *Mathematics in Context* on Student Performance

Student Background Data for 1997–1998 (Grades 5, 6. & 7)
(Working Paper #18a, b, c)

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INTRODUCTION

The purposes of the longitudinal/cross-sectional study of the impact of *Mathematics in Context* (MiC; National Center for Research in Mathematical Sciences Education & Freudenthal Institute, 1997–1998) on student performance are (a) to determine the mathematical knowledge, understanding, attitudes, and levels of student performance as a consequence of studying MiC for over three years; and (b) to compare student knowledge, understanding, attitudes, and levels of performance of students using MiC with those using conventional mathematics curricula. The research model for this study is an adaptation of a structural model for monitoring changes in school mathematics (Romberg, 1987). For this study, information is being gathered on 14 variables over a 3-year period for three groups of students (those in Grades 5, 6, and 7 in 1997). The variables have been organized in five categories (prior, independent, intervening, outcome, and consequent). (See Figure 1 for variables and hypothesized relationships.)

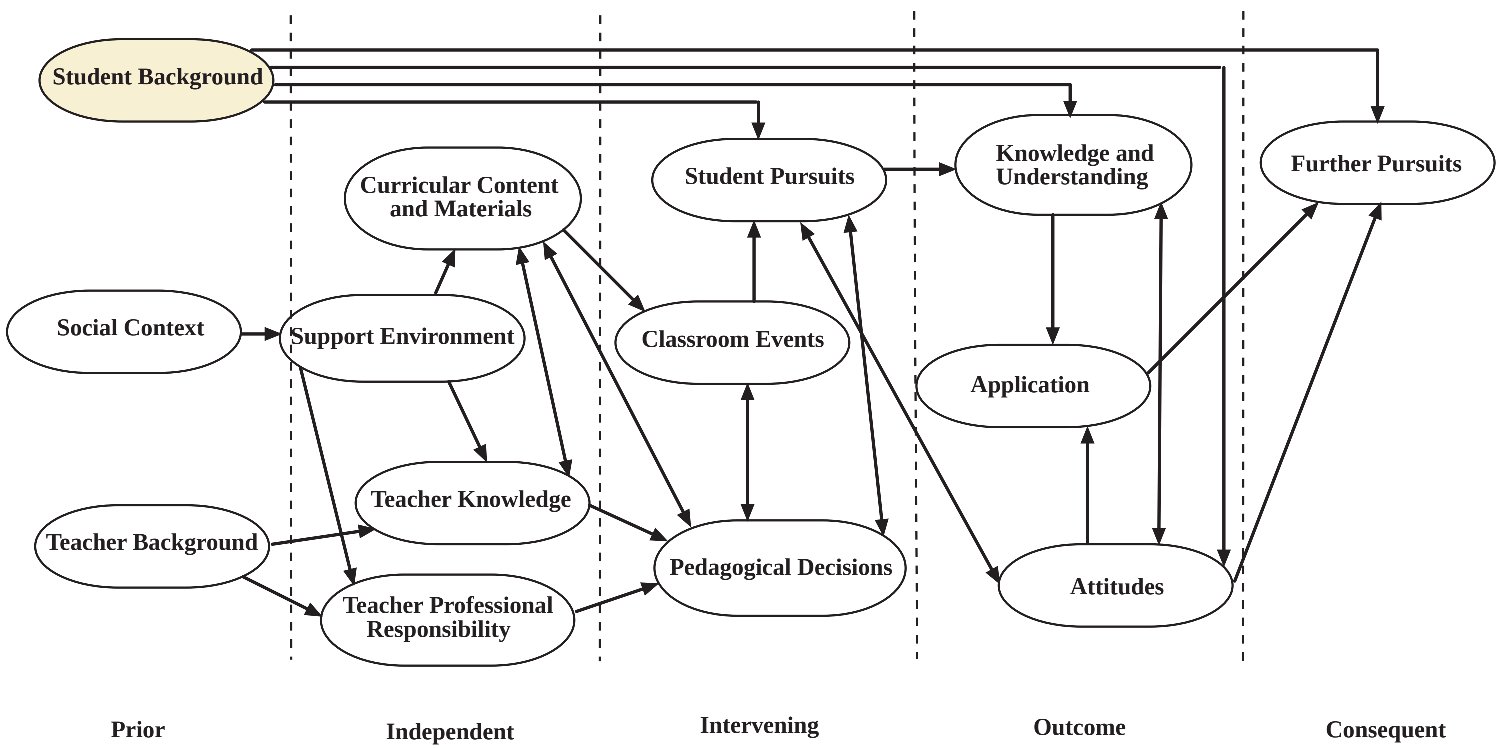


Figure 1. Revised structural model, with variables and hypothesized relationships, for the monitoring of change in school mathematics.

Overview: Grade 5 Student Background

The purpose of this working paper is to summarize the information of the *Student Background* variable collected in 1997 on fifth-grade classes at the beginning of the longitudinal/cross-sectional study of the impact of *Mathematics in Context* on student performance. The purpose of gathering this information was to describe similarities and differences in seven class characteristics prior to instruction (see Figure 2). Four fixed characteristics for the students in each class—gender, age, preferred language, and ethnicity—were gathered via a Student Questionnaire (see Appendix A; Shafer, 1997). Three other class characteristics—measures of student mathematical knowledge, student mathematical applications, and disposition toward mathematics—were taken, respectively, from standardized test scores provided by the schools, scores on the project-administered *Collis-Romberg Mathematical Problem-Solving Profiles* (Collis & Romberg, 1992), and student responses to the Student Questionnaire and Student Attitude Inventory (see Appendix B; Shafer, Wagner, & Davis,1997).

Students in 25 fifth-grade classrooms from three school districts participated in the study. Districts are identified by number, and the classes by school and teacher (both pseudonyms). Also noted are the type of materials used (MiC materials or a conventional text).

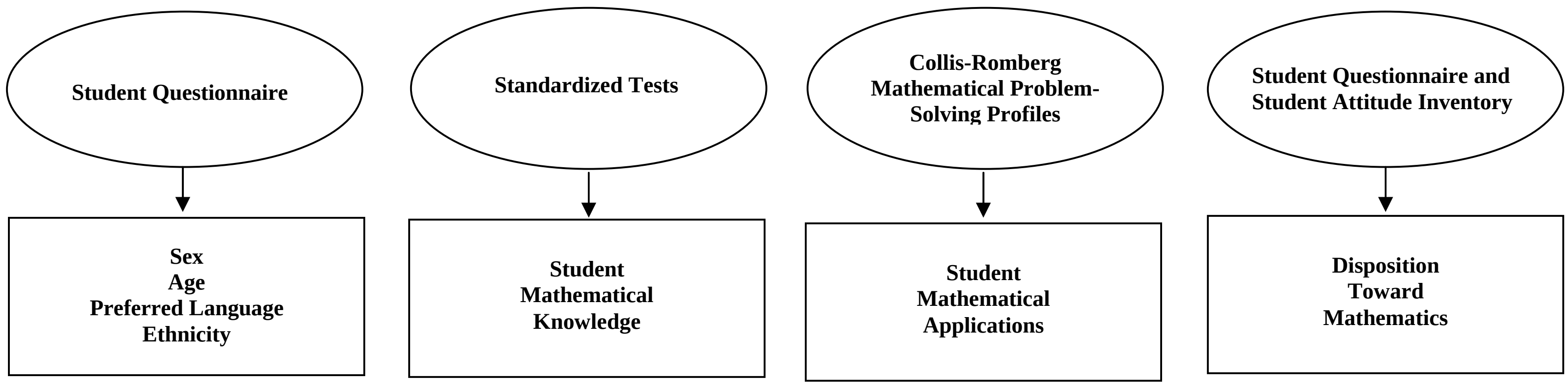


Figure 2. Fixed class characteristics in longitudinal/cross-sectional study of the impact of *Mathematics in Context* on student performance and their sources.

District 1

In District 1, 10 fifth-grade classes participated in the study. MiC was used in eight of the classrooms; in the other two, conventional texts were used. A summary of the variations in fixed characteristics is presented in Table 1.

Table 1
Fixed Characteristics, Grade 5, District 1

School-Class *(N)*	**Sex *(%)***		**Average Age *(years)***	**Language Preference *(%)* *** *(self-identified)*		**Ethnicity *(%)*****				
	Female	**Male**		**English Preference**	**Non-Response**	**African American**	**Hispanic**	**White**	**Multi/Other**	**Non-Response**
—MiC—										
Banneker-Greene 1 (22)	50	50	10.30	95	5	18	0	36	27	18
Beethoven-Kipling 1 (26)	54	46	10.39	100	0	4	4	69	19	4
Beethoven-LaSalle 1 (33)	45	55	10.32	94	0	0	0	79	15	6
Beethoven-Linne 1 (13)	77	23	10.40	100	0	77	0	15	8	0
Dewey-Hamilton 1 (21)	48	52	10.45	90	0	33	10	48	10	0
Dewey-Mitchell 1 (18)	50	50	10.55	100	0	22	11	56	11	0
Dewey-Mitchell 2 (19)	42	58	10.45	95	5	42	16	32	5	5
Dewey-Mitchell 3 (18)	39	61	10.37	94	0	56	17	28	0	0
—Conventional—										
Dewey-Kershaw 1 (24)	46	54	10.53	92	0	21	13	50	17	0
River Forest-Fulton 1 (31)	45	55	10.39	87	3	6	0	65	23	6

* Percent does not add to 100% when students identified a language preference other than English.
** Percent on ethnicity was rounded off and does not always total 100. Multi/Other comprises Asian, Haitian, Native American, Multiracial and Other.
(For detailed information, see Table C1 in Appendix C.)

In District 1, there was considerable variation in the class profiles. The number of students in a class varied from 13 to 33. With two exceptions (Beethoven-Linne, 77% female, and Dewey-Mitchell 3, 39% female), the proportion of boys to girls was similar across classes. Average age was similar across classes, and English was the primary language for 87–100% of the students. The ethnicity in these classes, however, varied considerably (0–77% African American, 0–17% Hispanic, 15–79% White, 0–27% Multi/Other).

In District 1, two measures of prior mathematics performance were used as indicators of prior student performance. The first performance indicator was a summary of percentile scores for the students in the study classes on the standardized test administered by the district to all of its students, *TerraNova* (CTB/McGraw-Hill, 1997), which were forwarded to project staff. Summary means and standard deviations of the percentiles for each class are reported in Table 2, and box plots are shown in Figure 3. Clearly, the classes differed in average percentiles on this test. Mean percentiles ranged from 24.09 to 92.37, and the box plots illustrate the vast between-class variation on this test in this district.

Table 2

Standardized Test Scores, Spring 1997, Grade 5, District 1

School-Class *(N)*	**TerraNova National Percentile**					
	(*N*)	**Mean**	**StDev**	**Minimum**	**Median**	**Maximum**
—MiC—						
Banneker-Greene 1 (22)	15	52.53	18.50	21	52.0	79
Beethoven-Kipling 1 (26)	25	70.76	14.27	44	70.0	95
Beethoven-LaSalle 1 (33)	30	92.37	5.88	78	94.0	99
Beethoven-Linne 1 (13)	11	24.09	12.49	9	26.0	44
Dewey-Hamilton 1 (21)	18	50.28	18.13	8	49.5	79
Dewey-Mitchell 1 (18)	16	64.88	18.97	38	66.0	97
Dewey-Mitchell 2 (19)	14	39.29	17.51	18	39.0	75
Dewey-Mitchell 3 (18)	17	28.53	16.13	4	25.0	64
—Conventional—						
Dewey-Kershaw 1 (24)	21	73.57	19.81	27	74.0	99
River Forest-Fulton 1 (31)	30	82.67	13.61	44	86.5	99

(For detailed information, see Table C2 in Appendix C.)

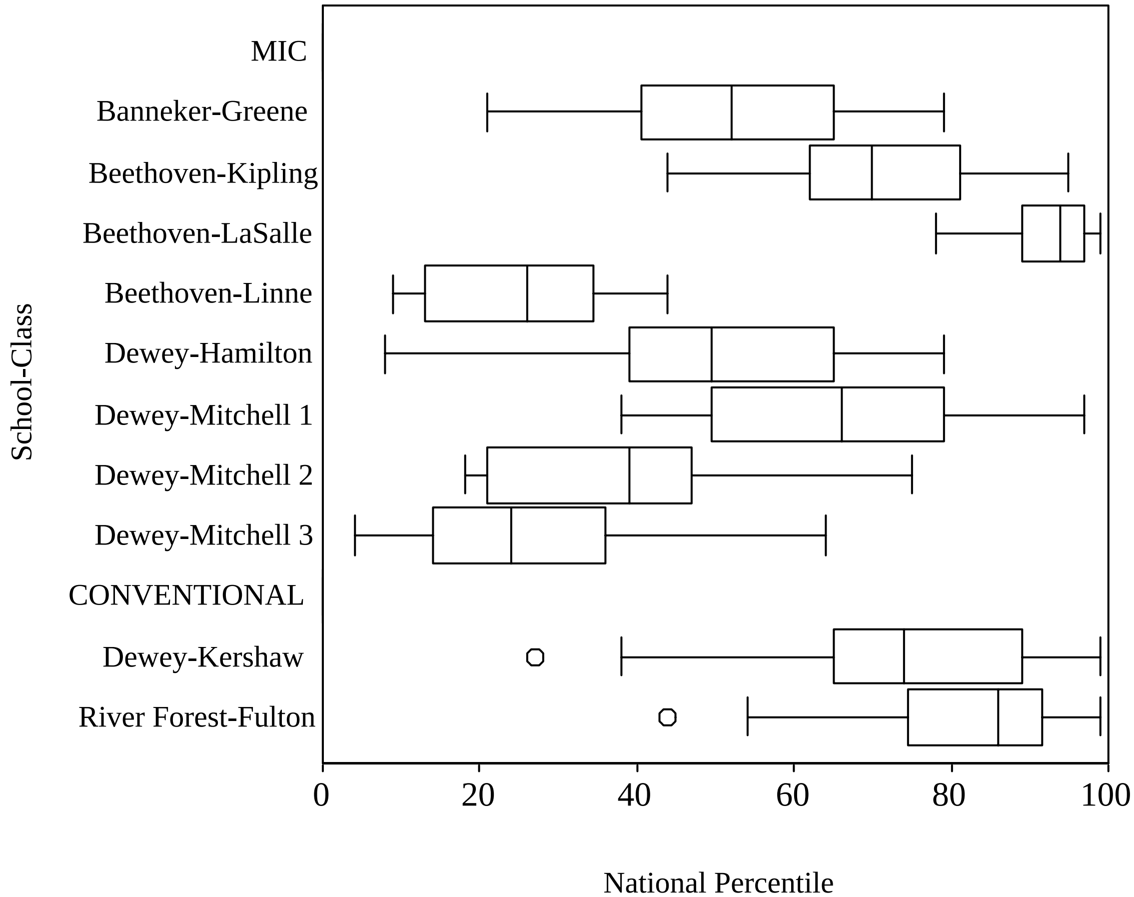


Figure 3. Box plots of class distributions on the *TerraNova*, Grade 5, District 1.

The second performance indicator used in the study is the *Collis-Romberg Mathematical Problem-Solving Profiles* (Collis & Romberg, 1992). This test was administered to all students participating in the study. The information on this test includes scores related to four levels of reasoning (unistructural, multistructural, relational, and extended abstract), and responses for each level are scored from 0–5. Class means on all four levels of reasoning are given in Table 3. For all but one class the means on the unistructural level of reasoning were above 2.50, indicating that students were operating at this level on many items. Only Beethoven-Linne 1 had a class mean below 2.50 (2.46). Even at this level, however, there was considerable variability in class means. The means on the other scales indicate that in only two classes (Beethoven-LaSalle 1 and River Forest-Fulton 1) were many students beginning to reason at a multistructural level, and only a very small number of students exhibited reasoning at either relational or extended abstract levels.

Table 3
Class means on the Collis-Romberg Mathematical Problem-Solving Profiles, Grade 5, District 1

School-Class *(N)*	Level of Reasoning				
	(*N*)	**Uni-structural**	**Multi-structural**	**Relational**	**Extended Abstract**
		—MiC—			
Banneker-Greene 1 (22)	19	2.84	1.47	0.16	0.00
Beethoven-Kipling 1 (26)	24	3.00	1.63	0.13	0.00
Beethoven-LaSalle 1 (33)	32	3.84	2.31	0.94	0.06
Beethoven-Linne 1 (13)	13	2.46	1.00	0.92	0.00
Dewey-Hamilton 1 (21)	20	3.00	1.55	0.10	0.00
Dewey-Mitchell 1 (18)	18	3.17	1.61	0.28	0.00
Dewey-Mitchell 2 (19)	18	3.22	1.00	0.00	0.00
Dewey-Mitchell 3 (18)	18	2.56	0.67	0.06	0.00
		—Conventional—			
Dewey-Kershaw 1 (24)	22	3.14	1.73	0.41	0.05
River Forest-Fulton 1 (31)	30	4.17	2.17	0.80	0.07

(For more detatiled information, see Table C3 in Appendix C.)

Because the standardized test scores showed a similar pattern to those on the unistructural scale of the Collis-Romberg test (see the scatter plot for means on the two measures in Figure 4), a correlation coefficient between the class means of the two measures was calculated (r = .88). From this information, it is apparent that there were two very low performing classes, three average, three high average, and two high classes.[1]

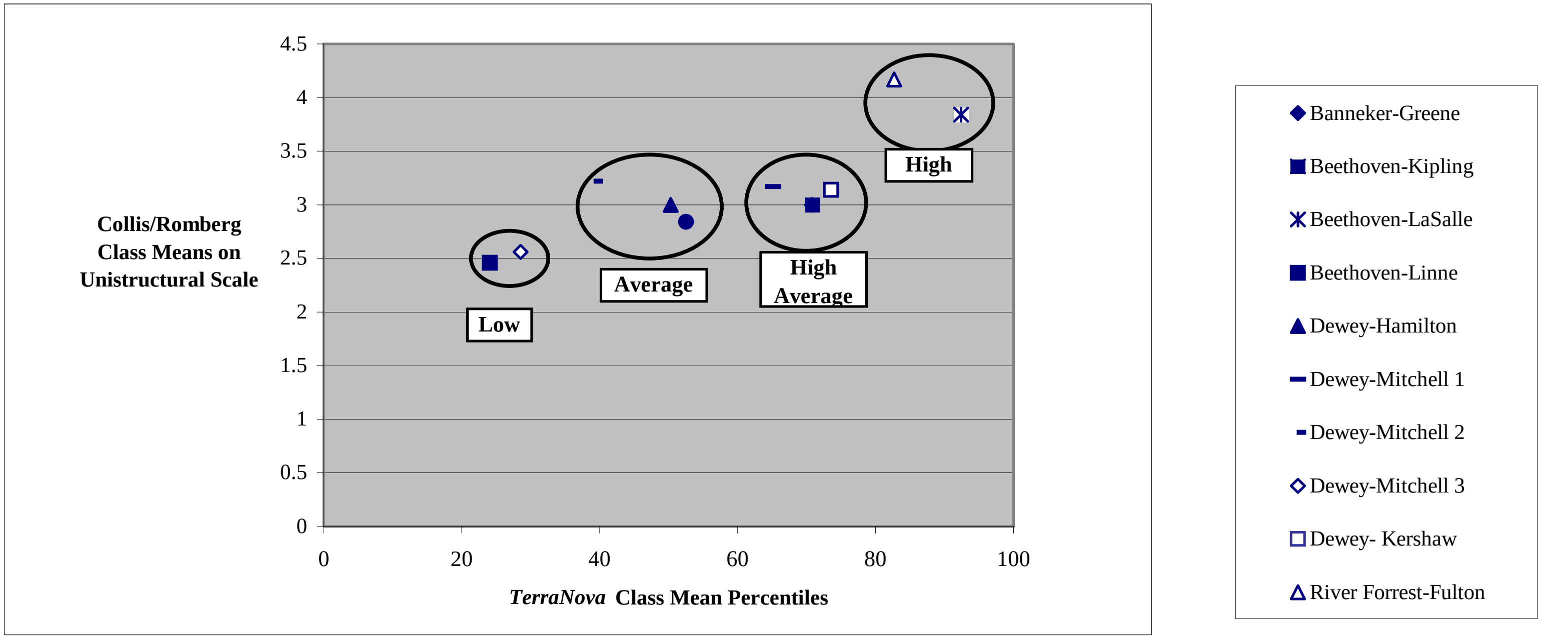


Figure 4. Scatter plot for class mean percentiles on the *TerraNova* and the class means on the unistructural scale of the *Collis-Romberg Mathematical Problem-Solving Profiles*, Grade 5, District 1.

Because the classes in District 1 varied so much on the two preceding achievement measures used in this study, either comparisons of student performances on outcome measures should be made only between classes at the same level of preceding achievement, or adjustments in outcome test scores should be made via covariance. In fact, because of this strong relationship between the two premeasures, only the standardized test scores should be considered as a potential covariate in order not to lose a degree of freedom in any statistical test about differences.

[1] This categorization was confirmed by the administration in District 1. The empirical grouping matches the perceived grouping in the schools. Note, however, that the within-class variance in scores seems to indicate that more than preceding achievement was involved in the tracking.

All students in the study responded to the items in the *Student Attitude Inventory;* six components are summarized here.

First, the class means for student judgments on questions related to their effort, confidence, interest, usefulness, and ability to communicate mathematically are shown in Table 4. Each item was judged (reverse-coded when appropriate) on a scale of 1–4 (1 = very true; 2 = true; 3 = not true; 4 = not true at all). Overall, the students in these classes judged the statements as true or very true, and there was little variation across classes.

Table 4
Class Means on Student Judgments About Mathematics (Subscales on the Student Attitude Inventory), Grade 5, District 1

School-Class *(N)*	**Effort** *in mathematics*		**Confidence** *in ability to do mathematics*		**Interest** *in mathematics*		**Usefulness** *of mathematics*		**Ability to Communicate** *about mathematics*	
	(*N*)	Mean	**(*N*)**	Mean	**(*N*)**	Mean	**(*N*)**	Mean	**(*N*)**	Mean
—MiC—										
Banneker-Greene (22)	15	1.59	17	1.80	15	1.60	15	1.67	16	1.82
Beethoven-Kipling (26)	23	1.60	21	1.69	23	1.53	23	1.43	20	1.59
Beethoven-LaSalle (33)	31	1.69	29	1.52	29	1.47	31	1.32	31	1.69
Beethoven-Linne (13)	10	1.77	12	2.07	10	1.55	11	1.83	10	1.73
Dewey-Hamilton (21)	19	1.53	20	1.61	20	1.66	18	1.44	19	1.68
Dewey-Mitchell 1 (18)	18	1.67	18	1.74	18	1.49	18	1.61	17	1.53
Dewey-Mitchell 2 (19)	12	1.53	17	1.79	17	1.44	16	1.59	14	1.60
Dewey-Mitchell 3 (18)	17	1.51	18	1.96	18	1.63	17	1.98	17	1.66
—Conventional—										
Dewey-Kershaw (24)	20	1.48	21	1.57	19	1.47	18	1.52	18	1.49
River Forest-Fulton (31)	28	1.61	29	1.49	29	1.55	28	1.38	29	1.74

(For more detailed information, see Table C4 in Appendix C.)

The two classes low on preceding achievement (Dewey-Mitchell 3 and Beethoven-Linne), however, tended both to be less confident in their ability to do mathematics and to believe mathematics less useful to them than did students in the other classes (see Figure 5).

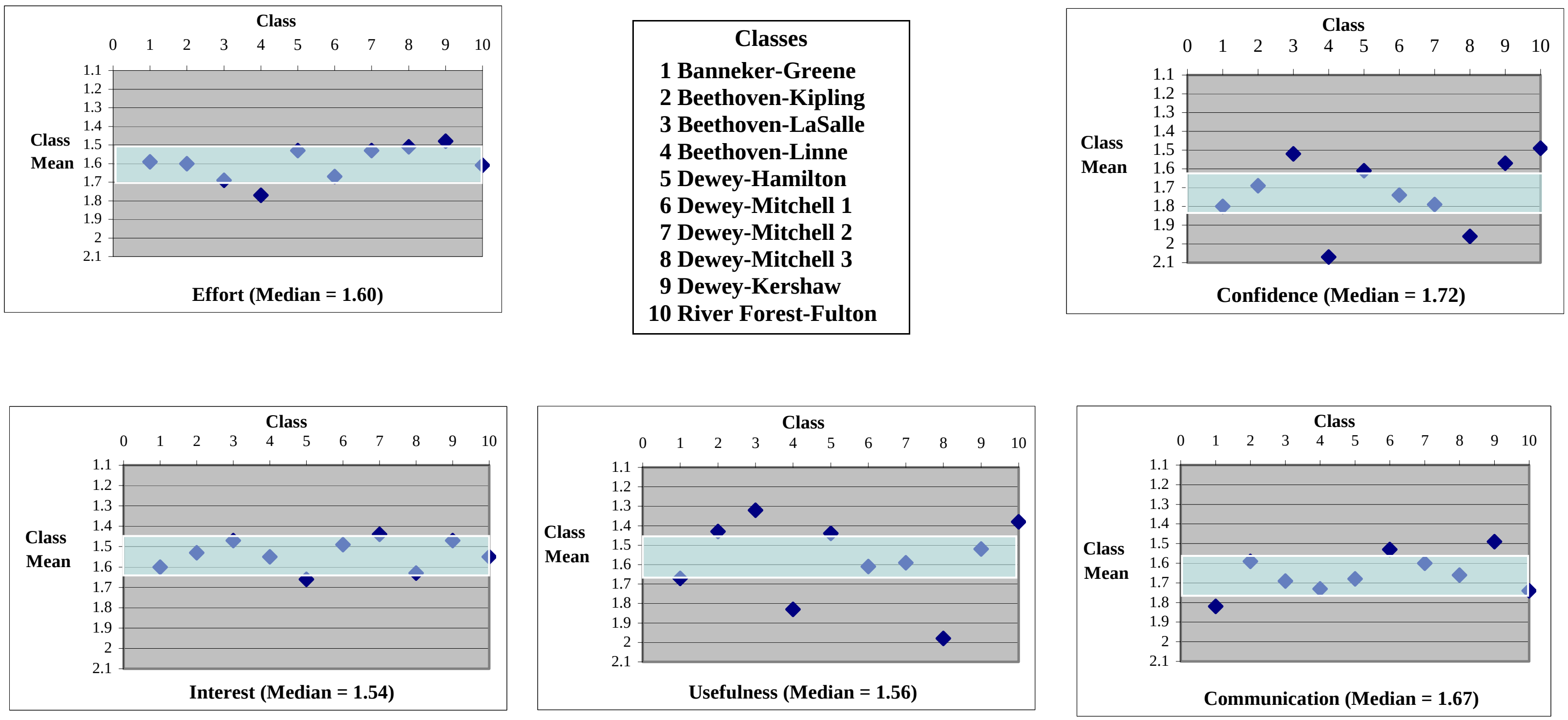


Figure 5. Plots showing class means on student judgments about mathematics, Grade 5, District 1. (Shaded areas show class medians ± 0.1.)

In the second component of the *Student Attitude Inventory*, students responded to 16 items related to general perceptions about mathematics (see Table C5 in Appendix C). Several items were reverse scored due to wording of question. In general, little variance was seen in the class means with respect to these items. Students felt very confident that they were able to learn new ideas in mathematics class (from 1.06, Dewey-Mitchell 1, to 1.53, Banneker-Greene 1, on Item 3). Students thought it was acceptable to solve mathematics problems differently than their classmates (from 1.06, Beethoven-LaSalle 1, to 1.54, Beethoven-Linne 1, on Item 16). However, students were less confident (from 1.18, Dewey-Kershaw 1, to 1.78, Dewey-Mitchell 1, on Item 4) that they could discover ways of solving problems that their teachers or their peers had not previously considered.

Students were very confident that anyone who worked hard enough in mathematics class could be good at mathematics (from 1.00, Banneker-Greene 1 and Beethoven-Kipling 1, to 1.30, River Forest-Fulton 1, on Item 11). Similarly, students disagreed that some students were naturally better, or worse, at mathematics than other students regardless of effort (from 2.63, Beethoven-LaSalle 1, to 3.53, Banneker-Greene 1, on Item 37).

Students felt that knowing how to solve a problem was as important as determining the answer (from 1.25, Dewey-Kershaw 1, to 1.70, Dewey-Hamilton 1, on Item 53), although they felt that answering questions correctly in mathematics class required providing only numbers (from 1.14, Dewey-Kershaw 1, to 2.33, Beethoven-Linne 1, on Item 38). Students tended to think that getting correct answers in mathematics class was at least as important as understanding why the answer was correct (from 1.63, Beethoven-LaSalle 1, to 2.83, Dewey-Mitchell 3, on Item 27), although students felt that getting correct answers was more important than understanding a mathematics problem or the process of finding an answer (from 1.25, Beethoven-LaSalle 1, to 2.92, Beethoven-Linne 1, on Item 49). Students tended to disagree that mathematics was mostly learned by memorizing facts and rules (from 2.24, River Forest-Fulton 1, to 2.92, Beethoven-Linne 1, on Item 55). They also disagreed that they would get correct answers to their teachers' questions if they memorized rules or facts (from 2.83 River Forest-Fulton 1, to 3.35, Beethoven-Kipling 1, on Item 44). Students disagreed that they did not know how to solve mathematics problems if they found they had to use calculators (from 2.44, Dewey-Mitchell 1, to 3.27 Beethoven-Kipling 1, on Item 45) and that calculators always generated correct answers (from 2.31, River Forest-Fulton 1, to 3.44, Dewey-Mitchell 3, on Item 6).

Students felt that new mathematics topics were related to ones they had already studied (from 2.03, Beethoven-LaSalle 1, to 3.18 Beethoven-Linne 1, on Item 39). Students felt that mathematics was related to other school subjects (from 1.35, Beethoven-Kipling 1, to 2.33, Dewey-Mitchell 3, on Item 20), although they thought that mathematics was harder to understand than other school subjects (from 1.82, Banneker-Greene 1, to 2.68, Dewey-Kershaw 1, on Item 28).

The third component involved students judging whether success or failure in mathematics could be attributed to teachers, ability, effort, or luck. The class means for these judgments are shown in Table 5. Each item was judged on a scale of 1–4 (1 = very true; 2 = true; 3 = not true; 4 = not true at all). All classes attributed success in mathematics to a combination of effort and ability, and failure to lack of effort.

Table 5

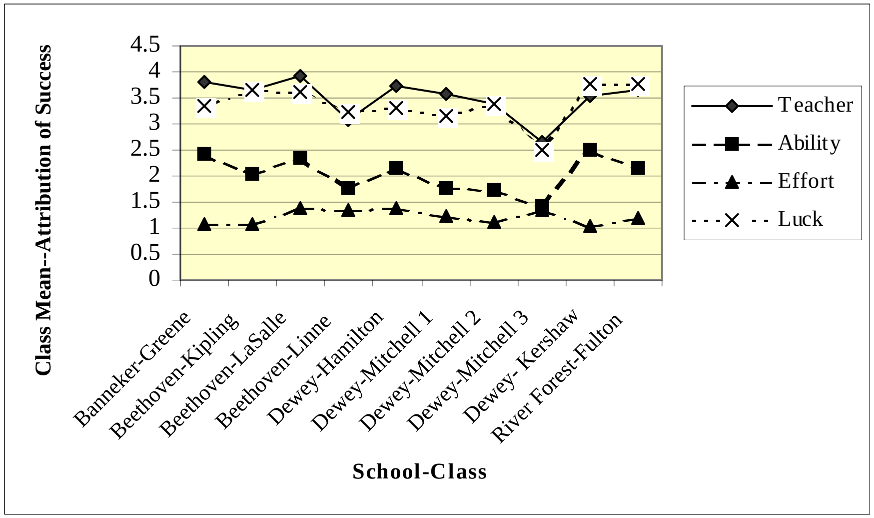
Class Means on Student Attribution of Success or Failure in Mathematics, Grade 5, District 1

School-Class (*N*)	**Success**							
	Teacher		**Ability**		**Effort**		**Luck**	
	(*N*)	**Mean**	**(*N*)**	**Mean**	**(*N*)**	**Mean**	**(*N*)**	**Mean**
—MiC—								
Banneker-Greene 1 (22)	17	3.82	17	2.41	17	1.06	17	3.35
Beethoven-Kipling 1 (26)	23	3.65	23	2.04	23	1.09	23	3.65
Beethoven-LaSalle 1 (33)	32	3.91	32	2.34	32	1.38	32	3.63
Beethoven-Linne 1 (13)	13	3.08	13	1.77	12	1.33	12	3.25
Dewey-Hamilton 1 (21)	20	3.75	20	2.15	20	1.40	20	3.30
Dewey-Mitchell 1 (18)	18	3.56	18	1.78	18	1.22	18	3.17
Dewey-Mitchell 2 (19)	18	3.39	18	1.72	17	1.12	18	3.39
Dewey-Mitchell 3 (18)	18	2.67	18	1.44	18	1.33	18	2.50
—Conventional—								
Dewey-Kershaw 1 (24)	22	3.55	22	2.50	22	1.05	22	3.77
River Forest-Fulton 1 (31)	28	3.64	29	2.17	28	1.18	29	3.76

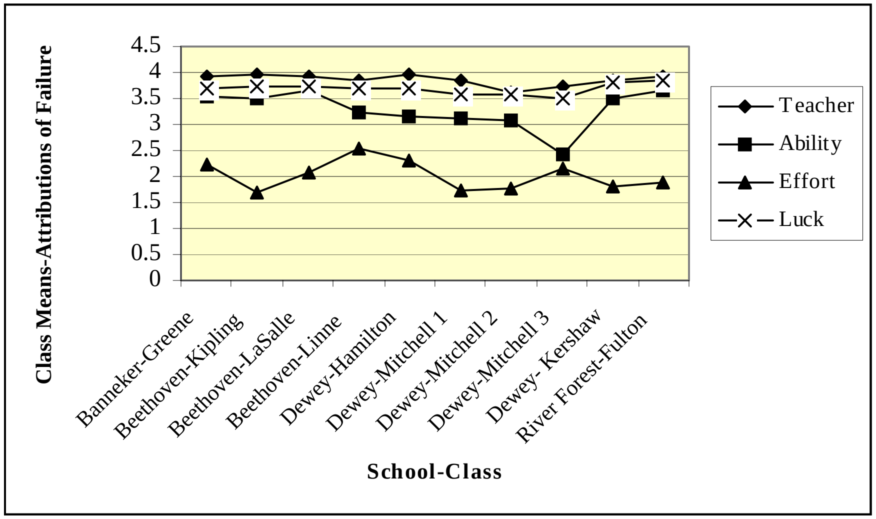
School-Class (*N*)	**Failure**							
	Teacher		**Ability**		**Effort**		**Luck**	
	(*N*)	**Mean**	**(*N*)**	**Mean**	**(*N*)**	**Mean**	**(*N*)**	**Mean**
—MiC—								
Banneker-Greene 1 (22)	17	3.94	17	3.53	17	2.24	17	3.71
Beethoven-Kipling 1 (26)	23	3.96	23	3.50	23	1.70	23	3.74
Beethoven-LaSalle 1 (33)	32	3.94	31	3.65	30	2.07	31	3.74
Beethoven-Linne 1 (13)	12	3.83	12	3.25	13	2.54	13	3.69
Dewey-Hamilton 1 (21)	20	3.95	20	3.15	19	2.32	20	3.70
Dewey-Mitchell 1 (18)	18	3.83	18	3.11	18	1.72	18	3.56
Dewey-Mitchell 2 (19)	18	3.61	18	3.06	18	1.78	17	3.59
Dewey-Mitchell 3 (18)	18	3.72	18	2.44	18	2.17	18	3.50
—Conventional—								
Dewey-Kershaw 1 (24)	21	3.86	22	3.50	20	1.80	20	3.80
River Forest-Fulton 1 (31)	29	3.93	30	3.67	29	1.90	29	3.86

(For more information, see Appendix C6 in Appendix C.)

Again, the two low classes (Beethoven-Linne and Dewey-Mitchell 3) were more inclined to attribute success to teachers (see Figure 6a), and Dewey-Mitchell 3 was more inclined to attribute failure to ability (see Figure 6b).



(a)



(b)

Figure 6. Line graphs showing class means of student attribution of (a) success and (b) failure in mathematics, Grade 5, District 1.

In the fourth component of the *Student Attitude Inventory*, students listed things they associated with the word "mathematics." Although classes varied, students in all classes most frequently listed words associated with number, including operations with numbers (see Table 6).

Table 6

Words Students Associated With "Mathematics," Grade 5, District 1

School-Class *(N)*	Number of Responses[1] *(N)*	Number[2] *(%)* [3]	Interest *(%)*	Geometry *(%)*	Negative Emotive Responses[4] *(%)*	Thinking *(%)*	Problem Solving *(%)*	Algebra *(%)*	Occupations *(%)*	Miscellaneous *(%)*
—MiC—										
Banneker-Greene 1 (16)	50	66	8	4	6	2	2	0	0	8
Beethoven-Kipling 1 (24)	99	74	6	11	0	2	1	2	0	2
Beethoven-LaSalle 1 (31)	161	75	3	11	1	2	4	0	0	4
Beethoven-Linne 1 (12)	41	61	10	7	5	7	0	0	0	10
Dewey-Hamilton 1 (20)	78	82	4	3	0	0	3	3	1	3
Dewey-Mitchell 1 (19)	75	71	4	5	1	4	0	1	0	12
Dewey-Mitchell 2 (17)	74	76	3	9	0	1	0	1	4	4
Dewey-Mitchell 3 (15)	51	90	4	2	0	2	0	0	0	0
—Conventional—										
Dewey-Kershaw 1 (19)	69	72	9	1	1	3	4	0	0	3
River Forest-Fulton 1 (30)	153	77	5	3	0	1	2	4	1	3

[1] Students were asked to list the words they "think of when they hear the word mathematics."

[2] Responses included operations with numbers.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included "boring," "stupid," and statements of displeasure.

In the fifth component of the *Student Attitude Inventory,* students listed jobs other than teaching that required the use of mathematics. Although classes varied, students in all classes most frequently listed service-related occupations, including retail sales, business, and food service, and very frequently mentioned finance-related occupations, such as accounting, banking, and insurance. Dewey-Mitchell 3 responses than other fifth-grade classes in this district (see Table 7).

Table 7
Nonteaching Jobs that Students Identified as Requiring Mathematics, Grade 5, District 1

School-Class *(N)*	**Number of Responses[1] *(N)***	**Services[2] *(%)*[3]**	**Financial[4] *(%)***	**Professional[5] *(%)***	**Science *(%)***	**Trades *(%)***	**Creative Arts *(%)***	**Government *(%)***	**Sports *(%)***	**Unreportable[6] *(%)***
—MiC—										
Banneker-Greene 1 (16)	33	42	9	9	3	12	3	3	6	9
Beethoven-Kipling 1 (24)	65	29	17	8	11	6	9	5	2	12
Beethoven-LaSalle 1 (31)	107	30	13	9	9	2	7	5	12	7
Beethoven-Linne 1 (12)	27	52	11	4	4	4	0	0	0	26
Dewey-Hamilton 1 (21)	48	44	10	8	6	10	10	2	4	4
Dewey-Mitchell 1 (16)	44	45	11	11	2	5	5	0	0	18
Dewey-Mitchell 2 (17)	41	22	15	12	2	12	7	2	0	22
Dewey-Mitchell 3 (15)	40	55	30	0	0	3	0	5	0	8
—Conventional—										
Dewey-Kershaw 1 (19)	56	41	18	9	7	7	0	4	2	9
River Forest-Fulton 1 (30)	101	42	11	12	11	2	1	5	3	4

[1] Students asked to list the jobs other than teaching that require mathematics.

[2] Responses included occupations in retail sales, business, and food service.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included occupations in accounting, banking, and insurance.

[5] Responses included occupations in medical fields, engineering, and law.

[6] Responses included teaching, thinking, and operations with numbers.

In the sixth component of the *Student Attitude Inventory*, students listed ways they used mathematics outside of class. Students in all classes most frequently listed monetary-related ways, such as banking and shopping, and calculation. Students also often listed measurement- and leisure-related uses (see Table 8).

Table 8

Ways Students Used Mathematics Outside of Class, Grade 5, District 1

School-Class *(N)*	**Number of Responses[1] *(N)***	**Monetary[2] *(%)*[3]**	**Calculation *(%)***	**Leisure *(%)***	**Measurement *(%)***	**Problem Solving *(%)***	**Unreportable[4] *(%)***
—MiC—							
Banneker-Greene 1 (16)	13	31	38	8	8	0	8
Beethoven-Kipling 1 (24)	32	31	22	19	19	0	9
Beethoven-LaSalle 1 (31)	50	20	22	18	18	0	8
Beethoven-Linne 1 (12)	23	13	22	4	22	9	13
Dewey-Hamilton 1 (21)	23	17	22	9	13	13	17
Dewey-Mitchell 1 (16)	24	17	13	17	8	8	21
Dewey-Mitchell 2 (17)	29	48	7	10	3	10	10
Dewey-Mitchell 3 (15)	25	32	20	4	16	8	20
—Conventional—							
Dewey-Kershaw 1 (19)	21	57	19	0	5	0	10
River Forest-Fulton 1 (30)	63	32	10	16	16	3	16

[1] Students were asked to describe how they would use mathematics outside of class.

[2] Responses included banking and shopping.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included occupations and nonmathematics school subjects.

Finally, all students in the study responded to items on the *Student Questionnaire*, five components of which are summarized in Table 9. The first component involved student judgment about the school subject they enjoyed the most. Students most frequently reported that they enjoyed mathematics, science, and physical education (PE) classes.

Table 9
Student Preference Ranking of Classes, Grade 5, District 1

School-Class (N)	**Subject (%)**									
	SocStudies	**Science**	**Math**	**Reading**	**Writing**	**Art**	**Music**	**PE**	**Band**	**Other**
—MiC—										
Banneker-Greene 1 (22)	6	41	0	0	0	18	0	18	0	18
Beethoven-Kipling 1 (26)	8	24	28	0	4	8	0	24	4	0
Beethoven-LaSalle 1 (33)	3	22	13	9	3	9	3	22	13	3
Beethoven-Linne 1 (13)	0	8	54	8	0	8	0	8	15	0
Dewey-Hamilton 1 (21)	10	30	25	5	0	0	5	10	10	5
Dewey-Mitchell 1 (18)	0	17	44	11	0	17	6	0	0	6
Dewey-Mitchell 2 (19)	0	11	28	0	0	22	0	17	17	6
Dewey-Mitchell 3 (18)	0	11	28	0	0	17	6	33	6	0
—Conventional—										
Dewey-Kershaw 1 (24)	10	24	29	0	5	0	0	19	10	5
River Forest-Fulton 1 (31)	0	33	13	3	7	7	0	13	20	3

The second component involved student judgments about their frequency of talking about mathematics with classmates, friends, and other acquaintances on three questions. Response frequency (never, sometimes, often, very often) for each class was strikingly different across questions and across classes (see Table 10).

Table 10

Student Judgment About Frequency of Communication About Mathematics, Grade 5, District 1

School-Class *(N)*	**Mathematical Ideas and Problem Strategies**					**Homework Problems**					**Ways Mathematics is Used Outside of School**				
	(*N*)	**Never**	**Some-times**	**Often**	**Very Often**	**(*N*)**	**Never**	**Some-times**	**Often**	**Very Often**	**(*N*)**	**Never**	**Some-times**	**Often**	**Very Often**
— MiC —															
Banneker-Greene 1 (22)	17	18	59	24	0	17	6	41	35	18	17	47	35	6	12
Beethoven-Kipling 1 (26)	24	25	58	8	8	24	0	21	54	25	24	0	50	50	0
Beethoven-LaSalle 1 (33)	31	6	74	16	3	31	16	29	35	19	31	16	58	26	0
Beethoven-Linne 1 (13)	12	42	33	0	25	12	25	33	33	8	12	67	0	0	33
Dewey-Hamilton 1 (21)	20	10	55	30	5	19	5	47	42	5	19	11	42	16	32
Dewey-Mitchell 1 (18)	17	0	53	29	18	18	0	22	39	39	18	11	42	16	32
Dewey-Mitchell 2 (19)	18	6	78	11	6	18	0	39	44	17	18	17	56	6	22
Dewey-Mitchell 3 (18)	18	0	89	11	0	18	0	11	61	28	18	17	28	6	50
—Conventional —															
Dewey-Kershaw (24)	22	5	45	23	27	20	5	30	30	35	19	26	32	16	26
River Forest-Fulton (31)	30	10	50	33	7	30	10	27	43	20	30	20	50	20	10

Note: Response rates designate class mean percents.

The third component involving student judgments about the things they liked most about mathematics class (see Table 11). Most students reported that they liked working with numbers and working with others more than they reported other categories, although the classes. The preferred number category is further broken down in Table 12.

Table 11
What Students Liked Most About Mathematics Class, Grade 5, District 1

School-Class *(N)*	**Number of Responses[1] *(N)***	**Number *(%)*[2]**	**Problem Solving *(%)***	**Classwork *(%)***	**Working With Others *(%)***	**Miscellaneous[3] *(%)***	**Negative Emotional Response[4] *(%)***	**Positive Emotional Response[5] *(%)***
—MiC—								
Banneker-Greene 1 (22)	37	11	3	11	22	5	0	5
Beethoven-Kipling 1 (26)	46	24	4	2	33	4	0	17
Beethoven-LaSalle 1 (33)	91	33	11	5	13	0	0	7
Beethoven-Linne 1 (13)	28	14	4	11	39	0	0	7
Dewey-Hamilton 1 (21)	62	16	10	5	6	27	0	6
Dewey-Mitchell 1 (18)	51	41	4	2	8	6	0	16
Dewey-Mitchell 2 (19)	45	40	9	4	13	7	0	2
Dewey-Mitchell 3 (18)	53	28	0	2	19	15	2	11
—Conventional—								
Dewey-Kershaw 1 (24)	51	31	12	8	22	0	0	8
River Forest-Fulton 1 (31)	89	20	7	4	31	13	0	6

[1] Students were asked to name three things they liked most about mathematics class.

[2] Percentage does not add to 100 due to number of unique responses.

[3] Responses included "teacher," "computer," and "warm-up activities."

[4] Responses included "hard," "boring," and "restrictive."

[5] Responses included "like it all" and "fun."

Additional patterns were revealed when examining student judgments about number (see Table 12). Most students reported that they liked multiplication and addition, although the classes varied. Dewey-Mitchell's classes indicated stronger preferences for division than addition.

Table 12
What Students Liked Most About Mathematics Class, Grade 5, District 1 (continued)

School-Class *(N)*	**Number of Responses[1] *(N)***	**Addition *(%)***	**Subtraction *(%)***	**Multiplication *(%)***	**Division *(%)***	**Decimals (%)**	**Fractions *(%)***	**Other[2] *(%)***
—MiC—								
Banneker-Greene 1 (22)	4	0	0	25	0	0	50	25
Beethoven-Kipling 1 (26)	11	9	9	45	0	0	0	36
Beethoven-LaSalle 1 (33)	30	27	13	33	20	0	0	7
Beethoven-Linne 1 (13)	4	25	0	50	0	0	25	0
Dewey-Hamilton 1 (21)	10	10	0	60	10	0	20	0
Dewey-Mitchell 1 (18)	21	19	5	33	24	5	5	10
Dewey-Mitchell 2 (19)	18	17	11	33	28	0	6	6
Dewey-Mitchell 3 (18)	15	20	7	27	27	0	20	0
—Conventional—								
Dewey-Kershaw 1 (24)	16	25	6	19	6	13	19	13
River Forest-Fulton 1 (31)	18	28	0	33	6	6	22	6

[1] Students were asked to name three things they liked the most about mathematics class.

[2] Responses included counting, average, estimation, least common denominator, least common multiple, money, rounding and time.

The fourth component, reported in Table 13, involved student judgments about the things they disliked most about mathematics class. Most classes reported that they disliked homework and working with numbers more than anything else, although the classes varied. The number category is broken down in Table 14.

Table 13

What Students Disliked Most about Mathematics Class, Grade 5, District 1

School-Class *(N)*	**Number of Responses[1] *(N)***	**Number *(%)*[2]**	**Tests *(%)***	**Homework *(%)***	**Classwork *(%)***	**Problem Solving *(%)***	**Miscellaneous[3] *(%)***	**Negative Emotional Response[4] *(%)***	**Positive Emotional Response[5] *(%)***
—MiC—									
Banneker-Greene 1 (22)	39	10	0	0	15	10	0	8	15
Beethoven-Kipling 1 (26)	46	8	24	22	0	0	0	0	0
Beethoven-LaSalle 1 (33)	76	34	11	20	0	0	0	0	0
Beethoven-Linne 1 (13)	30	0	40	23	7	0	0	0	0
Dewey-Hamilton 1 (21)	58	29	0	0	0	10	19	0	0
Dewey-Mitchell 1 (18)	40	43	0	0	0	0	0	0	10
Dewey-Mitchell 2 (19)	28	4	0	21	14	0	0	0	18
Dewey-Mitchell 3 (18)	27	22	0	19	0	0	30	0	0
—Conventional—									
Dewey-Kershaw 1 (24)	62	10	15	16	0	15	0	0	0
River Forest-Fulton 1 (31)	90	24	19	19	10	0	0	0	0

[1] Students were asked to name three things they disliked the most about mathematics class.

[2] Percentage does not add to 100 due to number of unique responses.

[3] Responses included "teacher," "computer," and "warm-up activities."

[4] Responses included "hard," "boring," and "restrictive."

[5] Responses included "like it all" and "fun."

The number of responses for number-related categories was too small to make inferences about student dislikes for these categories (see Table 14).

Table 14

What Students Disliked Most about Mathematics Class, Grade 5, District 1 (continued)

School-Class *(N)*	**Number of Responses[1] *(N)***	**Addition *(%)***	**Subtraction *(%)***	**Multiplication *(%)***	**Division *(%)***	**Decimals *(%)***	**Fractions *(%)***	**Other[2] *(%)***
—MiC—								
Banneker-Greene 1 (22)	4	0	25	25	50	0	0	0
Beethoven-Kipling 1 (26)	8	0	0	25	63	0	13	0
Beethoven-LaSalle 1 (33)	6	4	23	27	23	0	12	12
Beethoven-Linne 1 (13)	0	0	0	0	0	0	0	0
Dewey-Hamilton 1 (21)	17	6	4	2	5	0	3	2
Dewey-Mitchell 1 (18)	17	24	18	6	35	0	6	29
Dewey-Mitchell 2 (19)	1	0	0	0	100	0	0	0
Dewey-Mitchell 3 (18)	6	33	17	17	33	0	0	0
—Conventional—								
Dewey-Kershaw 1 (24)	8	0	13	0	0	25	13	50
River Forest-Fulton 1 (31)	22	0	23	23	36	0	0	18

[1] Students were asked to name three things they disliked the most about mathematics class.

[2] Responses included counting, average, estimation, least common denominator, least common multiple, money, rounding and time.

The fifth component involved student judgments about the ways mathematics helped them in other subjects (see Table 15). Most students in most classes reported that mathematics was used in specific applications such as measurement and problem solving. The classes varied in responses.

Table 15

Student Perception of the Usefulness of Mathematics in Other Classes, Grade 5, District 1

School-Class *(N)*	**Number of Responses[1] *(N)***	**General Applications[2] *(%)***	**Specific Applications[3] *(%)***	**Organization of Information *(%)***	**No Help *(%)***	**Miscellaneous *(%)***	**Inappropriate Responses[4] *(%)***
—MiC—							
Banneker-Greene 1 (22)	24	13	4	0	25	0	58
Beethoven-Kipling 1 (26)	54	17	41	4	2	4	33
Beethoven-LaSalle 1 (33)	60	15	43	5	3	3	30
Beethoven-Linne 1 (13)	26	35	42	15	0	0	8
Dewey-Hamilton 1 (21)	26	15	15	0	8	4	58
Dewey-Mitchell 1 (18)	34	0	59	12	6	0	24
Dewey-Mitchell 2 (19)	25	0	56	12	8	0	24
Dewey-Mitchell 3 (18)	23	9	48	0	4	9	30
—Conventional—							
Dewey-Kershaw 1 (24)	30	17	47	7	10	7	13
River Forest-Fulton 1 (31)	58	16	31	0	10	5	38

[1] Students were asked to identify how their knowledge of mathematics and the way they learned mathematics helped them in other classes.

[2] Responses included "estimating" and "calculating."

[3] Responses included "measurement" and "problem solving."

[4] Responses included "not good at math", "need to know something", "it's easier and more fun", "not good ", etc.

District 2

In District 2, 9 fifth-grade classes participated in the study. In seven of the classrooms, MiC was used; in the other two, conventional texts were used. A summary of the variations in fixed characteristics is presented in Table 16.

Table 16
Fixed Characteristics, Grade 5, District 2

School-Class *(N)*	Sex *(%)*		Average Age *(years)*	Language Preference *(%)* * *(self-identified)*		Ethnicity *(%)***				
	Female	Male		English Preference	Non-Response	African American	Hispanic	White	Multi/Other	Non-Response
—MiC—										
Armstrong-Murphy 1 (34)	56	44	10.70	94	6	15	32	35	9	9
Armstrong-Nash 1 (29)	52	48	10.66	72	21	10	17	17	34	21
Ogden-Fiske 1 (30)	33	67	10.62	90	0	0	73	10	17	0
Ogden-Fiske 2 (24)	46	54	10.39	63	4	0	58	8	29	4
Ogden-Piccolo 1 (27)	59	41	10.48	89	0	0	67	22	11	0
Ogden-Piccolo 2 (23)	57	43	10.40	74	0	4	52	17	26	0
Ogden-Piccolo 3 (25)	40	60	10.53	92	0	4	52	24	20	0
—Conventional—										
VonSteuben-Gant 1 (38)	37	63	10.33	79	5	3	18	24	21	34
VonSteuben-Gant 2 (37)	46	54	10.52	95	0	0	30	32	22	16

* Percent does not add to 100% when students identified a language preference other than English.
** Percent on ethnicity was rounded off and does not always total 100. Multi/Other comprises Asian, Haitian, Native American, Multiracial and Other
(For detailed information, see Table D1 in Appendix D.)

In District 2, there was some variation in the class profiles. The number of students in a class varied from 23 to 38. With two exceptions (Ogden-Fiske 1, 33%; VonSteuben-Gant 1, 37%; and Ogden-Piccolo 3, 40%) the proportion of females in a class varied from 33% to 59%. The average age was similar across classes, and English was the primary language for 63–95% of the students. The ethnicity in these classes, however, varied considerably, with the majority of students being of Hispanic background (0–15% African American, 17–73% Hispanic, 8–35% White, 9–34% Multi/Other).

In District 2, two measures of prior mathematics performance were used as indicators of prior student performance. The first performance indicator was the summary of percentile scores on the applications subtest for the students in the study classes on the standardized test administered by the district to all of its students, the *Stanford Mathematics Achievement Test* (Harcourt Brace Educational Measurement, 1997), which were forwarded to project staff. Summary means and standard deviations of the percentiles for each class on application subtests are reported in Table 17, and box plots are shown in Figure 7. Clearly, the classes differed in average percentiles on this test. Mean percentiles on the application subtest from 47.08 to 75.52. The box plots illustrate the large within-class variation on the subtest in this district, particularly for the classes in Ogden Elementary School.

Table 17
Standardized Test Scores, Spring 1997, Grade 5, District 2

School-Class *(N)*	**SAT Applications: National Percentiles**					
	(*N*)	**Mean**	**St Dev**	**Minimum**	**Median**	**Maximum**
—MiC—						
Armstrong-Murphy 1 (34)	25	68.24	23.32	10	70	99
Armstrong-Nash 1 (29)	23	63.43	23.13	19	63	99
Ogden-Fiske 1 (30)	25	51.36	28.35	8	43	93
Ogden-Fiske 2 (24)	13	47.08	24.23	8	50	86
Ogden-Piccolo 1 (27)	22	53.95	31.85	3	58	99
Ogden-Piccolo 2 (23)	20	59.05	26.01	12	63	93
Ogden-Piccolo 3 (25)	23	57.78	29.45	1	53	99
—Conventional—						
VonSteuben-Gant 1 (28)	23	75.52	19.73	35	82	99
VonSteuben-Gant 2 (27)	28	75.46	20.35	24	82	99

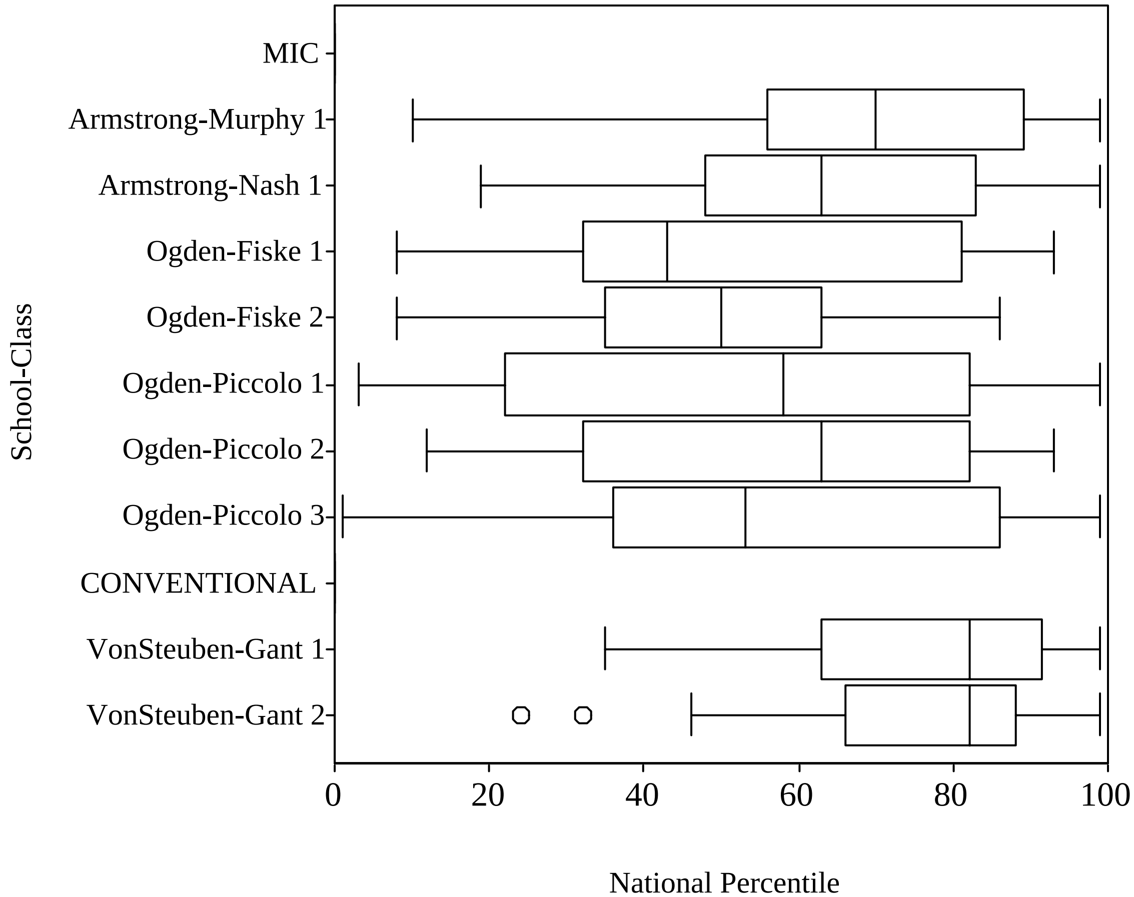


Figure 7. Box plots of class distributions on the *Stanford Achievement Test* (SAT) application subtest Grade 5, District 2.

The second performance indicator used in the study is the *Collis-Romberg Mathematical Problem-Solving Profiles* (Collis & Romberg, 1992). This test was administered to all students participating in the study. The information on this test includes scores related to four levels of reasoning (unistructural, multistructural, relational, and extended abstract), and responses for each level are scored from 0–5. Class means on all four levels of reasoning are given in Table 18. For all but one class, the means on unistructural level of reasoning were above 2.50, indicating that students were operating at this level on many items. Only Ogden-Fiske 1 had a class mean below 2.50 (2.43). Even at this level, however, there was considerable variability in class means. The class means on the other scales indicate that, except for the two classes at Armstrong Elementary School and one class at Von Steuben (Gant 1), very few students were beginning to reason at a multistructural level.

Table 18

Class means on the Collis-Romberg Mathematical Problem-Solving Profiles, Grade 5, District 2

School-Class *(N)*	**Level of Reasoning**				
	(*N*)	**Uni-structural**	**Multi-structural**	**Relational**	**Extended Abstract**
		—MiC—			
Armstrong-Murphy 1 (34)	32	3.81	1.25	0.34	0.06
Armstrong-Nash 1 (29)	23	3.70	1.26	0.17	0.00
Ogden-Fiske 1 (30)	30	2.43	0.93	0.10	0.00
Ogden-Fiske 2 (24)	21	2.57	0.86	0.10	0.00
Ogden-Piccolo 1 (27)	26	2.69	1.00	0.12	0.04
Ogden-Piccolo 2 (23)	22	2.64	0.95	0.05	0.00
Ogden-Piccolo 3 (25)	25	3.08	1.20	0.20	0.04
		—Conventional—			
VonSteuben-Gant 1 (38)	24	2.88	1.21	0.29	0.00
VonSteuben-Gant 2 (37)	31	2.65	1.00	0.39	0.00

(For detailed information, see Table D2 in Appendix D.)

Because the standardized test scores showed a similar pattern to those on the unistructural scale of the Collis-Romberg test (see the scatter plot for means on both subscales in on the two measures in Figure 8), a correlation coefficient between the class means of the two measures was calculated (r =.77) From this information it is apparent that there were five average performing classes, and four high average classes. The variations, however, seem to be attributable to the different schools.

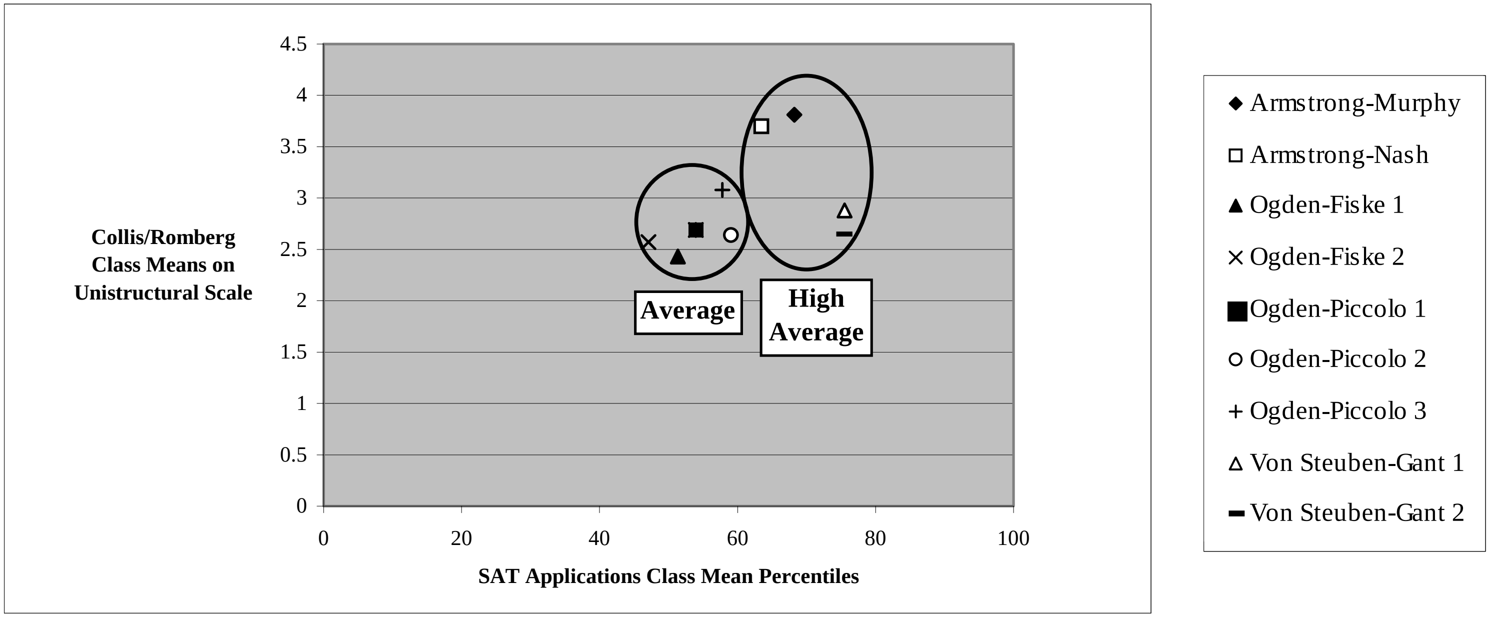


Figure 8. Scatter plot for class mean percentiles on the SAT test and the class means on the unistructural scale of the *Collis-Romberg Mathematical Problem-Solving Profiles*, Grade 5, District 2.

Because the classes in District 2 varied on the two preceding achievement measures used in this study, either comparisons of student performances on outcome measures should be made only between classes in the same level of preceding achievement, or adjustments in outcome test scores should be made via covariance. In fact, because of this strong relationship between the two premeasures, only the standardized test scores should be considered as a potential covariate in order not to lose a degree of freedom in any statistical test about differences.

All students in the study responded to the items in the *Student Attitude Inventory;* six components are summarized here.

First, the class means for student judgments on items related to their effort, confidence, interest, usefulness, and ability to communicate mathematically are shown in Table 19 and in Figure 9. Each item was judged (reverse-coded when appropriate) on a scale of 1–4 (1 = very true; 2 = true; 3 = not true; 4 = not true at all). Overall, the students in these classes judged the statements as true or very true, and there was little variation either across classes.

Table 19
Class Means on Student Judgments About Mathematics (Subscales on the Student Attitude Inventory), Grade 5, District 2

School-Class *(N)*	**Effort** *in mathematics*		**Confidence** *in ability to do mathematics*		**Interest** *in mathematics*		**Usefulness** *of mathematics*		**Ability to Communicate** *about mathematics*	
	(N)	Mean	***(N)***	Mean	***(N)***	Mean	***(N)***	Mean	***(N)***	Mean
—MiC—										
Armstrong-Murphy (34)	25	1.69	27	1.99	24	1.92	26	1.77	28	1.86
Armstrong-Nash (29)	20	1.62	19	1.73	19	1.92	19	1.74	18	1.86
Ogden-Fiske 1 (30)	18	1.88	18	2.04	18	1.94	18	1.81	19	1.85
Ogden-Fiske 2 (24)	17	1.65	18	1.78	17	1.67	16	1.48	17	1.84
Ogden-Piccolo 1 (27)	21	1.70	23	1.80	21	1.49	21	1.58	19	1.77
Ogden-Piccolo 2 (23)	20	1.71	20	2.05	19	1.41	19	1.57	20	1.71
Ogden-Piccolo 3 (25)	25	1.75	24	1.94	24	1.80	23	1.62	25	1.84
—Conventional—										
Von Steuben-Gant 1 (38)	16	1.68	15	1.84	15	1.69	15	1.51	16	1.82
Von Steuben-Gant 2 (37)	24	1.97	23	2.00	25	1.87	23	1.71	23	1.77

(For detailed information, see Table D3 in Appendix D.)

The pattern of responses is hard to interpret. Only for two classes (Ogden-Fiske 1 and Von Steuben-Gant 2) were the class means lower with respect to effort and only for one class (Ogden-Fiske 1) were the class means lower with respect to confidence, interest, and usefulness than those of the other classes (see Figure 9).

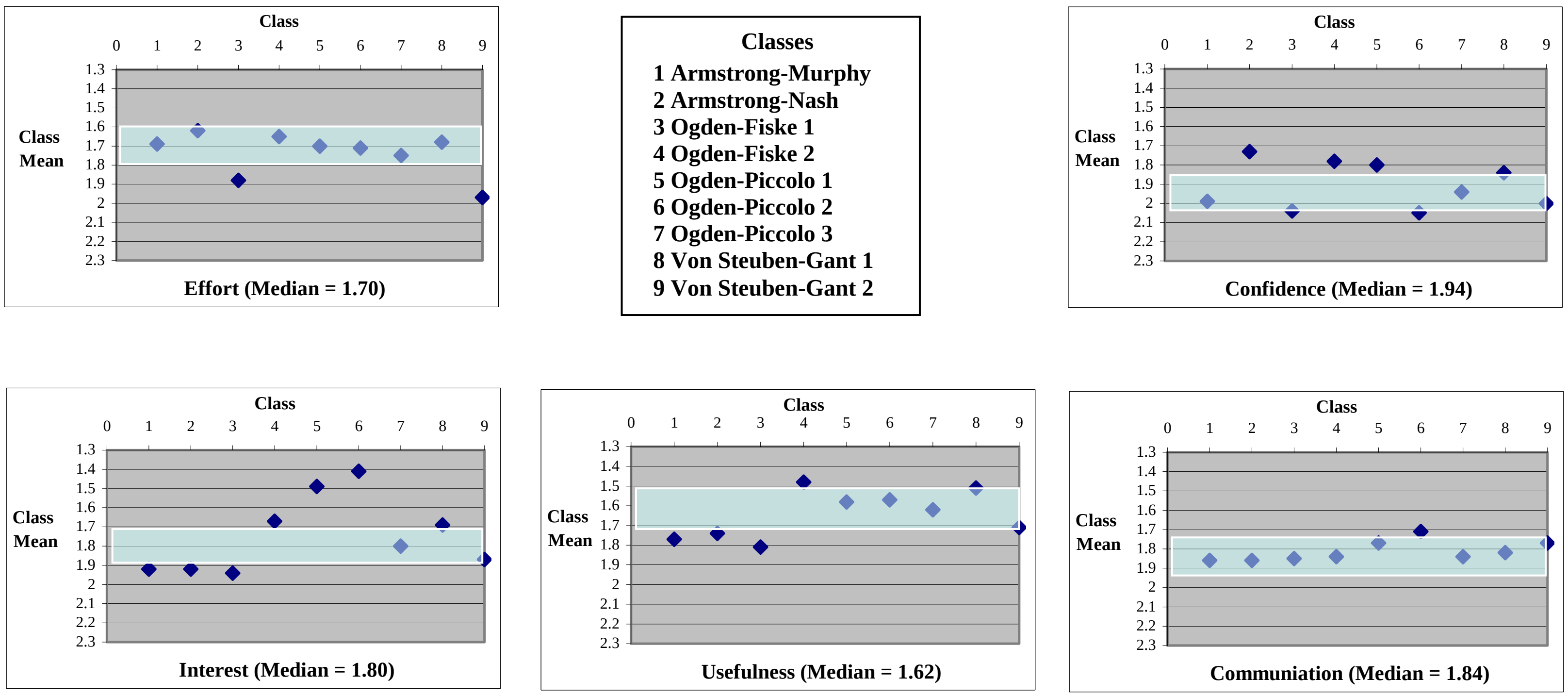


Figure 9. Plots showing class means on student judgments about mathematics, Grade 5, District 2. (Shaded areas show class medians $\pm$ 0.1.)

In the second component of the *Student Attitude Inventory*,students responded to 16 items related to general perceptions about mathematics (see Table D4 in Appendix D). Several items were reverse-scored due to wording of question. Generally, little variance was seen in the District 2 class means with respect to items related to general perceptions about mathematics. Students felt very confident that they were able to learn new ideas in mathematics class (from 1.10, Ogden-Fiske 2, to 1.60, Ogden-Piccolo 3, on Item 3). Students thought it was acceptable to solve mathematics problems differently than their classmates (from 1.10, Armstrong-Nash 1, to 1.79, Ogden-Piccolo 3, on Item 16). However, students were less confident (from 1.42, Armstrong-Nash 1, to 1.88, Von Steuben-Gant 1, on Item 4) that they could discover ways of solving problems that their teachers or their peers had not previously considered.

Students were very confident that anyone who worked hard enough in mathematics class could be good at mathematics (from 1.00, Armstrong-Nash 1 and Ogden-Piccolo 2, to 1.38, Ogden-Fiske 1, on Item 11). Similarly, students disagreed that some students were naturally better, or worse, at mathematics than other students regardless of effort (from 2.13, Von Steuben-Gant 2, to 3.23, Ogden-Piccolo 2, on Item 37).

Students felt that knowing how to solve a problem was as important as determining the answer (from 1.28, Ogden-Piccolo 3, to 1.70, Ogden-Piccolo 2, on Item 53), although they felt that answering questions correctly in mathematics class required providing only numbers (from 1.42, Von Steuben-Gant 2, to 2.11, Ogden-Fiske 2, on Item 38). Students tended to think that getting correct answers in mathematics class was at least as important as understanding why the answer was correct (from 2.00, Von Steuben-Gant 2, to 2.62, Ogden-Piccolo 1, on Item 27), although students felt that getting correct answers was more important than understanding a mathematics problem or the process of finding an answer (from 1.56, Von Steuben-Gant 2, to 2.83, Ogden-Piccolo 1, on Item 49). Students strongly disagreed that mathematics was mostly learned by memorizing facts and rules (from 2.68, Von Steuben-Gant 2, to 3.50, Ogden-Fiske 2, on Item 55). They also strongly disagreed that they would get correct answers to their teachers' questions if they memorized rules or facts (from 3.00 Ogden-Piccolo 2, to 3.65, Armstrong-Nash 1, on Item 44). Students disagreed that they did not know how to solve mathematics problems if they found they had to use calculators (from 2.68, Armstrong-Nash 1, to 3.13 Ogden-Piccolo 1, on Item 45) and that calculators always generated correct answers (from 2.41, Von Steuben-Gant 1, to 3.18, Ogden-Piccolo 2, on Item 6).

Students felt that new mathematics topics were related to ones they had already studied (from 2.17, Von Steuben-Gant 2, to 3.05 Ogden-Fiske 2, on Item 39). Students felt that mathematics was related to other school subjects (from 1.42, Armstrong-Nash 1, to 2.35, Ogden-Piccolo 1, on Item 20), although they thought that mathematics was harder to understand than other school subjects (from 1.88, Ogden-Piccolo 1, to 2.60, Armstrong-Nash 1, on Item 28).

The third component involved students judging whether success or failure in mathematics could be attributed to teachers, ability, effort, or luck. The class means for these judgments are shown in Table 20. Each item was judged on a scale of 1–4 (1 = very true; 2 = true; 3 = not true; 4 = not true at all). All classes attributed success in mathematics to a combination of effort and ability, and failure to lack of effort.

Table 20
Class Means on Student Attribution of Success or Failure in Mathematics, Grade 5, District 2

School-Class (*N*)	Success							
	Teacher		Ability		Effort		Luck	
	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean
—MiC—								
Armstrong-Murphy 1 (34)	29	3.55	29	2.00	29	1.21	30	3.30
Armstrong-Nash 1 (29)	19	3.63	20	1.80	20	1.50	20	3.50
Ogden-Fiske 1 (30)	26	3.42	26	1.96	23	1.39	25	2.64
Ogden-Fiske 2 (24)	20	3.05	20	1.50	19	1.11	20	3.10
Ogden-Piccolo 1 (27)	26	3.38	26	1.54	24	1.13	26	2.85
Ogden-Piccolo 2 (23)	22	3.32	22	2.14	21	1.19	22	2.64
Ogden-Piccolo 3 (25)	25	3.48	25	1.96	25	1.28	25	3.20
—Conventional—								
VonSteuben-Gant 1 (38)	17	3.71	17	2.12	16	1.25	17	3.59
VonSteuben-Gant 2 (37)	25	3.84	25	2.28	24	1.29	25	3.32

School-Class (*N*)	Failure							
	Teacher		Ability		Effort		Luck	
	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean
—MiC—								
Armstrong-Murphy 1 (34)	29	3.66	29	3.31	29	1.86	29	3.45
Armstrong-Nash 1 (29)	20	3.45	20	2.95	19	1.89	19	3.58
Ogden-Fiske 1 (30)	23	3.22	25	2.56	21	1.62	21	3.10
Ogden-Fiske 2 (24)	20	3.45	20	2.65	18	1.44	19	3.63
Ogden-Piccolo 1 (27)	24	3.79	26	2.54	22	1.82	24	3.50
Ogden-Piccolo 2 (23)	22	3.68	22	2.55	20	1.65	20	3.30
Ogden-Piccolo 3 (25)	25	3.76	25	2.40	24	1.71	25	3.56
—Conventional—								
VonSteuben-Gant 1 (38)	16	3.56	17	3.35	17	2.12	17	3.35
VonSteuben-Gant 2 (37)	24	3.83	24	3.13	25	1.84	24	3.58

(For more detailed information, see Table D5 in Appendix D.)

The similarity of class means of attribution of success is illustrated in Figure 10a and attribution of class means of attribution of failure is illustrated in Figure 10b.

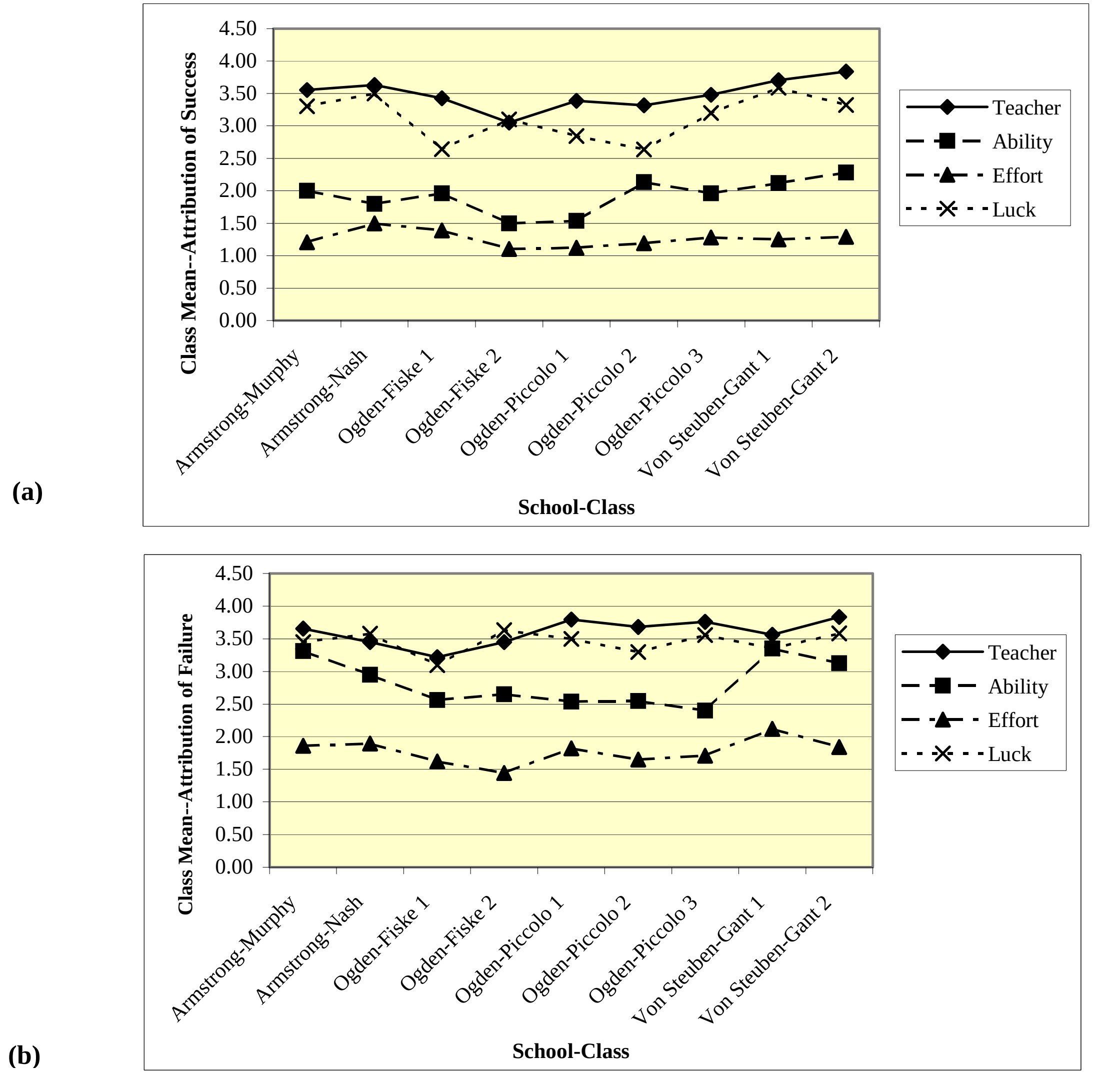


Figure 10. Line graphs showing class means of student attribution of (a) success and (b) failure in mathematics, Grade 5, District 2.

In the fourth component of the *Student Attitude Inventory*, students listed things they associated with the word "mathematics." Although classes varied, students in all classes most frequently listed words associated with number, including operations with numbers. The percent of interest-related responses in four of the five classes from Ogden Elementary School is notable in comparison to other fifth-grade classes in this district (see Table 21).

Table 21
Words Students Associated With "Mathematics," Grade 5, District 2

School-Class *(N)*	**Number of Responses[1] *(N)***	**Number[2] *(%)*[3]**	**Interest *(%)***	**Geometry *(%)***	**Negative Emotive Responses[4] *(%)***	**Thinking *(%)***	**Problem Solving *(%)***	**Algebra *(%)***	**Occupations *(%)***	**Miscellaneous *(%)***
—MiC—										
Armstrong-Murphy 1 (30)	114	75	5	3	4	0	2	0	1	3
Armstrong-Nash 1 (19)	74	77	0	0	5	1	0	0	1	7
Odgen-Fiske 1 (21)	71	42	24	0	14	1	0	1	0	13
Odgen-Fiske 2 (20)	75	69	11	5	4	1	3	0	0	3
Odgen-Piccolo 1 (27)	104	64	19	1	0	2	1	1	0	9
Odgen-Piccolo 2 (22)	83	59	13	4	1	5	4	0	0	8
Odgen-Piccolo 3 (21)	90	66	4	1	9	7	3	2	0	7
—Conventional—										
VonSteuben-Gant 1 (17)	91	69	4	4	4	0	2	3	1	7
VonSteuben-Gant 2 (25)	136	65	4	13	1	1	1	1	0	4

[1] Students were asked to list the words they "think of when they hear the word mathematics."

[2] Responses included operations with numbers.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included "boring," "stupid," and statements of displeasure.

In the fifth component of the *Student Attitude Inventory,* students listed jobs other than teaching that required the use of mathematics. Although classes varied, students in all classes most frequently listed service-related occupations, including retail sales, business, and food service, and very frequently mentioned financial-related occupations, such as accounting, banking, and insurance, are also noteworthy for most classes. Also, in four classes (Armstrong-Murphy 1, Ogden-Piccolo 2, and Von Steuben-Gant 1 and 2) more students listed professional-related occupations, including medical fields, engineering, and law, than in other classes (see Table 22).

Table 22
Nonteaching Jobs that Students Identified as Requiring Mathematics, Grade 5, District 2

School-Class *(N)*	**Number of Responses[1] *(N)***	**Services[2] *(%)*[3]**	**Financial[4] *(%)***	**Professional[5] *(%)***	**Science *(%)***	**Trades *(%)***	**Creative Arts *(%)***	**Government *(%)***	**Sports *(%)***	**Unreportable[6] *(%)***
—MiC—										
Armstrong-Murphy 1 (30)	82	38	11	15	7	0	2	1	4	15
Armstrong-Nash 1 (19)	50	40	10	4	8	10	6	4	0	12
Odgen-Fiske 1 (21)	53	25	15	8	0	4	6	8	11	15
Odgen-Fiske 2 (20)	53	51	15	4	0	8	0	2	2	15
Odgen-Piccolo 1 (24)	71	38	7	7	6	6	4	3	6	21
Odgen-Piccolo 2 (22)	70	24	6	16	4	1	6	3	7	26
Odgen-Piccolo 3 (24)	66	26	18	9	8	11	6	8	0	8
—Conventional—										
VonSteuben-Gant 1 (17)	57	37	12	14	7	5	9	7	2	2
VonSteuben-Gant 2 (25)	87	30	21	13	9	6	9	3	2	2

[1] Students asked to list the jobs other than teaching that require mathematics.

[2] Responses included occupations in retail sales, business, and food service.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included occupations in accounting, banking, and insurance.

[5] Responses included occupations in medical fields, engineering, and law.

[6] Responses included teaching, thinking, and operations with numbers.

In the sixth component of the *Student Attitude Inventory*, students listed ways they used mathematics outside of class. Students in all classes most frequently listed money-related ways, such as banking and shopping, and calculation-related responses. Students also often listed leisure-related uses (see Table 23).

Table 23
Ways Students Used Mathematics Outside of Class, Grade 5, District 2

School-Class *(N)*	Number of Responses[1] *(N)*	Monetary[2] *(%)*[3]	Calculation *(%)*	Leisure *(%)*	Measurement *(%)*	Problem Solving *(%)*	Unreportable[4] *(%)*
—MiC—							
Armstrong-Murphy 1 (30)	34	41	38	0	3	3	9
Armstrong-Nash 1 (19)	24	21	33	17	4	0	21
Odgen-Fiske 1 (21)	27	26	30	0	0	7	26
Odgen-Fiske 2 (20)	26	23	15	19	4	4	27
Odgen-Piccolo 1 (24)	39	15	33	5	8	8	31
Odgen-Piccolo 2 (22)	34	21	26	12	0	12	26
Odgen-Piccolo 3 (24)	34	26	32	18	6	6	6
—Conventional—							
VonSteuben-Gant 1 (17)	33	33	24	15	12	0	12
VonSteuben-Gant 2 (25)	51	27	25	12	4	4	12

[1] Students were asked to describe how they would use mathematics outside of class.

[2] Responses included banking and shopping.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included occupations and nonmathematics school subjects.

Finally, all students in the study responded to items on the *Student Questionnaire*, five components of which are summarized here. In Table 24, the first component involved student judgment about the school subject they enjoyed the most. Generally, students reported that they enjoyed physical education (PE) and Mathematics classes.

Table 24
Student Preference Ranking of Classes, Grade 5, District 2

School-Class (N)	Subject (%)									
	SocStudies	**Science**	**Math**	**Reading**	**Writing**	**Art**	**Music**	**PE**	**Band**	**Other**
—MiC—										
Armstrong-Murphy 1 (34)	7	3	17	0	3	3	3	52	0	10
Armstrong-Nash 1 (29)	0	13	26	0	0	17	0	39	0	4
Ogden-Fiske 1 (30)	0	8	32	16	8	8	0	20	0	8
Ogden-Fiske 2 (24)	16	5	32	5	5	5	5	16	5	5
Ogden-Piccolo 1 (27)	8	15	23	8	0	8	8	12	0	19
Ogden-Piccolo 2 (23)	5	0	50	9	5	9	14	0	0	9
Ogden-Piccolo 3 (25)	4	0	33	8	4	13	17	8	4	8
—Conventional—										
VonSteuben-Gant 1 (38)	5	23	14	9	5	9	5	9	5	18
VonSteuben-Gant 2 (37)	12	23	19	8	8	4	4	8	0	15

The second component involved student judgments about the frequency of talking about mathematics with classmates, friends, and other acquaintances on three questions. Response frequency (never, sometimes, often, very often) for each class was strikingly different across questions and across classes (see Table 25).

Table 25
Student Judgment About Frequency of Communication About Mathematics, Grade 5, District 2

School-Class *(N)*	**Mathematical Ideas and Problem Strategies**					**Homework Problems**					**Ways Mathematics is Used Outside of School**				
	(*N*)	**Never**	**Some-times**	**Often**	**Very Often**	**(*N*)**	**Never**	**Some-times**	**Often**	**Very Often**	**(*N*)**	**Never**	**Some-times**	**Often**	**Very Often**
— MiC —															
Armstrong-Murphy 1 (34)	29	7	62	10	21	29	14	17	41	28	29	38	34	14	14
Armstrong-Nash 1 (29)	22	9	32	32	27	22	14	32	14	41	22	14	32	41	14
Ogden-Fiske 1 (30)	25	20	36	24	20	26	12	46	8	35	25	32	20	24	24
Ogden-Fiske 2 (24)	19	21	53	16	11	19	16	37	11	37	19	37	32	26	5
Ogden-Piccolo 1 (27)	26	4	69	23	4	26	12	31	46	12	26	23	38	19	19
Ogden-Piccolo 2 (23)	22	14	45	32	9	22	18	36	41	5	22	36	32	9	23
Ogden-Piccolo 3 (25)	24	13	42	38	8	24	8	46	25	21	24	42	42	13	4
—Conventional —															
VonSteuben-Gant 1 (38)	22	9	45	23	23	22	9	32	36	23	22	27	50	9	14
VonSteuben-Gant 2 (37)	26	23	50	23	4	26	8	38	38	15	26	38	46	15	0

Note: Response rates designate class mean percents.

Table 26 shows the third component involved student judgments about the things they liked most about mathematics class. Students in all classes reported that they liked working with numbers than they reported other categories. However, the classes varied for this category. The number category is broken down in Table 27.

Table 26
What Students Liked Most About Mathematics Class, Grade 5, District 2

School-Class *(N)*	**Number of Responses[1] *(N)***	**Number *(%)*[2]**	**Problem Solving *(%)***	**Classwork *(%)***	**Working With Others *(%)***	**Miscellaneous[3] *(%)***	**Negative Emotional Response[4] *(%)***	**Positive Emotional Response[5] *(%)***
—MiC—								
Armstrong-Murphy 1 (34)	69	41	1	1	4	13	0	9
Armstrong-Nash 1 (27)	64	30	3	5	6	3	0	13
Odgen-Fiske 1 (30)	71	35	7	7	6	8	0	14
Odgen-Fiske 2 (24)	54	41	0	2	13	0	2	15
Odgen-Piccolo 1 (27)	17	41	0	0	6	12	0	12
Odgen-Piccolo 2 (23)	53	58	0	9	4	4	0	4
Odgen-Piccolo 3 (25)	65	60	8	2	3	0	0	8
—Conventional—								
VonSteuben-Gant 1 (38)	70	36	4	6	3	1	0	9
VonSteuben-Gant 2 (37)	135	58	1	2	4	4	0	7

[1] Students were asked to name three things they liked most about mathematics class.

[2] Percentage does not add to 100 due to number of unique responses.

[3] Responses included "teacher," "computer," and "warm-up activities."

[4] Responses included "hard," "boring," and "restrictive."

[5] Responses included "like it all" and "fun."

Additional patterns were revealed when examining student judgments about number (see Table 27). Most students reported that they liked addition and multiplication, although the classes varied. Ogden-Fiske 1 and 2 and Ogden-Piccolo 1 also indicated strong preferences for division.

Table 27
What Students Liked Most About Mathematics Class, Grade 5, District 2 (continued)

School-Class *(N)*	**Number of Responses[1] *(N)***	**Addition *(%)***	**Subtraction *(%)***	**Multiplication *(%)***	**Division *(%)***	**Decimals *(%)***	**Fractions *(%)***	**Other[2] *(%)***
—MiC—								
Armstrong-Murphy 1 (34)	28	32	18	21	14	0	0	14
Armstrong-Nash 1 (27)	19	26	16	26	11	0	11	11
Odgen-Fiske 1 (30)	25	28	24	12	24	0	8	4
Odgen-Fiske 2 (24)	22	23	5	23	36	0	5	9
Odgen-Piccolo 1 (27)	7	14	14	29	29	14	0	0
Odgen-Piccolo 2 (23)	31	42	19	23	3	0	13	0
Odgen-Piccolo 3 (25)	39	31	8	41	13	0	5	3
—Conventional—								
VonSteuben-Gant 1 (38)	25	20	16	20	8	0	36	0
VonSteuben-Gant 2 (37)	78	24	13	10	13	0	21	19

[1] Students were asked to name three things they liked the most about mathematics class.

[2] Responses included counting, average, estimation, least common denominator, least common multiple, money, rounding and time.

The fourth component involved student judgments about the things they disliked most about mathematics class (see Table 28). All classes reported that they disliked working with numbers, although the classes varied. The number category is broken down in Table 29.

Table 28

Percent of Things Most Disliked about Mathematics Class, District 2, Grade 5

School-Class *(N)*	Number of Responses[1] *(N)*	Number *(%)*[2]	Tests *(%)*	Homework *(%)*	Classwork *(%)*	Problem Solving *(%)*	Miscellaneous[3] *(%)*	Negative Emotional Response[4] *(%)*	Positive Emotional Response[5] *(%)*
—MiC—									
Armstrong-Murphy 1 (34)	84	35	10	0	0	0	0	7	6
Armstrong-Nash 1 (27)	52	17	0	0	10	0	0	15	12
Odgen-Fiske 1 (30)	56	43	0	0	0	0	11	2	10
Odgen-Fiske 2 (24)	30	13	0	0	0	0	0	7	27
Odgen-Piccolo 1 (27)	66	48	15	6	0	0	0	0	0
Odgen-Piccolo 2 (23)	59	49	14	0	8	0	0	0	0
Odgen-Piccolo 3 (25)	50	46	22	0	0	0	0	4	6
—Conventional—									
VonSteuben-Gant 1 (38)	61	31	13	0	10	0	0	0	0
VonSteuben-Gant 2 (37)	66	39	0	0	0	0	0	5	5

[1] Students were asked to name three things they disliked the most about mathematics class.

[2] Percentage does not add to 100 due to number of unique responses.

[3] Responses included "teacher," "computer," and "warm-up activities."

[4] Responses included "hard," "boring," and "restrictive."

[5] Responses included "like it all" and "fun."

Additional patterns revealed when examining student judgments about number (see Table 29). Most classes reported that they disliked division and subtraction, although the classes varied.

Table 29
Percent of Things Most Disliked about Mathematics Class, District 2, Grade 5 (continued)

School-Class *(N)*	**Number of Responses[1] *(N)***	**Addition *(%)***	**Subtraction *(%)***	**Multiplication *(%)***	**Division *(%)***	**Decimals *(%)***	**Fractions *(%)***	**Other[2] *(%)***
—MiC—								
Armstrong-Murphy 1 (34)	29	0	24	7	34	0	14	14
Armstrong-Nash 1 (27)	9	0	33	11	22	0	22	11
Odgen-Fiske 1 (30)	24	4	13	33	38	0	4	8
Odgen-Fiske 2 (24)	4	25	50	25	0	0	0	0
Odgen-Piccolo 1 (27)	32	9	34	19	13	9	13	3
Odgen-Piccolo 2 (23)	29	0	17	28	48	0	7	0
Odgen-Piccolo 3 (25)	23	0	22	13	52	4	9	0
—Conventional—								
VonSteuben-Gant 1 (38)	19	11	11	11	37	5	21	5
VonSteuben-Gant 2 (37)	26	4	12	15	23	12	15	19

[1] Students were asked to name three things they disliked the most about mathematics class.

[2] Responses included counting, average, estimation, least common denominator, least common multiple, money, rounding and time.

The fifth component involving student judgments about the ways mathematics helped them in other subjects is reported in Table 30. Students in most classes reported that mathematics was used in specific applications such as measurement and problem solving. The classes varied in responses (see Table 30).

Table 30

Student Perception of Usefulness of the Mathematics in Other Classes, Grade 5, District 2

School-Class *(N)*	**Number of Responses[1] *(N)***	**General Applications[2] *(%)***	**Specific Applications[3] *(%)***	**Organization of Information *(%)***	**No Help *(%)***	**Miscellaneous *(%)***	**Inappropriate Responses[4] *(%)***
—MiC—							
Armstrong-Murphy 1 (34)	45	24	33	0	7	0	36
Armstrong-Nash 1 (27)	30	23	10	0	7	0	60
Odgen-Fiske 1 (30)	51	12	20	2	6	8	53
Odgen-Fiske 2 (24)	31	10	32	3	10	3	42
Odgen-Piccolo 1 (27)	45	9	33	4	11	13	29
Odgen-Piccolo 2 (23)	39	15	36	0	8	21	21
Odgen-Piccolo 3 (25)	36	28	28	8	14	3	19
—Conventional—							
VonSteuben-Gant 1 (38)	47	6	9	2	4	6	72
VonSteuben-Gant 2 (37)	56	9	9	20	13	4	46

[1] Students were asked to identify how their knowledge of mathematics and the way they learned mathematics helped them in other classes.

[2] Responses included "estimating" and "calculating."

[3] Responses included "measurement" and "problem solving."

[4] Responses included "not good at math", "need to know something", "it's easier and more fun", "not good ", etc.

District 3

In District 3, 6 fifth-grade classes participated in the study. In all of the classrooms, MiC was used. A summary of the variations in fixed characteristics is presented in Table 31.

Table 31
Fixed Characteristics, Grade 5, District 3

School-Class *(N)*	**Sex *(%)***		**Average Age *(years)***	**Language Preference *(%)* *** *(self-identified)*		**Ethnicity *(%)*** **				
	Female	**Male**		**English Preference**	**Non-Response**	**African American**	**Hispanic**	**White**	**Multi/Other**	**Non-Response**
—MiC—										
Taft-Allen 1 (19)	47	53	10.44	94	0	0	0	94	6	0
Taft-Cameron 1 (23)	43	57	10.50	100	0	0	0	91	9	0
Taft-Cooper 1 (23)	52	48	10.43	100	0	0	4	70	26	0
Taft-DeLaCruz 1 (21)	43	57	10.44	100	0	0	10	86	5	0
Taft-Dodge 1 (23)	52	48	10.47	91	0	0	4	87	4	4
Taft-Edgebrook 1 (23)	46	54	10.56	83	13	0	0	48	48	4

* Percent does not add to 100% when students identified a language preference other than English.

** Percent on ethnicity was rounded off and does not always total 100. Multi/Other comprises Asian, Haitian, Native American, Multiracial and Oth

(For detailed information, see Table E1 in Appendix E.)

In District 3, there was little variation in the class profiles. The number of students in a class varied from 19 to 23. The proportion of girls to boys is similar across classes. The average age was similar across classes, and English was the primary language for 83–100% of the students. The ethnicity in these classes is primarily White or Multiracial/Other.

In District 3, two measures of prior mathematics performance were used as indicators of prior student performance. The first performance indicator was the summary of percentile scores for the students in the study classes on the standardized test administered by the district to all of its students, *TerraNova* (CTB/McGraw-Hill, 1997), which were forwarded to project staff. Summary means and standard deviations of the percentiles for each class on the application subtest[1] are reported in Table 32, and box plots are shown in Figure 11. The classes differed in average percentiles on this test, with mean percentiles ranging from 46.00 to 66.65. The box plots illustrate the within-class variation on this test in this district.

Table 32
Standardized Test Scores, Spring 1997, Grade 5, District 3

	TerraNova: National Percentiles					
	Application					
School-Class *(N)*	**(*N*)**	**Mean**	**StDev**	**Minimum**	**Median**	**Maximum**
—MiC—						
Taft-Allen 1 (19)	16	63.81	22.65	25	72.5	99
Taft-Cameron 1 (23)	20	66.65	23.38	23	63.5	99
Taft-Cooper 1 (23)	21	46.00	24.83	5	41	92
Taft-DeLaCruz 1 (21)	18	58.22	21.76	5	57	97
Taft-Dodge 1 (23)	19	50.16	26.19	9	49	99
Taft-Edgebrook 1 (24)	21	58.67	27.38	13	62	99

(For detailed information, see Table E2 in Appendix E.)

[1] Only the application subtest is reported here because a large number of computation scores (and the composite scores) were omitted from the information provided by the schools.

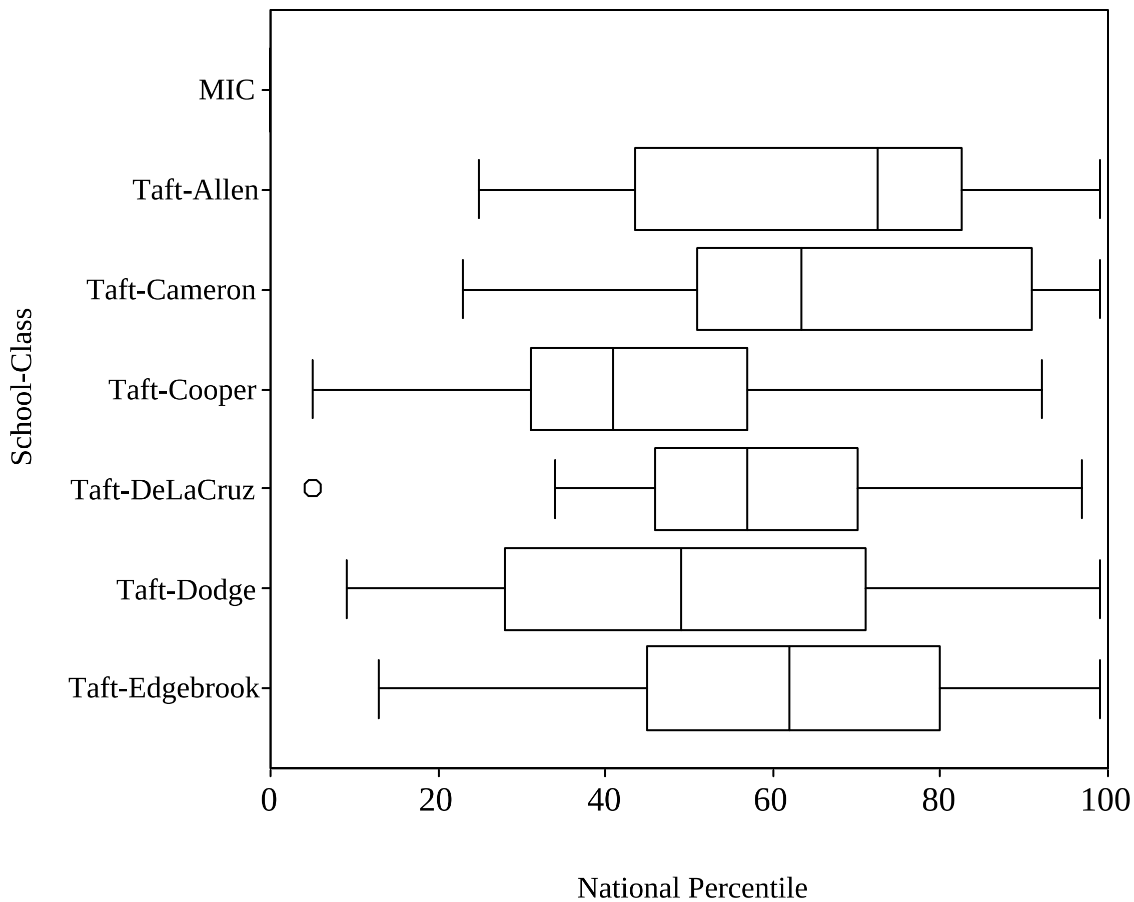


Figure 11. Box plots of class distributions on the *TerraNova* application subtest, Grade 5, District 3.

The second performance indicator used in the study is the *Collis-Romberg Mathematical Problem-Solving Profiles* (Collis & Romberg, 1992). This test was administered to all students participating in the study. The information on this test includes scores related to four levels of reasoning (unistructural, multistructural, relational, and extended abstract), and responses for each level are scored from 0–5. Class means on all four levels of reasoning are given in Table 33. For all but one class, the means on unistructural level of reasoning were above 2.50, indicating that students were operating at this level on many items. Only Taft-DeLaCruz 1 had a class mean below 2.50 (2.40). Even at this level, however, there was considerable variability in class means. The class means on the other scales indicate that some students in all classes were beginning to reason at a multistructural level, and only a very small number of students exhibited reasoning at either relational or extended abstract levels.

Table 33
Class means on the Collis-Romberg Mathematical Problem-Solving Profiles, Grade 5, District 3

School-Class *(N)*	**Level of Reasoning**				
	(*N*)	**Uni-structural**	**Multi-structural**	**Relational**	**Extended Abstract**
		—MiC—			
Taft-Allen 1 (19)	19	3.05	1.53	0.42	0.05
Taft-Cameron 1 (23)	23	3.26	1.52	0.26	0.00
Taft-Cooper 1 (23)	23	3.04	1.57	0.04	0.00
Taft-DeLaCruz 1 (21)	20	2.40	1.00	0.35	0.00
Taft-Dodge 1 (23)	22	2.64	1.18	0.36	0.05
Taft-Edgebrook 1 (23)	22	3.23	1.68	0.41	0.09

(For detailed information, see Table E3 in Appendix E.)

Because the standardized test scores show a similar pattern to those on the unistructural scale of the Collis-Romberg test (see the scatter plot for means on the two measures in Figure 12, a correlation coefficient between the class means of the two measures was calculated (*r* = .68). From this information, it is apparent that the classes were comparable. There are two average and four high average classes.

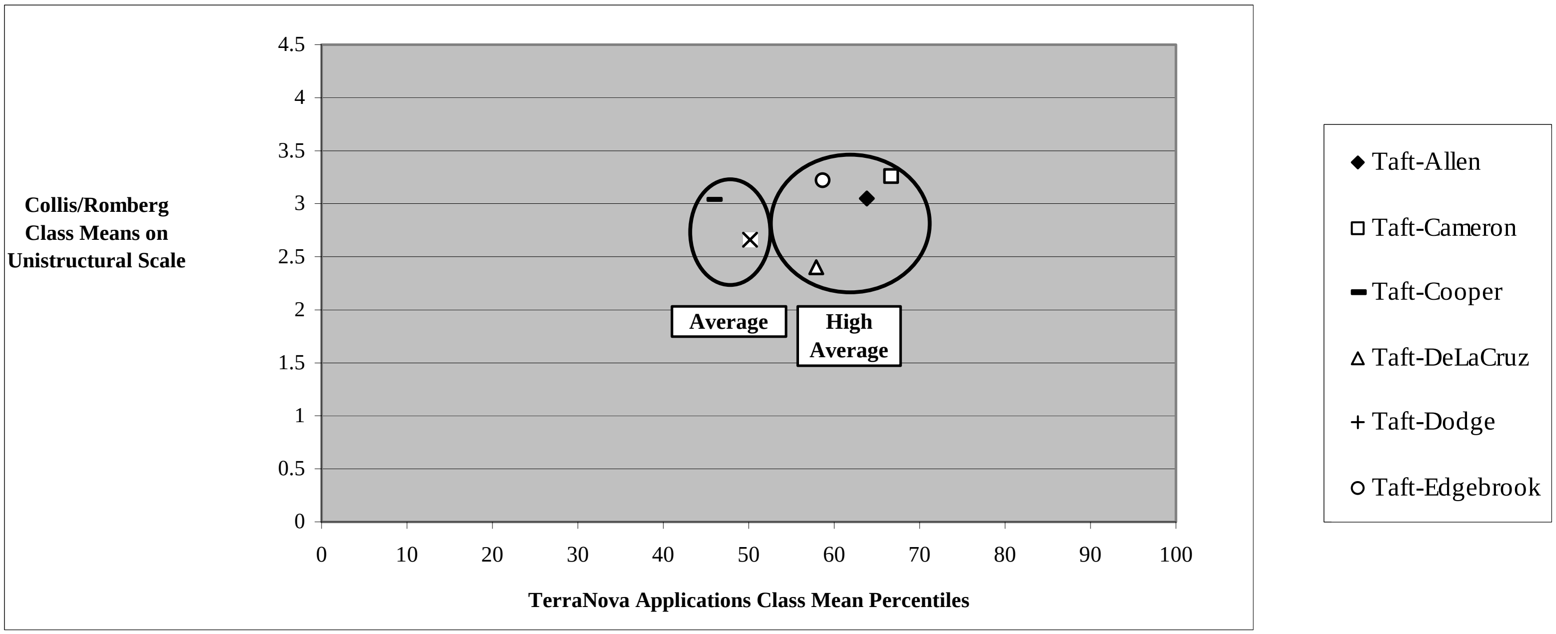


Figure 12. Scatter plot for class mean percentiles on the *TerraNova* test and the class means on the unistructural scale of the *Collis-Romberg Mathematical Problem-Solving Profiles* for fifth-grade classes in District 3.

Finally, all students in the study responded to the items in the *Student Attitude Inventory;* three components of which are summarized here.

First, the class means for student judgments on items related to their effort, confidence, interest, usefulness, and ability to communicate mathematically are reported in Table 34. Each item was judged (reverse-coded when appropriate) on a scale of 1–4 (1 = very true; 2 = true; 3 = not true; 4 = not true at all). Overall, the students in these classes judged the statements as true or very true, and there was little variation across classes.

Table 34

Class Means on Student Judgments About Mathematics (Subscales on the Student Attitude Inventory), Grade 5, District 3

School-Class *(N)*	**Effort** *in mathematics*		**Confidence** *in ability to do mathematics*		**Interest** *in mathematics*		**Usefulness** *of mathematics*		**Ability to Communicate** *about mathematics*	
	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean
—MiC—										
Taft-Allen (19)	17	1.83	17	1.78	14	1.95	15	1.82	15	1.71
Taft-Cameron (23)	20	1.70	21	1.56	21	1.83	21	1.71	21	1.84
Taft-Cooper (23)	18	1.69	18	1.73	19	1.83	18	1.58	18	1.71
Taft-DeLaCruz (21)	17	1.62	20	1.64	15	1.79	17	1.61	20	1.65
Taft-Dodge (23)	19	1.83	19	1.85	18	1.83	17	1.83	18	1.76
Taft-Edgebrook (23)	23	1.58	23	1.63	23	1.75	21	1.48	22	1.69

(For detailed information, see Table E4 in Appendix E.)

The variation in class means is shown in Figure 13. Only for two classes (Taft-Allen and Taft-Dodge) were class means lower on effort.

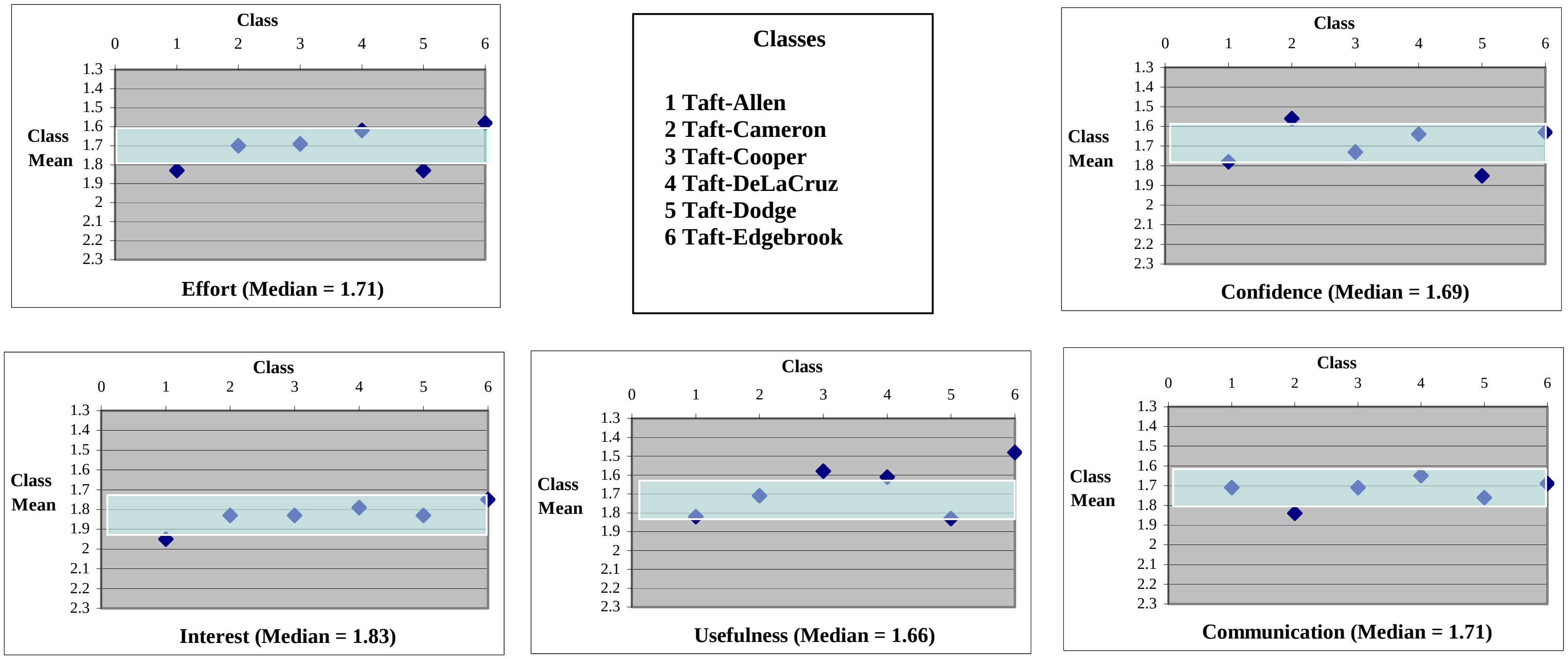


Figure 13. Plots showing class means on student judgments about mathematics for fifth-grade classes in District 3. (Shaded areas show class medians ± 0.1.)

In the second component of the *Student Attitude Inventory*, students responded to 16 items related to general perceptions about mathematics (see Table E5 in Appendix E). Several items were reverse-scored due to wording of question. Generally, little variance was seen in the District 3 class means with respect to these items. Students felt confident that they were able to learn new ideas in mathematics class (from 1.18, Taft-Dodge 1, to 1.69, Taft-Allen 1, on Item 3). Students thought it was very acceptable to solve mathematics problems differently than their classmates (from 1.11, Taft-Allen 1, to 1.52, Taft-Cameron 1, on Item 16). However, students were much less confident (from 1.67, Taft-Edgebrook 1, to 2.00, Taft-Cameron 1, on Item 4) that they could discover ways of solving problems that their teachers or their peers had not previously considered.

Students were very confident that anyone who worked hard enough in mathematics class could be good at mathematics (from 1.10, Taft-Cooper 1, to 1.50, Taft-Allen 1, on Item 11). Similarly, students disagreed that some students were naturally better, or worse, at mathematics than other students regardless of effort (from 2.59, Taft-Cameron 1, to 3.00, Taft-De La Cruz 1, on Item 37).

Students felt that knowing how to solve a problem was as important as determining the answer (from 1.08, Taft-Edgebrook 1, to 1.80, Taft-De La Cruz 1, on Item 53), although they felt that answering questions correctly in mathematics class required providing only numbers (from 1.41, Taft-Cameron 1, to 1.95, Taft-Cooper 1, on Item 38). Students tended to think that getting correct answers in mathematics class was not as important as understanding why the answer was correct (from 2.14, Taft-Cameron 1, to 2.94, Taft-Allen 1, on Item 27), and they felt that getting correct answers was more important than understanding a mathematics problem or the process of finding an answer (from 1.45, Taft-Cameron 1, to 2.24, Taft-Cooper 1, on Item 49). Students disagreed that mathematics was mostly learned by memorizing facts and rules (from 2.64, Taft-Cameron 1, to 3.24, Taft-Dodge 1, on Item 55). They also disagreed that they would get correct answers to their teachers' questions if they memorized rules or facts (from 1.75 Taft-De La Cruz 1, to 3.23, Taft-Cameron 1, on Item 44). Students disagreed that they did not know how to solve mathematics problems if they found they had to use calculators (from 2.50, Taft-Cameron 1, to 3.25 Taft-Edgebrook 1, on Item 45) and that calculators always generated correct answers (from 2.70, Taft-Cameron 1, to 3.18, Taft-Dodge 1, on Item 6).

Students felt that new mathematics topics were related to ones they had already studied (from 2.05, Taft-De La Cruz 1, Taft-Dodge 1, and Taft-Edgebrook 1, to 2.18, Taft-Cameron 1, on Item 39). Students felt that mathematics was related to other school subjects (from 1.63, Taft-Edgebrook 1, to 2.25, Taft-Dodge 1, on Item 20), although they thought that mathematics was harder to understand than other school subjects (from 1.88, Taft-Edgebrook 1, to 2.65, Taft-Dodge 1, on Item 28).

The third component involving students judging whether success or failure in mathematics could be attributed to teachers, ability, effort, or luck are reported in Table 35. The class means for these judgments are shown in Table 17 and Figures 14a and 14b. Each item was judged (reverse-coded when appropriate) on a scale of 1–4 (1 = very true; 2 = true; 3 = not true; 4 = not true at all). All classes attributed success in mathematics to a combination of effort and ability, and failure to lack of effort.

Table 35
Class Means on Student Attribution of Success or Failure in Mathematics, Grade 5, District 3

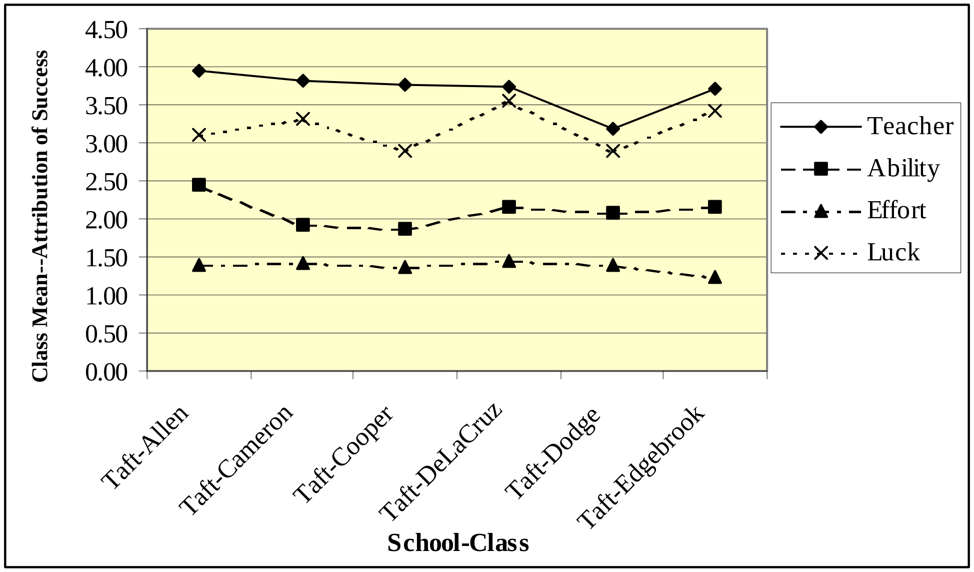
School-Class (*N*)	Success							
	Teacher		Ability		Effort		Luck	
	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean
—MiC—								
Taft-Allen 1 (19)	18	3.94	18	2.44	18	1.39	18	3.11
Taft-Cameron 1 (23)	23	3.83	23	1.91	22	1.41	22	3.32
Taft-Cooper 1 (23)	21	3.76	22	1.86	21	1.38	21	2.90
Taft-DeLaCruz 1 (21)	19	3.74	20	2.15	20	1.45	20	3.55
Taft-Dodge 1 (23)	22	3.18	22	2.09	20	1.40	21	2.90
Taft-Edgebrook 1 (23)	23	3.71	23	2.17	23	1.25	23	3.42

School-Class (*N*)	Failure							
	Teacher		Ability		Effort		Luck	
	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean
—MiC—								
Taft-Allen 1 (19)	18	3.89	18	3.00	17	2.35	17	3.59
Taft-Cameron 1 (23)	22	4.00	23	3.57	22	2.05	22	3.50
Taft-Cooper 1 (23)	21	3.86	23	3.13	22	2.32	22	3.59
Taft-DeLaCruz 1 (21)	20	4.00	19	3.37	20	2.50	20	3.80
Taft-Dodge 1 (23)	21	3.52	20	2.85	21	2.10	22	3.18
Taft-Edgebrook 1 (23)	23	4.00	23	3.21	23	2.57	23	3.67

(For more detailed information, see Table E6 in Appendix E.)

The similarity in class means on these scales is apparent in Figures 14a and 14b.

(a)



(b)

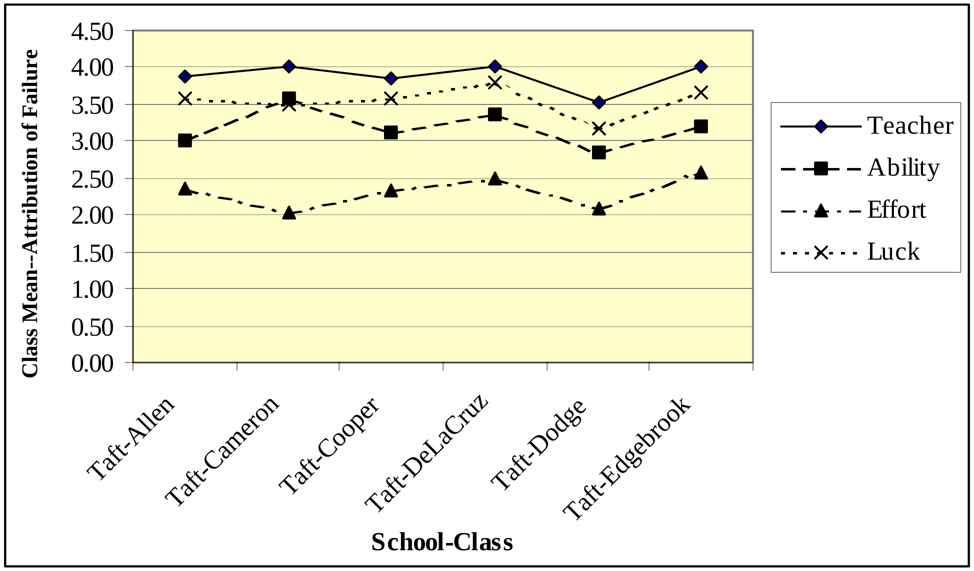


Figure 14. Line graphs showing class means of student attribution of (a) success and (b) failure in mathematics, Grade 5, District 3.

In the fourth component of the *Student Attitude Inventory*, students listed things they associated withthe word "mathematics." Although classes varied, students in all classes most frequently listed words associated with number, including operations with numbers (see Table 36). It is notable that students in Taft-Cameron's class and Taft-Cooper's class listed words associated with interest more often that other fifth-grade classes in this district.

Table 36

Words Students Associated With "Mathematics," Grade 5, District 3

School-Class *(N)*	**Number of Responses[1] *(N)***	**Number[2] *(%)*[3]**	**Interest *(%)***	**Geometry *(%)***	**Negative Emotive Responses[4] *(%)***	**Thinking *(%)***	**Problem Solving *(%)***	**Algebra *(%)***	**Occupations *(%)***	**Miscellaneous *(%)***
—MiC—										
Taft-Allen 1 (18)	76	75	8	0	3	7	3	0	0	3
Taft-Cameron 1 (23)	102	58	17	1	8	3	2	2	1	4
Taft-Cooper 1 (22)	90	76	11	2	3	3	0	0	0	2
Taft-Delacruz 1 (19)	87	67	2	3	0	2	3	2	6	10
Taft-Dodge 1 (19)	71	76	3	1	0	1	10	0	0	4
Taft-Edgebrook 1 (23)	92	80	8	0	1	4	2	2	0	1

[1] Students were asked to list the words they "think of when they hear the word mathematics."

[2] Responses included operations with numbers.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included "boring," "stupid," and statements of displeasure.

In the fifth component of the *Student Attitude Inventory,* students listed jobs other than teaching that required the use of mathematics. Although classes varied, students in all classes most frequently listed service-related occupations, including retail sales, business, and food service, and financial-related occupations, such as accounting, banking, and insurance. Also, more students in two classes, Taft-Allen 1 and Taft-Cameron 1, listed professional-related occupations, including medical fields, engineering, and law, in and more students in two other classes, Taft-De La Cruz 1 and Taft-Dodge 1, listed trades-related occupations than students in other classes in this district(see Table 37).

Table 37
Nonteaching Jobs that Students Identified as Requiring Mathematics, Grade 5, District 3

School-Class *(N)*	**Number of Responses[1] *(N)***	**Services[2] *(%)*[3]**	**Financial[4] *(%)***	**Professional[5] *(%)***	**Science *(%)***	**Trades *(%)***	**Creative Arts *(%)***	**Government *(%)***	**Sports *(%)***	**Unreportable[6] *(%)***
—MiC—										
Taft-Allen 1 (18)	47	32	21	15	11	2	0	4	4	6
Taft-Cameron 1 (23)	63	30	32	10	5	5	5	2	0	11
Taft-Cooper 1 (22)	48	38	17	8	6	4	0	2	0	13
Taft-Delacruz 1 (19)	69	33	22	9	0	14	3	6	1	3
Taft-Dodge 1 (19)	41	34	20	7	5	15	0	2	2	10
Taft-Edgebrook 1 (23)	69	35	10	9	7	9	6	0	6	12

[1] Students asked to list the jobs other than teaching that require mathematics.

[2] Responses included occupations in retail sales, business, and food service.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included occupations in accounting, banking, and insurance.

[5] Responses included occupations in medical fields, engineering, and law.

[6] Responses included teaching, thinking, and operations with numbers.

In the sixth component of the *Student Attitude Inventory*, students listed ways they used mathematics outside of class. Students in all classes most frequently listed monetary-related ways, such as banking and shopping, and calculation. Students in many of the classes also listed leisure-related responses. Also, measurement-related responses were higher in Taft-De La Cruz 1 than in the other classes (see Table 38).

Table 38

Ways Students Used Mathematics Outside of Class, Grade 5, District 3

School-Class *(N)*	**Number of Responses[1] *(N)***	**Monetary[2] *(%)*[3]**	**Calculation *(%)***	**Leisure *(%)***	**Measurement *(%)***	**Problem Solving *(%)***	**Unreportable[4] *(%)***
—MiC—							
Taft-Allen 1 (18)	28	21	25	14	4	11	7
Taft-Cameron 1 (23)	46	26	28	26	0	2	7
Taft-Cooper 1 (22)	30	13	23	20	3	3	17
Taft-Delacruz 1 (19)	42	14	26	17	24	5	5
Taft-Dodge 1 (19)	24	29	17	17	4	4	17
Taft-Edgebrook 1 (23)	37	32	27	8	8	3	19

[1] Students were asked to describe how they would use mathematics outside of class.

[2] Responses included banking and shopping.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included occupations and nonmathematics school subjects.

Finally, all students in the study responded to items on the *Student Questionnaire,* five components of which are summarized here. The first component involving student judgment about the school subject the enjoyed the most is presented in Table 39. Generally, students reported that they enjoyed art, mathematics, and physical education (PE).

Table 39
Student Preference Ranking of Classes in District 3, Grade 5

School-Class (N)	**Subject (%)**									
	SocStudies	**Science**	**Math**	**Reading**	**Writing**	**Art**	**Music**	**PE**	**Band**	**Other**
—MiC—										
Taft-Allen 1 (19)	0	6	28	11	0	11	6	22	0	17
Taft-Cameron 1 (23)	4	13	17	9	0	26	13	13	0	4
Taft-Cooper 1 (23)	0	4	26	13	4	30	13	0	9	0
Taft-DeLaCruz 1 (21)	0	10	10	5	5	30	15	15	10	0
Taft-Dodge 1 (23)	0	0	10	14	10	38	0	19	10	0
Taft-Edgebrook 1 (23)	0	8	38	21	0	17	0	4	4	8

The second component involved student judgments about their frequency of talking about mathematics with classmates, friends, and other acquaintances on three questions. Response frequency (never, sometimes, often, very often) for each class was strikingly different across questions and across classes (see Table 40).

Table 40

Class Mean Percents on Student Judgment About Frequency of Communication About Mathematics for Fifth-Grade Classes in District 3.

School-Class *(N)*	**Mathematical Ideas and Problem Strategies**					**Homework Problems**					**Ways Mathematics is Used Outside of School**				
	(*N*)	**Never**	**Some-times**	**Often**	**Very Often**	**(*N*)**	**Never**	**Some-times**	**Often**	**Very Often**	**(*N*)**	**Never**	**Some-times**	**Often**	**Very Often**
— MiC —															
Taft-Allen 1 (19)	18	22	72	6	0	18	22	44	28	6	18	28	61	11	0
Taft-Cameron 1 (23)	23	4	52	26	17	23	13	57	22	9	23	43	35	17	4
Taft-Cooper 1 (23)	23	26	52	13	9	23	26	52	13	9	23	43	35	17	4
Taft-DeLaCruz 1 (21)	20	0	30	50	20	20	0	70	25	5	20	0	35	35	30
Taft-Dodge 1 (23)	21	5	86	5	5	21	14	38	43	5	21	29	38	24	10
Taft-Edgebrook 1 (23)	23	4	57	30	9	23	4	43	35	17	23	30	35	26	9

The third component involved student judgments about the things they liked most about mathematics class (see Table 41). Most students reported that they liked working with numbers, although the classes varied. The number category is broken down in Table 42. Also, most students reported positive emotive responses and preferences for problem solving.

Table 41
What Students Liked Most About Mathematics Class, Grade 5, District 3

School-Class *(N)*	**Number of Responses[1] *(N)***	**Number *(%)*[2]**	**Problem Solving *(%)***	**Classwork *(%)***	**Working With Others *(%)***	**Miscellaneous[3] *(%)***	**Negative Emotional Response[4] *(%)***	**Positive Emotional Response[5] *(%)***
				—MiC—				
Taft-Allen 1 (19)	45	64	2	7	4	2	0	7
Taft-Cameron 1 (23)	52	23	17	4	13	0	0	25
Taft-Cooper 1 (23)	69	39	13	0	25	4	0	1
Taft-Delacruz 1 (21)	62	24	19	2	18	0	0	10
Taft-Dodge 1 (23)	41	51	24	2	0	0	0	10
Taft-Edgebrook 1 (23)	38	61	11	0	3	0	0	16

[1] Students were asked to name three things they liked most about mathematics class.

[2] Percentage does not add to 100 due to number of unique responses.

[3] Responses included "teacher," "computer," and "warm-up activities."

[4] Responses included "hard," "boring," and "restrictive."

[5] Responses included "like it all" and "fun."

Additional patterns were revealed when examining student judgments about number (see in Table 42). Most studentss reported that they liked multiplication, although the classes varied. Also, students in half of the classes indicated strong preferences for addition, while half indicated strong preferences for division.

Table 42
What Students Liked Most About Mathematics Class, Grade 5, District 3 (continued)

School-Class *(N)*	**Number of Responses[1] *(N)***	**Addition *(%)***	**Subtraction *(%)***	**Multiplication *(%)***	**Division *(%)***	**Decimals (%)**	**Fractions *(%)***	**Other[2] *(%)***
				—MiC—				
Taft-Allen 1 (19)	29	31	24	24	10	0	7	3
Taft-Cameron 1 (23)	12	8	0	42	8	0	33	8
Taft-Cooper 1 (23)	27	30	11	26	22	0	7	4
Taft-Delacruz 1 (21)	15	7	13	20	27	0	20	13
Taft-Dodge 1 (23)	21	29	19	33	14	0	0	5
Taft-Edgebrook 1 (23)	23	30	9	26	22	4	9	0

[1] Students were asked to name three things they liked the most about mathematics class.

[2] Responses included counting, average, estimation, least common denominator, least common multiple, money, rounding and time.

The fourth component involved student judgments about the things they disliked most about mathematics class (see Table 43). The number category is broken down in Table 44. Students in all classes reported that they disliked working with numbers, although the classes varied.

Table 43
Percent of Things Most Disliked about Mathematics Class, District 3, Grade 5

School-Class *(N)*	**Number of Responses[1] *(N)***	**Number[2] *(%)***	**Tests *(%)***	**Homework *(%)***	**Classwork *(%)***	**Problem Solving *(%)***	**Miscellaneous Class Activities[3] *(%)***	**Negative Emotional Response[4] *(%)***	**Positive Emotional Response[5] *(%)***
—MiC—									
Taft-Allen 1 (19)	41	56	0	0	0	12	0	0	0
Taft-Cameron 1 (23)	51	24	0	0	25	0	0	16	6
Taft-Cooper 1 (23)	48	33	15	0	0	0	0	10	8
Taft-Delacruz 1 (21)	55	25	0	0	0	16	16	0	0
Taft-Dodge 1 (23)	41	46	0	0	0	20	0	5	4
Taft-Edgebrook 1 (23)	53	66	0	0	9	6	0	0	0

[1] Students were asked to name three things they disliked the most about mathematics class.

[2] Percentage does not add to 100 due to number of unique responses.

[3] Responses included "teacher," "computer," and "warm-up activities."

[4] Responses included "hard," "boring," and "restrictive."

[5] Responses included "like it all" and "fun."

Additional patterns were revealed when examining student judgments about number (see Table 44). Students in most classes reported that they disliked division and subtraction, although the classes varied.

Table 44
Percent of Things Most Disliked about Mathematics Class, District 3, Grade 5 (continued)

School-Class *(N)*	**Number of Responses[1] *(N)***	**Addition *(%)***	**Subtraction *(%)***	**Multiplication *(%)***	**Division *(%)***	**Decimals *(%)***	**Fractions *(%)***	**Other[2] *(%)***
—MiC—								
Taft-Allen 1 (19)	23	4	30	17	48	0	0	0
Taft-Cameron 1 (23)	12	0	50	8	25	0	0	17
Taft-Cooper 1 (23)	16	0	44	13	31	0	13	0
Taft-Delacruz 1 (21)	14	7	21	29	36	0	7	0
Taft-Dodge 1 (23)	19	11	21	11	58	0	0	0
Taft-Edgebrook 1 (23)	35	3	31	11	40	0	6	9

[1] Students were asked to name three things they disliked the most about mathematics class.

[2] Responses included counting, average, estimation, least common denominator, least common multiple, money, rounding and time.

The fifth component involved student judgments about the ways mathematics helped them in other subjects (see Table 45). Students in most classes reported that mathematics was used in both general applications, such as estimating and calculating, and specific applications, such as measurement and problem solving. The classes varied responses.

Table 45
Student Perception of the Usefulness of Mathematics in Other Classes, Grade 5, District 3

School-Class *(N)*	**Number of Responses[1] *(N)***	**General Applications[2] *(%)***	**Specific Applications[3] *(%)***	**Organization of Information *(%)***	**No Help *(%)***	**Miscellaneous *(%)***	**Inappropriate Responses[4] *(%)***
			—MiC—				
Taft-Allen 1 (19)	45	2	0	0	2	0	96
Taft-Cameron 1 (23)	55	22	22	5	0	0	51
Taft-Cooper 1 (23)	37	8	5	0	0	65	22
Taft-Delacruz 1 (21)	36	19	22	25	0	6	28
Taft-Dodge 1 (23)	30	17	17	7	10	7	43
Taft-Edgebrook 1 (23)	37	22	24	11	11	5	27

[1] Students were asked to identify how their knowledge of mathematics and the way they learned mathematics helped them in other classes.

[2] Responses included "estimating" and "calculating."

[3] Responses included "measurement" and "problem solving."

[4] Responses included "not good at math", "need to know something", "it's easier and more fun", "not good ", etc.

Among the things they liked (or disliked) most about mathematics class, students reported that they liked addition and multiplication and disliked subtraction and division to greater degrees than any other reported categories. Students also indicated that they used mathematics in other subject areas in specific applications such as measurement and problem solving.

Summary

This working paper described the background characteristics of the 25 fifth-grade classes in the three school districts involved in the longitudinal/cross-sectional study of the impact of *Mathematics in Context* on student performance. The classes contained 10-year-old students with a comparable number of boys and girls (except for one small class in District 1 in which 9 of 13 students were African American girls). The students in the classes and districts varied in ethnicity, with a number of African American students in most District 1 classes, Hispanic students in District 2 classes, and White and Multiracial students in District 3 classes.

Some of the classes in District 1 were tracked, yielding considerable between-class variation on measures of prior achievement (*TerraNova*). Classes in the other two districts were not tracked and, thus, show considerable within-class variation in scores on the *Stanford Achievement Test* or the *TerraNova*. On the *Collis-Romberg Mathematical Problem-Solving Profiles*, most students exhibited unistructural reasoning, with a few showing multistructural reasoning or higher. Classifying classes in terms of both tests yielded a picture of high, high average, average, and low average classes in District 1; high average and average in District 2; and high average in District 3. Clearly, comparisons between classes on later performance measures will need to take prior achievement into consideration.

Class means on the *Student Attitude Inventory* were very similar across districts. Students believed that they would succeed in mathematics class if they put forth the effort. They felt confident in their abilities to do mathematics and communicate mathematically. Students were interested in mathematics, and they felt that mathematics was useful in their daily lives. They attributed success in mathematics to a combination of effort and ability, and failure to lack of effort. Students most frequently associated number-related items with mathematics and identified service- and financial-related occupations other than teaching as those that required mathematics. Students noted money and calculation-related uses of mathematics outside of school.

Class means on the *Student Questionnaire* were similar across districts. Students most enjoyed mathematics, science, and physical Education classes. In mathematics class, they most liked working with addition and subtraction and disliked subtraction and division. Students also reported that they used mathematics in other classes in specific applications such as measurement and problem solving.

Among the things they liked (or disliked) most about mathematics class, students reported that they liked addition and multiplication and disliked subtraction and division compared to other mathematics topics. Students also indicated that they used mathematics in other subject areas in specific applications such as measurement and problem solving.

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Longitudinal/Cross-Sectional Study of the Impact of *Mathematics in Context* on Student Performance

Student Background Data for 1997–1998 (Grade 6)
(Working Paper #18b)

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INTRODUCTION

The purposes of the longitudinal/cross-sectional study of the impact of *Mathematics in Context* (MiC; National Center for Research in Mathematical Sciences Education & Freudenthal Institute, 1997–1998) on student performance are (a) to determine the mathematical knowledge, understanding, attitudes, and levels of student performance as a consequence of studying MiC for over three years; and (b) to compare student knowledge, understanding, attitudes, and levels of performance of students using MiC with those using conventional mathematics curricula. The research model for this study is an adaptation of a structural model for monitoring changes in school mathematics (Romberg, 1987). For this study, information is being gathered on 14 variables over a 3-year period for three groups of students (those in Grades 5, 6, and 7 in 1997). The variables have been organized in five categories (prior, independent, intervening, outcome, and consequent). (See Figure 1 for variables and hypothesized relationships.)

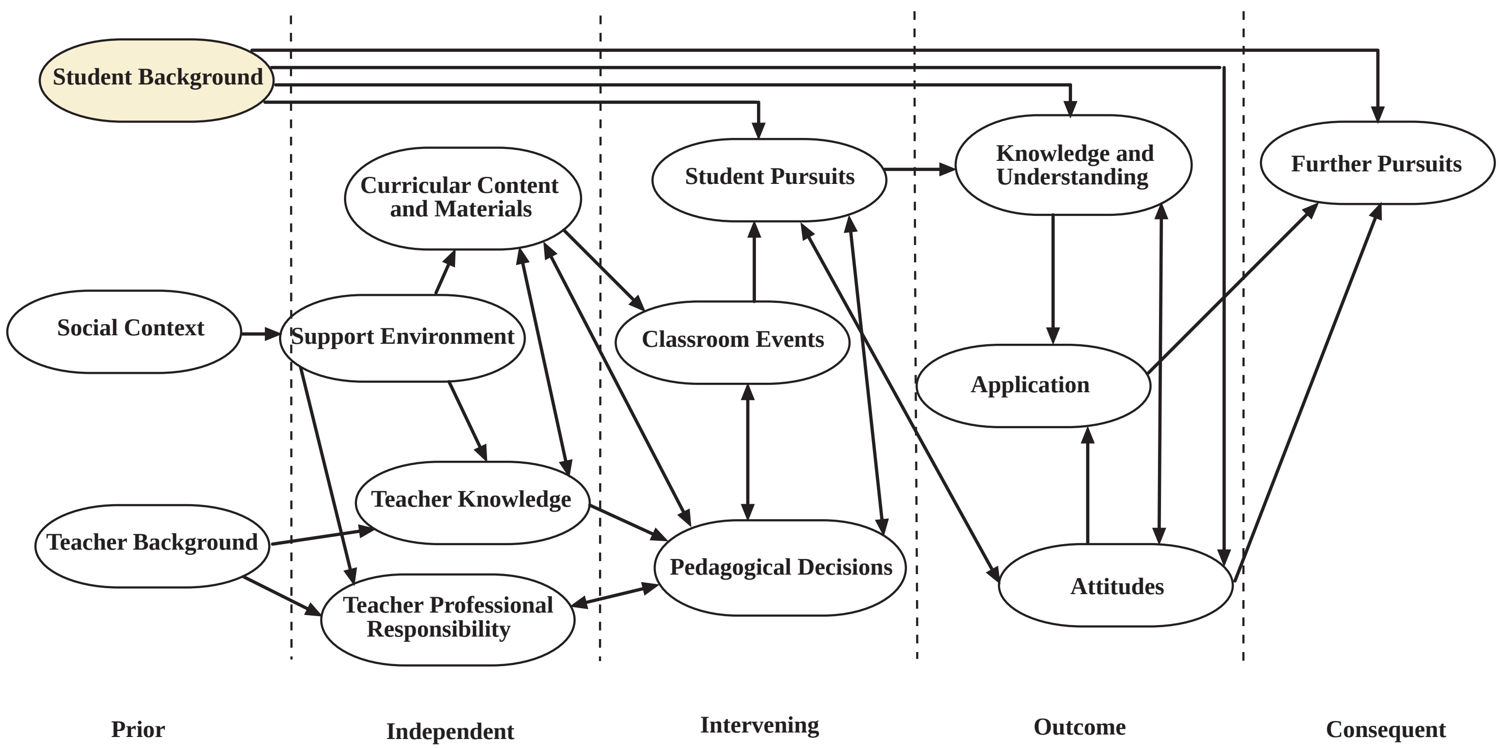


Figure 1. Revised model for the monitoring of school mathematics.

Overview: Grade 6 Student Background

The purpose of this working paper is to summarize the information of the *Student Background* variable collected in 1997 on sixth-grade classes at the beginning of the longitudinal/cross-sectional study of the impact of *Mathematics in Context* on student performance. The purpose of gathering this information was to describe similarities and differences in seven class characteristics prior to instruction (see Figure 2). Four fixed characteristics for the students in each class—gender, age, ethnicity, and preferred language—were gathered via a Student Questionnaire (see Appendix A; Shafer, 1997). Three other class characteristics—measures of student mathematical knowledge, student mathematical applications, and disposition toward mathematics—were taken, respectively, from standardized test scores provided by the schools, scores on the project-administered Collis/Romberg Mathematical Reasoning Test (Collis & Romberg, 1992), and student responses to the Student Questionnaire and the Student Attitude Inventory (see Appendix B; Shafer, Davis, & Wagner,1997).

Students in 35 sixth-grade classrooms from four school districts participated in the study. Districts are identified by number, and the classes by school and teacher (both pseudonyms). Also noted are the type of materials used (MiC materials or a conventional text).

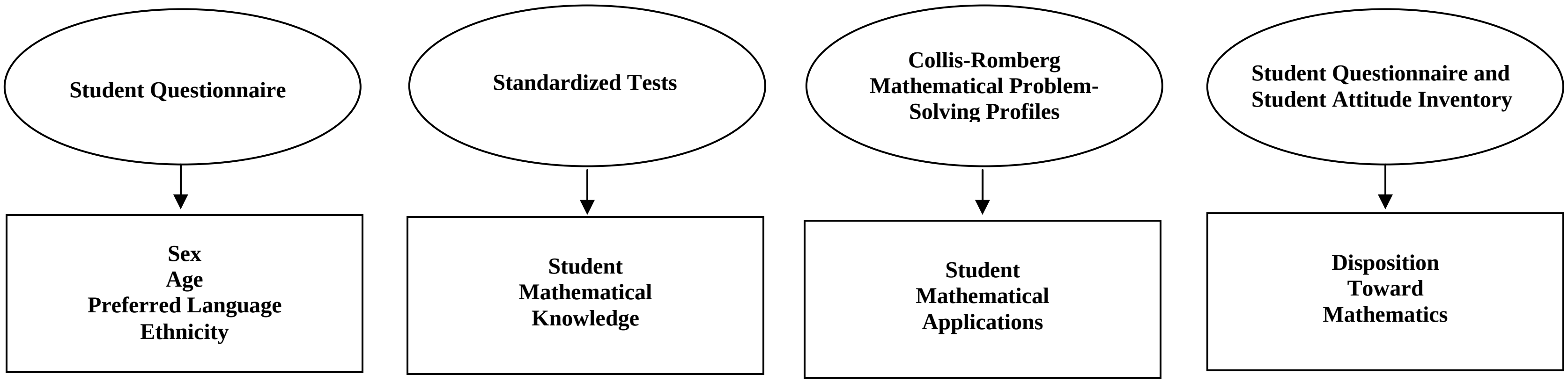


Figure 2. Fixed class characteristics in longitudinal/cross-sectional study of the impact of *Mathematics in Context* on student performance and their sources.

District 1

In District 1, 13 sixth-grade classes participated in the study. MiC was used in nine of the classrooms; in the other four, conventional texts were used. A summary of the variations in fixed characteristics is presented in Table 1.

Table 1
Fixed Characteristics, Grade 6, District 1

School-Class *(N)*	**Sex *(%)***		**Average Age *(years)***	**Language Preference *(%)* *** *(self-identified)*		**Ethnicity *(%)*** *(self-identified)***				
	Female	**Male**		**English Preference**	**Non-Response**	**African American**	**Hispanic**	**White**	**Multi/Other**	**Non-Response**
—MiC—										
Fernwood-Lee/Weatherspoon 1 (28)	61	39	11.14	86	7	14	14	54	11	7
Fernwood-Lee/Weatherspoon 2 (28)	43	57	11.40	79	7	18	11	39	29	4
Fernwood-Lee/Weatherspoon 3 (25)	44	56	11.36	84	0	8	12	60	20	0
VonHumboldt-Brown 1 (23)	43	57	11.48	96	0	30	0	65	4	0
VonHumboldt-Brown 2 (19)	47	53	11.51	89	0	37	5	42	11	5
VonHumboldt-Brown 3 (29)	55	45	11.40	93	3	28	3	59	6	3
VonHumboldt-Harvey 1 (28)	54	46	11.02	86	10	14	4	57	15	11
VonHumboldt-Harvey 2 (26)	54	46	11.58	92	0	15	0	69	16	0
VonHumboldt-Harvey 3 (31)	52	48	11.34	90	3	32	3	48	6	10
—Conventional—										
Addams-Tallackson 1 (20)	45	55	11.39	95	0	20	10	45	25	0
Wacker-Krittendon 1 (26)	46	54	11.38	92	4	35	0	46	16	4
Wacker-Krittendon 2 (23)	30	70	11.37	83	0	39	0	39	21	0
Wacker-Krittendon 3 (22)	41	59	11.36	90	5	41	5	41	10	5

* Percent does not add to 100% when students identified a language preference other than English.
** Percent on ethnicity was rounded off and does not always total 100. Multi/Other comprises Asian, Haitian, Native American, Multiracial and Other.
(For more detailed information, see Table C1 in Appendix C.)

In District 1, there was considerable variation in the class profiles. The number of students in a class varied from 19 to 31. With two exceptions (Fernwood-Weatherspoon 1, 61% female and Wacker-Krittendon 2, 30% female), the proportion of boys to girls was similar across classes. The average age was similar across classes, and English was the primary language for 79–96% of the students. The ethnicity in these classes, however, varied considerably (8–41% African American, 0–14% Hispanic, 39–69% White, 4–29% Multiracial or Other).

In District 1, two measures of prior mathematics performance were used as indicators of prior student performance. The first performance indicator was the summary of percentile scores for the students in the study classes on the standardized test administered by the district to all of its students, the TerraNova Mathematics Test (CTB/McGraw-Hill, 1997), which were forwarded to project staff. Summary means and standard deviations of the percentiles for each class are reported in Table 2, and box plots are shown in Figure 3. Mean percentiles range from 29.29 to 59.00, and the box plots illustrate the between-class variation on this test in this district. (Note the very wide range of scores in Fernwood-Weatherspoon 3.)

Table 2
Standardized Test Scores, Spring 1997, Grade 6, District 1

School-Class *(N)*	***TerraNova* National Percentile**					
	(*N*)	**Mean**	**StDev**	**Minimum**	**Median**	**Maximum**
—MiC—						
Fernwood-Lee/Weatherspoon 1 (28)	22	39.27	20.57	12	36.0	86
Fernwood-Lee/Weatherspoon 2 (28)	20	42.55	26.42	12	34.5	92
Fernwood-Lee/Weatherspoon 3 (25)	19	59.00	28.82	10	73.0	88
VonHumboldt-Brown 1 (23)	15	44.87	22.42	7	46.0	91
VonHumboldt-Brown 2 (19)	14	29.29	17.20	11	28.0	59
VonHumboldt-Brown 3 (29)	18	49.00	25.84	5	50.5	89
VonHumboldt-Harvey 1 (28)	22	46.05	19.26	15	48.0	81
VonHumboldt-Harvey 2 (26)	23	53.17	28.32	9	60.0	94
VonHumboldt-Harvey 3 (32)	22	46.59	21.25	1	49.5	83
—Conventional—						
Addams-Tallackson 1 (20)	11	43.27	29.30	6	41.0	94
Wacker-Krittendon 1 (26)	14	39.86	15.81	8	42.0	66
Wacker-Krittendon 2 (23)	13	35.15	17.14	1	35.0	55
Wacker-Krittendon 3 (21)	16	33.31	19.92	10	27.0	83

(For detailed information, see Table C2 in Appendix C.)

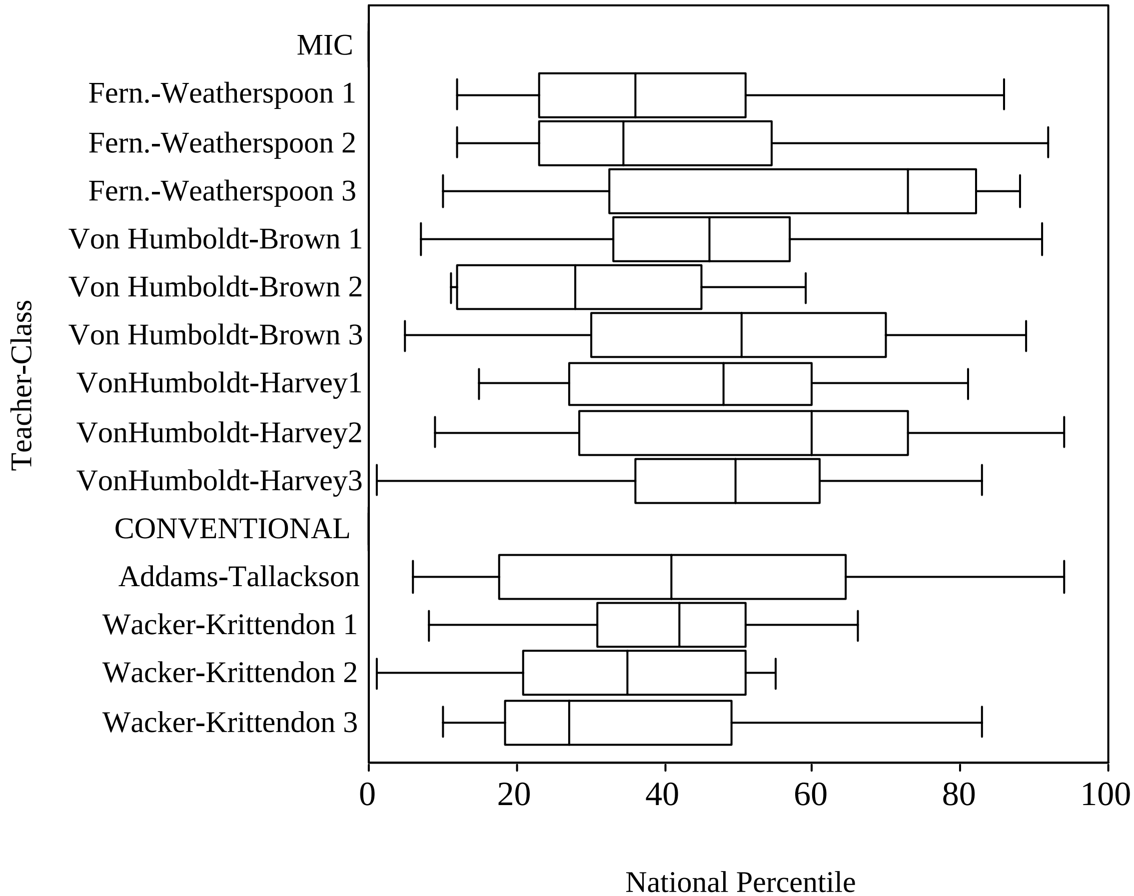


Figure 3. Box plots of class distributions on the *TerraNova* test, Grade 6, District 1.

The second performance indicator used in the study was the Collis/Romberg Mathematical Reasoning Test (Collis & Romberg, 1992). This test was administered to all students participating in the study. The information on this test includes scores related to four levels of reasoning (unistructural, multistructural, relational, and extended abstract), and responses for each level are scored from 0–5. Class means on all four levels of reasoning are given in Table 3. For all but two classes the means on unistructural level of reasoning were above 2.50, indicating that students were operating at this level on many items. Only Von-Humboldt-Brown 2 and Wacker-Krittendon 2 had class means below 2.50 (both at 2.27). Even at this level, however, there was considerable variability in class means. The means on the other scales indicate that in only seven classes (Fernwood-Lee/Weatherspoon 1, Fernwood-Lee/Weatherspoon 2, Fernwood-Lee/Weatherspoon 3, VonHumboldt-Brown 1, VonHumboldt-Brown 3, VonHumboldt-Harvey 2, and Wacker-Krittendon 3) were many students beginning to reason at a multistructural level, and only a very small number of students exhibit reasoning at either relational or extended abstract levels. (Note the relatively high scores of Fernwood-Weatherspoon 3.)

Table 3
Class means on the Collis-Romberg Mathematical Problem-Solving Profiles, Grade 6, District 1

School-Class *(N)*	Level of Reasoning				
	(*N*)	**Uni-structural**	**Multi-structural**	**Relational**	**Extended Abstract**
—MiC—					
Fernwood-Lee/Weatherspoon 1 (28)	26	3.19	1.15	0.35	0.00
Fernwood-Lee/Weatherspoon 2 (28)	26	3.15	1.27	0.19	0.00
Fernwood-Lee/Weatherspoon 3 (25)	25	3.12	1.44	0.52	0.12
VonHumboldt-Brown 1 (23)	12	3.17	1.42	0.25	0.00
VonHumboldt-Brown 2 (19)	15	2.27	0.73	0.27	0.00
VonHumboldt-Brown 3 (29)	28	2.89	1.36	0.36	0.00
VonHumboldt-Harvey 1 (28)	23	2.76	0.80	0.12	0.04
VonHumboldt-Harvey 2 (26)	20	2.75	1.30	0.40	0.05
VonHumboldt-Harvey 3 (31)	27	2.81	0.93	0.22	0.04
—Conventional—					
Addams-Tallackson 1 (20)	17	2.59	0.88	0.18	0.00
Wacker-Krittendon 1 (26)	24	2.67	0.75	0.08	0.00
Wacker-Krittendon 2 (23)	22	2.27	0.77	0.00	0.00
Wacker-Krittendon 3 (22)	20	2.90	1.20	0.25	0.00

(For detailed information, see Table C3 in Appendix C.)

Because the standardized test scores show a similar pattern to those on the unistructural scale of the Collis/Romberg Test (see the scatter plot for means on the two measures in Figure 4), a correlation coefficient between the class means of the two measures was calculated (r = .49). From this information, it is apparent that there are eleven average classes and two high average classes.

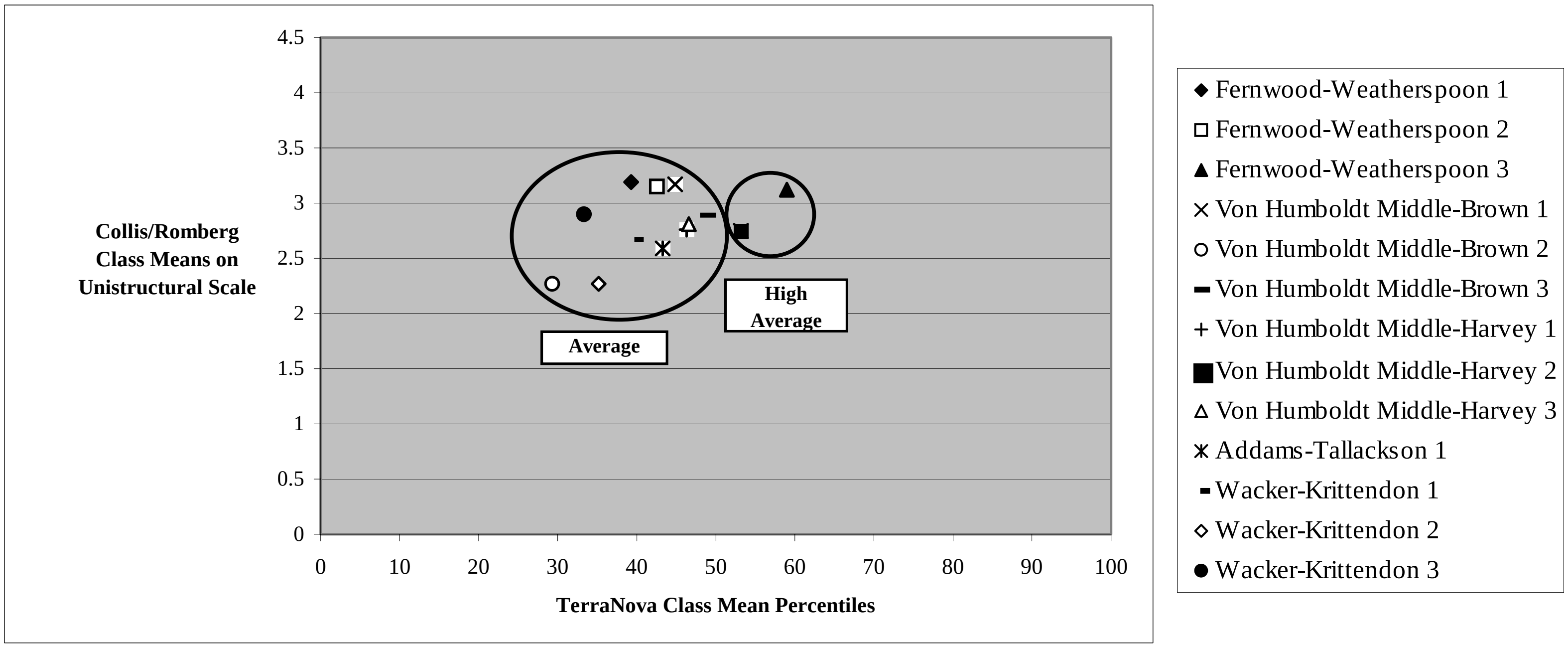


Figure 4. Scatter plot for class mean percentiles on the *TerraNova* test and the class means on the unistructural scale of the Collis/Romberg reasoning test, Grade 6, District 1.

Because the classes in District 1 on the two preceding achievement measures used in this study, either comparisons of student performances on outcome measures should be made only between classes in the same level of preceding achievement, or adjustments in outcome test scores should be made via covariance. In fact, because of this strong relationship between the two premeasures, only the standardized test scores should be considered as a potential covariate in order not to lose a degree of freedom in any statistical test about differences.

All students in the study responded to the items in the *Student Attitude Inventor;* six components of which are summarized here.

First, the class means for student judgments on items related to their effort, confidence, interest, usefulness, and ability to communicate mathematically are shown in Table 4. Each item was judged on a scale of 1–4 (1 = very true; 2 = true; 3 = not true; 4 = not true at all). Overall, the students in these classes judged the statements as true or very true, and there was little variation across classes.

Table 4
Class Means on Student Judgments About Mathematics (Subscales o the Student Attitude Inventory), Grade 6, District 1

School-Class *(N)*	**Effort** *in mathematics*		**Confidence** *in ability to do mathematics*		**Interest** *in mathematics*		**Usefulness** *of mathematics*		**Ability to Communicate** *about mathematics*	
	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean
—MiC—										
Fernwood-Weatherspoon 1 (28)	22	2.02	23	2.15	24	2.10	20	1.68	24	1.90
Fernwood-Weatherspoon 2 (28)	23	1.88	24	2.03	22	2.16	21	1.76	23	1.87
Fernwood-Weatherspoon 3 (25)	24	1.77	23	1.92	23	1.83	22	1.65	23	1.77
Von Humboldt Middle-Brown 1 (23)	20	1.83	20	1.93	18	2.28	19	1.80	18	1.88
Von Humboldt Middle-Brown 2 (19)	15	2.03	16	2.18	15	2.41	15	2.08	15	1.90
Von Humboldt Middle-Brown 3 (29)	22	2.33	22	2.20	21	2.45	21	2.03	22	2.25
Von Humboldt Middle-Harvey 1 (28)	21	1.99	23	2.12	24	2.22	21	2.07	22	2.00
Von Humboldt Middle-Harvey 2 (26)	19	2.18	21	2.26	19	2.45	20	1.91	21	2.12
Von Humboldt Middle-Harvey 3 (31)	24	1.94	25	1.90	24	1.99	23	1.87	24	2.03
—Conventional—										
Addams-Tallackson 1 (20)	16	1.98	16	1.98	16	1.95	16	1.62	17	2.03
Wacker-Krittendon 1 (26)	21	1.89	20	1.94	22	1.94	20	1.74	22	1.71
Wacker-Krittendon 2 (23)	20	1.79	18	1.93	20	1.81	17	1.90	20	1.86
Wacker-Krittendon 3 (22)	15	1.89	16	1.79	14	1.78	11	1.56	12	1.73

(For detailed information, see Table C4 in Appendix C.)

Generally, more students in classes from Von Humboldt judged the statements not to be true, especially those in Von Humboldt-Brown 3. The exception is the high-achieving Von Humboldt-Harvey 2 class (see Figure 5).

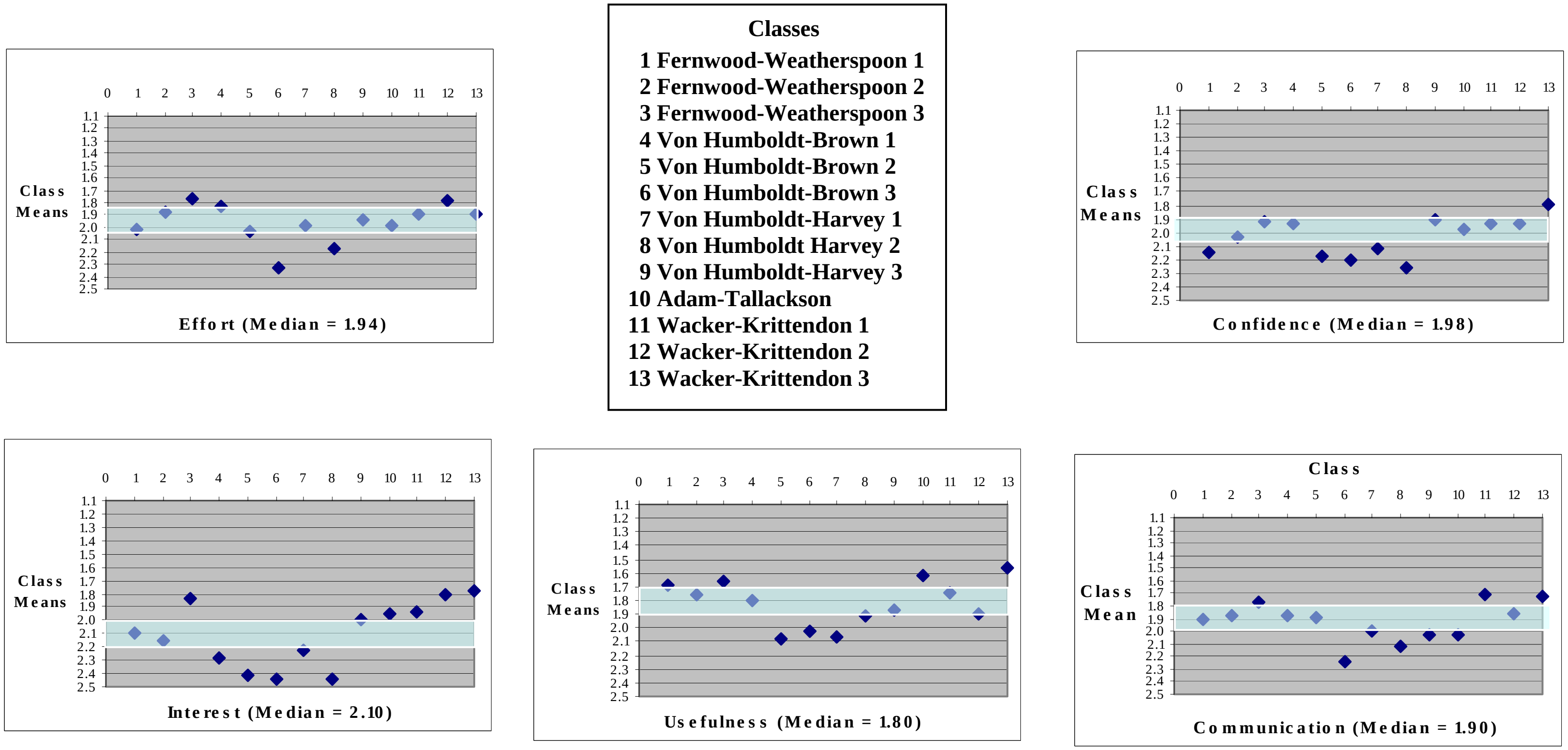


Figure 5. Plots showing class means on student judgments about mathematics Grade 6, District 1. (Shaded areas show class medians ± 0.1.)

In the second component of the *Student Attitude Inventory*, students responded to 16 items related to general perceptions about mathematics (see Table C5 in Appendix C). Several items were reverse-scored due to wording of question. In general, little variance was seen in class means with respect to items related to general perceptions about mathematics. Students felt confident that they were able to learn new ideas in mathematics class (from 1.09, Wacker-Krittendon 1, to 1.88, Addams-Tallackson 1, on Item 3). Students thought it was acceptable to solve mathematics problems differently than their classmates (from 1.18, Wacker-Krittendon 3, to 1.56, Fernwood-Weatherspoon 3 and Addams-Tallackson 1, on Item 16). However, students were less confident (from 1.44, Fernwood-Weatherspoon 1, to 1.95, Von Humboldt-Harvey 2, on Item 4) that they could discover ways of solving problems that their teachers or their peers had not previously considered.

Students were confident that anyone who worked hard enough in mathematics class could be good at mathematics (from 1.04, Wacker-Krittendon 1, to 1.64, Von Humboldt-Brown 3, on Item 11). Similarly, students disagreed that some students are naturally better, or worse, at mathematics than other students regardless of effort (from 2.56, Fernwood-Weatherspoon 3, to 3.38, Von Humboldt-Harvey 1, on Item 37).

Students felt that knowing how to solve a problem was as important as determining the answer (from 1.29, Fernwood-Weatherspoon 2, to 2.21, Von Humboldt-Harvey 3, on Item 53), although they felt that answering questions correctly in mathematics class require providing only numbers (from 1.59, Wacker-Krittendon 3, to 2.08, Fernwood-Weatherspoon 1, on Item 38). Students thought that getting correct answers in mathematics class was at least as important as understanding why the answer was correct (from 1.87, Wacker-Krittendon 1, to 2.89, Addams-Tallackson 1, on Item 27), although students felt that getting correct answers was more important than understanding a mathematics problem or the process of finding an answer (from 1.67, Von Humboldt-Harvey 2, to 2.50, Von Humboldt-Brown 2, on Item 49). Students disagreed that mathematics was mostly learned by memorizing facts and rules (from 2.42, Von Humboldt-Harvey 3, to 3.08, Fernwood-Weatherspoon 1, on Item 55). They also disagreed that they would get correct answers to their teachers' questions if they memorized rules or facts (from 2.33, Von Humboldt-Harvey 2, to 3.28, Von Humboldt-Harvey 1, on Item 44). Students disagreed that they did not know how to solve mathematics problems if they found they had to use calculators (from 2.39, Von Humboldt-Brown 3, to 2.96, Fernwood-Weatherspoon 2, on Item 45) and that calculators always generated correct answers (from 2.22, Addams-Tallackson 1, to 2.96, Fernwood-Weatherspoon 3, on Item 6).

Students felt that new mathematics topics were related to ones they had already studied (from 2.18, Wacker-Krittendon 3, to 3.05, Wacker-Krittendon 2, on Item 39). Students felt that mathematics was related to other school subjects (from 1.56, Addams-Tallackson 1, to 2.40, Wacker-Krittendon 2, on Item 20), although they thought that mathematics was harder to understand than other school subjects (from 2.24, Von Humboldt-Harvey 3 and Wacker-Krittendon 3, to 2.91, Von Humboldt-Brown 3, on Item 28).

The third component involved students judging whether success or failure in mathematics could be attributed to teachers, ability, effort, or luck. The class means for these judgments are shown in Table 5. Each item was judged on a scale of 1–4 (1 = very true; 2 = true; 3 = not true; 4 = not true at all). All classes attributed success in mathematics to a combination of effort and ability, and failure to lack of effort.

Table 5
Class Means on Student Attribution of Success or Failure in Mathematics, Grade 6, District 1

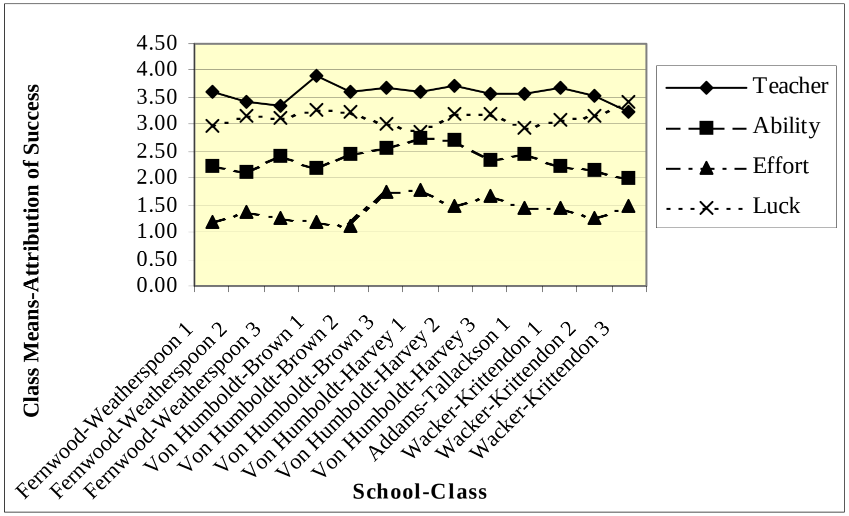
School-Class (*N*)	Success							
	Teacher		Ability		Effort		Luck	
	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean
—MiC—								
Fernwood-Lee/Weatherspoon 1 (28)	25	3.60	24	2.25	25	1.20	25	2.96
Fernwood-Lee/Weatherspoon 2 (28)	26	3.42	26	2.12	25	1.36	26	3.15
Fernwood-Lee/Weatherspoon 3 (25)	25	3.36	25	2.40	25	1.28	25	3.12
VonHumboldt-Brown 1 (23)	22	3.91	22	2.18	21	1.19	21	3.29
VonHumboldt-Brown 2 (19)	15	3.60	16	2.44	16	1.13	16	3.25
VonHumboldt-Brown 3 (29)	23	3.70	23	2.57	23	1.74	23	3.00
VonHumboldt-Harvey 1 (28)	23	3.61	26	2.77	23	1.78	25	2.88
VonHumboldt-Harvey 2 (26)	22	3.73	21	2.71	21	1.48	21	3.19
VonHumboldt-Harvey 3 (31)	25	3.56	25	2.36	25	1.68	25	3.20
—Conventional—								
Addams-Tallackson 1 (20)	18	3.56	17	2.47	18	1.44	18	2.94
Wacker-Krittendon 1 (26)	23	3.70	23	2.22	22	1.45	23	3.09
Wacker-Krittendon 2 (23)	20	3.55	19	2.16	20	1.25	20	3.15
Wacker-Krittendon 3 (22)	17	3.24	15	2.00	17	1.47	17	3.41

School-Class (*N*)	Failure							
	Teacher		Ability		Effort		Luck	
	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean
—MiC—								
Fernwood-Lee/Weatherspoon 1 (28)	25	3.48	25	2.48	25	2.20	25	3.36
Fernwood-Lee/Weatherspoon 2 (28)	26	3.42	27	2.59	24	2.08	23	3.30
Fernwood-Lee/Weatherspoon 3 (25)	25	3.44	25	2.92	25	2.00	25	3.40
VonHumboldt-Brown 1 (23)	21	3.86	22	2.77	20	2.05	21	3.52
VonHumboldt-Brown 2 (19)	16	3.44	16	2.75	15	2.33	16	3.19
VonHumboldt-Brown 3 (29)	23	3.35	23	2.96	23	2.13	23	3.13
VonHumboldt-Harvey 1 (28)	24	3.42	26	2.92	25	1.80	25	3.12
VonHumboldt-Harvey 2 (26)	21	3.67	22	2.82	21	2.10	20	3.15
VonHumboldt-Harvey 3 (31)	25	3.52	25	3.36	24	2.25	24	3.58
—Conventional—								
Addams-Tallackson 1 (20)	18	3.56	18	2.72	18	2.00	18	3.67
Wacker-Krittendon 1 (26)	23	3.26	23	3.13	20	1.80	21	3.33
Wacker-Krittendon 2 (23)	20	3.60	20	2.65	20	2.10	20	3.20
Wacker-Krittendon 3 (22)	17	3.47	17	3.06	16	2.19	17	3.71

(For more detailed information, see Table C6 in Appendix C.)

The classes were inclined to attribute success or failure to effort and ability (see Figures 6a and 6b).

(a)



(b)

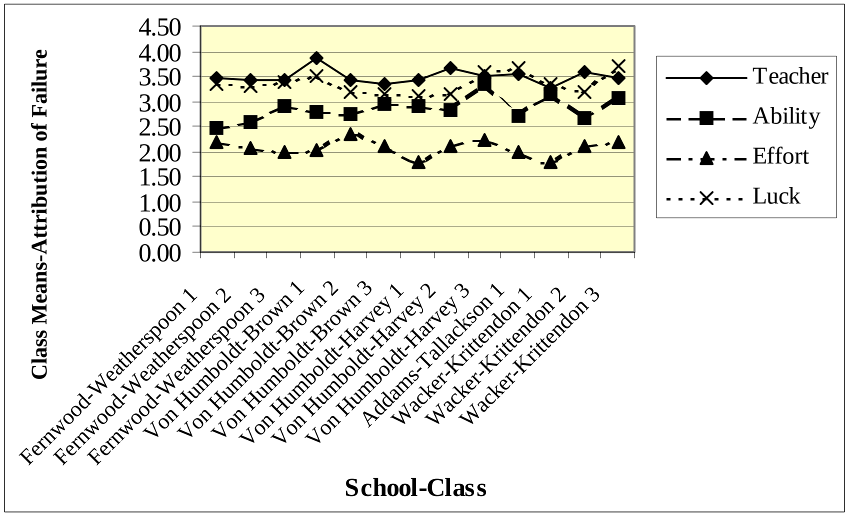


Figure 6. Line graphs showing class means of student attribution of (a) success and (b) failure in mathematics, Grade 6, District 1.

In the fourth component of the *Student Attitude Inventory*, students listed things they associated with the word "mathematics." Although classes varied, students in all classes most frequently listed words associated with number including operations with numbers. Interest-related responses were notable in Fernwood-Lee/Weatherspoon 3, and geometry-related responses in Fernwood-Lee/Weatherspoon 1 and 2 and Von Humboldt-Brown 1 in comparison to other sixth-grade classes in this district. Also, negative emotive responses were higher in all three of Von Humboldt-Harvey's classes (see Table 6).

Table 6

Words Students Associated With "Mathematics," Grade 6, District 1

School-Class *(N)*	**Number of Responses[1] *(N)***	**Number[2] *(%)* [3]**	**Interest *(%)***	**Geometry *(%)***	**Negative Emotive Responses[4] *(%)***	**Thinking *(%)***	**Problem Solving *(%)***	**Algebra *(%)***	**Occupations *(%)***	**Miscellaneous *(%)***
—MiC—										
Fernwood-Lee/Weatherspoon 1 (25)	91	47	4	19	3	1	7	0	1	12
Fernwood-Lee/Weatherspoon 2 (21)	84	52	2	23	0	4	2	2	0	10
Fernwood-Lee/ Weatherspoon 3	69	41	17	0	7	10	9	1	3	6
VonHumboldt-Brown 1 (20)	87	57	1	14	1	1	10	2	1	3
VonHumboldt-Brown 2 (14)	50	56	2	0	8	4	8	8	2	6
VonHumboldt-Brown 3 (22)	85	69	0	6	5	0	5	2	1	7
VonHumboldt-Harvey 1 (19)	67	43	9	4	10	3	9	0	1	12
VonHumboldt-Harvey 2 (18)	66	59	0	0	11	5	2	2	0	14
VonHumboldt-Harvey 3 (17)	53	64	4	0	13	4	4	0	2	4
—Conventional—										
Addams-Tallackson 1 (18)	62	60	0	0	8	3	5	2	0	18
Wacker-Krittendon 1 (18)	77	69	0	12	1	4	5	5	0	4
Wacker-Krittendon 2 (20)	83	76	0	7	0	0	8	1	0	2
Wacker-Krittendon 3 (14)	51	80	0	4	0	0	10	0	2	0

[1] Students were asked to list the words they "think of when they hear the word mathematics."

[2] Responses included operations with numbers.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included "boring," "stupid," and statements of displeasure.

In the fifth component of the *Student Attitude Inventory*, students listed jobs other than teaching that required the use of mathematics. Although classes varied, students in all classes most frequently listed service-related occupations, including retail sales, business, and food service, and financial-related occupations, such as accounting, banking, and insurance. Students also often listed professional-related occupations, including medical fields, engineering, and law, in Von Humbolt-Brown 2, science-related occupations in Von Humboldt-Harvey 3, and trades-related occupations in Fernwood-Lee/Weatherspoon 3 are higher than in other classes (see Table 7).

Table 7
Nonteaching Jobs that Students Identified as Requiring Mathematics, Grade 6, District 1

School-Class *(N)*	Number of Responses[1] *(N)*	Services[2] *(%)*[3]	Financial[4] *(%)*	Professional[5] *(%)*	Science *(%)*	Trades *(%)*	Creative Arts *(%)*	Government *(%)*	Sports *(%)*	Unreportable[6] *(%)*
—MiC—										
Fernwood-Lee/Weatherspoon 1	78	36	13	10	13	10	0	3	4	8
Fernwood-Lee/Weatherspoon 2	64	36	17	9	5	14	2	2	6	3
Fernwood-Lee/ Weatherspoon 3	52	37	19	2	4	19	0	0	2	12
VonHumboldt-Brown 1 (20)	53	49	32	4	2	0	0	0	4	6
VonHumboldt-Brown 2 (14)	33	30	12	21	9	6	3	3	0	9
VonHumboldt-Brown 3 (22)	49	45	22	4	8	2	4	0	0	14
VonHumboldt-Harvey 1 (19)	43	40	40	2	5	2	0	2	0	2
VonHumboldt-Harvey 2 (18)	40	35	20	8	8	5	8	0	0	18
VonHumboldt-Harvey 3 (17)	43	21	19	7	23	9	5	2	0	7
—Conventional—										
Addams-Tallackson 1 (18)	42	40	14	2	10	10	2	0	0	19
Wacker-Krittendon 1 (18)	37	35	22	5	5	5	3	3	3	19
Wacker-Krittendon 2 (20)	46	41	15	7	7	9	2	0	4	11
Wacker-Krittendon 3 (14)	31	52	16	6	6	3	6	3	0	6

[1] Students asked to list the jobs other than teaching that require mathematics.

[2] Responses included occupations in retail sales, business, and food service.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included occupations in accounting, banking, and insurance.

[5] Responses included occupations in medical fields, engineering, and law.

[6] Responses included teaching, thinking, and operations with numbers.

In the sixth component of the *Student Attitude Inventory*, students listed ways they used mathematics outside of class. Students in all classes most frequently listed money-related ways, such as banking and shopping, and calculation-related responses. The leisure- and measurement-related responses are also notable for many classes. Also, problem solving-related ways were listed more frequently in Fernwood-Lee/Weatherspoon 3 and Von Humboldt-Brown 2 than in the other classes (see Table 8).

Table 8

Ways Students Used Mathematics Outside of Class, Grade 6, District 1

School-Class *(N)*	**Number of Responses[1] *(N)***	**Monetary[2] *(%)* [3]**	**Calculation *(%)***	**Leisure *(%)***	**Measurement *(%)***	**Problem Solving *(%)***	**Unreportable[4] *(%)***
—MiC—							
Fernwood-Lee/Weatherspoon 1 (25)	19	11	21	11	21	0	21
Fernwood-Lee/Weatherspoon 2 (21)	21	38	10	14	14	5	14
Fernwood-Lee/ Weatherspoon 3 (22)	17	35	12	18	6	18	12
VonHumboldt-Brown 1 (20)	14	50	29	0	7	7	7
VonHumboldt-Brown 2 (14)	12	0	17	17	8	17	25
VonHumboldt-Brown 3 (22)	15	0	33	20	13	0	33
VonHumboldt-Harvey 1 (19)	10	0	40	20	10	10	10
VonHumboldt-Harvey 2 (18)	14	29	36	0	14	7	7
VonHumboldt-Harvey 3 (17)	13	8	31	38	15	8	0
—Conventional—							
Addams-Tallackson 1 (18)	16	13	44	0	19	0	25
Wacker-Krittendon 1 (18)	11	27	18	9	0	9	27
Wacker-Krittendon 2 (20)	10	30	20	0	0	0	40
Wacker-Krittendon 3 (14)	7	29	29	29	0	0	14

[1] Students were asked to describe how they would use mathematics outside of class.

[2] Responses included banking and shopping.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included occupations and nonmathematics school subjects.

Finally, all students in the study responded to items on the *Student Questionnaire,* five components of which are summarized here. The first component involving student judgment about the school subject they enjoyed the most is reported in Table 9. Students most frequently reported that they enjoyed physical education (PE), mathematics, and science classes.

Table 9
Student Preference Ranking of Classes, Grade 6, District 1

School-Class *(N)*	**Subject *(%)***									
	SocStudies	**Science**	**Math**	**Reading**	**Writing**	**Art**	**Music**	**PE**	**Band**	**Other**
					—MiC—					
Fernwood-Lee/Weatherspoon 1 (28)	0	16	20	16	0	0	16	12	0	20
Fernwood-Lee/Weatherspoon 2 (28)	0	16	8	0	12	12	4	32	0	16
Fernwood-Lee/Weatherspoon 3 (25)	4	20	20	0	0	4	12	20	0	20
VonHumboldt-Brown 1 (23)	20	10	10	10	0	5	5	20	5	15
VonHumboldt-Brown 2 (19)	18	18	12	0	0	18	6	18	0	12
VonHumboldt-Brown 3 (29)	4	15	15	8	8	4	0	23	0	23
VonHumboldt-Harvey 1 (28)	13	4	8	8	8	8	0	21	8	21
VonHumboldt-Harvey 2 (26)	4	4	4	4	0	8	4	33	21	17
VonHumboldt-Harvey 3 (31)	9	13	9	4	0	17	0	39	9	0
					—Conventional—					
Addams-Tallackson 1 (20)	0	6	22	6	0	22	0	0	17	28
Wacker-Krittendon 1 (26)	8	33	21	0	4	8	0	13	4	8
Wacker-Krittendon 2 (23)	9	39	22	0	4	4	0	17	0	4
Wacker-Krittendon 3 (22)	5	20	15	10	5	5	0	10	0	30

The second component involved student judgments about their frequency of talking about mathematics with classmates, friends, and other acquaintances on three questions. Response frequency (never, sometimes, often, very often) for each class was strikingly different across questions and across classes (see Table 10).

Table 10

Student Judgment About Frequency of Communication About Mathematics, Grade 6, District 1

School-Class (*N*)	**Mathematical Ideas and Problem Strategies**					**Homework Problems**					**Ways Mathematics is Used Outside of School**				
	(*N*)	**Never**	**Some-times**	**Often**	**Very Often**	**(*N*)**	**Never**	**Some-times**	**Often**	**Very Often**	**(*N*)**	**Never**	**Some-times**	**Often**	**Very Often**
— MiC —															
Fernwood-Lee/Weatherspoon 1 (28)	25	8	60	20	12	25	8	56	28	8	25	24	52	12	12
Fernwood-Lee/Weatherspoon 2 (28)	25	8	64	12	16	25	16	56	20	8	25	36	40	20	4
Fernwood-Lee/Weatherspoon 3 (25)	25	8	48	32	12	24	33	50	13	4	24	33	33	21	13
VonHumboldt-Brown 1 (23)	20	20	55	25	0	20	20	35	30	15	20	50	25	20	5
VonHumboldt-Brown 2 (19)	17	24	47	12	18	16	31	25	38	6	16	56	19	6	19
VonHumboldt-Brown 3 (29)	26	15	42	35	8	26	23	31	31	15	26	62	27	8	4
VonHumboldt-Harvey 1 (28)	25	44	36	16	4	25	32	44	20	4	25	60	28	4	8
VonHumboldt-Harvey 2 (26)	24	38	33	13	17	24	25	58	4	13	24	42	33	25	0
VonHumboldt-Harvey 3 (31)	24	25	46	25	4	24	25	63	13	0	24	54	25	13	8
—Conventional —															
Addams-Tallackson 1 (20)	18	17	33	39	11	18	28	56	17	17	18	50	22	11	17
Wacker-Krittendon 1 (26)	24	4	67	17	13	24	4	38	25	33	24	13	33	21	33
Wacker-Krittendon 2 (23)	22	145	55	18	14	22	9	18	45	27	22	23	18	27	32
Wacker-Krittendon 3 (22)	20	10	40	15	35	20	15	40	30	15	20	10	25	40	25

Note: Response rates designate class mean percents.

The third component involving student judgments about the things they liked the most about mathematics class is reported in Table 11. Most students reported that they liked miscellaneous class activities more than they reported other categories, although the classes varied. Also, more students in Wacker-Krittendon 3 indicated preferences for work with number than students in other classes.

Table 11
What Students Liked Most About Mathematics Class, Grade 6, District 1

School-Class *(N)*	**Number of Responses[1] *(N)***	**Number *(%)*[2]**	**Problem Solving *(%)***	**Classwork *(%)***	**Working With Others *(%)***	**Miscellaneous[3] *(%)***	**Negative Emotional Response[4] *(%)***	**Positive Emotional Response[5] *(%)***
—MiC—								
Fernwood-Lee/Weatherspoon 1 (28)	74	4	5	8	8	23	0	16
Fernwood-Lee/Weatherspoon 2 (28)	69	9	6	19	14	17	3	4
Fernwood-Lee/ Weatherspoon 3 (25)	69	10	10	6	20	16	2	7
VonHumboldt-Brown 1 (23)	59	12	7	12	3	36	9	3
VonHumboldt-Brown 2 (19)	47	2	6	6	11	32	2	7
VonHumboldt-Brown 3 (29)	70	9	4	14	10	36	3	0
VonHumboldt-Harvey 1 (28)[6]	--	--	--	--	--	--	--	--
VonHumboldt-Harvey 2 (26)[6]	--	--	--	--	--	--	--	--
VonHumboldt-Harvey 3 (31)[6]	--	--	--	--	--	--	--	--
—Conventional—								
Addams-Tallackson 1 (20)	54	19	4	4	0	41	2	6
Wacker-Krittendon 1 (26)	64	9	11	19	6	22	0	5
Wacker-Krittendon 2 (8)	18	17	0	33	11	17	0	0
Wacker-Krittendon 3 (22)	57	37	14	2	2	16	0	5

[1] Students were asked to name three things they liked most about mathematics class.

[2] Percentage does not add to 100 due to number of unique responses.

[3] Responses included "teacher," "computer," and "warm-up activities."

[4] Responses included "hard," "boring," and "restrictive."

[5] Responses included "like it all" and "fun."

[6] Student questionaires were not submitted.

Generally, the number of responses for number-related categories was too small to make inferences about student preferences (see Table 12). Wacker-Krittendon 3, however, indicated preferences for addition, multiplication, and division.

Table 12
What Students Liked Most About Mathematics Class, Grade 6, District 1 (continued)

School-Class *(N)*	**Number of Responses[1] *(N)***	**Addition *(%)***	**Subtraction *(%)***	**Multiplication *(%)***	**Division *(%)***	**Decimals (%)**	**Fractions *(%)***	**Other[2] *(%)***
—MiC—								
Fernwood-Lee/Weatherspoon 1 (28)	3	67	0	0	33	0	0	0
Fernwood-Lee/Weatherspoon 2 (28)	6	17	0	50	33	0	0	0
Fernwood-Lee/Weatherspoon 3 (25)	7	0	0	43	29	0	14	14
VonHumboldt-Brown 1 (23)	7	29	0	29	0	0	0	43
VonHumboldt-Brown 2 (19)	1	0	0	0	0	0	100	0
VonHumboldt-Brown 3 (29)	6	17	0	17	33	0	17	17
VonHumboldt-Harvey 1 (28)[3]	--	--	--	--	--	--	--	--
VonHumboldt-Harvey 2 (26)[3]	--	--	--	--	--	--	--	--
VonHumboldt-Harvey 3 (31)[3]	--	--	--	--	--	--	--	--
—Conventional—								
Addams-Tallackson 1 (20)	10	30	10	30	10	0	0	20
Wacker-Krittendon 1 (26)	6	17	0	33	17	0	17	17
Wacker-Krittendon 2 (8)	3	33	0	67	0	0	0	0
Wacker-Krittendon 3 (22)	21	24	14	24	19	0	5	14

[1] Students were asked to name three things they liked most about mathematics class.

[2] Responses included counting, average, estimation, least common denominator, least common multiple, money, rounding and time.

[3] Student questionaires were not submitted.

The fourth component involved student judgments about the things they disliked most about mathematics class (see Table 13). Most classes reported that they disliked classwork and miscellaneous class activities more than anything else, although the classes varied.

Table 13
What Students Disliked Most About Mathematics Class, Grade 6, District 1

School-Class *(N)*	**Number of Responses[1] *(N)***	**Number *(%)*[2]**	**Classwork *(%)***	**Homework *(%)***	**Tests *(%)***	**Problem Solving *(%)***	**Book *(%)***	**Miscellaneous[3] *(%)***	**Negative Emotional Response[4] *(%)***	**Positive Emotional Response[5] *(%)***
—MiC—										
Fernwood-Lee/Weatherspoon 1 (28)	61	10	15	5	8	8	7	16	13	0
Fernwood-Lee/Weatherspoon 2 (28)	62	5	18	13	10	6	6	19	8	0
Fernwood-Lee/ Weatherspoon 3 (25)	52	15	25	10	8	6	2	12	6	2
VonHumboldt-Brown 1 (23)	51	4	25	8	8	4	10	20	6	8
VonHumboldt-Brown 2 (19)	39	8	15	18	18	3	0	13	5	8
VonHumboldt-Brown 3 (29)	75	4	31	11	15	7	8	11	5	1
VonHumboldt-Harvey 1 (28)[6]	--	--	--	--	--	--	--	--	--	--
VonHumboldt-Harvey 2 (26)[6]	--	--	--	--	--	--	--	--	--	--
VonHumboldt-Harvey 3 (31)[6]	--	--	--	--	--	--	--	--	--	--
—Conventional—										
Addams-Tallackson 1 (20)	50	16	12	16	22	6	0	8	16	0
Wacker-Krittendon 1 (26)	49	8	10	24	12	8	4	2	8	8
Wacker-Krittendon 2 (8)	18	11	11	11	0	6	6	11	0	0
Wacker-Krittendon 3 (22)	36	19	11	11	3	3	0	19	0	6

[1] Students were asked to name three things they disliked the most about mathematics class.

[2] Percentage does not add to 100 due to number of unique responses.

[3] Responses included "teacher," "computer," and "warm-up activities."

[4] Responses included "hard," "boring," and "restrictive."

[5] Responses included "like it all" and "fun."

[6] Student questionaires were not submitted.

The number of responses for number-related categories was too small to make inferences about student dislikes for these categories (see Table 14).

Table 14
What Students Disliked Most About Mathematics Class, Grade 6, District 1 (continued)

School-Class *(N)*	**Number of Responses[1] *(N)***	**Addition *(%)***	**Subtraction *(%)***	**Multiplication *(%)***	**Division *(%)***	**Decimals (%)**	**Fractions *(%)***	**Other[2] *(%)***
—MiC—								
Fernwood-Lee/Weatherspoon 1 (28)	6	0	0	67	33	0	0	0
Fernwood-Lee/Weatherspoon 2 (28)	3	0	33	33	33	0	0	0
Fernwood-Lee/Weatherspoon 3 (25)	8	13	13	25	25	0	0	25
VonHumboldt-Brown 1 (23)	2	0	50	0	50	0	0	0
VonHumboldt-Brown 2 (19)	3	0	0	33	33	0	33	0
VonHumboldt-Brown 3 (29)	3	0	0	0	0	33	33	33
VonHumboldt-Harvey 1 (28)[3]	--	--	--	--	--	--	--	--
VonHumboldt-Harvey 2 (26)[3]	--	--	--	--	--	--	--	--
VonHumboldt-Harvey 3 (31)[3]	--	--	--	--	--	--	--	--
—Conventional—								
Addams-Tallackson 1 (20)	8	0	13	13	13	0	38	25
Wacker-Krittendon 1 (26)	4	0	0	0	75	0	25	0
Wacker-Krittendon 2 (8)	2	0	50	0	0	0	50	0
Wacker-Krittendon 3 (22)	7	14	29	14	29	0	0	14

[1] Students were asked to name three things they disliked the most about mathematics class.

[2] Responses included counting, average, estimation, least common denominator, least common multiple, money, rounding and time.

[3] Student questionaires were not submitted.

The fifth component involved student judgments about the ways mathematics helped them in other subjects (see Table 15). Although classes varied, students in most classes reported that mathematics was used in general applications such as estimating and calculating. Also, nearly 25% of the responses for Von Humboldt-Brown's classes indicated that mathematics was not helpful in other subjects.

Table 15

Student Perception of the Usefulness of Mathematics in Other Classes, Grade 6, District 1

School-Class *(N)*	**Number of Responses[1] *(N)***	**General Applications[2] *(%)***	**Specific Applications[3] *(%)***	**Organization of Information *(%)***	**No Help *(%)***	**Miscellaneous *(%)***	**Inappropriate Responses[4] *(%)***
			—MiC—				
Fernwood-Lee/Weatherspoon 1 (28)	38	24	11	0	8	5	53
Fernwood-Lee/Weatherspoon 2 (28)	38	32	11	0	13	3	42
Fernwood-Lee/ Weatherspoon 3 (25)	31	16	35	6	10	6	26
VonHumboldt-Brown 1 (23)	29	21	21	0	24	3	31
VonHumboldt-Brown 2 (19)	23	17	9	4	22	9	39
VonHumboldt-Brown 3 (29)	34	35	15	0	24	0	26
VonHumboldt-Harvey 1 (28)[5]	--	--	--	--	--	--	--
VonHumboldt-Harvey 2 (26)[5]	--	--	--	--	--	--	--
VonHumboldt-Harvey 3 (31)[5]	--	--	--	--	--	--	--
			—Conventional—				
Addams-Tallackson 1 (20)	28	32	21	7	7	14	18
Wacker-Krittendon 1 (26)	44	23	18	18	9	7	25
Wacker-Krittendon 2 (8)	13	8	23	0	0	0	69
Wacker-Krittendon 3 (22)	27	22	11	7	7	7	44

[1] Students were asked to identify how their knowledge of mathematics and the way they learned mathematics helped them in other classes.

[2] Responses included "estimating" and "calculating."

[3] Responses included "measurement" and "problem solving."

[4] Responses included "not good at math", "need to know something", "it's easier and more fun", "not good ", etc.

[5] Students questionaires were not submitted.

District 2

In District 2, 10 sixth-grade classes participated in the study. In eight of the classrooms, MiC was used; in the other two, conventional texts were used. A summary of the variations in fixed characteristics is presented in Table 16.

Table 16

Fixed Characteristics, Grade 6, District 2

School-Class *(N)*	**Sex *(%)***		**Average Age *(years)***	**Language Preference *(%)* * *(self-identified)***		**Ethnicity *(%)*** *(self-identified)***				
	Female	**Male**		**English Preference**	**Non-Response**	**African American**	**Hispanic**	**White**	**Multi/Other**	**Non-Response**
—MiC—										
Guggenheim-Broughton 1 (26)	46	54	11.93	69	15	27	31	19	15	8
Guggenheim-Broughton 2 (14)	36	64	11.79	79	14	36	21	36	7	0
Guggenheim-Dillard 1 (27)	67	33	11.36	96	4	11	19	37	30	4
Guggenheim-Dillard 2 (16)	63	38	11.35	94	0	13	31	25	25	6
HirschMetro-Davenport 1 (22)	68	32	11.73	100	0	0	68	0	32	0
HirschMetro-Davenport 2 (26)	58	42	11.71	85	0	4	69	4	23	0
HirschMetro-Holland 1 (27)	70	30	11.72	81	0	4	81	0	11	4
HirschMetro-Holland 2 (27)	59	41	11.54	78	4	4	63	15	15	4
—Conventional—										
Newberry-Renlund 1 (29)	45	55	11.56	76	3	14	38	10	34	3
Newberry-Rhaney 1 (37)	43	57	11.75	86	3	30	32	3	22	14

* Percent does not add to 100% when students identified a language preference other than English.

** Percent on ethnicity was rounded off and does not always total 100. Multi/Other comprises Asian, Haitian, Native American, Multiracial and Other.

(For more detailed information, see Table D1 in Appendix D.)

In District 2, there was significant variation in the class profiles. The number of students in a class varied from 14 to 37. The proportion of girls in a class varied from 36% to 70%. The average age was similar across classes, and English was the primary language for 69–100% of the students. The ethnicity in these classes also varied considerably (African American, 0–36%; Hispanic, 19–81%; White, 0–37%; Multiracial/Other, 7–34%).

In District 2, two measures of prior mathematics performance were used as indicators of prior student performance. The first performance indicator was the summary of percentile scores on applications subtests for the students in the study classes on the standardized test administered by the district to all of its students, The *Stanford Mathematics Achievement Test* (Harcourt Brace Educational Measurement, 1997**),** which were forwarded to project staff. Summary means and standard deviations of the percentiles for each class on applications subtests are reported in Table 17, and box plots are shown in Figure 7. Clearly, the classes differed in average percentiles on this test. Mean percentiles on the applications subtest from 31.96 to 75.29.

Table 17
Standardized Test Scores, Spring 1997, Grade 6, District 2

School-Class *(N)*	**SAT Applications: National Percentiles**					
	(*N*)	**Mean**	**St Dev**	**Minimum**	**Median**	**Maximum**
—MiC—						
Guggenheim-Broughton 1 (26)	23	31.96	20.20	1	27.5	71
Guggenheim-Broughton 2 (14)	12	34.75	29.01	1	34.5	90
Guggenheim-Dillard 1 (27)	24	75.29	15.96	44	70.5	99
Guggenheim-Dillard 2 (16)	15	65.20	28.14	15	76	94
HirschMetro-Davenport 1 (22)	19	56.95	23.82	13	64	87
HirschMetro-Davenport 2 (26)	20	44.80	27.47	7	42	92
HirschMetro-Holland 1 (27)	21	56.38	25.95	17	55	92
HirschMetro-Holland 2 (27)	25	57.00	24.09	9	61	93
—Conventional—						
Newberry-Renlund 1 (29)	26	73.88	16.93	41	77.5	99
Newberry-Rhaney 1 (37)	31	35.35	24.71	2	31	84

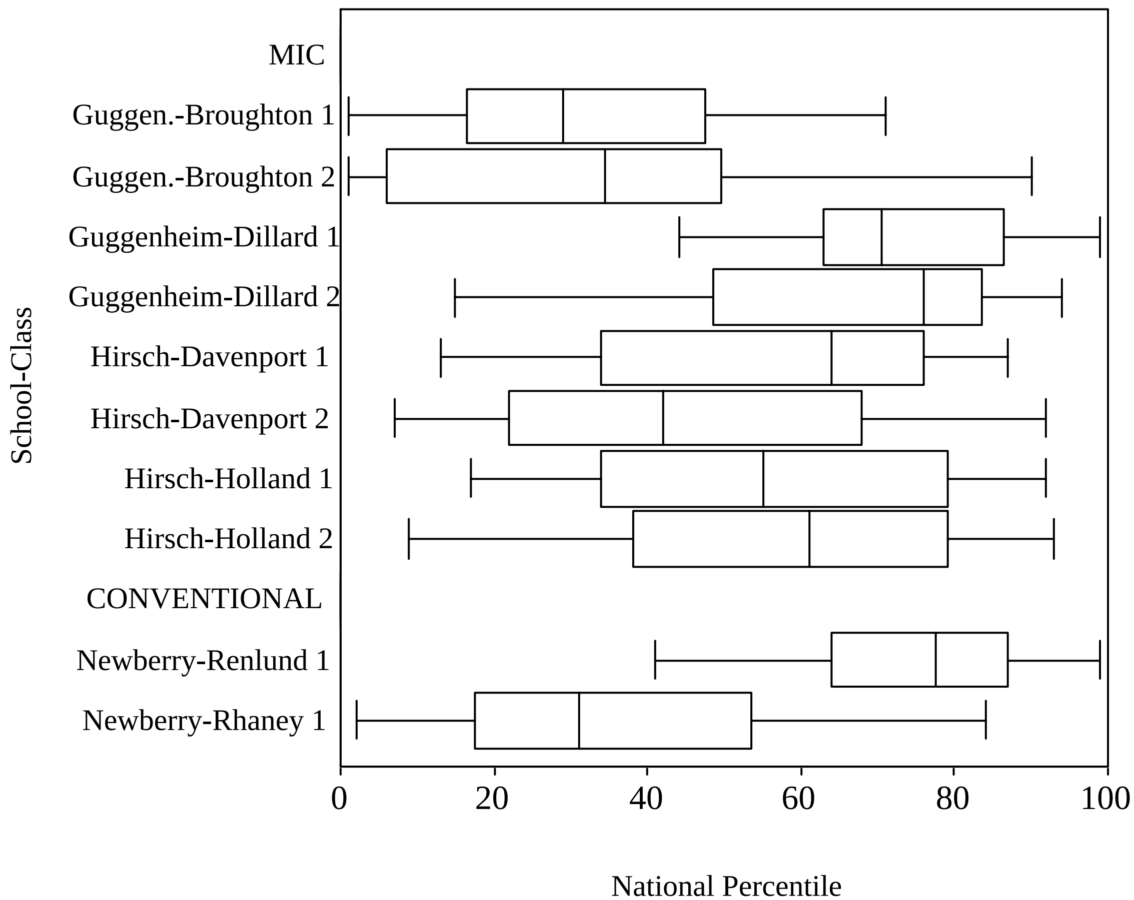


Figure 7. Box plots of class distributions on the Stanford Achievement Test (SAT-Applications Subtest), Grade 6, District 2.

The second performance indicator used in the study is the Collis/Romberg Mathematical Reasoning Test (Collis & Romberg, 1992). This test was administered to all students participating in the study. The information on this test includes scores related to four levels of reasoning (unistructural, multistructural, relational, and extended abstract), and responses for each level are scored from 0–5. Class means on all four levels of reasoning are given in Table 18. For all but three classes, the means on unistructural level of reasoning are above 2.50, indicating that students were operating at this level on many items. Only Guggenheim-Broughton 2, and Newberry-Rhaney 1 have a class mean below 2.50 (2.27, and 1.28, respectively). Even at this level, however, there is considerable variability in class means. The class means on the other scales indicate that in six classes students were beginning to reason at a multistructural level (Guggenheim-Dillard 1, Guggenheim-Dillard 2, HirschMetro-Davenport 1, HirschMetro-Holland 1, HirschMetro-Holland 2, and Newberry-Renlund).

Table 18

Class means on the Collis-Romberg Mathematical Problem-Solving Profiles, Grade 6, District 2

School-Class *(N)*	**Level of Reasoning**				
	(*N*)	**Uni-structural**	**Multi-structural**	**Relational**	**Extended Abstract**
		—MiC—			
Guggenheim-Broughton 1 (26)	22	2.64	0.73	0.09	0.00
Guggenheim-Broughton 2 (14)	13	2.27	0.54	0.00	0.00
Guggenheim-Dillard 1 (27)	20	2.47	1.30	0.30	0.05
Guggenheim-Dillard 2 (16)	13	3.08	1.08	0.15	0.00
HirschMetro-Davenport 1 (22)	22	3.09	1.27	0.18	0.00
HirschMetro-Davenport 2 (26)	26	2.58	0.92	0.08	0.00
HirschMetro-Holland 1 (27)	27	2.89	1.07	0.15	0.00
HirschMetro-Holland 2 (27)	24	3.25	1.54	0.46	0.00
		—Conventional—			
Newberry-Renlund 1 (29)	26	3.50	1.62	0.27	0.04
Newberry-Rhaney 1 (37)	25 (17)*	1.28 (1.94)	0.44 (0.65)	0.04	0.00

*Although there were 37 students in Rhaney's class, only 25 tests were submitted to the project for scoring, and 8 of these were incomplete. Apparently, eight students had been given a test with a missing page. Several unsuccessful attempts were made to have the rest of the class take the Collis-Romberg Profile. The averages reported here are based on the scores of the students who actually took these sections of the test.
(For more detailed information, see Table D2 in Appendix D.)

Because the standardized test scores show a similar pattern to those on the unistructural scale of the Collis/Romberg Test (see the scatter plot for means on both subscales in on the two measures in Figure 8), a correlation coefficient between the class means of the two measures (r =.62) was calculated. From this information it is apparent that there are three low average performing classes, four average and three high average classes. The some of the variations, however, seem to be attributable to the different schools.

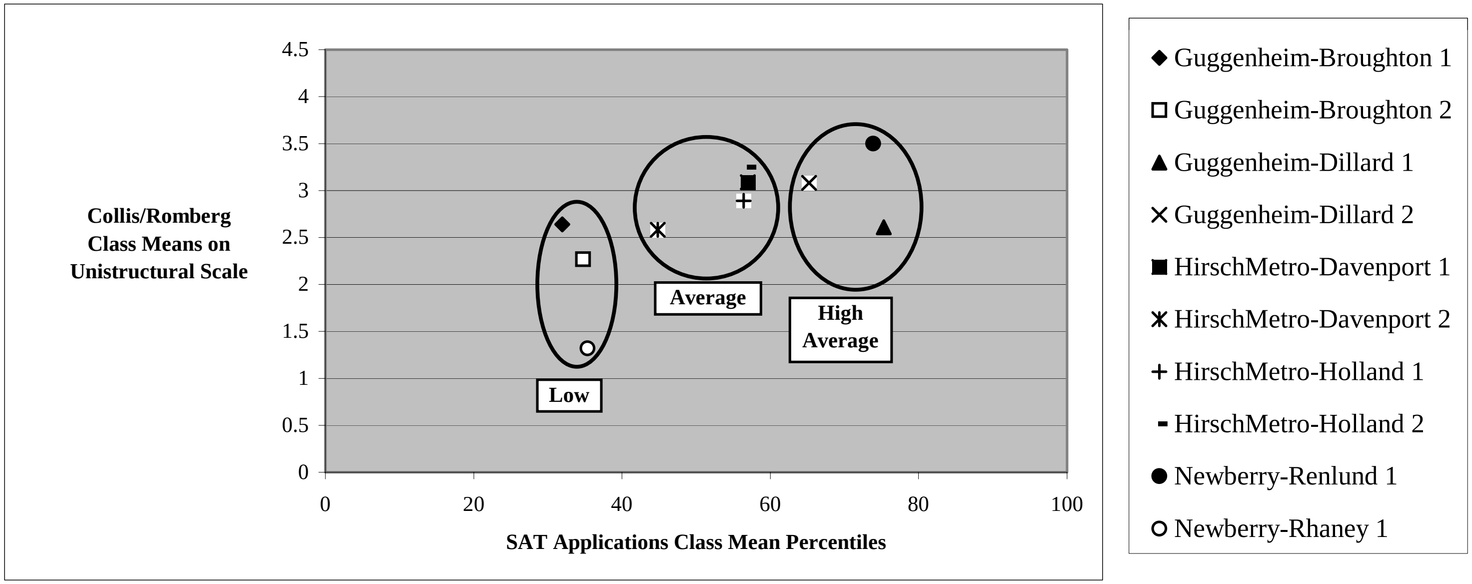


Figure 8. Scatter plot for class mean percentiles on the TerraNova test and the class means on the unistructural scale of the Collis/Romberg reasoning test, Grade 6, District 2.

Because the classes in District 2 varied on the two preceding achievement measures used in this study, either comparisons of student performances on outcome measures should be made only between classes in the same level of preceding achievement, or adjustments in outcome test scores should be made via covariance. In fact, because of this strong relationship between the two premeasures, only the standardized test scores should be considered as a potential covariate in order not to lose a degree of freedom in any statistical test about differences.

All students in the study responded to the items in the *Student Attitude Inventory;* six components of which are summarized here.

First, the class means for student judgments on items related to their effort, confidence, interest, usefulness, and ability to communicate mathematically are shown in Table 19. Each item was judged on a scale of 1–4 (1 = very true; 2 = true; 3 = not true; 4 = not true at all). Overall, the students in these classes judged the statements as true or very true, and there was little variation between classes classes.

Table 19

Class Means on Student Judgment About Mathematics (Subscales of the Student Attitude Inventory), Grade 6, District 2

School-Class *(N)*	**Effort** *in mathematics*		**Confidence** *in ability to do mathematics*		**Interest** *in mathematics*		**Usefulness** *of mathematics*		**Ability to Communicate** *about mathematics*	
	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean
—MiC—										
Guggenheim-Broughton 1 (26)	22	2.09	22	2.28	19	2.44	22	2.18	22	2.28
Guggenheim-Broughton 2 (14)	11	2.05	12	2.23	12	2.24	12	1.98	12	2.06
Guggenheim-Dillard 1 (27)	24	1.99	23	2.04	23	2.25	24	1.76	23	1.91
Guggenheim-Dillard 2 (16)	13	1.86	12	1.78	12	2.02	13	1.58	12	1.81
Hirsch Metro-Davenport 1 (22)	21	1.88	21	2.13	20	1.98	20	1.81	20	2.06
Hirsch Metro-Davenport 2 26)	25	1.91	23	2.17	22	2.32	23	1.71	25	1.89
Hirsch Metro-Holland 1 (27)	24	1.65	26	2.04	26	1.85	26	1.55	25	1.81
Hirsch Metro-Holland 2 (27)	20	1.73	19	1.97	20	2.01	17	1.65	18	1.80
—Conventional—										
Newberry-Renlund (29)	22	1.89	23	1.82	23	1.92	21	1.64	23	1.86
Newberry-Rhaney (37)	13	2.21	17	2.33	13	2.24	13	2.39	15	2.16

(For detailed information, see Table D3 in Appendix D.)

The one class low on preceding achievement (Newberry-Rhaney 1), however, tended to be less confident in their ability to do mathematics and to believe mathematics less useful to them than did students in the other classes (see Figure 9).

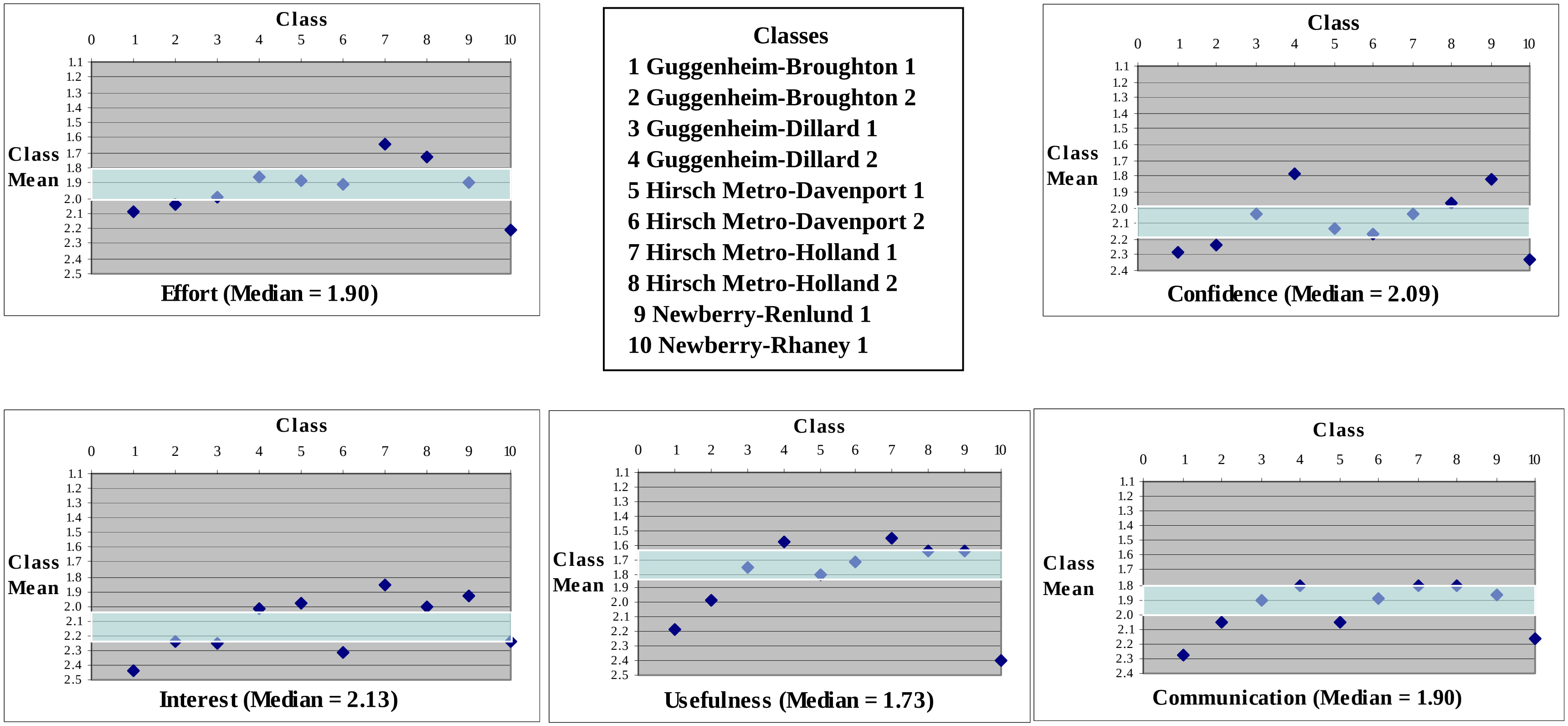


Figure 9. Scatter plots showing class means on student judgments about mathematics, Grade 6, District 2. (Shaded areas show class medians ± 0.1.)

In the second component of the *Student Attitude Inventory*, students responded to 16 items related to general perceptions about mathematics (see Table D4 in Appendix D). Several items were reverse-scored due to wording of question. In general, little variance was seen in class means with respect to items related to general perceptions about mathematics. Students felt confident that they were able to learn new ideas in mathematics class (from 1.22, Newberry-Renlund 1, to 1.75, Guggenheim-Broughton 2, on Item 3). Students thought it was acceptable to solve mathematics problems differently than their classmates (from 1.23, Guggenheim- Dillard 2, to 1.79, Newberry-Rhaney 1, on Item 16). However, students were less confident (from 1.31, Guggenheim-Dillard 2, to 1.80, Guggenheim-Broughton 1, on Item 4) that they could discover ways of solving problems that their teachers or their peers had not previously considered.

Students were confident that anyone who worked hard enough in mathematics class could be good at mathematics (from 1.08, Hirsch Metro-Holland 1, to 1.50, Guggenheim-Broughton 2, on Item 11). Similarly, students disagreed that some students were naturally better, or worse, at mathematics than other students regardless of effort (from 2.71, Hirsch Metro-Davenport 1, to 3.08, Guggenheim-Broughton 2, on Item 37).

Students felt that knowing how to solve a problem was as important as determining the answer (from 1.15, Guggenheim-Dillard 2, to 1.89, Newberry-Rhaney 1, on Item 53), although they felt that answering questions correctly in mathematics class require providing only numbers (from 1.46, Newberry-Renlund 1, to 2.95, Newberry-Rhaney 1, on Item 38). Students thought that getting correct answers in mathematics class was at least as important as understanding why the answer was correct (from 1. 73, Hirsch Metro-Holland 2, to 2.85, Guggenheim-Broughton 1, on Item 27), although students felt that getting correct answers was more important than understanding a mathematics problem or the process of finding an answer (from 1.59, Hirsch Metro-Holland 2, to 2.83, Guggenheim-Broughton 2, on Item 49). Students disagreed that mathematics was mostly learned by memorizing facts and rules (from 2.68, Guggenheim-Broughton 1, to 3.25, Guggenheim-Broughton 2, on Item 55). They also disagreed that they would get correct answers to their teachers' questions if they memorized rules or facts (from 2.95, Hirsch Metro-Davenport 1, to 3.50, Newberry-Renlund 1, on Item 44). Students disagreed that they did not know how to solve mathematics problems if they found they had to use calculators (from 2.42, Guggenheim-Dillard 1, to 3.33, Guggenheim-Broughton 2, on Item 45) and that calculators always generated correct answers (from 2.21, Guggenheim-Dillard 1, to 3.32, Hirsch Metro-Holland 1, on Item 6).

Students felt that new mathematics topics were related to ones they had already studied (from 2.04, Newberry-Renlund 1, to 2.69, Guggenheim-Dillard 2, on Item 39). Students felt that mathematics was related to other school subjects (from 1.33, Newberry-Renlund 1, to 2.19, Newberry-Rhaney 1, on Item 20), although they thought that mathematics was harder to understand than other school subjects (from 2.09, Newberry-Renlund 1, to 2.88, Newberry-Rhaney 1, on Item 28).

The third component involved students judging whether success or failure in mathematics could be attributed to teachers, ability, effort, or luck. The class means for these judgments are shown in Table 20. Each item was judged on a scale of 1–4 (1 = very true; 2 = true; 3 = not true; 4 = not true at all). All classes attributed success in mathematics to a combination of effort and ability, and failure to lack of effort.

Table 20
Class Means on Student Attribution of Success or Failure in Mathematics, Grade 6, District 2

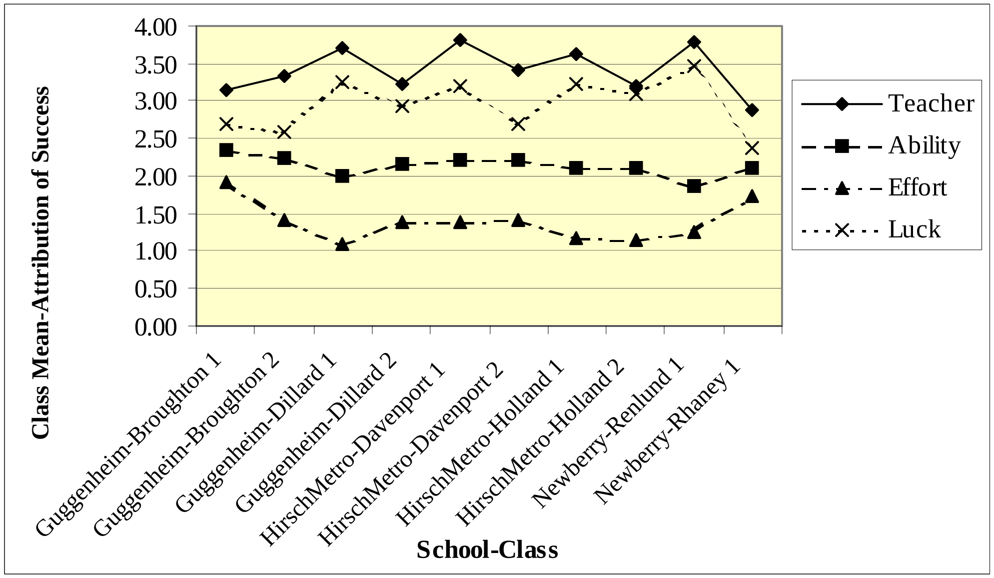
School-Class (*N*)	Success							
	Teacher		Ability		Effort		Luck	
	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean
—MiC—								
Guggenheim-Broughton 1 (26)	22	3.14	21	2.33	22	1.91	22	2.68
Guggenheim-Broughton 2 (14)	12	3.33	12	2.25	12	1.42	12	2.58
Guggenheim-Dillard 1 (27)	24	3.71	24	2.00	24	1.08	24	3.25
Guggenheim-Dillard 2 (16)	13	3.23	12	2.17	13	1.38	13	2.92
HirschMetro-Davenport 1 (22)	21	3.81	20	2.20	21	1.38	21	3.19
HirschMetro-Davenport 2 (26)	24	3.42	25	2.20	26	1.42	26	2.69
HirschMetro-Holland 1 (27)	26	3.62	26	2.12	27	1.19	27	3.22
HirschMetro-Holland 2 (27)	21	3.19	21	2.10	21	1.14	21	3.10
—Conventional—								
Newberry-Renlund 1 (29)	24	3.79	23	1.87	24	1.25	24	3.46
Newberry-Rhaney 1 (37)	28	2.89	28	2.11	18	1.72	22	2.36

School-Class (*N*)	Failure							
	Teacher		Ability		Effort		Luck	
	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean
—MiC—								
Guggenheim-Broughton 1 (26)	22	2.91	22	2.27	21	1.95	22	2.73
Guggenheim-Broughton 2 (14)	12	3.33	12	2.75	12	2.42	11	3.18
Guggenheim-Dillard 1 (27)	24	3.79	24	2.71	24	1.96	24	3.63
Guggenheim-Dillard 2 (16)	13	3.85	13	3.08	13	2.46	13	3.46
HirschMetro-Davenport 1 (22)	21	3.62	21	3.00	21	2.19	21	3.52
HirschMetro-Davenport 2 (26)	26	3.27	24	2.46	26	1.85	26	2.88
HirschMetro-Holland 1 (27)	27	3.70	27	2.37	27	1.59	27	3.59
HirschMetro-Holland 2 (27)	19	3.84	22	2.86	22	1.50	22	3.64
—Conventional—								
Newberry-Renlund 1 (29)	24	4.00	24	3.04	23	1.70	23	3.87
Newberry-Rhaney 1 (37)	21	2.62	27	2.81	14	2.14	18	2.67

(For more detailed information, see Table D5 in Appendix D.)

The classes were inclined to attribute success or failure to effort and ability (see Figures 10a and 10b).

(a)



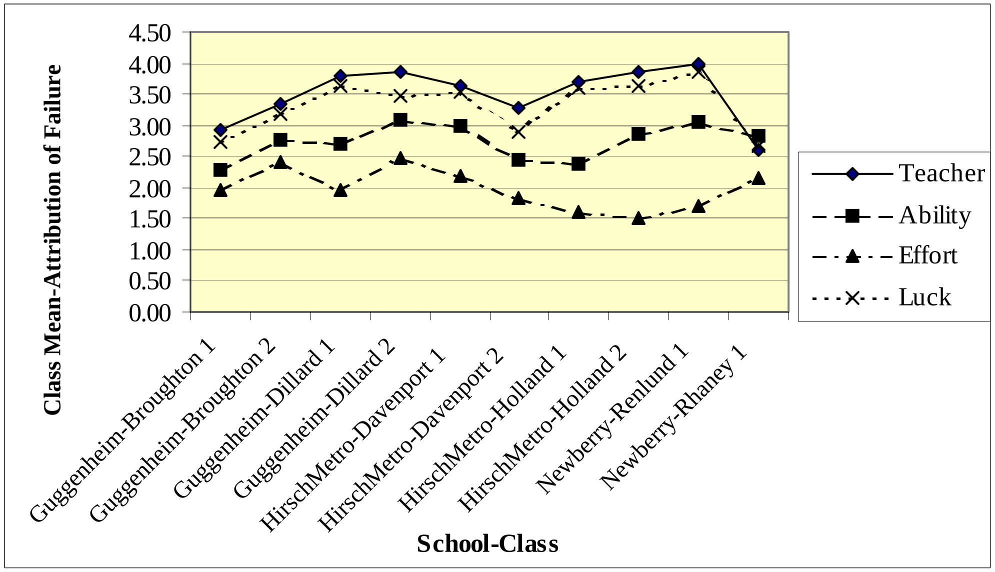


Figure 10. Line graphs showing class means of student attribution of (a) success and (b) failure in mathematics, Grade 6, District 2.

In the fourth component of the *Student Attitude Inventory*, students listed things they associated with the word "mathematics" (see Table 21). Although classes varied, students in all classes most frequently listed words associated with number, including operations with numbers.

Table 21

Words Students Associated With "Mathematics," Grade 6, District 2

School-Class *(N)*	**Number of Responses[1] *(N)***	**Number[2] *(%)*[3]**	**Interest *(%)***	**Geometry *(%)***	**Negative Emotive Responses[4] *(%)***	**Thinking *(%)***	**Problem Solving *(%)***	**Algebra *(%)***	**Occupations *(%)***	**Miscellaneous *(%)***
—MiC—										
Guggenheim-Broughton 1 (21)	85	73	4	0	5	6	4	0	0	4
Guggenheim-Broughton 2 (9)	32	59	9	3	3	3	3	3	6	6
Guggenheim-Dillard 1 (22)	142	60	1	5	3	1	6	6	0	15
Guggenheim-Dillard 2 (13)	62	76	2	2	5	0	3	5	0	5
HirschMetro-Davenport 1 (20)	78	74	5	5	1	5	1	1	1	3
HirschMetro-Davenport 2 (26)	78	63	5	11	0	4	1	1	1	6
HirschMetro-Holland 1 (27)	78	55	6	6	0	3	5	3	4	12
HirschMetro-Holland 2 (22)	78	63	3	3	0	4	8	4	0	8
—Conventional—										
Newberry-Renlund 1 (23)	127	70	2	3	0	2	5	6	1	6
Newberry-Rhaney 1 (13)	46	50	4	4	2	2	9	0	0	13

[1] Students were asked to list the words they "think of when they hear the word mathematics."

[2] Responses included operations with numbers.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included "boring," "stupid," and statements of displeasure.

In the fifth component of the *Student Attitude Inventory,* students listed jobs other than teaching that required the use of mathematics (see Table 22). Although classes varied, students in all classes most frequently listed service-related occupations, including retail sales, business, and food service; financial-related occupations, such as accounting, banking, and insurance; and professional-related occupations, including medical fields, engineering, and law. Also, more students in Guggenheim-Broughton 2, Guggenheim-Dillard 1, Newberry-Renlund 1, and Newberry-Rhaney 1 listed science-related occupations than in other classes.

Table 22
Nonteaching Jobs that Students Identified as Requiring Mathematics, Grade 6, District 2

School-Class *(N)*	**Number of Responses[1] *(N)***	**Services[2] *(%)*[3]**	**Financial[4] *(%)***	**Professional[5] *(%)***	**Science *(%)***	**Trades *(%)***	**Creative Arts *(%)***	**Government *(%)***	**Sports *(%)***	**Unreportable[6] *(%)***
—MiC—										
Guggenheim-Broughton 1 (21)	46	24	4	2	9	7	0	2	17	22
Guggenheim-Broughton 2 (9)	23	39	13	13	17	9	0	0	0	4
Guggenheim-Dillard 1 (22)	71	42	13	7	13	8	0	4	6	7
Guggenheim-Dillard 2 (13)	34	47	21	9	6	9	0	0	6	0
HirschMetro-Davenport 1 (20)	59	34	17	19	7	3	2	3	3	7
HirschMetro-Davenport 2 (26)	77	35	10	12	6	9	1	4	4	10
HirschMetro-Holland 1 (27)	108	38	14	12	7	5	6	3	2	7
HirschMetro-Holland 2 (22)	79	28	13	15	10	9	9	3	0	10
—Conventional—										
Newberry-Renlund 1 (23)	75	33	13	8	19	1	0	5	0	11
Newberry-Rhaney 1 (13)	21	5	0	10	14	0	14	0	0	57

[1] Students asked to list the jobs other than teaching that require mathematics.

[2] Responses included occupations in retail sales, business, and food service.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included occupations in accounting, banking, and insurance.

[5] Responses included occupations in medical fields, engineering, and law.

[6] Responses included teaching, thinking, and operations with numbers.

In the sixth component of the *Student Attitude Inventory,* students listed ways they used mathematics outside of class (see Table 23). Although classes varied, students in all classes most frequently listed monetary-related ways, such as banking and shopping, and calculation-related responses. Students in many classes listed leisure- and measurement-related ways. Also, students in Guggenheim-Broughton 1 listed problem solving-related ways more often than students in the other classes.

Table 23
Ways Students Used Mathematics Outside of Class, Grade 6, District 2

School-Class *(N)*	**Number of Responses[1] *(N)***	**Monetary[2] *(%)*[3]**	**Calculation *(%)***	**Leisure *(%)***	**Measurement *(%)***	**Problem Solving *(%)***	**Unreportable[4] *(%)***
—MiC—							
Guggenheim-Broughton 1 (21)	14	21	29	7	7	14	7
Guggenheim-Broughton 2 (9)	4	50	50	0	0	0	0
Guggenheim-Dillard 1 (22)	22	27	23	23	18	0	0
Guggenheim-Dillard 2 (13)	11	45	27	18	0	0	9
HirschMetro-Davenport 1 (20)	15	20	47	0	13	0	7
HirschMetro-Davenport 2 (26)	18	39	22	11	17	6	6
HirschMetro-Holland 1 (27)	24	21	25	13	8	4	17
HirschMetro-Holland 2 (22)	24	21	42	4	13	0	21
—Conventional—							
Newberry-Renlund 1 (23)	23	26	17	4	22	0	26
Newberry-Rhaney 1 (13)	4	25	25	0	25	0	25

[1] Students were asked to describe how they would use mathematics outside of class.

[2] Responses included banking and shopping.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included occupations and nonmathematics school subjects.

Finally, all students in the study responded to items on the *Student Questionnaire,* five components of which are summarized here. In Table 24, the first component involved students in who enjoyed physical education (PE) classes is notable for Guggenheim-Broughton 1.

Table 24
Student Preference Ranking of Classes, Grade 6, District 2

School-Class *(N)*	Subject *(%)*									
	SocStudies	**Science**	**Math**	**Reading**	**Writing**	**Art**	**Music**	**PE**	**Band**	**Other**
—MiC—										
Guggenheim-Broughton 1 (26)	0	10	19	0	0	10	5	48	5	5
Guggenheim-Broughton 2 (14)	8	8	25	8	0	8	8	17	17	0
Guggenheim-Dillard 1 (27)	4	20	4	4	0	24	8	4	16	16
Guggenheim-Dillard 2 (16)	0	21	7	0	0	14	14	14	0	29
HirschMetro-Davenport 1 (22)	9	14	14	0	0	9	5	14	9	27
HirschMetro-Davenport 2 (26)	0	17	11	11	0	17	6	0	0	6
HirschMetro-Holland 1 (27)	0	17	11	11	0	17	6	0	0	6
HirschMetro-Holland 2 (27)	0	17	11	11	0	17	6	0	0	6
—Conventional—										
Newberry-Renlund 1 (29)	0	11	18	0	0	7	7	43	0	14
Newberry-Rhaney 1 (37)	3	13	9	6	0	19	9	34	3	3

The second component involved student judgments about the frequency of talking about mathematics with classmates, friends, and other acquaintances on three questions. Response frequency (never, sometimes, often, very often) for each class was strikingly different (see Table 25).

Table 25

Student Judgment About Frequency of Communication About Mathematics, Grade 6, District 2

School-Class *(N)*	**Mathematical Ideas and Problem Strategies**					**Homework Problems**					**Ways Mathematics is Used Outside of School**				
	(*N*)	**Never**	**Some-times**	**Often**	**Very Often**	**(*N*)**	**Never**	**Some-times**	**Often**	**Very Often**	**(*N*)**	**Never**	**Some-times**	**Often**	**Very Often**
— MiC —															
Guggenheim-Broughton 1 (26)	25	8	60	20	12	25	8	56	28	8	25	24	52	12	12
Guggenheim-Broughton 2 (14)	25	8	64	12	16	25	16	56	20	8	25	36	40	20	4
Guggenheim-Dillard 1 (27)	25	8	48	32	12	24	33	50	13	4	24	33	33	21	13
Guggenheim-Dillard 2 (16)	20	20	55	25	0	20	20	35	30	15	20	50	25	20	5
HirschMetro-Davenport 1 (22)	17	24	47	12	18	16	31	25	38	6	16	56	19	6	19
HirschMetro-Davenport 2 (26)	26	15	42	35	8	26	23	31	31	15	26	62	27	8	4
HirschMetro-Holland 1 (27)	25	44	36	16	4	25	32	44	20	4	25	60	28	4	8
HirschMetro-Holland 2 (27)	24	38	33	13	17	24	25	58	4	13	24	42	33	25	0
—Conventional —															
Newberry-Renlund 1 (29)	18	17	33	39	11	18	28	56	17	17	18	50	22	11	17
Newberry-Rhaney 1 (37)	24	4	67	17	13	24	4	38	25	33	24	13	33	21	33

Note: Response rates designate class mean percents.

The third component involved student judgments about the things they liked the most about mathematics class (see Table 26). Most students reported that they liked working with numbers more than they reported other categories, although the classes varied. Guggenheim-Dillard 1 and 2 indicated preferences for miscellaneous class activities.

Table 26
What Students Liked Most About Mathematics Class, Grade 6, District 2

School-Class *(N)*	**Number of Responses[1] *(N)***	**Number *(%)*[2]**	**Problem Solving *(%)***	**Classwork *(%)***	**Working With Others *(%)***	**Miscellaneous[3] *(%)***	**Negative Emotional Response[4] *(%)***	**Positive Emotional Response[5] *(%)***
—MiC—								
Guggenheim-Broughton 1 (26)	62	19	3	11	8	15	2	10
Guggenheim-Broughton 2 (14)	32	38	0	13	13	9	3	3
Guggenheim-Dillard 1 (27)	67	18	7	7	4	19	4	6
Guggenheim-Dillard 2 (16)	38	8	8	13	5	37	3	8
HirschMetro-Davenport 1 (22)	63	48	3	6	14	5	0	2
HirschMetro-Davenport 2 (26)	67	46	4	3	10	4	0	1
HirschMetro-Holland 1 (27)	74	30	11	14	5	15	3	8
HirschMetro-Holland 2 (27)	62	26	5	11	5	18	0	3
—Conventional—								
Newberry-Renlund 1 (29)[6]	--	--	--	--	--	--	--	--
Newberry-Rhaney 1 (37)[6]	--	--	--	--	--	--	--	--

[1] Students were asked to name three things they liked most about mathematics class.

[2] Percentage does not add to 100 due to number of unique responses.

[3] Responses included "teacher," "computer," and "warm-up activities."

[4] Responses included "hard," "boring," and "restrictive."

[5] Responses included "like it all" and "fun."

[6] Student questionaires were not submitted.

An additional pattern was revealed when examining student judgments about number (see Table 27). All students reported that they liked addition and multiplication, although the classes varied.

Table 27
What Students Liked Most About Mathematics Class, Grade 6, District 2 (continued)

School-Class *(N)*	**Number of Responses[1] *(N)***	**Addition *(%)***	**Subtraction *(%)***	**Multiplication *(%)***	**Division *(%)***	**Decimals *(%)***	**Fractions *(%)***	**Other[2] *(%)***
—MiC—								
Guggenheim-Broughton 1 (26)	12	42	33	17	0	0	0	8
Guggenheim-Broughton 2 (14)	12	33	25	33	8	0	0	0
Guggenheim-Dillard 1 (27)	12	17	8	42	8	0	8	17
Guggenheim-Dillard 2 (16)	3	67	0	33	0	0	0	0
HirschMetro-Davenport 1 (22)	30	30	7	27	13	3	17	3
HirschMetro-Davenport 2 (26)	31	29	13	23	16	3	6	10
HirschMetro-Holland 1 (27)	22	27	5	36	5	0	14	14
HirschMetro-Holland 2 (27)	16	25	13	25	13	0	19	6
—Conventional—								
Newberry-Renlund 1 (29)[3]	--	--	--	--	--	--	--	--
Newberry-Rhaney 1 (37)[3]	--	--	--	--	--	--	--	--

[1] Students were asked to name three things they liked most about mathematics class.

[2] Responses included counting, average, estimation, least common denominator, least common multiple, money, rounding and time.

[3] Student questionaires were not submitted.

The fourth component involved student judgments about the things they disliked most about mathematics class (see Table 28). Most classes reported that they disliked working with numbers and classwork more than anything else, although the classes varied. The number category is broken down in Table 28.

Table 28
What Students Disliked Most About Mathematics Class, Grade 6, District 2

School-Class *(N)*	**Number of Responses[1] *(N)***	**Number *(%)*[2]**	**Classwork *(%)***	**Homework *(%)***	**Tests *(%)***	**Problem Solving *(%)***	**Book *(%)***	**Miscellaneous[3] *(%)***	**Negative Emotional Response[4] *(%)***	**Positive Emotional Response[5] *(%)***
—MiC—										
Guggenheim-Broughton 1 (26)	58	28	21	9	0	5	2	14	10	2
Guggenheim-Broughton 2 (14)	24	17	4	13	8	4	4	0	8	8
Guggenheim-Dillard 1 (27)	65	12	22	9	9	0	9	22	5	2
Guggenheim-Dillard 2 (16)	32	13	22	3	3	3	6	16	6	13
HirschMetro-Davenport 1 (22)	62	55	8	10	8	5	2	0	2	0
HirschMetro-Davenport 2 (26)	61	36	11	5	2	2	0	8	5	3
HirschMetro-Holland 1 (27)	71	30	18	10	10	1	0	10	6	3
HirschMetro-Holland 2 (27)	63	21	30	11	6	3	2	3	10	3
—Conventional—										
Newberry-Renlund 1 (29)[6]	--	--	--	--	--	--	--	--	--	--
Newberry-Rhaney 1 (37)[6]	--	--	--	--	--	--	--	--	--	--

[1] Students were asked to name three things they disliked the most about mathematics class.

[2] Percentage does not add to 100 due to number of unique responses.

[3] Responses included "teacher," "computer," and "warm-up activities."

[4] Responses included "hard," "boring," and "restrictive."

[5] Responses included "like it all" and "fun."

[6] Student questionaires were not submitted.

An additional pattern was revealed when examining student judgments about number (see Table 29). Most classes reported that they disliked division, although the classes varied.

Table 29
What Students Disliked Most About Mathematics Class, Grade 6, District 2 (continued)

School-Class *(N)*	**Number of Responses[1] *(N)***	**Addition *(%)***	**Subtraction *(%)***	**Multiplication *(%)***	**Division *(%)***	**Decimals *(%)***	**Fractions *(%)***	**Other[2] *(%)***
—MiC—								
Guggenheim-Broughton 1 (26)	16	0	6	38	50	0	6	0
Guggenheim-Broughton 2 (14)	4	0	0	25	50	0	25	0
Guggenheim-Dillard 1 (27)	8	13	25	0	50	0	0	13
Guggenheim-Dillard 2 (16)	4	25	50	0	25	0	0	0
HirschMetro-Davenport 1 (22)	34	6	21	18	29	9	9	9
HirschMetro-Davenport 2 (26)	22	0	5	14	14	23	27	18
HirschMetro-Holland 1 (27)	21	10	24	10	24	14	19	0
HirschMetro-Holland 2 (27)	13	0	8	15	54	0	23	0
—Conventional—								
Newberry-Renlund 1 (29)[3]	--	--	--	--	--	--	--	--
Newberry-Rhaney 1 (37)[3]	--	--	--	--	--	--	--	--

[1] Students were asked to name three things they disliked the most about mathematics class.

[2] Responses included counting, average, estimation, least common denominator, least common multiple, money, rounding and time.

[3] Student questionaires were not submitted.

The fifth component involved student judgments about the ways mathematics helped them in other subjects (see Table 30). Most students in most classes reported that mathematics was used in both general applications, such as estimating and calculating, and specific applications, such as measurement and problem solving. The classes varied in responses.

Table 30

Student Perception of the Usefulness of Mathematics in Other Classes, Grade 6, District 2

School-Class *(N)*	**Number of Responses[1] *(N)***	**General Applications[2] *(%)***	**Specific Applications[3] *(%)***	**Organization of Information *(%)***	**No Help *(%)***	**Miscellaneous *(%)***	**Inappropriate Responses[4] *(%)***
—MiC—							
Guggenheim-Broughton 1 (26)	36	19	19	0	17	8	36
Guggenheim-Broughton 2 (14)	18	11	39	6	6	0	39
Guggenheim-Dillard 1 (27)	34	26	38	3	3	6	24
Guggenheim-Dillard 2 (16)	23	22	30	4	0	9	35
HirschMetro-Davenport 1 (22)	47	30	36	4	2	11	17
HirschMetro-Davenport 2 (26)	53	21	36	2	6	8	28
HirschMetro-Holland 1 (27)	47	26	21	4	2	17	30
HirschMetro-Holland 2 (27)	44	16	41	2	16	5	20
—Conventional—							
Newberry-Renlund 1 (29)[5]	--	--	--	--	--	--	--
Newberry-Rhaney 1 (37)[5]	--	--	--	--	--	--	--

[1] Students were asked to identify how their knowledge of mathematics and the way they learned mathematics helped them in other classes.

[2] Responses included "estimating" and "calculating."

[3] Responses included "measurement" and "problem solving."

[4] Responses included "not good at math", "need to know something", "it's easier and more fun", "not good ", etc.

[5] Students questionaires were not submitted.

District 3

In District 3, 8 sixth-grade classes participated in the study. In all of the classrooms, MiC was used. A summary of the variations in fixed characteristics is presented in Table 31.

Table 31
Fixed Characteristics, Grade 6, District 3

School-Class *(N)*	**Sex *(%)***		**Average Age *(years)***	**Language Preference *(%)* *** *(self-identified)*		**Ethnicity *(%)***** *(self-identified)*				
	Female	**Male**		**English Preference**	**Non-Response**	**African American**	**Hispanic**	**White**	**Multi/Other**	**Non-Response**
—MiC—										
Calhoun North-Bragg 1 (24)	58	42	11.34	92	4	0	0	96	4	0
Calhoun North-Bragg 2 (21)	48	52	11.51	100	0	0	5	81	14	0
Calhoun North-Schlueter 1 (23)	52	48	11.49	87	13	0	4	96	0	0
Calhoun North-Schlueter 2 (20)	55	45	11.47	95	5	0	0	95	0	5
Calhoun North-Solomon 1 (21)	52	48	11.54	90	5	0	5	81	10	5
Calhoun North-Solomon 2 (22)	55	45	11.53	91	9	0	0	95	0	5
Calhoun North-Tierney 1 (24)	58	42	11.31	92	8	0	8	79	13	0
Calhoun North-Vetter 1 (7)***	14	86	11.47	100	0	0	0	86	14	0

* Percent does not add to 100% when students identified a language preference other than English.
** Percent on ethnicity was rounded off and does not always total 100. Multi/Other comprises Asian, Haitian, Native American, Multiracial and Other.
*** Special education class.
(For more detailed information, see Table E1 in Appendix E.)

In District 3, there was little variation in the class profiles. The number of students in a class varied from 7 to 24. With one exception (Calhoun North-Vetter, 14% female), the proportion of girls to boys is similar across classes. The average age was similar across classes, and English was the primary language for 87–100% of the students. The ethnicity in these classes is primarily White or Multiracial/Other.

In District 3, two measures of prior mathematics performance were used as indicators of prior student performance. The first performance indicator was the summary of percentile scores for the students in the study classes on the standardized test administered by the district to all of its students, the TerraNova Mathematics Test (CTB/McGraw-Hill, 1997), which were forwarded to project staff. Summary means and standard deviations of the percentiles for each class on the applications subtest and the computation subtest are reported in Table 32, and box plots are shown in Figure 11. The classes differed in average percentiles on this test. Mean percentiles on the applications subtest range from 9.43 to 59.78, and on the computation subtest from 6.29 to 54.18, and the box plots illustrate the within-class variation on this test in this district.

Table 32

Standardized Test Scores, Spring 1997, Grade 6, District 3

School-Class *(N)*	TerraNova: National Percentiles										
	(*N*)	Application					Computation				
		Mean	StDev	Minimum	Median	Maximum	Mean	StDev	Minimum	Median	Maximum
—MiC—											
Calhoun North-Bragg 1 (24)	23	56.74	19.90	22	55.0	92	49.61	24.55	5	51.0	96
Calhoun North-Bragg 2 (21)	18	59.61	26.30	9	66.5	92	47.83	24.95	11	40.5	93
Calhoun North-Schlueter 1 (23)	22	48.73	19.53	14	44.0	92	44.50	19.11	14	49.5	72
Calhoun North-Schlueter 2 (20)	18	59.78	19.66	14	63.5	88	52.56	18.29	29	52.0	85
Calhoun North-Solomon 1 (21)	20	47.10	26.74	1	44.0	96	40.00	27.27	2	33.5	91
Calhoun North-Solomon 2 (22)	20	47.55	23.71	14	46.5	96	43.45	20.98	4	39.0	79
Calhoun North-Tierney 1 (24)	22	59.68	24.25	12	59.0	97	54.18	25.17	6	61.0	87
Calhoun North-Vetter 1 (7)	7	9.43	6.55	2	7.0	19	6.29	4.03	1	6.0	14

(For more detailed information, see Table E2 in Appendix E.)

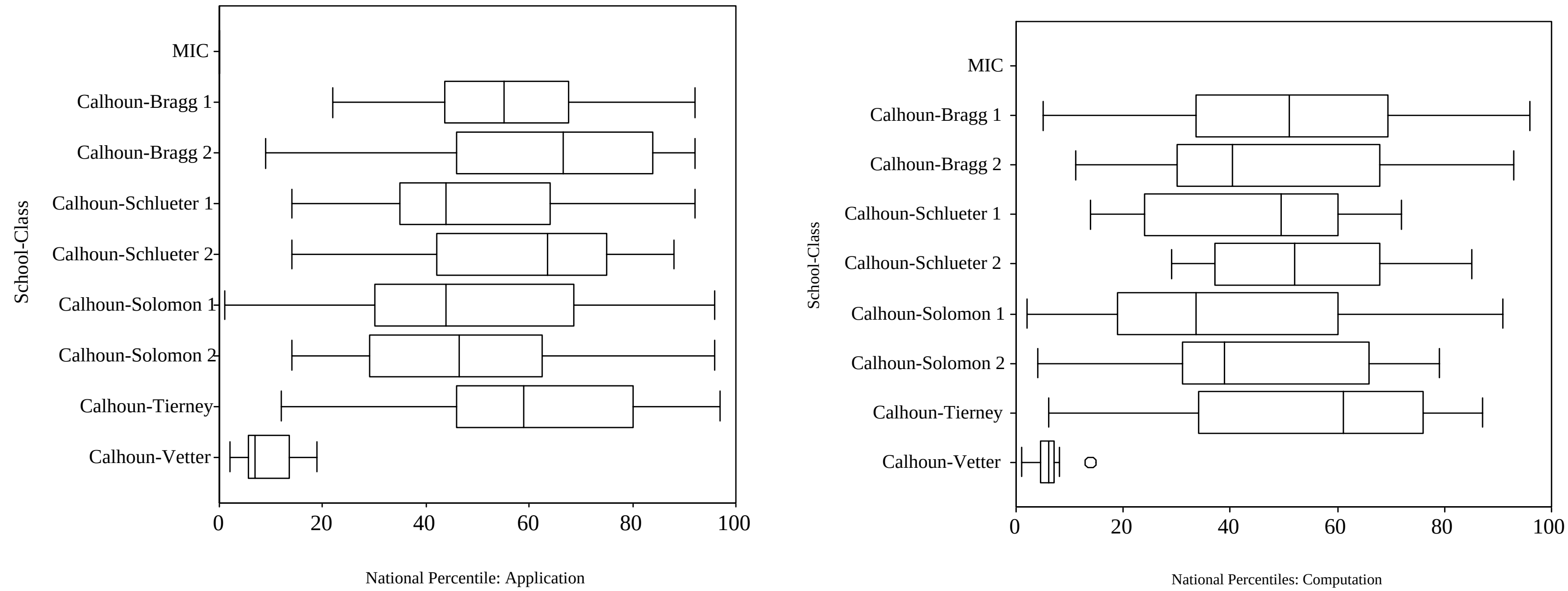


Figure 11. Box plots of class distributions on the *TerraNova* application and computation subtests, Grade 6, District 3.

The second performance indicator used in the study is the Collis/Romberg Mathematical Reasoning Test (Collis & Romberg, 1992). This test was administered to all students participating in the study. The information on this test includes scores related to four levels of reasoning (unistructural, multistructural, relational, and extended abstract), and responses for each level are scored from 0–5. Class means on all four levels of reasoning are given in Table 33. For all but one class, the means on unistructural level of reasoning are above 2.50, indicating that students were operating at this level on many items. Only Calhoun North-Vetter has a class mean below 2.50 (2.00). Even at this level, however, there is considerable variability in class means. The class means on the other scales indicate that some students in all classes but Calhoun North-Vetter are beginning to reason at a multistructural level, and only a very small number of students exhibit reasoning at either relational or extended abstract levels.

Table 33
Class means on the Collis-Romberg Mathematical Problem-Solving Profiles, Grade 6, District 3

School-Class *(N)*	Level of Reasoning				
	(*N*)	**Uni-structural**	**Multi-structural**	**Relational**	**Extended Abstract**
		—MiC—			
Calhoun North-Bragg 1 (24)	21	3.81	1.89	0.76	0.05
Calhoun North-Bragg 2 (21)	21	3.71	1.90	0.52	0.10
Calhoun North-Schlueter 1 (23)	20	3.05	1.40	0.25	0.05
Calhoun North-Schlueter 2 (20)	17	3.76	1.59	0.06	0.00
Calhoun North-Solomon 1 (21)	17	3.53	1.88	0.53	0.06
Calhoun North-Solomon 2 (22)	18	4.00	2.00	0.61	0.06
Calhoun North-Tierney 1 (24)	21	3.67	1.76	0.43	0.00
Calhoun North-Vetter 1 (7)	7	2.00	0.57	0.00	0.00

(For detailed information, see Table E3 in Appendix E.)

Because the standardized test scores show a similar pattern to those on the unistructural scale of the Collis/Romberg Test (see the scatter plot for means on the two measures in Figure 12), a correlation coefficient between the class means of the two measures was calculated at (r = .89) with the applications subtest and (r= .85) with the computation subtest. From this information, it is apparent that all but the one low performing special education class are comparable average classes.

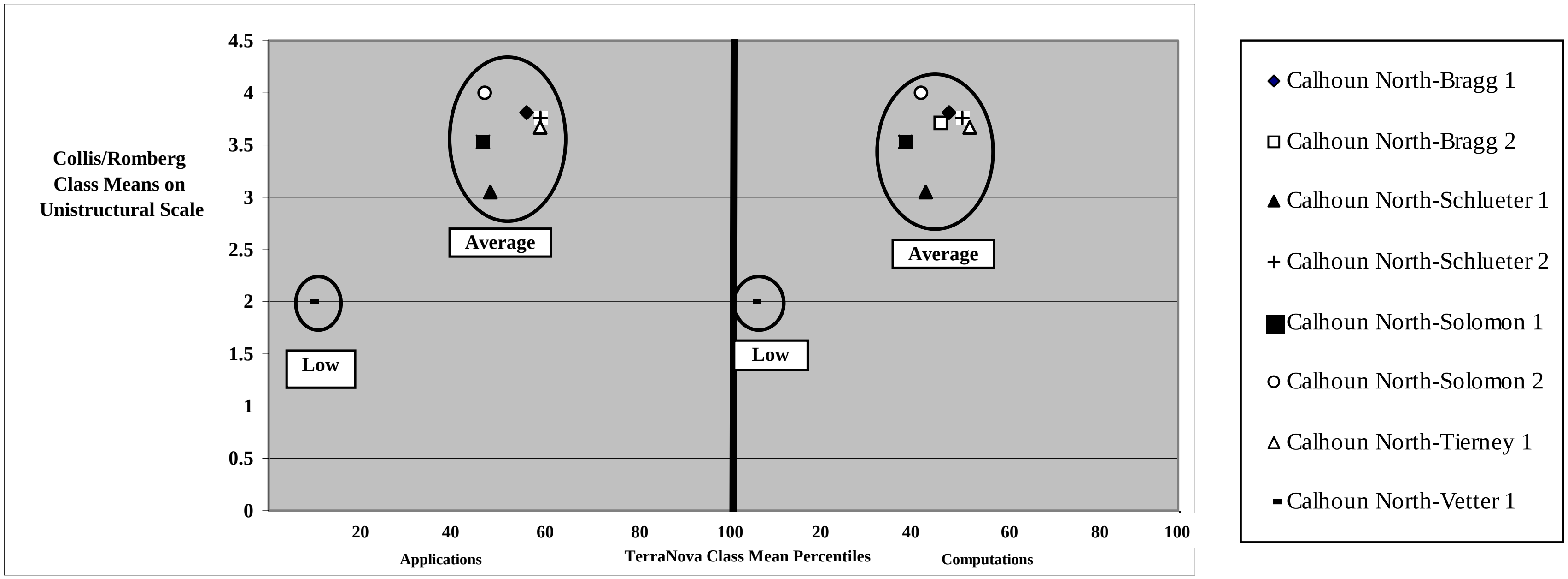


Figure 12. Scatter plot for class mean percentiles on the *TerraNova* test and the class means on the unistructural scale of the Collis/Romberg reasoning test, Grade 6, District 3.

All students in the study responded to the items in the *Student Attitude Inventory;* three components of which are summarized here.

First, the class means for student judgments on items related to their effort, confidence, interest, usefulness, and ability to communicate mathematically are shown in Table 34. Each item was judged on a scale of 1–4 (1 = very true; 2 = true; 3 = not true; 4 = not true at all). Overall, the students in these classes judged the statements as true or very true, and there was little variation between classes.

Table 34
Class Means on Student Judgments About Mathematics (Subscales on the Student Attitude Inventory), Grade 6, District 3

School-Class *(N)*	**Effort** *in mathematics*		**Confidence** *in ability to do mathematics*		**Interest** *in mathematics*		**Usefulness** *of mathematics*		**Ability to Communicate** *about mathematics*	
	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean
—MiC—										
Calhoun North-Bragg 1 (24)	14	1.68	21	1.98	18	2.48	17	1.70	19	1.85
Calhoun North-Bragg 2 (21)	19	1.98	19	1.95	19	2.07	16	1.77	18	1.98
Calhoun North-Schlueter 1 (23)	19	1.89	20	1.87	19	2.21	20	1.59	19	1.80
Calhoun North-Schlueter 2 (20)	19	1.64	19	1.74	19	1.92	19	1.47	17	1.66
Calhoun North-Solomon 1 (21)	17	1.69	17	1.75	13	2.17	16	1.82	17	1.83
Calhoun North-Solomon 2 (22)	18	1.56	17	1.74	17	2.04	18	1.76	17	1.91
Calhoun North-Tierney 1 (24)	23	1.70	23	1.73	23	2.15	20	1.83	22	1.72
Calhoun North-Vetter 1 (7)	7	2.26	6	2.67	7	2.36	7	2.11	7	2.22

(For detailed information, see Table E4 in Appendix E.)

The special education class (Calhoun North-Vetter 1), however, tended to be both less convinced than other classes that effort could affect ability to do mathematics, that mathematics was useful, and that they could communicate their ideas in mathematics class (see Figure 13).

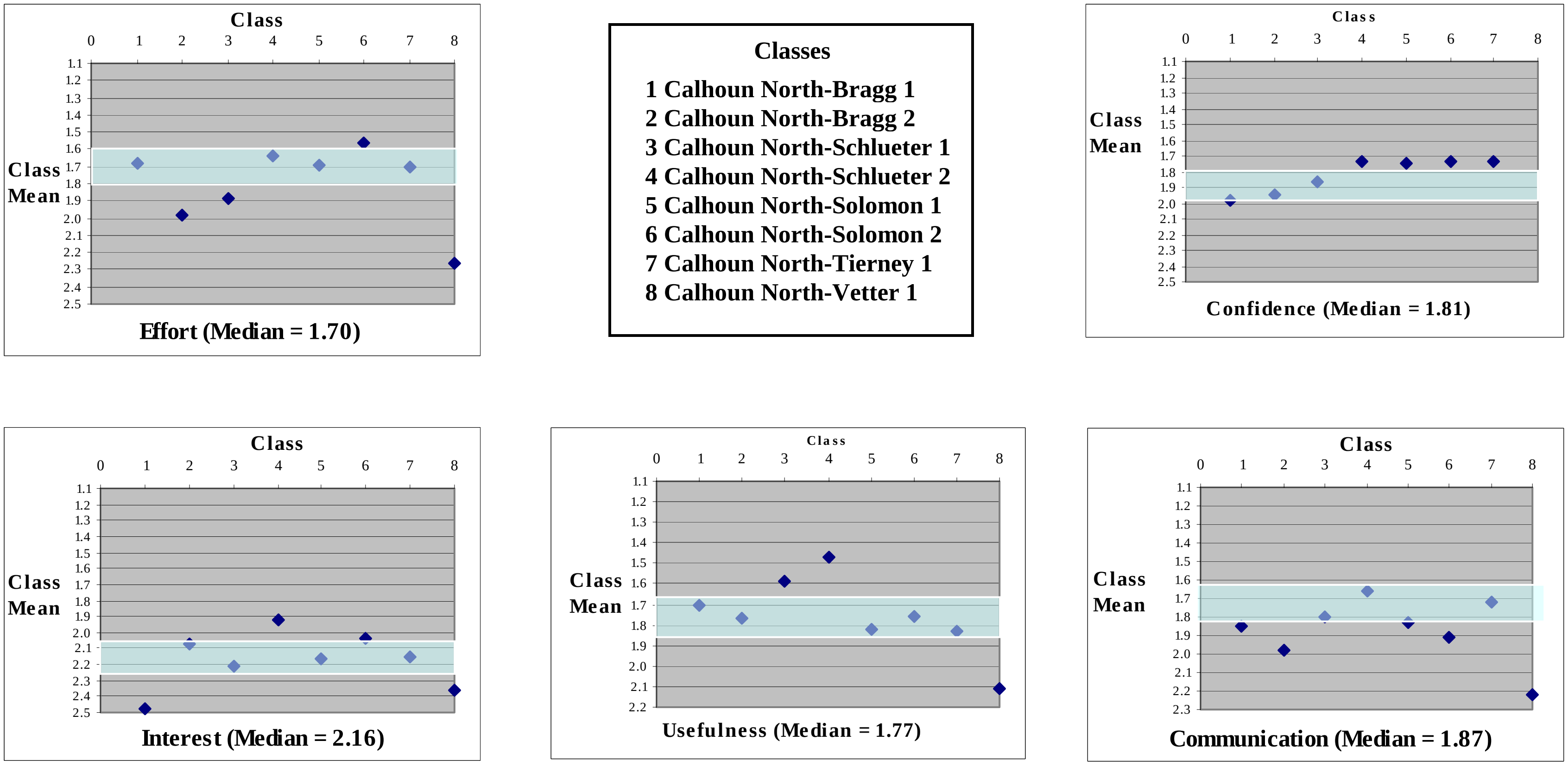


Figure 13. Plots showing class means on student judgments about mathematics, Grade 6, District 3. (Shaded areas show class medians ± 0.1.)

In the second component of the *Student Attitude Inventory*, students responded to 16 items related to general perceptions about mathematics (see Table E5 in Appendix E). Several items were reverse-scored due to wording of question. In general, little variance was seen in class means with respect to items related to general perceptions about mathematics. Students felt confident that they were able to learn new ideas in mathematics class (from 1.26, Calhoun North-Schlueter 1, to 2.14, Calhoun North-Vetter 1, a special education class, on Item 3). Students thought it was acceptable to solve mathematics problems differently than their classmates (from 1.06, Calhoun North-Solomon 2, to 1.71, Calhoun North-Vetter 1, on Item 16). However, students were less confident (from 1.32, Calhoun North-Schlueter 2, to 1.96, Calhoun North-Tierney 1, on Item 4) that they could discover ways of solving problems that their teachers or their peers had not previously considered.

Students were confident that anyone who worked hard enough in mathematics class could be good at mathematics (from 1.00, Calhoun North-Schlueter 2, to 1.35, Calhoun North-Bragg 2, on Item 11). Similarly, students disagreed that some students were naturally better, or worse, at mathematics than other students regardless of effort (from 2.57, Calhoun North-Vetter 1, to 3.42, Calhoun North-Schlueter 2, on Item 37).

Students felt that knowing how to solve a problem was as important as determining the answer (from 1.26, Calhoun North-Schlueter 2 and Calhoun North-Tierney 1, to 1.63, Calhoun North-Bragg 2, on Item 53), although they felt that answering questions correctly in mathematics class require providing only numbers (from 1.17, Calhoun North-Solomon 2, to 2.21, Calhoun North-Bragg 2, on Item 38). Students thought that getting correct answers in mathematics class was at least as important as understanding why the answer was correct (from 2.00, Calhoun North-Solomon 1, to 2.85, Calhoun North-Bragg 2, on Item 27), although students felt that getting correct answers was more important than understanding a mathematics problem or the process of finding an answer (from 1.20, Calhoun North-Schlueter 1, to 2.16, Calhoun North-Bragg 2, on Item 49). Students disagreed that mathematics was mostly learned by memorizing facts and rules (from 2.56, Calhoun North-Solomon 2, to 3.16, Calhoun North-Bragg 1, on Item 55). They also disagreed that they would get correct answers to their teachers' questions if they memorized rules or facts (from 2.71, Calhoun North-Vetter 1, to 3.17, Calhoun North-Schlueter 2 and Calhoun North-Solomon 2, on Item 44). Students disagreed that they did not know how to solve mathematics problems if they found the had to use calculators (from 2.29, Calhoun North-Solomon 1, to 3.16, Calhoun North-Bragg 2, on Item 45) and that calculators always generated correct answers (from 2.29, Calhoun North-Vetter 1, to 2.76, Calhoun North-Solomon 1, on Item 6).

Students felt that new mathematics topics were related to ones they had already studied (from 1.89, Calhoun North-Schlueter 2, to 2.80, Calhoun North-Bragg 1, on Item 39). Students felt that mathematics was related to other school subjects (from 1.47, Calhoun North-Schlueter 2, to 2.80, Calhoun North-Bragg 1, on Item 20), although they thought that mathematics was harder to understand than other school subjects (from 1.76, Calhoun North-Bragg 1, to 2.85, Calhoun North-Schlueter 1, on Item 28).

The second component involved students judging whether success or failure in mathematics could be attributed to teachers, ability, effort, or luck. The class means for these judgments are shown in Table 35. Each item was judged on a scale of 1–4 (1 = very true; 2 = true; 3 = not true; 4 = not true at all). All classes attributed success in mathematics to a combination of effort and ability, and failure to lack of effort.

Table 35
Class Means on Student Attribution of Success or Failure in Mathematics, Grade 6, District 3

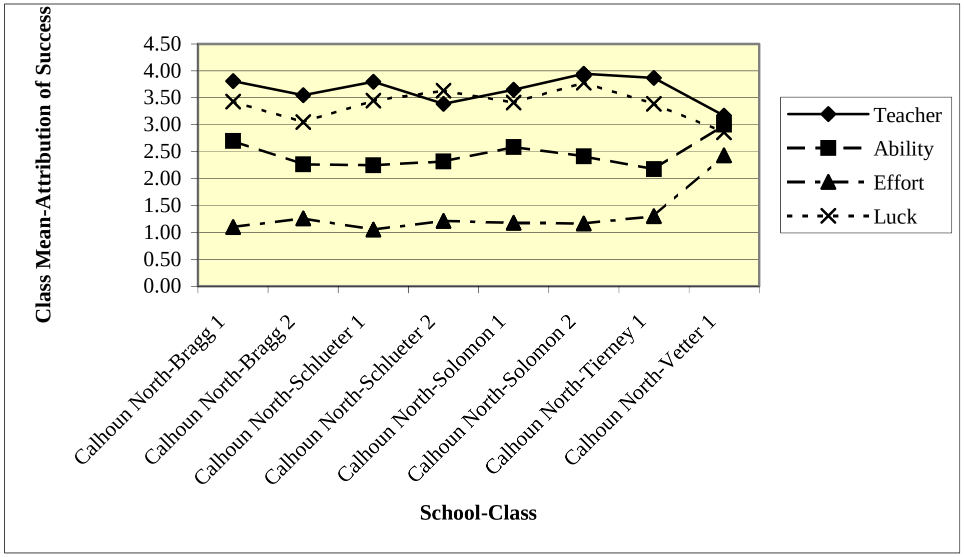
School-Class (*N*)	Success							
	Teacher		Ability		Effort		Luck	
	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean
—*MiC*—								
Calhoun North-Bragg 1 (24)	21	3.81	20	2.70	20	1.10	21	3.43
Calhoun North-Bragg 2 (21)	20	3.55	19	2.26	19	1.26	20	3.05
Calhoun North-Schlueter 1 (23)	20	3.80	20	2.25	20	1.05	20	3.45
Calhoun North-Schlueter 2 (20)	18	3.39	19	2.32	19	1.21	19	3.63
Calhoun North-Solomon 1 (21)	17	3.65	17	2.59	17	1.18	17	3.41
Calhoun North-Solomon 2 (22)	18	3.94	17	2.41	18	1.17	18	3.78
Calhoun North-Tierney 1 (24)	23	3.87	23	2.17	23	1.30	23	3.39
Calhoun North-Vetter 1 (7)	6	3.17	7	3.00	7	2.43	7	2.86

School-Class (*N*)	Failure							
	Teacher		Ability		Effort		Luck	
	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean
—*MiC*—								
Calhoun North-Bragg 1 (24)	19	3.89	21	2.86	19	1.79	20	3.70
Calhoun North-Bragg 2 (21)	19	3.63	20	2.95	19	2.26	19	3.32
Calhoun North-Schlueter 1 (23)	20	3.90	19	3.00	20	1.75	20	3.45
Calhoun North-Schlueter 2 (20)	19	3.84	19	3.37	19	1.84	19	3.89
Calhoun North-Solomon 1 (21)	17	3.88	17	3.06	17	1.94	17	3.65
Calhoun North-Solomon 2 (22)	18	3.83	18	3.22	18	2.06	18	4.00
Calhoun North-Tierney 1 (24)	23	3.74	23	3.36	23	2.30	23	3.74
Calhoun North-Vetter 1 (7)	7	3.29	7	3.00	7	2.43	7	1.71

(For more detailed information, see Table E6 in Appendix E.)

Again, the low class (Calhoun North-Vetter) was less inclined to attribute success to effort (see Figure 14a), and was more inclined to attribute failure to luck (see Figure 14b).

(a)



(b)

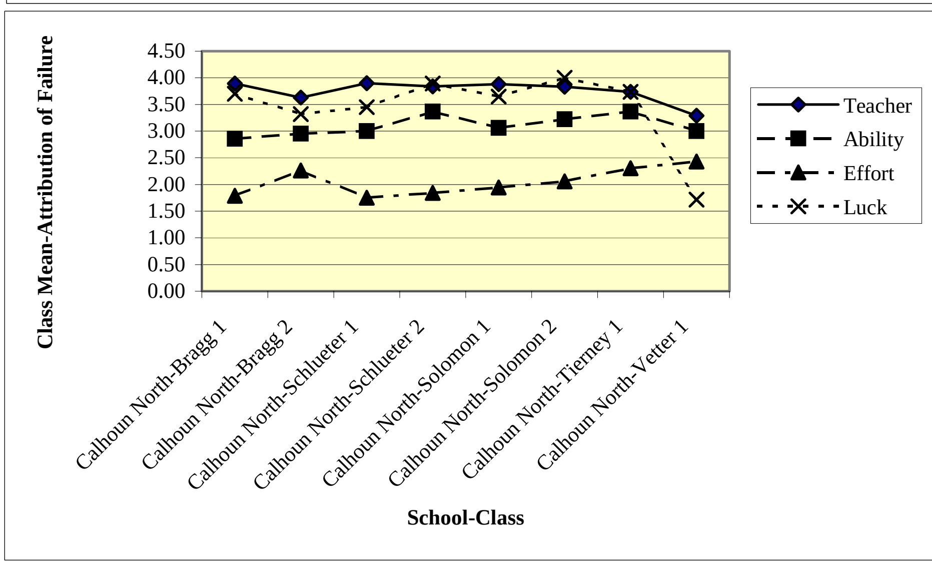


Figure 14. Line graphs showing class means of student attribution of (a) success and (b) failure in mathematics, Grade 6, District 3.

In the fourth component of the *Student Attitude Inventory*, students listed things they associated with the word "mathematics" (see Table 36). Although classes varied, students in all classes most frequently listed words associated with number, including operations with number.

Table 36

Words Students Associated With "Mathematics," Grade 6, District 3

School-Class *(N)*	**Number of Responses[1] *(N)***	**Number[2] *(%)*[3]**	**Interest *(%)***	**Geometry *(%)***	**Negative Emotive Responses[4] *(%)***	**Thinking *(%)***	**Problem Solving *(%)***	**Algebra *(%)***	**Occupations *(%)***	**Miscellaneous *(%)***
					—MiC—					
Calhoun North-Bragg 1 (19)	75	64	3	0	8	9	1	3	0	11
Calhoun North-Bragg 2 (19)	84	80	0	2	1	1	5	2	0	5
Calhoun North-Schlueter 1 (20)	70	61	6	0	11	6	3	1	0	6
Calhoun North-Schlueter 2 (19)	49	78	0	0	2	0	4	0	0	8
Calhoun North-Solomon 1 (17)	76	67	3	4	8	3	5	0	0	9
Calhoun North-Solomon 2 (17)	68	60	1	3	7	4	7	0	0	6
Calhoun North-Tierney 1 (22)	95	84	1	1	2	2	1	2	0	3
Calhoun North-Vetter 1 (7)	14	43	7	0	0	0	7	0	0	21

[1] Students were asked to list the words they "think of when they hear the word mathematics."

[2] Responses included operations with numbers.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included "boring," "stupid," and statements of displeasure.

In the fifth component of the *Student Attitude Inventory,* students listed jobs other than teaching that required the use of mathematics (see Table 37). Although classes varied, students in classes most frequently listed service-related occupations, including retail sales, business, and food service; financial-related occupations, such as accounting, banking, and insurance; and professional-related occupations, including medical fields, engineering, and law, although the classes varied in the percents of responses for these categories. Also, the percents of science-related occupations in Calhoun North-Bragg 2, trades-related occupations in Calhoun North-Bragg 1, Calhoun North-Solomon 1 and 2, and sports-related occupations in Calhoun North-Vetter 1 are higher than in other classes.

Table 37
Nonteaching Jobs that Students Identified as Requiring Mathematics, Grade 6, District 3

School-Class *(N)*	**Number of Responses[1] *(N)***	**Services[2] *(%)*[3]**	**Financial[4] *(%)***	**Professional[5] *(%)***	**Science *(%)***	**Trades *(%)***	**Creative Arts *(%)***	**Government *(%)***	**Sports *(%)***	**Unreportable[6] *(%)***
—MiC—										
Calhoun North-Bragg 1 (19)	58	33	17	7	2	14	2	9	2	10
Calhoun North-Bragg 2 (20)	54	30	15	13	13	9	4	6	2	6
Calhoun North-Schlueter 1 (20)	47	32	11	13	4	4	4	2	0	26
Calhoun North-Schlueter 2 (19)	37	38	24	5	0	3	5	0	0	19
Calhoun North-Solomon 1 (17)	47	36	6	6	4	13	11	11	2	9
Calhoun North-Solomon 2 (17)	60	38	5	13	0	20	2	2	0	7
Calhoun North-Tierney 1 (22)	65	25	18	14	8	6	2	8	3	11
Calhoun North-Vetter 1 (7)	17	35	18	12	0	6	0	0	12	12

[1] Students asked to list the jobs other than teaching that require mathematics.

[2] Responses included occupations in retail sales, business, and food service.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included occupations in accounting, banking, and insurance.

[5] Responses included occupations in medical fields, engineering, and law.

[6] Responses included teaching, thinking, and operations with numbers.

In the sixth component of the *Student Attitude Inventory*, students listed ways they used mathematics outside of class (see Table 38). Students in all classes most frequently listed money-related responses, such as banking and shopping, leisure- and measurement-related responses. Also, the percents of calculation-related responses are higher in Calhoun North-Schlueter 2 and Calhoun North-Solomon 1 than in the other classes.

Table 38

Ways Students Used Mathematics Outside of Class, Grade 6, District 3

School-Class *(N)*	**Number of Responses[1] *(N)***	**Monetary[2] *(%)*[3]**	**Calculation *(%)***	**Leisure *(%)***	**Measurement *(%)***	**Problem Solving *(%)***	**Unreportable[4] *(%)***
			—MiC—				
Calhoun North-Bragg 1 (19)	19	21	5	21	37	5	5
Calhoun North-Bragg 2 (20)	6	17	0	17	33	0	33
Calhoun North-Schlueter 1 (20)	11	9	0	27	18	9	36
Calhoun North-Schlueter 2 (19)	14	50	21	7	7	14	0
Calhoun North-Solomon 1 (17)	22	23	32	27	0	0	0
Calhoun North-Solomon 2 (17)	9	22	0	11	33	0	11
Calhoun North-Tierney 1 (22)	15	13	13	20	13	13	7
Calhoun North-Vetter 1 (7)	2	0	0	0	0	0	100

[1] Students were asked to describe how they would use mathematics outside of class.

[2] Responses included banking and shopping.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included occupations and nonmathematics school subjects.

Finally, all students in the study responded to items on the *Student Questionnaire*, five components of which are summarized here (see Table 39). The first component involved student judgments about the school subject they enjoyed the most. Students indicated that they enjoyed art class more than other subjects.

Table 39
Student Preference Ranking of Classes, Grade 6, District 3

School-Class *(N)*	**Subject *(%)***									
	SocStudies	**Science**	**Math**	**Reading**	**Writing**	**Art**	**Music**	**PE**	**Band**	**Other**
—MiC—										
Calhoun North-Bragg 1 (24)	0	10	10	5	5	43	5	5	0	19
Calhoun North-Bragg 2 (21)	5	10	15	20	0	15	10	10	0	15
Calhoun North-Schlueter 1 (23)	5	5	0	14	5	43	5	14	5	5
Calhoun North-Schlueter 2 (20)	0	21	26	11	0	16	0	26	0	0
Calhoun North-Solomon 1 (21)	12	18	6	0	6	29	6	6	0	18
Calhoun North-Solomon 2 (22)	0	18	12	18	0	24	6	24	0	0
Calhoun North-Tierney 1 (24)	9	0	18	0	5	45	5	0	0	18
Calhoun North-Vetter 1 (7)	0	14	0	14	14	43	0	0	0	14

The second component of the *Student Questionnaire* involved student judgments about their frequency of talking about mathematics with classmates, friends, and other acquaintances on three questions. Response frequency (never, sometimes, often, very often) for each class was strikingly different across questions and across classes (see Table 40).

Table 40

Student Judgment About Frequency of Communication About Mathematics, Grade 6, District 3

School-Class *(N)*	**Mathematical Ideas and Problem Strategies**					**Homework Problems**					**Ways Mathematics is Used Outside of School**				
	(*N*)	**Never**	**Some-times**	**Often**	**Very Often**	**(*N*)**	**Never**	**Some-times**	**Often**	**Very Often**	**(*N*)**	**Never**	**Some-times**	**Often**	**Very Often**
— MiC —															
Calhoun North-Bragg 1 (24)	21	0	71	19	10	21	0	67	29	5	21	19	52	14	14
Calhoun North-Bragg 2 (21)	20	0	65	30	5	20	0	45	30	25	20	30	60	0	10
Calhoun North-Schlueter 1 (23)	21	0	62	29	10	21	0	14	43	43	19	11	37	32	21
Calhoun North-Schlueter 2 (20)	19	5	42	53	0	19	0	26	32	42	21	5	38	33	24
Calhoun North-Solomon 1 (21)	17	18	53	24	6	17	18	41	24	18	17	65	18	18	0
Calhoun North-Solomon 2 (22)	17	6	65	12	18	17	18	35	41	6	17	59	35	6	0
Calhoun North-Tierney 1 (24)	22	5	55	41	0	22	5	32	50	14	22	27	59	9	5
Calhoun North-Vetter 1 (7)	7	4	43	0	14	7	43	29	14	14	7	43	57	0	0

Note: Response rates designate class mean percents.

The third component of the *Student Questionnaire* involved student judgments about the things they liked the most about mathematics class (see Table 41). Most students reported that they liked working with numbers more than they reported other categories, although the classes varied. Most classes also indicated preferences to problem solving and miscellaneous class activities.

Table 41
What Students Liked Most About Mathematics Class, Grade 6, District 3

School-Class *(N)*	**Number of Responses[1] *(N)***	**Number *(%)* [2]**	**Problem Solving *(%)***	**Classwork *(%)***	**Working With Others *(%)***	**Miscellaneous[3] *(%)***	**Negative Emotional Response[4] *(%)***	**Positive Emotional Response[5] *(%)***
—MiC—								
Calhoun North-Bragg 1 (24)	63	16	16	5	10	16	17	2
Calhoun North-Bragg 2 (21)	57	25	14	5	5	9	7	0
Calhoun North-Schlueter 1 (23)	63	48	6	0	2	29	5	0
Calhoun North-Schlueter 2 (20)	54	33	19	0	2	26	4	0
Calhoun North-Solomon 1 (21)	47	19	15	6	4	11	9	0
Calhoun North-Solomon 2 (22)	51	14	14	2	8	20	14	0
Calhoun North-Tierney 1 (24)	65	57	9	2	12	5	2	3
Calhoun North-Vetter 1 (7)	21	52	19	0	0	10	5	5

[1] Students were asked to name three things they liked most about mathematics class.

[2] Percentage does not add to 100 due to number of unique responses.

[3] Responses included "teacher," "computer," and "warm-up activities."

[4] Responses included "hard," "boring," and "restrictive."

[5] Responses included "like it all" and "fun."

Additional patterns were revealed when examining student judgments about number (see Table 42). Most students reported that they liked addition, multiplication, division, and fractions, although the classes varied. The percent of responses for fractions is also notable for these classes.

Table 42
What Students Liked Most About Mathematics Class, Grade 6, District 3 (continued)

School-Class *(N)*	**Number of Responses[1] *(N)***	**Addition *(%)***	**Subtraction *(%)***	**Multiplication *(%)***	**Division *(%)***	**Decimals *(%)***	**Fractions *(%)***	**Other[2] *(%)***
				—MiC—				
Calhoun North-Bragg 1 (24)	10	10	0	20	30	0	10	30
Calhoun North-Bragg 2 (21)	14	21	7	14	36	0	21	0
Calhoun North-Schlueter 1 (23)	30	23	3	23	10	0	37	3
Calhoun North-Schlueter 2 (20)	18	17	11	28	11	0	28	6
Calhoun North-Solomon 1 (21)	9	22	22	11	11	0	22	11
Calhoun North-Solomon 2 (22)	7	0	0	29	43	0	29	0
Calhoun North-Tierney 1 (24)	37	16	5	27	24	0	24	3
Calhoun North-Vetter 1 (7)	11	27	18	18	0	0	27	9

[1] Students were asked to name three things they liked most about mathematics class.

[2] Responses included counting, average, estimation, least common denominator, least common multiple, money, rounding and time.

The fourth component involved student judgments about the things they disliked most about mathematics class (see Table 43). All classes reported that they disliked working with numbers more than anything else, although the classes varied in the percent of responses for this category.

Table 43
What Students Disliked Most About Mathematics Class, Grade 6, District 3

School-Class *(N)*	Number of Responses[1] *(N)*	Number *(%)*[2]	Classwork *(%)*	Homework *(%)*	Tests *(%)*	Problem Solving *(%)*	Book *(%)*	Miscellaneous[3] *(%)*	Negative Emotional Response[4] *(%)*	Positive Emotional Response[5] *(%)*
—MiC—										
Calhoun North-Bragg 1 (24)	51	14	12	0	4	10	4	10	18	10
Calhoun North-Bragg 2 (21)	53	21	11	6	11	17	4	11	13	0
Calhoun North-Schlueter 1 (23)	58	28	2	9	36	10	2	2	3	2
Calhoun North-Schlueter 2 (20)	41	34	0	12	24	5	0	7	2	5
Calhoun North-Solomon 1 (21)	43	21	7	14	9	14	5	7	9	2
Calhoun North-Solomon 2 (22)	49	12	6	12	6	16	2	18	10	4
Calhoun North-Tierney 1 (24)	50	58	2	0	2	8	4	2	8	10
Calhoun North-Vetter 1 (7)	17	59	6	0	0	6	0	0	6	0

[1] Students were asked to name three things they disliked the most about mathematics class.

[2] Percentage does not add to 100 due to number of unique responses.

[3] Responses included "teacher," "computer," and "warm-up activities."

[4] Responses included "hard," "boring," and "restrictive."

[5] Responses included "like it all" and "fun."

Additional patterns were revealed when examining student judgments about number (see Table 44). Most classes reported that they disliked division and working with fractions, although the classes varied in the percent of responses in each of these categories.

Table 44
What Students Disliked Most About Mathematics Class, Grade 6, District 3 (continued)

School-Class *(N)*	**Number of Responses[1] *(N)***	**Addition *(%)***	**Subtraction *(%)***	**Multiplication *(%)***	**Division *(%)***	**Decimals *(%)***	**Fractions *(%)***	**Other[2] *(%)***
—MiC—								
Calhoun North-Bragg 1 (24)	7	0	0	14	43	14	29	0
Calhoun North-Bragg 2 (21)	11	9	0	27	36	0	18	9
Calhoun North-Schlueter 1 (23)	16	0	6	6	56	0	31	0
Calhoun North-Schlueter 2 (20)	14	0	7	7	36	0	43	7
Calhoun North-Solomon 1 (21)	9	0	0	22	56	0	22	0
Calhoun North-Solomon 2 (22)	6	0	0	17	33	0	50	0
Calhoun North-Tierney 1 (24)	29	0	24	10	24	7	31	3
Calhoun North-Vetter 1 (7)	10	0	10	40	40	0	0	10

[1] Students were asked to name three things they disliked the most about mathematics class.

[2] Responses included counting, average, estimation, least common denominator, least common multiple, money, rounding and time.

The fifth component involved student judgments about the ways mathematics helped them in other subjects (see Table 45). Although classes varied, most students in most classes reported that mathematics was used in both general applications, such as estimating and calculating, and specific applications, such as measurement and problem solving. Also, over 40% of the responses for Calhoun North-Tierney's class indicated that mathematics was not helpful in other subjects.

Table 45

Student Perception of the Usefulness of Mathematics in Other Classes, Grade 6, District 3

School-Class *(N)*	**Number of Responses[1] *(N)***	**General Applications[2] *(%)***	**Specific Applications[3] *(%)***	**Organization of Information *(%)***	**No Help *(%)***	**Miscellaneous *(%)***	**Inappropriate Responses[4] *(%)***
			—MiC—				
Calhoun North-Bragg 1 (24)	37	24	38	3	16	0	19
Calhoun North-Bragg 2 (21)	31	32	19	6	10	6	26
Calhoun North-Schlueter 1 (23)	43	19	53	2	0	7	19
Calhoun North-Schlueter 2 (20)	32	9	44	13	9	9	16
Calhoun North-Solomon 1 (21)	38	13	26	11	11	8	32
Calhoun North-Solomon 2 (22)	33	18	42	15	0	3	21
Calhoun North-Tierney 1 (24)	27	15	22	0	44	7	11
Calhoun North-Vetter 1 (7)	11	9	9	36	9	27	9

[1] Students were asked to identify how their knowledge of mathematics and the way they learned mathematics helped them in other classes.

[2] Responses included "estimating" and "calculating."

[3] Responses included "measurement" and "problem solving."

[4] Responses included "not good at math", "need to know something", "it's easier and more fun", "not good ", etc.

District 4

In District 4, 4 sixth-grade classes participated in the study. MiC was used in all of the classrooms. A summary of the variations in fixed characteristics is presented in Table 46.

Table 46

Fixed Characteristics, Grade 6, District 4

School-Class *(N)*	**Sex *(%)***		**Average Age *(years)***	**Language Preference *(%)* *** *(self-identified)*		**Ethnicity *(%)***** ***(self-identified)***				
	Female	**Male**		**English Preferenc**	**Non-Response**	**African American**	**Hispanic**	**White**	**Multi/Othe r**	**Non-Response**
—MiC—										
Kelvyn Park-Downer 1 (24)	50	50	11.31	92	0	46	17	8	29	0
Kelvyn Park-Downer 2 (24)	33	67	11.30	88	0	58	4	4	29	4
Kelvyn Park-Vega 1 (14)	71	29	11.34	93	0	21	21	0	58	0
Kelvyn Park-Vega 2 (19)	58	42	11.29	100	0	58	16	5	21	0

* Percent does not add to 100% when students identified a language preference other than English.

** Percent on ethnicity was rounded off and does not always total 100. Multi/Other comprises Asian, Haitian, Native American, Multiracial and Other.

(For more detailed information, see Table F1 in Appendix F.)

In District 4, there was considerable variation in the class profiles. The number of students in a class varied from 14 to 24. The proportion of boys to girls was varied across classes, ranging from 33–71% female. The average age was similar across classes, and English was the primary language for 88–100% of the students. The ethnicity in these classes, however, varied considerably (21–58% African American, 4–21% Hispanic, 0–8% White, and 21–58% Multi-racial/Other).

In District 4, two measures of prior mathematics performance were used as indicators of prior student performance. The first performance indicator was the summary of percentile scores for the students in the study classes on the standardized test administered by the district to all of its students, the California Achievement Test (CTB/McGraw-Hill, 1992), were forwarded to project staff. Summary means and standard deviations of the percentiles for each class are reported in Table 47, and box plots are shown in Figure 15. Clearly, the classes differed in average percentiles on this test. Mean percentiles range from 51.77 to 82.47, and the box plots illustrate the between-class variation on this test in this district.

Table 47
Standardized Test Scores, Spring 1997, Grade 6, District 4

School-Class *(N)*	**CAT**					
	National Percentile					
	(*N*)	**Mean**	**StDev**	**Minimum**	**Median**	**Maximum**
—MiC—						
Kelvyn Park-Downer 1 (24)	23	56.35	20.18	15	60.0	93
Kelvyn Park-Downer 2 (24)	22	51.77	19.43	15	55.0	83
Kelvyn Park-Vega 1 (14)	14	78.00	20.35	23	84.5	99
Kelvyn Park-Vega 2 (19)	19	82.47	13.62	51	86.0	99

(For more detailed information, see Table F2 in Appendix F.)

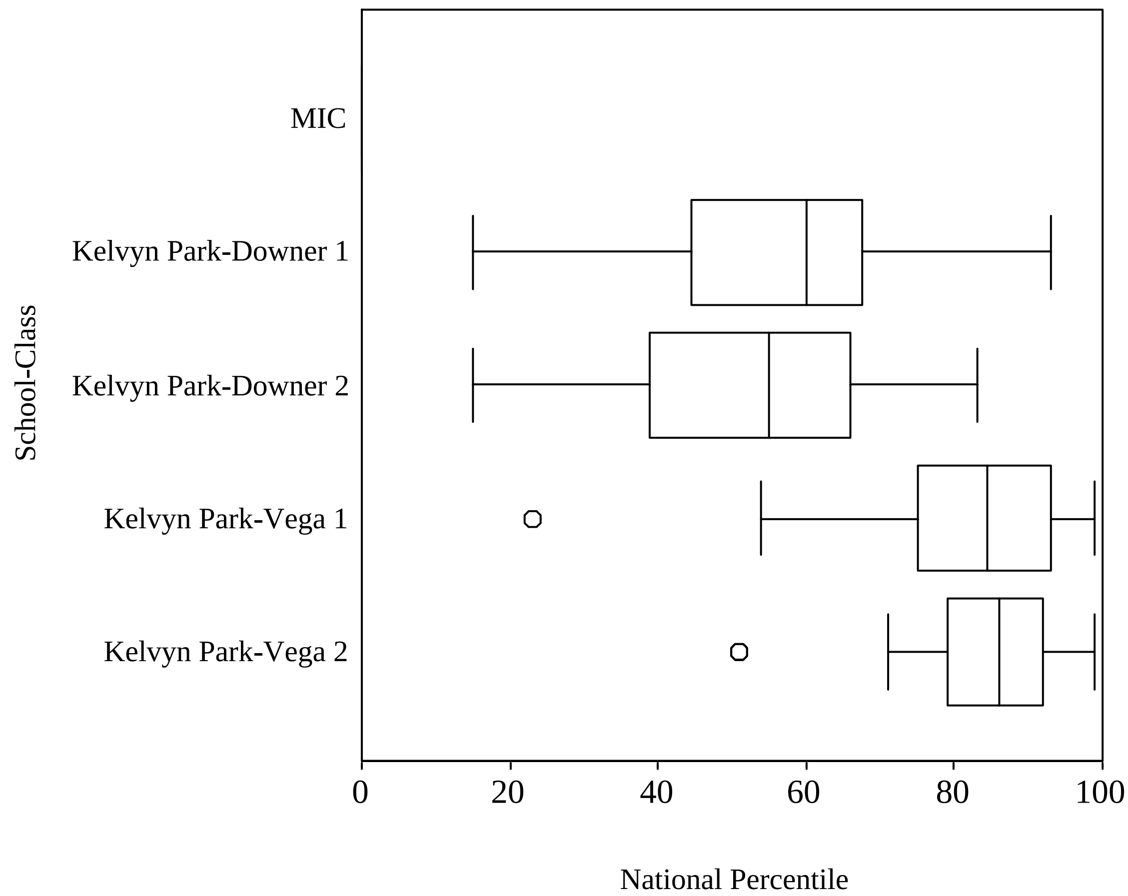


Figure 15. Box plots of class distributions on the CAT test, Grade 6, District 4.

The second performance indicator used in the study is the Collis/Romberg Mathematical Reasoning Test (Collis & Romberg, 1992). This test was administered to all students participating in the study. The information on this test includes scores related to four levels of reasoning (unistructural, multistructural, relational, and extended abstract), and responses for each level are scored from 0–5. Class means on all four levels of reasoning are given in Table 48. For all but one class the means on unistructural level of reasoning are above 2.50, indicating that students were operating at this level on many items. Only Kelvyn Park-Downer 2 has a class mean below 2.50 (2.26). Even at this level, however, there is considerable variability in class means. The means on the other scales indicate that in only two classes (Kelvyn Park-Vega 1 and Kelvyn Park-Vega 2) were many students beginning to reason at a multistructural level, and only a very small number of students exhibit reasoning at either relational or extended abstract levels.

Table 48
Class means on the Collis-Romberg Mathematical Problem-Solving Profiles, Grade 6, District 4

School-Class *(N)*	Level of Reasoning				
	(*N*)	**Uni-structural**	**Multi-structural**	**Relational**	**Extended Abstract**
		—MiC—			
Kelvyn Park-Downer 1 (24)	24	2.63	0.79	0.00	0.00
Kelvyn Park-Downer 2 (24)	23	2.26	0.70	0.04	0.00
Kelvyn Park-Vega 1 (14)	14	3.07	1.43	0.21	0.07
Kelvyn Park-Vega 2 (19)	19	3.26	1.37	0.32	0.11

(For detailed information, see Table F3 in Appendix F.)

Because the standardized test scores show a similar pattern to those on the unistructural scale of the Collis/Romberg Test (see the scatter plot for means on the two measures in Figure 16), a correlation coefficient between the class means of the two measures was calculated (r = .97). From this information, it is apparent that there are two average performing classes and two high average classes.

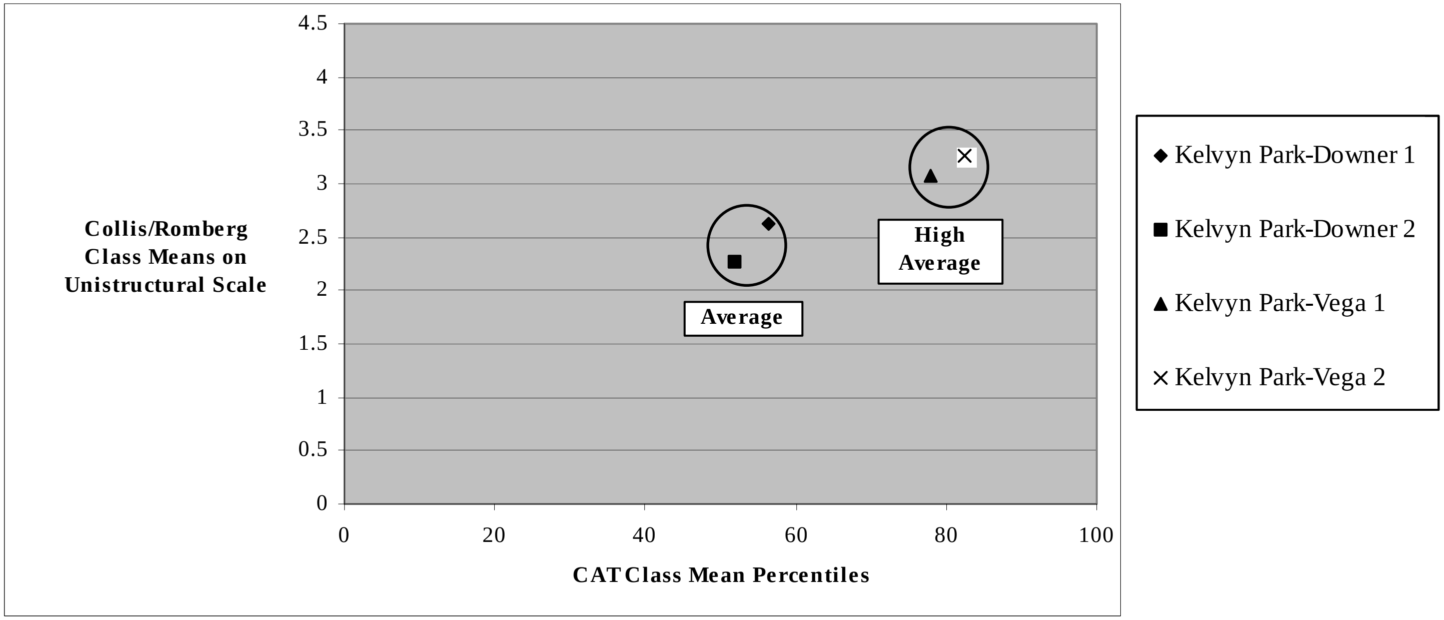


Figure 16. Scatter plot for class mean percentiles on the TerraNova test and the class means on the unistructural scale of the Collis/Romberg reasoning test, Grade 6, District 4.

Because the classes in District 4 varied so much on the two preceding achievement measures used in this study, either comparisons of student performances on outcome measures should be made only between classes in the same level of preceding achievement, or adjustments in outcome test scores should be made via covariance. In fact, because of this strong relationship between the two premeasures, only the standardized test scores should be considered as a potential covariate in order not to lose a degree of freedom in any statistical test about differences.

Finally, all students in the study responded to the items in the *Student Attitude Inventory;* six components of which are summarized here.

First, the class means for student judgments on items related to their effort, confidence, interest, usefulness, and ability to communicate mathematically are shown in Table 49. Each item was judged on a scale of 1–4 (1 = very true; 2 = true; 3 = not true; 4 = not true at all). Overall, the students in these classes judged the statements as true or very true, and there was little variation both between classes and within classes.

Table 49
Class Means on Student Judgments About Mathematics (Subscales on the Student Attitude Inventory), Grade 6, District 4

School-Class *(N)*	**Effort** *in mathematics*		**Confidence** *in ability to do mathematics*		**Interest** *in mathematics*		**Usefulness** *of mathematics*		**Ability to Communicate** *about mathematics*	
	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean
—MiC—										
Kelvyn Park-Downer 1 (24)	17	1.87	17	2.26	17	2.43	16	1.98	15	1.82
Kelvyn Park-Downer 2 (24)	11	1.85	10	1.90	10	1.91	8	1.70	9	1.71
Kelvyn Park-Vega 1 (14)	14	1.61	14	2.03	13	1.96	13	1.82	12	1.92
Kelvyn Park-Vega 2 (19)	19	1.87	17	1.98	19	2.38	19	1.70	18	1.90

(For detailed information, see Table F4 in Appendix F.)

The one class (Kelvin Park-Downer 1) tended to be less confident in their ability to do mathematics, to have less interest, to believe mathematics less useful to them than did students in the other classes and to consider mathematics less useful (see Figure 17).

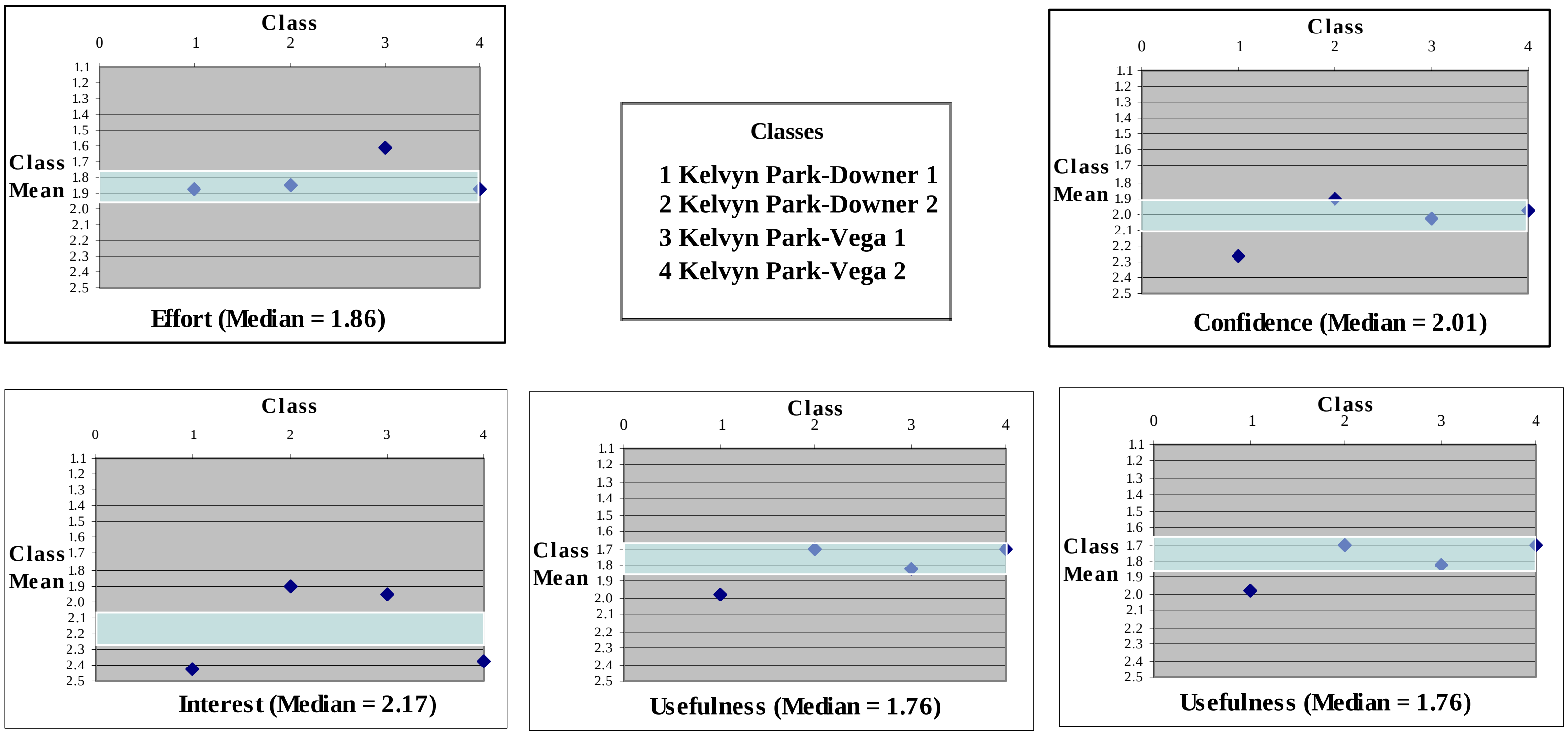


Figure 17. Plots showing class means on student judgments about mathematics, Grade 6, District 4. (Shaded areas show class medians ± 0.1.)

In the second component of the *Student Attitude Inventory*, students responded to 16 items related to general perceptions about mathematics (see Table F5 in Appendix F). Several items were reverse-scored due to wording of question. In general, little variance was seen in class means with respect to items related to general perceptions about mathematics. Students felt very confident that they were able to learn new ideas in mathematics class (from 1.09, Kelvyn Park-Downer 2, to 1.47, Kelvyn Park-Vega 2, on Item 3). Students thought it was acceptable to solve mathematics problems differently than their classmates (from 1.13, Kelvyn Park-Downer 1, to 1.47, Kelvyn Park-Vega 2, on Item 16). However, students were less confident (from 1.63, Kelvyn Park-Vega 2, to 1.73, Kelvyn Park-Downer 2, on Item 4) that they could discover ways of solving problems that their teachers or their peers had not previously considered.

Students were very confident that anyone who worked hard enough in mathematics class could be good at mathematics (from 1.05, Kelvyn Park-Vega 2, to 1.36, Kelvyn Park-Downer 2, on Item 11). Similarly, students disagreed that some students were naturally better, or worse, at mathematics than other students regardless of effortr (from 2.86, Kelvyn Park-Vega 1, to 3.09, Kelvyn Park-Downer 2, on Item 37).

Students felt that knowing how to solve a problem was as important as determining the answer (from 1.45, Kelvyn Park-Downer 2, to 1.89, Kelvyn Park-Vega 2, on Item 53), although they felt that answering questions correctly in mathematics class require providing only numbers (from 1.21, Kelvyn Park-Vega 1, to 1.88, Kelvyn Park-Downer 1, on Item 38). Students thought that getting correct answers in mathematics class was at least as important as understanding why the answer was correct (from 1.60, Kelvyn Park-Downer 2, to 2.44, Kelvyn Park-Downer 1, on Item 27), although students felt that getting correct answers was more important than understanding a mathematics problem or the process of finding an answer (from 1.71, Kelvyn Park-Vega 1, to 2.41, Kelvyn Park-Downer 1, on Item 49). Students disagreed that mathematics was mostly learned by memorizing facts and rules (from 2.36, Kelvyn Park-Vega 1, to 3.45, Kelvyn Park-Downer 2, on Item 55). They also disagreed that they would get correct answers to their teachers' questions if they had memorized rules or facts (from 2.71, Kelvyn Park-Vega 1, to 3.45, Kelvyn Park-Downer 2, on Item 44). Students disagreed that they did not know how to solve mathematics problems if they found they had to use calculators (from 2.62, Kelvyn Park-Vega 1, to 3.11, Kelvyn Park-Vega 2, on Item 45) and that calculators always generated correct answers (from 2.53, Kelvyn Park-Vega 2, to 2.91, Kelvyn Park-Downer 2, on Item 6).

Students felt that new mathematics topics were related to ones they had already studied (from 1.86, Kelvyn Park-Vega 1, to 3.00, Kelvyn Park-Downer 2, on Item 39). Students felt that mathematics was related to other school subjects (from 1.42, Kelvyn Park-Vega 2, to 2.55, Kelvyn Park-Downer 2, on Item 20), although they thought that mathematics was harder to understand than other school subjects (from 1.55, Kelvyn Park-Downer 2, to 2.53, Kelvyn Park-Downer 1, on Item 28).

The third component involved students judging whether success or failure in mathematics could be attributed to teachers, ability, effort, or luck. The class means for these judgments are shown in Table 50. Each item was judged on a scale of 1–4 (1 = very true; 2 = true; 3 = not true; 4 = not true at all). All classes attributed success in mathematics to a combination of effort and ability, and failure to lack of effort.

Table 50

Class Means on Student Attribution of Success or Failure in Mathematics, Grade 6, District 4

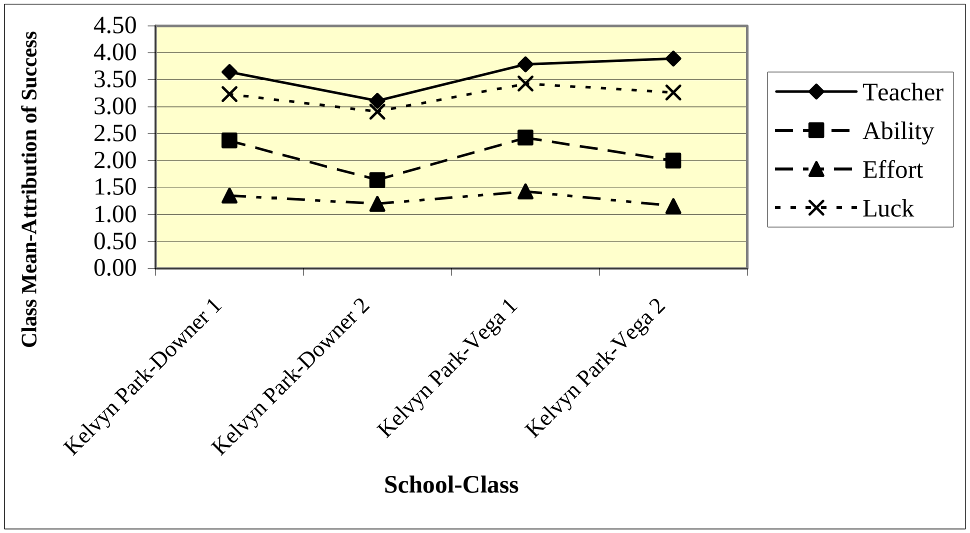
School-Class (*N*)	Success							
	Teacher		Ability		Effort		Luck	
	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean
—MiC—								
Kelvyn Park-Downer 1 (24)	17	3.65	16	2.38	17	1.35	17	3.24
Kelvyn Park-Downer 2 (24)	9	3.11	11	1.64	10	1.20	11	2.91
Kelvyn Park-Vega 1 (14)	14	3.79	14	2.43	14	1.43	14	3.43
Kelvyn Park-Vega 2 (19)	19	3.89	19	2.00	19	1.16	19	3.26

School-Class (*N*)	Failure							
	Teacher		Ability		Effort		Luck	
	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean
—MiC—								
Kelvyn Park-Downer 1 (24)	17	3.71	17	2.65	17	2.12	17	3.35
Kelvyn Park-Downer 2 (24)	11	3.36	11	3.36	11	2.45	11	3.36
Kelvyn Park-Vega 1 (14)	14	3.71	12	3.00	14	2.21	14	3.79
Kelvyn Park-Vega 2 (19)	19	3.47	19	2.74	19	2.00	18	3.67

(For more detailed information, see Table F6 in Appendix F.)

In all classes, students were more inclined to attribute success to ability and effort (see Figure 18a), and more inclined to attribute failure to effort (see Figure 18b).

(a)



(b)

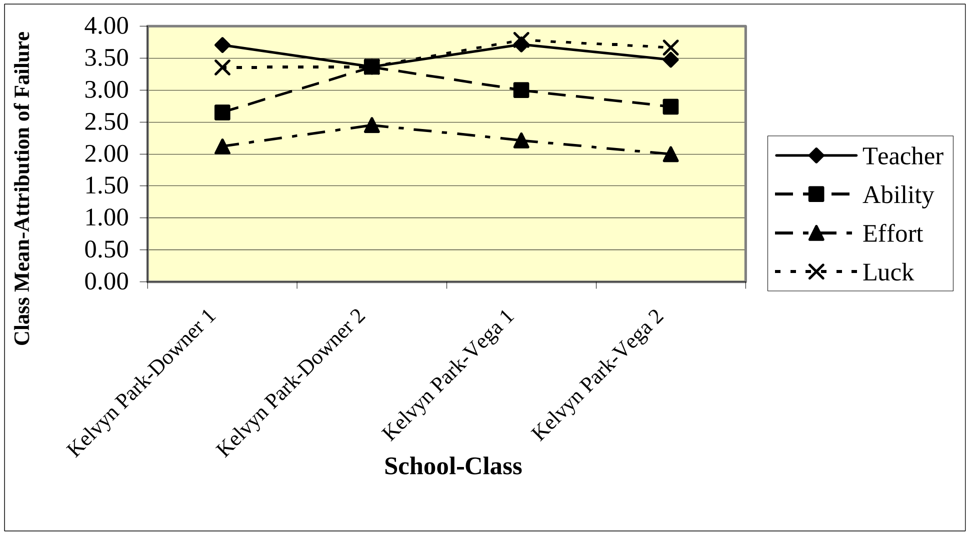


Figure 18. Line graphs showing class means of student attribution of (a) success and (b) failure in mathematics, Grade 6, District 4.

In the fourth component of the *Student Attitude Inventory*, students listed things they associated with the word "mathematics" (see Table 51). Although classes varied, students in all classes most frequently listed words associated with number, including operations with number. The interest-related responses in Kelvyn Park-Vega 1, geometry-related responses in Kelvyn Park-Downer 2, and thinking-related responses in Kelvyn Park-Downer 1 are notable.

Table 51
Words Students Associated With "Mathematics," Grade 6, District 4

School-Class *(N)*	**Number of Responses[1] *(N)***	**Number[2] *(%)*[3]**	**Interest *(%)***	**Geometry *(%)***	**Negative Emotive Responses[4] *(%)***	**Thinking *(%)***	**Problem Solving *(%)***	**Algebra *(%)***	**Occupations *(%)***	**Miscellaneous *(%)***
—MiC—										
Kelvyn Park-Downer 1 (17)	66	62	3	0	5	11	8	0	0	3
Kelvyn Park-Downer 2 (11)	52	50	2	10	2	4	8	4	0	13
Kelvyn Park-Vega 1 (14)	63	52	11	6	2	8	2	3	2	8
Kelvyn Park-Vega 2 (19)	92	66	5	1	5	4	4	0	2	5

[1] Students were asked to list the words they "think of when they hear the word mathematics."

[2] Responses included operations with numbers.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included "boring," "stupid," and statements of displeasure.

In the fifth component of the *Student Attitude Inventory*, students listed jobs other than teaching that required the use of mathematics (see Table 52). Although classes varied, students in classes most frequently listed service-related occupations, including retail sales, business, and food service; and frequently financial-related occupations, such as accounting, banking, and insurance.

Table 52
Nonteaching Jobs that Students Identified as Requiring Mathematics, Grade 6, District 4

School-Class *(N)*	Number of Responses[1] *(N)*	Services[2] *(%)*[3]	Financial[4] *(%)*	Professional[5] *(%)*	Science *(%)*	Trades *(%)*	Creative Arts *(%)*	Government *(%)*	Sports *(%)*	Unreportable[6] *(%)*
—MiC—										
Kelvyn Park-Downer 1 (17)	48	48	13	6	2	4	0	4	4	13
Kelvyn Park-Downer 2 (11)	18	22	6	0	6	6	11	0	0	28
Kelvyn Park-Vega 1 (14)	49	35	8	12	6	2	6	0	2	27
Kelvyn Park-Vega 2 (19)	53	32	23	9	9	6	2	4	0	8

[1] Students asked to list the jobs other than teaching that require mathematics.

[2] Responses included occupations in retail sales, business, and food service.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included occupations in accounting, banking, and insurance.

[5] Responses included occupations in medical fields, engineering, and law.

[6] Responses included teaching, thinking, and operations with numbers.

In the sixth component of the *Student Attitude Inventory*, students listed ways they used mathematics outside of class (see Table 53). Although classes varied, students in all classes most frequently listed money-related ways, such as banking and shopping. Students also often listed calculation-related ways in Calhoun North-Schlueter 2 and Calhoun North-Solomon 1 than in the other classes.

Table 53
Ways Students Used Mathematics Outside of Class, Grade 6, District 4

School-Class *(N)*	**Number of Responses[1] *(N)***	**Monetary[2] *(%)*[3]**	**Calculation *(%)***	**Leisure *(%)***	**Measurement *(%)***	**Problem Solving *(%)***	**Unreportable[4] *(%)***
—MiC—							
Kelvyn Park-Downer 1 (17)	7	29	0	29	0	0	29
Kelvyn Park-Downer 2 (11)	7	57	0	0	14	0	14
Kelvyn Park-Vega 1 (14)	19	26	21	16	16	0	16
Kelvyn Park-Vega 2 (19)	27	37	22	7	4	4	19

[1] Students were asked to describe how they would use mathematics outside of class.

[2] Responses included banking and shopping.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included occupations and nonmathematics school subjects.

Finally, all students in the study responded to items on the *Student Questionnaire*, five components of which are summarized here. The first component involved student judgments about the school subject they enjoyed the most (see Table 54). Students reported that they enjoyed physical education (PE) and social studies classes more than other subjects.

Table 54
Student Preference Ranking of Classes, Grade 6, District 4

School-Class *(N)*	**Subject *(%)***									
	SocStudies	**Science**	**Math**	**Reading**	**Writing**	**Art**	**Music**	**PE**	**Band**	**Other**
—MiC—										
Kelvyn Park-Downer 1 (24)	26	0	9	0	0	26	4	22	0	13
Kelvyn Park-Downer 2 (24)	33	0	0	0	0	8	0	38	4	17
Kelvyn Park-Vega 1 (14)	7	7	0	0	7	0	0	29	0	50
Kelvyn Park-Vega 2 (19)	21	11	11	5	0	0	11	37	0	5

The second component involved student judgments about their frequency of talking about mathematics with classmates, friends, and other acquaintances on three questions. Response frequency (never, sometimes, often, very often) for each class was strikingly different across questions and across classes (see Table 55).

Table 55

Student Judgment About Frequency of Communication About Mathematics, Grade 6, District 4

School-Class *(N)*	**Mathematical Ideas and Problem Strategies**					**Homework Problems**					**Ways Mathematics is Used Outside of School**				
	(*N*)	**Never**	**Some-times**	**Often**	**Very Often**	**(*N*)**	**Never**	**Some-times**	**Often**	**Very Often**	**(*N*)**	**Never**	**Some-times**	**Often**	**Very Often**
— MiC —															
Kelvyn Park-Downer 1 (24)	23	13	57	26	4	23	26	39	26	9	23	48	39	9	4
Kelvyn Park-Downer 2 (24)	24	13	79	8	0	24	0	46	33	21	23	26	52	4	17
Kelvyn Park-Vega 1 (14)	14	7	43	43	7	14	0	36	21	43	14	14	43	29	14
Kelvyn Park-Vega 2 (19)	19	11	53	32	5	19	16	37	32	16	19	37	26	26	11

Note: Response rates designate class mean percents.

The third component of the *Student Questionnaire* involved student judgments about the things they liked the most about mathematics class (see Table 56). Most students reported that they liked working with numbers more than they reported other categories, although the classes varied. Also, students in Kelvyn Park-Downer 1 and Kelvyn Park-Downer 2 reported positive emotive responses.

Table 56
What Students Liked Most About Mathematics Class, Grade 6, District 4

School-Class *(N)*	**Number of Responses[1] *(N)***	**Number *(%)*[2]**	**Problem Solving *(%)***	**Classwork *(%)***	**Working With Others *(%)***	**Miscellaneous[3] *(%)***	**Negative Emotional Response[4] *(%)***	**Positive Emotional Response[5] *(%)***
—MiC—								
Kelvyn Park-Downer 1 (24)	44	16	7	7	2	16	5	0
Kelvyn Park-Downer 2 (24)	46	20	4	7	4	22	4	0
Kelvyn Park-Vega 1 (14)	40	53	10	10	3	10	3	0
Kelvyn Park-Vega 2 (19)	37	54	5	3	0	0	5	19

[1] Students were asked to name three things they liked most about mathematics class.

[2] Percentage does not add to 100 due to number of unique responses.

[3] Responses included "teacher," "computer," and "warm-up activities."

[4] Responses included "hard," "boring," and "restrictive."

[5] Responses included "like it all" and "fun."

Additional patterns were revealed when examining student judgments about number (see Table 57). Most students reported that they liked multiplication, although the classes varied. Also, half of the classes indicated preferences for addition, while half indicated preferences for division. Kelvyn Park-Vega 1 indicated strong preferences for fractions.

Table 57
What Students Liked Most About Mathematics Class, Grade 6, District 4 (continued)

School-Class *(N)*	**Number of Responses[1] *(N)***	**Addition *(%)***	**Subtraction *(%)***	**Multiplication *(%)***	**Division *(%)***	**Decimals *(%)***	**Fractions *(%)***	**Other[2] *(%)***
—MiC—								
Kelvyn Park-Downer 1 (24)	7	43	14	29	0	0	0	14
Kelvyn Park-Downer 2 (24)	9	11	0	44	33	0	11	0
Kelvyn Park-Vega 1 (14)	21	10	10	24	19	0	29	10
Kelvyn Park-Vega 2 (19)	20	30	15	30	20	0	5	0

[1] Students were asked to name three things they liked most about mathematics class.

[2] Responses included counting, average, estimation, least common denominator, least common multiple, money, rounding and time.

The fourth component involved student judgments about the things they disliked most about mathematics class (see Table 58). All classes reported that they disliked working with numbers more than anything else, although the classes varied.

Table 58
What Students Disliked Most About Mathematics Class, Grade 6, District 4

School-Class *(N)*	**Number of Responses[1] *(N)***	**Number *(%)* [2]**	**Classwork *(%)***	**Homework *(%)***	**Tests *(%)***	**Problem Solving *(%)***	**Book *(%)***	**Miscellaneous [3] *(%)***	**Negative Emotional Response[4] *(%)***	**Positive Emotional Response[5] *(%)***
—MiC—										
Kelvyn Park-Downer 1 (24)	42	31	7	10	5	7	2	7	5	2
Kelvyn Park-Downer 2 (24)	32	6	0	6	0	3	6	9	0	13
Kelvyn Park-Vega 1 (14)	30	30	10	10	7	7	7	7	3	10
Kelvyn Park-Vega 2 (19)	34	35	9	9	6	3	0	6	15	6

[1] Students were asked to name three things they disliked the most about mathematics class.

[2] Percentage does not add to 100 due to number of unique responses.

[3] Responses included "teacher," "computer," and "warm-up activities."

[4] Responses included "hard," "boring," and "restrictive."

[5] Responses included "like it all" and "fun."

The number responses for number-related categories was too small to make inferences about student dislikes for these categories (see Table 59).

Table 59
What Students Disliked Most About Mathematics Class, Grade 6, District 4 (continued)

School-Class *(N)*	**Number of Responses[1] *(N)***	**Addition *(%)***	**Subtraction *(%)***	**Multiplication *(%)***	**Division *(%)***	**Decimals (%)**	**Fractions *(%)***	**Other[2] *(%)***
—MiC—								
Kelvyn Park-Downer 1 (24)	13	8	23	15	23	0	8	23
Kelvyn Park-Downer 2 (24)	2	0	0	50	50	0	0	0
Kelvyn Park-Vega 1 (14)	9	11	0	0	33	11	44	0
Kelvyn Park-Vega 2 (19)	12	0	8	8	8	0	58	17

[1] Students were asked to name three things they disliked the most about mathematics class.

[2] Responses included counting, average, estimation, least common denominator, least common multiple, money, rounding and time.

The fifth component involved student judgments about the ways mathematics helped them in other subjects (see Table 60). Although classes varied, most students in most classes reported that mathematics was used in both general applications, such as estimating and calculating. Also, nearly 30% of the responses for Kelvyn Park- Downer 1 and Kelvyn Park-Vega 2 classes indicated that mathematics was not helpful in other subjects.

Table 60

Student Perception of the Usefulness of Mathematics in Other Classes, Grade 6, District 4

School-Class *(N)*	**Number of Responses[1] *(N)***	**General Applications[2] *(%)***	**Specific Applications[3] *(%)***	**Organization of Information *(%)***	**No Help *(%)***	**Miscellaneous *(%)***	**Inappropriate Responses[4] *(%)***
				—MiC—			
Kelvyn Park-Downer 1 (24)	33	21	0	0	27	9	42
Kelvyn Park-Downer 2 (24)	27	33	7	0	11	0	48
Kelvyn Park-Vega 1 (14)	25	48	16	0	12	0	24
Kelvyn Park-Vega 2 (19)	24	33	13	8	33	4	8

[1] Students were asked to identify how their knowledge of mathematics and the way they learned mathematics helped them in other classes.

[2] Responses included "estimating" and "calculating."

[3] Responses included "measurement" and "problem solving."

[4] Responses included "not good at math", "need to know something", "it's easier and more fun", "not good ", etc.

Summary

This working paper described the background characteristics of the 35 sixth-grade classes in the four school districts involved in the longitudinal/cross-sectional study of the impact of *Mathematics in Context* on student performance. The classes contained 11-year-old students with a comparable number of boys and girls in Districts 1 and 3 and more uneven assignment of boys and girls in Districts 2 and 4. The students in the classes and districts varied in ethnicity with a number of African American and White students in most District 1 classes, Hispanic and Multiracial students in District 2 classes, White students in District 3 classes, and African American and Multiracial students in District 4.

Classes showed between-class and within-class variation on measures of prior achievement (*TerraNova* in Districts 1 and 3, *Stanford Mathematics Achievement Test* in District 2, and *California Achievement Test* in District 4). On the *Collis-Romberg Mathematical Problem Solving Profiles*, most students exhibited unistructural reasoning, about a third of the classes exhibited multistructural reasoning, and few students demonstrated reasoning at relational or extended abstract levels. Classifying classes in terms of both tests yielded a picture of average and high average classes in District 1; low, average, and high average classes in District 2; low (special education class) and average classes in District 3; and average and high average classes in District 4.

Class means on the *Student Attitude Inventory* were very similar across districts. Students believed that they would succeed in mathematics class if they put forth the effort. They felt confident in their abilities to communicate mathematically and do mathematics (with exception of the special education class in District 3). Students were interested in mathematics, and they felt that mathematics was useful in their daily lives. They attributed success in mathematics to a combination of effort and ability, and failure to lack of effort (Districts 1 and 4) or to lack of effort and ability (Districts 2 and 3). Students most frequently associated number-related items with mathematics and identified service-, financial-, and professional-related occupations as those that required mathematics. Students noted monetary- and calculation-related uses of mathematics outside of school.

Class means on the *Student Questionnaire* were similar across districts. Students most enjoyed mathematics, science, physical education, and art classes. In mathematics class, they most liked working with addition and subtraction and disliked division. Students also reported that they used mathematics in other classes in general applications such as estimating and calculating and in specific applications such as measurement and problem solving.

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Longitudinal/Cross-Sectional Study of the Impact of *Mathematics in Context* on Student Performance

Student Background Data for 1997–1998 (Grade 7)
(Working Paper #18c)

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INTRODUCTION

The purposes of the longitudinal/cross-sectional study of the impact of *Mathematics in Context* (MiC; National Center for Research in Mathematical Sciences Education & Freudenthal Institute, 1997–1998) on student performance are (a) to determine the mathematical knowledge, understanding, attitudes, and levels of student performance as a consequence of studying MiC for over three years; and (b) to compare student knowledge, understanding, attitudes, and levels of performance of students using MiC with those using conventional mathematics curricula. The research model for this study is an adaptation of a structural model for monitoring changes in school mathematics (Romberg, 1987). For this study, information is being gathered on 14 variables over a 3-year period for three groups of students (those in Grades 5, 6, and 7 in 1997). The variables have been organized in five categories (prior, independent, intervening, outcome, and consequent). (See Figure 1 for variables and hypothesized relationships.)

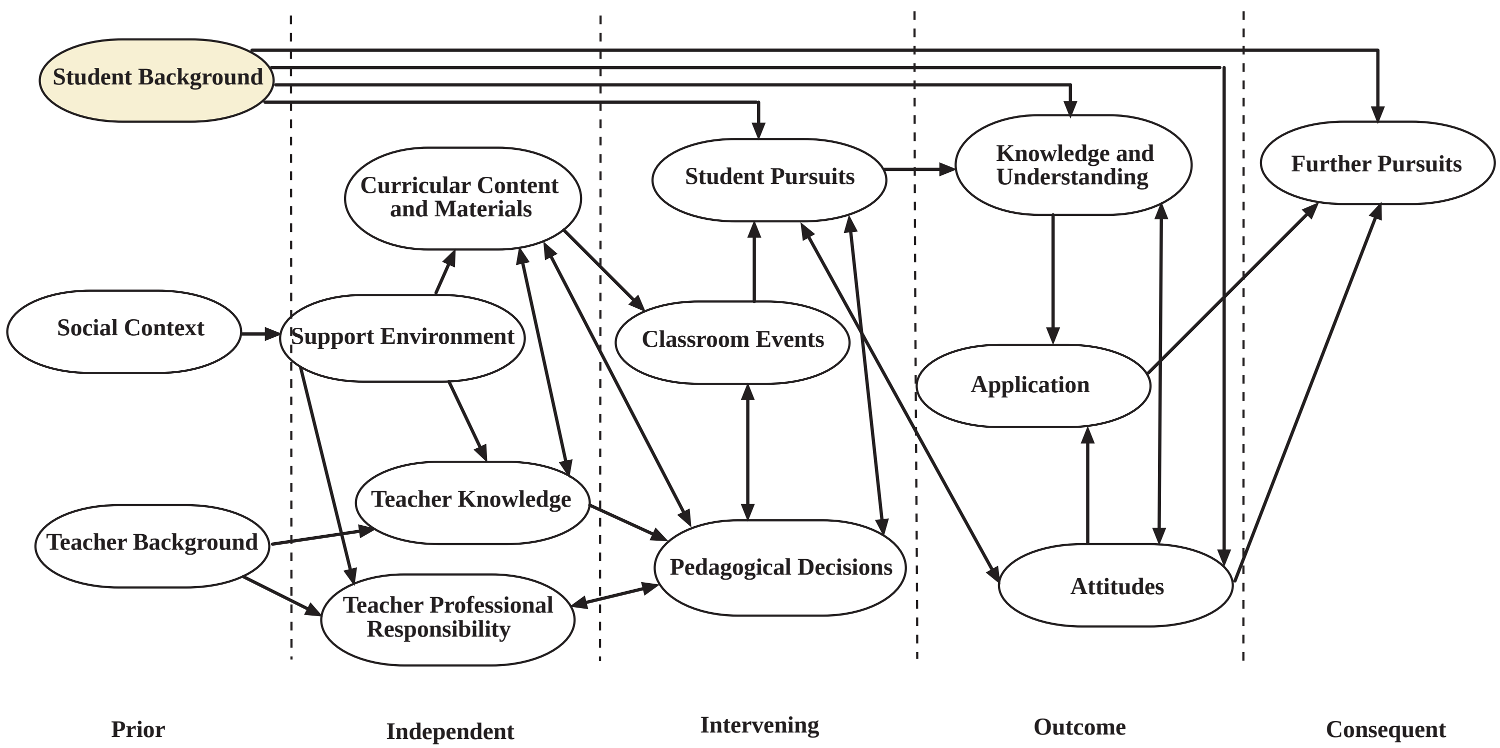


Figure 1. Revised model for the monitoring of school mathematics.

Overview: Grade 7 Student Background

The purpose of this working paper is to summarize the information of the *Student Background* variable collected in 1997 on seventh-grade classes at the beginning of the longitudinal/cross-sectional study of the impact of *Mathematics in Context* on student performance. The purpose of gathering this information was to describe similarities and differences in seven class characteristics prior to instruction (see Figure 2). Four fixed characteristics for the students in each class—gender, age, ethnicity, and preferred language—were gathered via a Student Questionnaire (see Appendix A, Shafer, 1997). Three other class characteristics—measures of student mathematical knowledge, student mathematical applications, and disposition toward mathematics—were taken, respectively, from standardized test scores provided by the schools, scores on the project-administered Collis/Romberg Mathematical Reasoning Test (Collis & Romberg, 1992), and student responses to the Student Attitude Inventory (see Appendix B, Shafer, Davis, & Wagner, 1997).

Students in 35 seventh-grade classrooms from four school districts participated in the study. Districts are identified by number, and the classes by school and teacher (both pseudonyms). Also noted are the type of materials used (MiC materials or a conventional text).

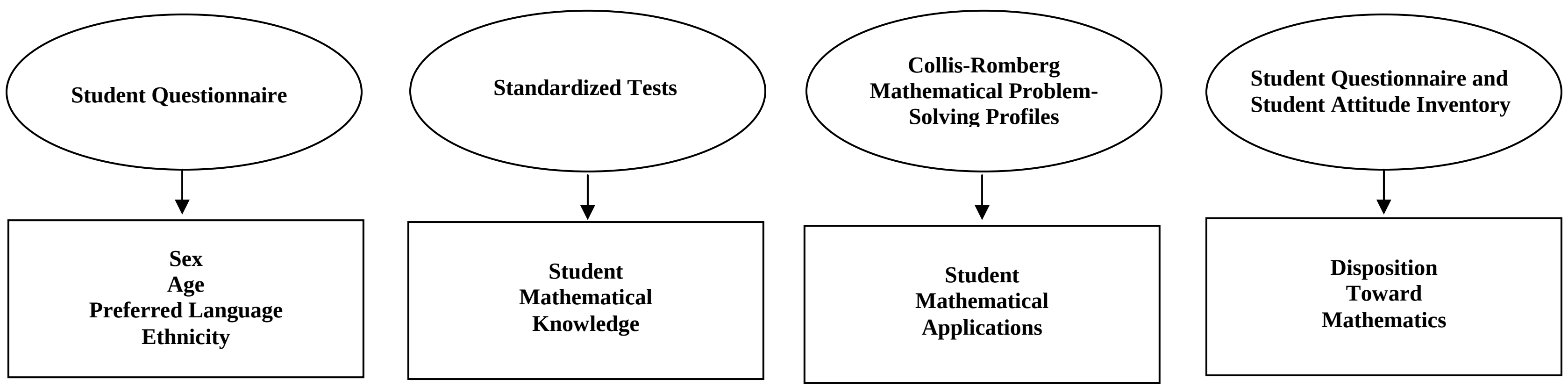


Figure 2. Fixed class characteristics in longitudinal/cross-sectional study of the impact of *Mathematics in Context* on student performance and their sources.

District 1

In District 1, 10 seventh-grade classes participated in the study. MiC was used in five of the classrooms; in the other five, conventional texts were used. A summary of the variations in fixed characteristics is presented in Table 1.

Table 1

Fixed Characteristics, Grade 7, District 1

School-Class *(N)*	**Sex *(%)***		**Average Age *(years)***	**Language Preference *(%)* * *(self-identified)***		**Ethnicity *(%)*** *(self-identified)***				
	Female	**Male**		**English Preference**	**Non-Response**	**African American**	**Hispanic**	**White**	**Multi/Other**	**Non-Response**
—MiC—										
Fernwood-Heath 1 (30)	50	50	12.70	93	3	10	13	53	10	13
Fernwood-Heath 2 (23)	65	35	12.39	96	4	13	13	48	17	9
VonHumboldt-Donnely 1 (25)	44	56	12.45	88	0	12	4	64	16	4
VonHumboldt-Donnely 2 (23)	52	48	12.44	100	0	13	4	65	13	4
VonHumboldt-Donnely 3 (23)	52	48	12.46	91	0	26	9	57	4	4
—Conventional—										
Addams-St.James 1 (20)	80	20	12.23	95	0	5	10	80	5	0
Addams-St.James 2 (19)	63	37	12.31	89	0	21	0	58	21	0
Wacker-McLaughlin 1 (24)	46	54	12.92	96	0	42	0	54	0	4
Wacker-McLaughlin 2 (16)	44	56	12.56	81	6	25	0	56	13	6
Wacker-McLaughlin 3 (16)	50	50	12.57	100	0	13	0	81	6	0

* Percent does not add to 100% when students identified a language preference other than English.

** Percent on ethnicity was rounded off and does not always total 100. Multi/Other comprises Asian, Haitian, Native American, Multiracial and Other.

(For detailed information, see Table C1 in Appendix C.)

In District 1, there was considerable variation in the class profiles. The number of students in a class varied from 16 to 30. With three exceptions (Addams-St. James 1, 80% female, Fernwood-Heath 2, 65% female; Addams-St. James 2, 63% female), the proportion of boys to girls was similar across classes. The average age was similar across classes, and English was the primary language for 81–100% of the students. The ethnicity in these classes, however, varied considerably (5–42% African American, 0–13% Hispanic, 48–81% White, 0–21% Multiracial or Other).

In District 1, two measures of prior mathematics performance were used as indicators of student prior performance. The first performance indicator was the summary of percentile scores for the students in the study classes on the standardized test administered by the district to all of its students, the *TerraNova* Mathematics Test (CTB/McGraw-Hill, 1997), which were forwarded to project staff. Summary means and standard deviations of the percentiles for each class are reported in Table 2, and box plots are shown in Figure 3. Mean percentiles range from 30.92 to 66.50, and the box plots illustrate the between-class variation on this test in this district. (Note the very wide range of scores in Von Humboldt-Donnely 1, and the relatively narrow range of scores in Wacker-McLaughlin 1, Wacker-McLaughlin 2, and Wacker-McLaughlin 3.)

Table 2
Standardized Test Scores, Spring 1997, Grade 7, District 1

School-Class *(N)*	**TerraNova National Percentile**					
	(*N*)	**Mean**	**StDev**	**Mini-mum**	**Median**	**Maxi-mum**
—MiC—						
Fernwood-Heath 1 (30)	23	42.65	25.33	5	43.0	94
Fernwood-Heath 2 (23)	18	47.44	24.87	4	43.0	90
VonHumboldt-Donnely 1 (25)	18	49.17	34.40	2	38.5	93
VonHumboldt-Donnely 2 (23)	21	47.48	25.66	2	43.0	97
VonHumboldt-Donnely 3 (23)	19	49.84	22.44	9	46.0	91
—Conventional—						
Addams-St.James 1 (20)	16	66.50	25.20	17	72.0	96
Addams-St.James 2 (19)	17	60.53	19.27	34	58.0	89
Wacker-McLaughlin 1 (24)	18	43.22	24.54	1	46.0	84
Wacker-McLaughlin 2 (16)	13	30.92	18.31	5	25.0	62
Wacker-McLaughlin 3 (16)	11	46.72	19.21	18	44.0	70

(For more detailed information, see Table C2 in Appendix C.)

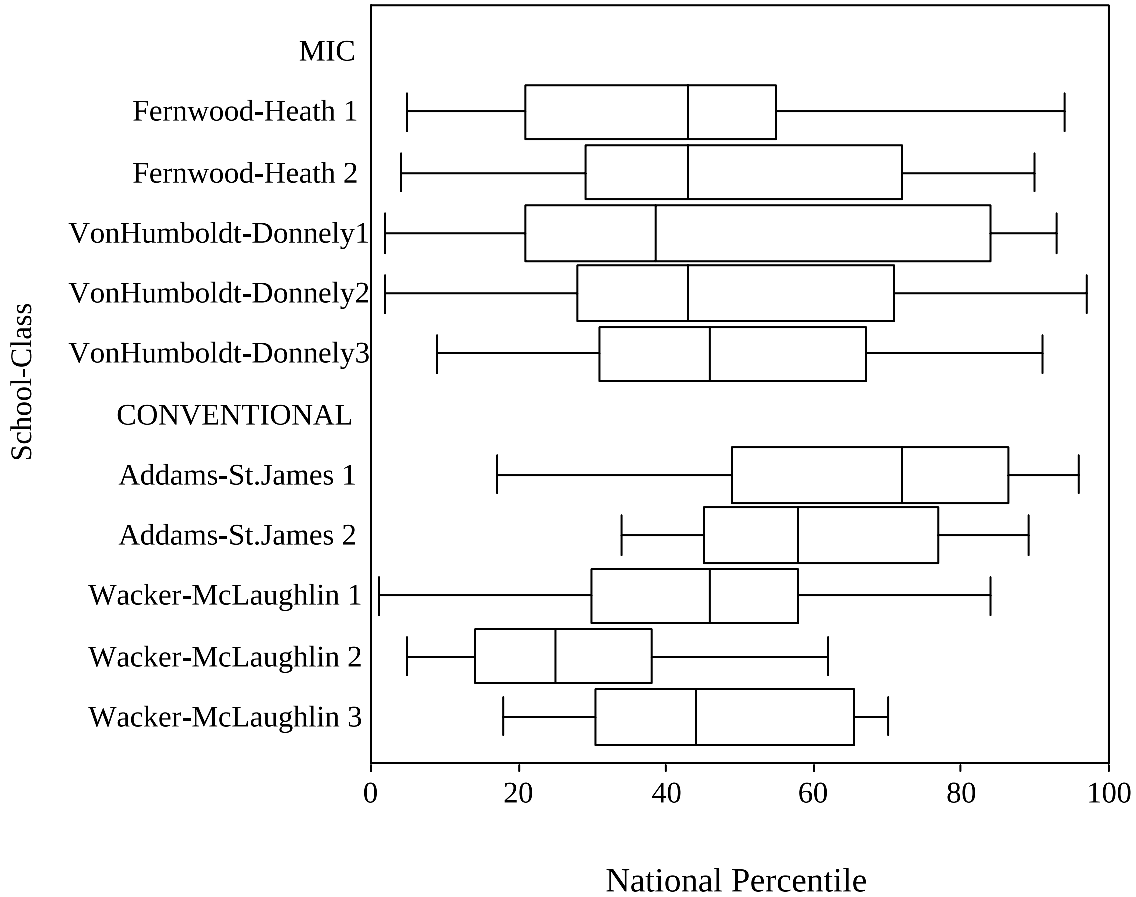


Figure 3. Box plots of class distributions on the *TerraNova* test, Grade 7, District 1.

The second performance indicator used in the study was the Collis/Romberg Mathematical Reasoning Test (Collis & Romberg, 1992). This test was administered to all students participating in the study. The information on this test includes scores related to four levels of reasoning (unistructural, multistructural, relational, and extended abstract), and responses for each level are scored from 0–5. Class means on all four levels of reasoning are given in Table 3. For all classes the means on unistructural level of reasoning were above 2.50, indicating that students were operating at this level on many items. Even at this level, however, there was considerable variability in class means. The means on the other scales indicate that in all classes were many students beginning to reason at a multistructural level, and only a very small number of students exhibit reasoning at either relational or extended abstract levels. (Note the relatively high scores of Addams-St.James 1.)

Table 3
Class Means on the Collis-Romberg Mathematical Problem-Solving Profiles, Grade 7, District 1

School-Class *(N)*	**Level of Reasoning**				
	(*N*)	**Uni-structural**	**Multi-structural**	**Relational**	**Extended Abstract**
—MiC—					
Fernwood-Heath 1 (30)	26	3.04	1.38	0.38	0.00
Fernwood-Heath 2 (23)	22	3.41	1.68	0.45	0.05
VonHumboldt-Donnely 1 (25)	23	3.17	1.65	0.74	0.13
VonHumboldt-Donnely 2 (23)	21	3.24	1.33	0.33	0.05
VonHumboldt-Donnely 3 (23)	22	2.86	1.18	0.32	0.09
—Conventional—					
Addams-St.James 1 (20)	20	4.10	2.20	1.25	0.05
Addams-St.James 2 (19)	19	3.47	1.79	0.89	0.11
Wacker-McLaughlin 1 (24)	21	3.19	1.24	0.33	0.00
Wacker-McLaughlin 2 (16)	15	2.53	1.07	0.07	0.00
Wacker-McLaughlin 3 (16)	15	2.73	1.27	0.33	0.00

(For detailed information, see Table C3 in Appendix C.)

Because the standardized test scores show a similar pattern to those on the unistructural scale of the Collis/Romberg Test (see the scatter plot for means on the two measures in Figure 4), a correlation coefficient between the class means of the two measures was calculated (r = .84). From this information, it is apparent that there are one low performing classes, seven average, and two high average classes.

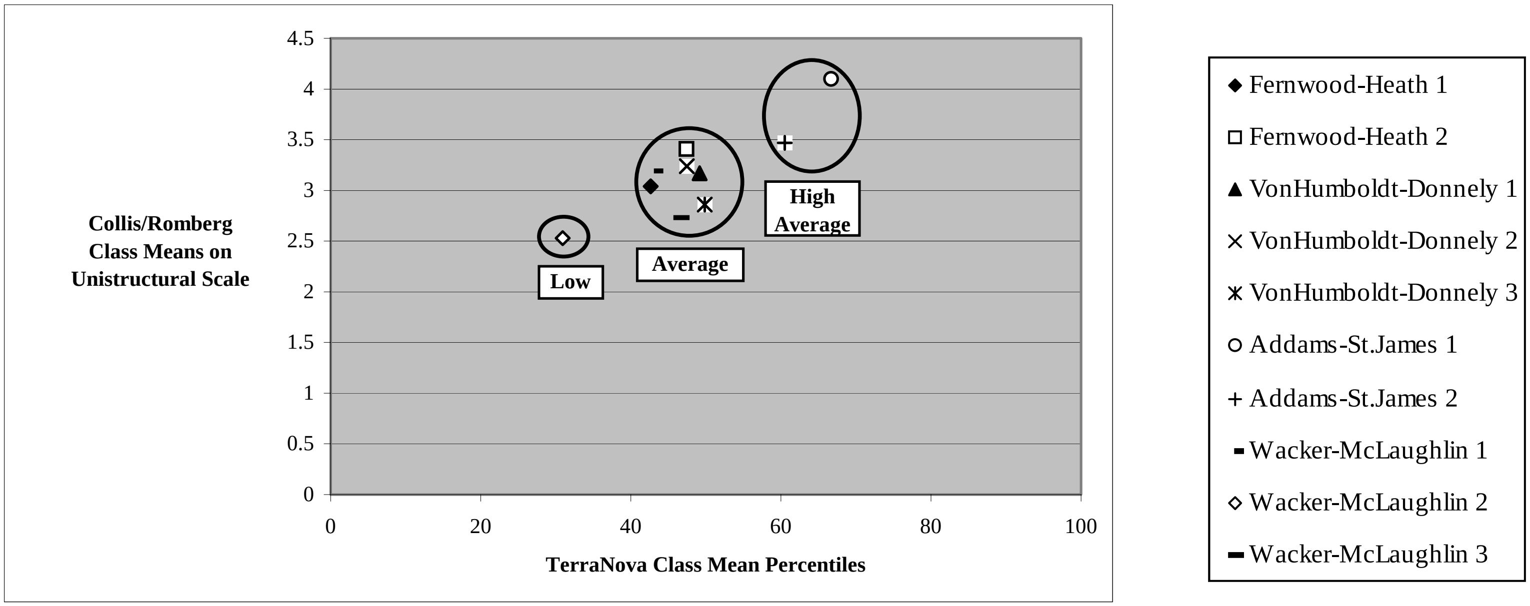


Figure 4. Scatter plot for class mean percentiles on the *TerraNova* test and the class means on the unistructural scale of the Collis/Romberg reasoning test, Grade 7, District 1.

Because the classes in District 1 on the two preceding achievement measures used in this study, either comparisons of student performances on outcome measures should be made only between classes in the same level of preceding achievement, or adjustments in outcome test scores should be made via covariance. In fact, because of this strong relationship between the two premeasures, only the standardized test scores should be considered as a potential covariate in order not to lose a degree of freedom in any statistical test about differences.

All students in the study responded to the items in the *Student Attitude Inventory;* six components are summarized here.

First, the class means for student judgments on items related to their effort, confidence, interest, usefulness, and ability to communicate mathematically are shown in Table 4. Each item was judged on a scale of 1–4 (1 = very true; 2 = true; 3 = not true; 4 = not true at all). Overall, the students in these classes judged the statements as true, and there was little variation between classes.

Table 4

Class Means on Student Judgment About Mathematics (Subscales of the Student Attitude Inventory), Grade 7, District 1

School-Class *(N)*	**Effort** *in mathematics*		**Confidence** *in ability to do mathematics*		**Interest** *in mathematics*		**Usefulness** *of mathematics*		**Ability to Communicate** *about mathematics*	
	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean
—MiC—										
Fernwood-Heath 1 (30)	24	2.09	25	2.05	23	2.20	23	1.77	23	1.76
Fernwood-Heath 2 (23)	17	2.07	18	1.98	15	1.98	17	1.68	16	1.86
VonHumboldt-Donnely 1 (25)	11	1.80	12	1.98	12	2.25	11	1.86	12	2.08
VonHumboldt-Donnely 2 (23)	10	2.42	15	2.45	11	2.74	10	1.94	11	2.16
VonHumboldt-Donnely 3 (23)	18	2.10	18	2.02	18	2.32	17	2.03	18	2.03
—Conventional—										
Addams-St.James 1 (20)	19	2.11	19	1.92	18	2.19	18	1.78	18	1.85
Addams-St.James 2 (19)	17	1.98	18	1.84	18	2.08	18	1.69	18	1.82
Wacker-McLaughlin 1 (24)	20	2.03	21	1.79	20	2.08	19	1.76	20	2.03
Wacker-McLaughlin 2 (16)	12	2.01	10	2.04	11	2.26	11	1.85	12	1.86
Wacker-McLaughlin 3 (16)	10	1.53	10	1.64	10	1.71	9	1.46	10	1.84

(For detailed information, see Table C4 in Appendix C.)

The one class (Von Humboldt-Donnelly 2), expressed less effort in mathematics class, and were less confident in their ability to do mathematics and to communicate about mathematics than were students in the other classes, with the exception of Wacker-McLaughlin 3 who expressed more effort, were more confident, and had more interest in mathematics. (see Figure 5).

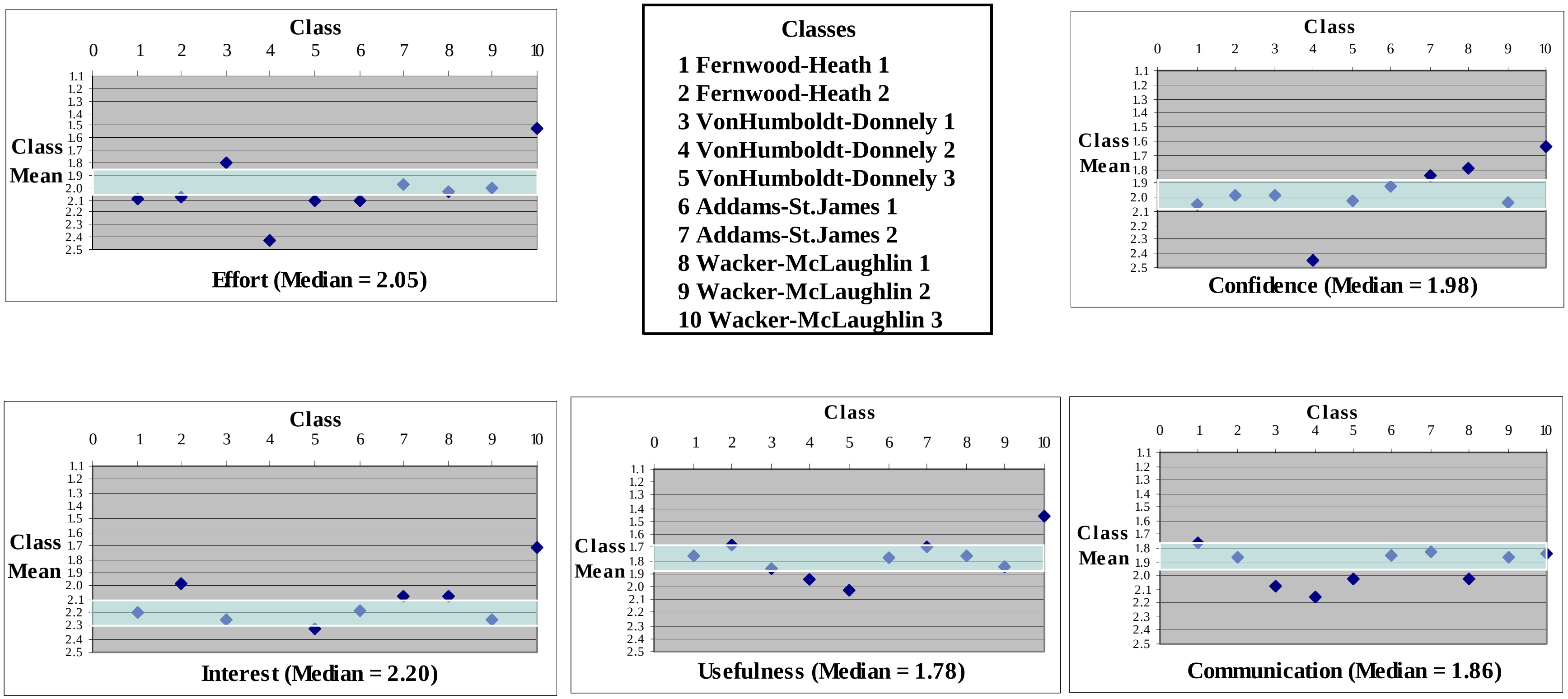


Figure 5. Plots showing class means on student judgments about mathematics, Grade 7, District 1. (Shaded areas show class medians ± 0.1.)

In the second component of the *Student Attitude Inventory*, students responded to 16 items related to general perceptions about mathematics (see Table C5 in Appendix C). Several items were reverse-scored due to wording of question. In general, little variance was seen in class means with respect to items related to general perceptions about mathematics. Students felt confident that they were able to learn new ideas in mathematics class (from 1.28, Addams-St. James 1, to 1.94, Von Humboldt-Donnely 2, on Item 3). Students thought it was acceptable to solve mathematics problems differently than their classmates (from 1.10, Von Humboldt-Donnely 3, to 1.68, Addams-St. James 1, on Item 16). However, students were less confident (from 1.45, Wacker-McLaughlin 3, to 1.95, Addams-St. James 1, on Item 4) that they could discover ways of solving problems that their teachers or their peers had not previously considered.

Students were confident that anyone who worked hard enough in mathematics class could be good at mathematics (from 1.11, Addams-St. James 2, to 1.55, Wacker-McLaughlin 1, on Item 11). Similarly, students disagreed that some students were naturally better, or worse, at mathematics than other students regardless of effort (from 2.58, Addams-St. James 1 and Addams-St. James 2, to 3.50, Wacker-McLaughlin 2, on Item 37).

Students felt that knowing how to solve a problem was as important as determining the answer (from 1.40, Wacker-McLaughlin 3, to 2.00, Fernwood-Heath 2, on Item 53), although they felt that answering questions correctly in mathematics class require providing only numbers (from 1.20, Wacker-McLaughlin 3, to 2.08, Von Humboldt-Donnely 1, on Item 38). Students thought that getting correct answers in mathematics class was at least as important as understanding why the answer was correct (from 1.68, Addams-St. James 2, to 2.64, Wacker-McLaughlin 2, on Item 27), although students felt that getting correct answers was more important than understanding a mathematics problem or the process of finding an answer (from 1.40, Wacker-McLaughlin 3, to 2.75, Wacker-McLaughlin 2, on Item 49). Students disagreed that mathematics was mostly learned by memorizing facts and rules (from 2.40, Wacker-McLaughlin 3, to 3.00, Von Humboldt-Donnely 3, on Item 55). They also disagreed that they would get correct answers to their teachers' questions if they memorized rules or facts (from 2.79, Addams-St. James 1, to 3.33, Fernwood-Heath 2, on Item 44). Students disagreed that they did not know how to solve mathematics problems if they found they had to use calculators (from 1.95, Addams-St. James 2, to 2.96, Fernwood-Heath 1, on Item 45) and that calculators always generated correct answers (from 1.94, Von Humboldt-Donnely 2, to 2.92, Wacker-McLaughlin 2, on Item 6).

Students felt that new mathematics topics were related to ones they had already studied (from 1.70, Wacker-McLaughlin 3, to 2.58, Wacker-McLaughlin 2, on Item 39). Students felt that mathematics was related to other school subjects (from 1.26, Addams-St. James 2, to 2.05, Von Humboldt-Donnely 3, on Item 20), although they thought that mathematics was harder to understand than other school subjects (from 1.91, Wacker-McLaughlin 3, to 3.00, Wacker-McLaughlin 2, on Item 28).

The third component involved students judging whether success or failure in mathematics could be attributed to teachers, ability, effort, or luck. The class means for these judgments are shown in Table 5. Each item was judged on a scale of 1–4 (1 = very true; 2 = true; 3 = not true; 4 = not true at all). All classes attributed success in mathematics to effort and failure to lack of effort.

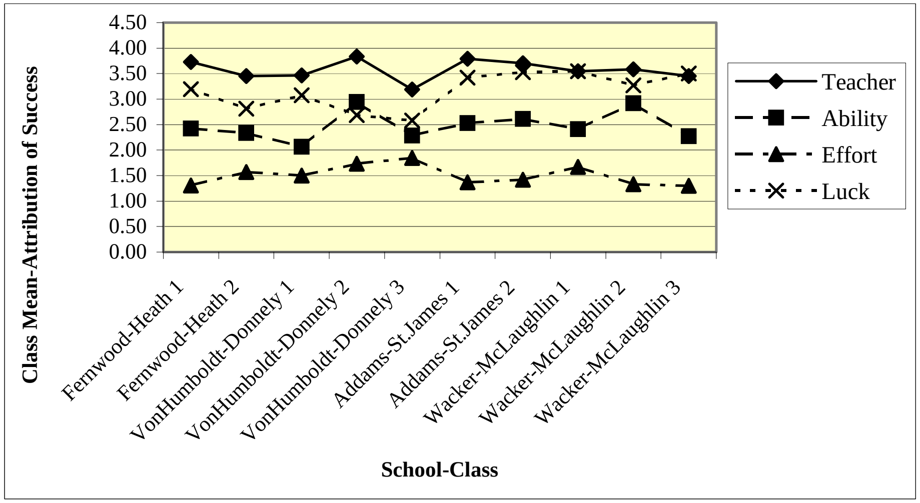
Table 5
Class Means on Student Attribution of Success or Failure in Mathematics, Grade 7, District 1

School-Class (*N*)	Success							
	Teacher		Ability		Effort		Luck	
	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean
—MiC—								
Fernwood-Heath 1 (30)	26	3.73	26	2.42	26	1.31	26	3.19
Fernwood-Heath 2 (23)	20	3.45	21	2.33	21	1.57	21	2.81
VonHumboldt-Donnely 1 (25)	15	3.47	15	2.07	12	1.50	13	3.08
VonHumboldt-Donnely 2 (23)	18	3.83	18	2.94	15	1.73	16	2.69
VonHumboldt-Donnely 3 (23)	21	3.19	21	2.29	19	1.84	19	2.58
—Conventional—								
Addams-St.James 1 (20)	19	3.79	19	2.53	19	1.37	19	3.42
Addams-St.James 2 (19)	17	3.71	18	2.61	19	1.42	19	3.53
Wacker-McLaughlin 1 (24)	22	3.55	22	2.41	21	1.67	22	3.55
Wacker-McLaughlin 2 (16)	12	3.58	12	2.92	12	1.33	11	3.27
Wacker-McLaughlin 3 (16)	11	3.45	11	2.27	10	1.30	10	3.50

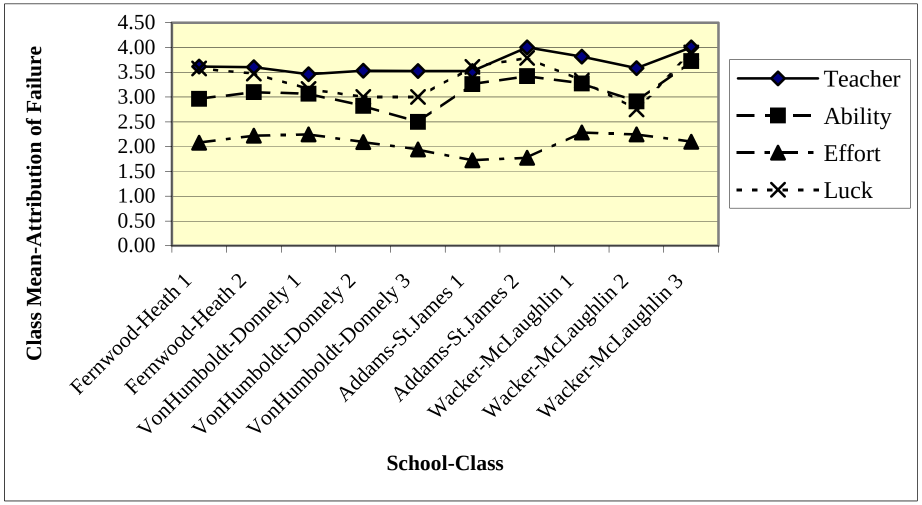
School-Class (*N*)	Failure							
	Teacher		Ability		Effort		Luck	
	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean
—MiC—								
Fernwood-Heath 1 (30)	26	3.62	26	2.96	26	2.08	26	3.58
Fernwood-Heath 2 (23)	20	3.60	20	3.10	18	2.22	19	3.47
VonHumboldt-Donnely 1 (25)	13	3.46	15	3.07	12	2.25	12	3.17
VonHumboldt-Donnely 2 (23)	15	3.53	17	2.82	11	2.09	11	3.00
VonHumboldt-Donnely 3 (23)	19	3.53	20	2.50	18	1.94	18	3.00
—Conventional—								
Addams-St.James 1 (20)	19	3.53	19	3.26	18	1.72	18	3.61
Addams-St.James 2 (19)	19	4.00	19	3.42	18	1.78	19	3.79
Wacker-McLaughlin 1 (24)	22	3.82	22	3.27	21	2.29	21	3.33
Wacker-McLaughlin 2 (16)	12	3.58	11	2.91	12	2.25	12	2.75
Wacker-McLaughlin 3 (16)	10	4.00	11	3.73	10	2.10	10	3.90

(For more detailed information, see Table C6 in Appendix C.)

In general, the classes tended to attribute success or failure in mathematics to effort (see Figures 6a and 6b).



(a)



(b)

Figure 6. Line graphs showing class means of student attribution of (a) success and (b) failure in mathematics, Grade 7, District 1.

In the fourth component of the *Student Attitude Inventory*, students listed things they associated with the word "mathematics" (see Table 6). Although the classes varied, students in all classes most frequently listed words associated with number, including operations with numbers. More students in Fernwood-Heath 1 and 2 and Von Humboldt-Donnelly 1 listed geometry-related words in comparison to students in the other seventh-grade classes in this district. Also, more students in Fernwood-Heath 1 and Von Humboldt-Donnelly 1 listed negative emotive words than students in the other classes.

Table 6

Words Students Associated With "Mathematics," Grade 7, District 1

School-Class *(N)*	**Number of Responses[1] *(N)***	**Number[2] *(%)*[3]**	**Interest *(%)***	**Geometry *(%)***	**Negative Emotive Responses[4] *(%)***	**Thinking *(%)***	**Problem Solving *(%)***	**Algebra *(%)***	**Occupations *(%)***	**Miscellaneous *(%)***
—MiC—										
Fernwood-Heath 1 (25)	99	42	3	14	11	6	5	2	0	5
Fernwood-Heath 2 (18)	70	57	4	11	0	4	6	1	0	6
VonHumboldt-Donnelly 1 (12)	38	50	0	11	16	0	5	3	0	5
VonHumboldt-Donnelly 2 (9)	35	51	0	9	0	0	11	3	0	20
VonHumboldt-Donnelly 3 (14)	51	76	0	0	6	2	4	0	0	8
—Conventional—										
Addams-St.James 1 (19)	76	61	3	0	1	3	4	7	0	17
Addams-St.James 2 (19)	113	52	0	7	2	5	9	7	0	15
Wacker-McLaughlin 1 (18)	82	77	1	2	2	0	5	5	0	4
Wacker-McLaughlin 2 (11)	47	74	0	0	6	4	2	0	2	9
Wacker-McLaughlin 3 (10)	51	71	0	0	2	0	8	8	6	4

[1] Students were asked to list the words they "think of when they hear the word mathematics."

[2] Responses included operations with numbers.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included "boring," "stupid," and statements of displeasure.

In the fifth component of the *Student Attitude Inventory,* students listed jobs other than teaching that required the use of mathematics (see Table 7). Although the classes varied, students in all classes most frequently listed service-related occupations, including retail sales, business, and food service and very frequently mentioned financial-related occupations, such as accounting, banking, and insurance. Also, students in Fernwood-Heath 2 and Addams-St. James 1 and 2 listed professional-related occupations, including medical fields, engineering, and law, more often than students in the other classes.

Table 7
Nonteaching Jobs that Students Identified as Requiring Mathematics, Grade 7, District 1

School-Class *(N)*	**Number of Responses[1] *(N)***	**Services[2] *(%)*[3]**	**Financial[4] *(%)***	**Professional[5] *(%)***	**Science *(%)***	**Trades *(%)***	**Creative Arts *(%)***	**Government *(%)***	**Sports *(%)***	**Unreportable[6] *(%)***
—MiC—										
Fernwood-Heath 1 (25)	61	36	11	11	2	15	10	0	2	11
Fernwood-Heath 2 (18)	51	31	8	22	4	12	4	0	0	16
VonHumboldt-Donnelly 1 (12)	26	31	27	8	8	8	4	0	0	8
VonHumboldt-Donnelly 2 (9)	23	43	22	13	9	4	4	4	0	0
VonHumboldt-Donnelly 3 (14)	28	29	25	7	11	7	4	7	0	11
—Conventional—										
Addams-St.James 1 (19)	52	27	25	17	6	8	4	2	0	10
Addams-St.James 2 (19)	55	38	7	24	5	11	0	2	5	4
Wacker-McLaughlin 1 (18)	48	52	15	4	2	6	4	0	6	8
Wacker-McLaughlin 2 (11)	30	50	20	10	3	10	3	0	0	3
Wacker-McLaughlin 3 (10)	27	48	22	4	4	0	11	0	0	4

[1] Students asked to list the jobs other than teaching that require mathematics.

[2] Responses included occupations in retail sales, business, and food service.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included occupations in accounting, banking, and insurance.

[5] Responses included occupations in medical fields, engineering, and law.

[6] Responses included teaching, thinking, and operations with numbers.

In the sixth component of the *Student Attitude Inventory,* students listed ways they used mathematics outside of class (see Table 8). Although the classes varied, students in all classes most frequently listed money-related ways, such as banking and shopping. Also, students in Fernwood-Heath 2, Von Humboldt-Donnely 1, Wacker-McLaughlin 2 and 3 frequently listed calculation-related ways; students in Fernwood-Heath 2 frequently listed leisure-related ways; and students in Von Humboldt-Donnely 3 and Addams-St.James 2 frequently listed measurement-related ways more often than students in the other classes.

Table 8
Ways Students Used Mathematics Outside of Class, Grade 7, District 1

School-Class *(N)*	Number of Responses[1] *(N)*	Monetary[2] *(%)*[3]	Calculation *(%)*	Leisure *(%)*	Measurement *(%)*	Problem Solving *(%)*	Unreportable[4] *(%)*
—MiC—							
Fernwood-Heath 1 (25)	36	42	8	14	8	0	14
Fernwood-Heath 2 (18)	31	19	23	29	10	0	6
VonHumboldt-Donnelly 1 (12)	17	24	29	0	12	0	35
VonHumboldt-Donnelly 2 (9)	13	38	8	8	0	15	15
VonHumboldt-Donnelly 3 (14)	22	27	18	0	23	9	18
—Conventional—							
Addams-St.James 1 (19)	33	58	9	9	3	3	15
Addams-St.James 2 (19)	33	33	3	3	18	0	39
Wacker-McLaughlin 1 (18)	27	30	7	15	7	4	33
Wacker-McLaughlin 2 (11)	23	48	22	13	0	4	9
Wacker-McLaughlin 3 (10)	16	38	31	6	6	6	13

[1] Students were asked to describe how they would use mathematics outside of class.

[2] Responses included banking and shopping.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included occupations and nonmathematics school subjects.

Finally, all students in the study responded to items on the *Student Questionnaire*, five components of which are summarized here (see Table 9). The first component involved student judgments about the school subject they enjoyed the most. Students generally enjoyed physical education (PE) and mathematics classes more than other school subjects.

Table 9

Student Preference Ranking of Classes, Grade 7, District 1

School-Class (N)	**Subject *(%)***									
	SocStudies	**Science**	**Math**	**Reading**	**Writing**	**Art**	**Music**	**PE**	**Band**	**Other**
—MiC—										
Fernwood-Heath 1 (30)	20	8	20	8	4	4	0	16	0	20
Fernwood-Heath 2 (23)	0	5	0	5	0	10	10	35	0	35
VonHumboldt-Donnely 1 (25)	8	4	13	8	0	13	13	8	13	21
VonHumboldt-Donnely 2 (23)	0	19	10	0	0	5	10	38	5	14
VonHumboldt-Donnely 3 (23)	5	5	0	0	5	16	5	42	0	21
—Conventional—										
Addams-St.James 1 (20)	5	5	25	0	5	5	15	5	0	35
Addams-St.James 2 (19)	5	5	25	0	5	5	15	5	0	35
Wacker-McLaughlin 1 (24)	0	5	29	0	10	5	10	24	0	19
Wacker-McLaughlin 2 (16)	8	0	15	8	0	15	8	31	0	15
Wacker-McLaughlin 3 (16)	0	8	15	0	15	0	0	31	15	15

The second component involved student judgments about their frequency of talking about mathematics with classmates, friends, and other acquaintances on three questions. Response frequency(never, sometimes, often, very often) for each class was strikingly different across questions and across classes (see Table 10).

Table 10

Student Judgment About Frequency of Communication About Mathematics, Grade 7, District 1

School-Class *(N)*	**Mathematical Ideas and Problem Strategies**					**Homework Problems**					**Ways Mathematics is Used Outside of School**				
	(*N*)	**Never**	**Some-times**	**Often**	**Very Often**	**(*N*)**	**Never**	**Some-times**	**Often**	**Very Often**	**(*N*)**	**Never**	**Some-times**	**Often**	**Very Often**
— MiC —															
Fernwood-Heath 1 (30)	25	12	56	16	16	25	8	44	44	4	25	40	28	16	16
Fernwood-Heath 2 (23)	19	16	42	26	16	19	26	37	21	16	19	37	26	21	16
VonHumboldt-Donnely 1 (25)	24	21	63	8	8	24	17	38	42	4	24	29	54	8	8
VonHumboldt-Donnely 2 (23)	21	57	38	5	0	21	24	52	19	5	21	67	24	10	0
VonHumboldt-Donnely 3 (23)	19	37	53	11	0	19	5	63	32	0	19	32	42	26	0
—Conventional —															
Addams-St.James 1 (20)	20	30	35	25	10	20	5	35	25	35	20	40	35	10	15
Addams-St.James 2 (19)	19	37	47	11	5	19	16	21	47	16	19	47	42	5	5
Wacker-McLaughlin 1 (24)	21	10	62	19	10	21	14	19	38	29	21	19	43	29	10
Wacker-McLaughlin 2 (16)	13	8	38	23	31	13	0	54	31	15	13	31	54	15	0
Wacker-McLaughlin 3 (16)	13	0	85	8	8	13	0	46	31	23	13	46	23	23	8

Note: Response rates designate class mean percents.

The third component involved student judgments about the things they liked the most about mathematics class (see Table 11). Students in most classes reported that they liked problem solving and miscellaneous class activities more than other categories, although the classes varied. Addams-St. James 2 indicated stronger preferences for work with number than other categories.

Table 11
What Students Liked Most About Mathematics Class, Grade 7, District 1

School-Class *(N)*	**Number of Responses[1] *(N)***	**Number *(%)*[2]**	**Problem Solving *(%)***	**Classwork *(%)***	**Working With Others *(%)***	**Miscellaneous[3] *(%)***	**Negative Emotional Response[4] *(%)***	**Positive Emotional Response[5] *(%)***
—MiC—								
Fernwood-Heath 1 (30)	60	2	13	3	7	10	3	8
Fernwood-Heath 2 (23)	49	6	14	6	4	20	2	6
VonHumboldt-Donnelly 1 (25)	56	11	20	9	5	27	2	9
VonHumboldt-Donnelly 2 (23)	47	0	17	15	4	26	2	9
VonHumboldt-Donnelly 3 (22)	50	0	24	8	4	16	2	8
—Conventional—								
Addams-St.James 1 (20)	57	14	18	7	11	7	4	5
Addams-St.James 2 (19)	53	28	21	6	6	11	2	6
Wacker-McLaughlin 1 (24)	48	6	15	17	8	13	0	13
Wacker-McLaughlin 2 (16)	35	9	11	0	6	29	0	20
Wacker-McLaughlin 3 (16)	36	0	6	0	8	44	0	17

[1] Students were asked to name three things they liked most about mathematics class.

[2] Percentage does not add to 100 due to number of unique responses.

[3] Responses included "teacher," "computer," and "warm-up activities."

[4] Responses included "hard," "boring," and "restrictive."

[5] Responses included "like it all" and "fun."

The number of responses for number-related categories was too small to make inferences about student preferences (see Table 12).

Table 12
What Students Liked Most About Mathematics Class, Grade 7, District 1 (continued)

School-Class *(N)*	**Number of Responses[1] *(N)***	**Addition *(%)***	**Subtraction *(%)***	**Multiplication *(%)***	**Division *(%)***	**Decimals *(%)***	**Fractions *(%)***	**Other[2] *(%)***
—MiC—								
Fernwood-Heath 1 (30)	1	100	0	0	0	0	0	0
Fernwood-Heath 2 (23)	3	67	0	0	33	0	0	0
VonHumboldt-Donnelly 1 (25)	6	0	17	17	0	17	33	17
VonHumboldt-Donnelly 2 (23)	0	--	--	--	--	--	--	--
VonHumboldt-Donnelly 3 (22)	0	--	--	--	--	--	--	--
—Conventional—								
Addams-St.James 1 (20)	8	13	13	25	0	0	13	38
Addams-St.James 2 (19)	15	13	7	20	13	0	20	27
Wacker-McLaughlin 1 (24)	3	0	0	33	0	0	0	67
Wacker-McLaughlin 2 (16)	3	33	0	0	33	0	0	33
Wacker-McLaughlin 3 (16)	0	--	--	--	--	--	--	--

[1] Students were asked to name three things they liked most about mathematics class.

[2] Responses included counting, average, estimation, least common denominator, least common multiple, money, rounding and time.

The fourth component involved student judgments about the things they disliked most about mathematics class (see Table 13). Most classes reported that they disliked classwork more than anything else, although the classes varied.

Table 13
What Students Disliked Most About Mathematics Class, Grade 7, District 1

School-Class *(N)*	Number of Responses[1] *(N)*	Number *(%)*[2]	Classwork *(%)*	Homework *(%)*	Tests *(%)*	Problem Solving *(%)*	Book *(%)*	Miscellaneous[3] *(%)*	Negative Emotional Response[4] *(%)*	Positive Emotional Response[5] *(%)*
—MiC—										
Fernwood-Heath 1 (30)	55	5	13	7	13	4	7	13	7	2
Fernwood-Heath 2 (23)	42	21	21	10	14	2	2	2	5	0
VonHumboldt-Donnelly 1 (25)	48	8	29	6	2	0	2	25	6	6
VonHumboldt-Donnelly 2 (23)	49	14	33	16	2	2	0	12	6	0
VonHumboldt-Donnelly 3 (22)	44	7	14	9	25	7	7	2	11	7
—Conventional—										
Addams-St.James 1 (20)	62	0	16	27	39	2	2	11	2	0
Addams-St.James 2 (19)	45	2	13	20	40	4	0	2	7	2
Wacker-McLaughlin 1 (24)	50	4	16	16	14	12	4	12	8	0
Wacker-McLaughlin 2 (16)	30	20	7	10	3	10	13	17	3	3
Wacker-McLaughlin 3 (16)	29	10	17	14	21	0	0	0	0	14

[1] Students were asked to name three things they disliked the most about mathematics class.

[2] Percentage does not add to 100 due to number of unique responses.

[3] Responses included "teacher," "computer," and "warm-up activities."

[4] Responses included "hard," "boring," and "restrictive."

[5] Responses included "like it all" and "fun."

The number of responses for number-related categories was too small to make inferences about student dislikes for these categories (see Table 14).

Table 14
What Students Disliked Most About Mathematics Class, Grade 7, District 1 (continued)

School-Class *(N)*	**Number of Responses[1] *(N)***	**Addition *(%)***	**Subtraction *(%)***	**Multiplication *(%)***	**Division *(%)***	**Decimals *(%)***	**Fractions *(%)***	**Other[2] *(%)***
—MiC—								
Fernwood-Heath 1 (30)	3	0	0	33	67	0	0	0
Fernwood-Heath 2 (23)	9	0	33	33	22	0	11	0
VonHumboldt-Donnelly 1 (25)	4	0	0	0	50	25	25	0
VonHumboldt-Donnelly 2 (23)	7	0	0	14	43	0	43	0
VonHumboldt-Donnelly 3 (22)	3	0	0	0	0	0	33	67
—Conventional—								
Addams-St.James 1 (20)	0	--	--	--	--	--	--	--
Addams-St.James 2 (19)	1	0	0	0	0	100	0	0
Wacker-McLaughlin 1 (24)	2	0	0	0	0	50	0	50
Wacker-McLaughlin 2 (16)	6	0	0	33	33	17	17	0
Wacker-McLaughlin 3 (16)	3	0	0	33	67	0	0	0

[1] Students were asked to name three things they disliked the most about mathematics class.

[2] Responses included counting, average, estimation, least common denominator, least common multiple, money, rounding and time.

The fifth component involved student judgments about the ways mathematics helped them in other subjects (see Table 15). Although the classes varied, students in most classes reported that mathematics was used in both general applications, such as estimating and calculating, and specific applications, such as measurement and problem solving. It is also notable that several classes indicated that mathematics did not help them in other classes.

Table 15
Student Perception of the Usefulness of Mathematics in Other Classes, Grade 7, District 1

School-Class *(N)*	**Number of Responses[1] *(N)***	**General Applications[2] *(%)***	**Specific Applications[3] *(%)***	**Organization of Information *(%)***	**No Help *(%)***	**Miscellaneous *(%)***	**Inappropriate Responses[4] *(%)***
—MiC—							
Fernwood-Heath 1 (30)	38	13	18	0	8	3	58
Fernwood-Heath 2 (23)	25	24	12	0	16	8	40
VonHumboldt-Donnelly 1 (25)	32	13	28	3	13	0	44
VonHumboldt-Donnelly 2 (23)	25	8	20	4	24	0	44
VonHumboldt-Donnelly 3 (22)	26	19	0	12	19	8	42
—Conventional—							
Addams-St.James 1 (20)	40	23	50	5	3	3	18
Addams-St.James 2 (19)	32	13	56	3	3	3	22
Wacker-McLaughlin 1 (24)	33	27	30	0	3	3	36
Wacker-McLaughlin 2 (16)	21	33	24	0	10	0	33
Wacker-McLaughlin 3 (16)	18	0	17	22	17	6	39

[1] Students were asked to identify how their knowledge of mathematics and the way they learned mathematics helped them in other classes.

[2] Responses included "estimating" and "calculating."

[3] Responses included "measurement" and "problem solving."

[4] Responses included "not good at math", "need to know something", "it's easier and more fun", "not good ", etc.

District 2

In District 2, 11 seventh-grade classes participated in the study. In eight of the classrooms, MiC was used; in the other three, conventional texts were used. A summary of the variations in fixed characteristics is presented in Table 16.

Table 16
Fixed Characteristics, Grade 7, District 2

School-Class *(N)*	**Sex *(%)***		**Average Age *(years)***	**Language Preference *(%)* *** *(self-identified)*		**Ethnicity *(%)***** ***(self-identified)***				
	Female	**Male**		**English Preference**	**Non-Response**	**African American**	**Hispanic**	**White**	**Multi/Other**	**Non-Response**
—MiC—										
Guggenheim-Keeton 1 (27)	67	33	12.47	89	7	11	30	41	11	7
Guggenheim-Keeton 2 (24)	46	54	12.59	92	0	25	25	29	20	0
Guggenheim-Teague 1 (27)	52	48	12.56	96	4	22	22	26	26	4
Guggenheim-Teague 2 (25)	64	36	12.41	76	8	20	36	12	24	8
HirschMetro-Draski 1 (26)	38	62	12.61	96	0	4	54	4	27	12
HirschMetro-Draski 2 (25)	36	64	12.78	84	0	0	52	4	24	20
HirschMetro-McFadden 1 (23)	48	52	12.39	91	0	0	83	4	13	0
HirschMetro-McFadden 2 (30)	50	50	12.46	83	0	0	77	3	17	3
—Conventional—										
Newberry-Cunningham 1 (15)	27	73	12.67	93	0	40	47	7	7	0
Newberry-Cunningham 2 (23)	61	39	12.75	78	13	35	45	4	4	13
Newberry-Stark 1 (26)	50	50	12.67	85	8	23	42	8	19	8

* Percent does not add to 100% when students identified a language preference other than English.
** Percent on ethnicity was rounded off and does not always total 100. Multi/Other comprises Asian, Haitian, Native American, Multiracial and Other.
(For more detailed information, see Table D1 in Appendix D.)

In District 2, there was significant variation in the class profiles. The number of students in a class varied from 15 to 30. The proportion of girls in a class varied from 27–67%. The average age varied from 12.39 to 12.78, and English was the primary language for 76–96% of the students. The ethnicity in these classes also varied considerably (African American, 0–40%; Hispanic, 22–83%; White, 3–41%; Multiracial/Other, 4–27%).

In District 2, two measures of prior mathematics performance were used as indicators of student prior performance. The first performance indicator was the measure of prior mathematics performance used as indicators of student prior performance was the applications subtest for the students in the study classes on the standardized test administered by the district to all of its students, The *Stanford Mathematics Achievement Test* (Harcourt Brace Educational Measurement, 1997**),** which were forwarded to project staff. Summary means and standard deviations of the percentiles for each class on both the computation and applications subtests are reported in Table 17, and box plots are shown in Figure 7. Clearly, the classes differed in average percentiles. Mean percentiles range from 22.92 to 55.16. The box plots illustrate the between-class variation on this test in this district.

Table 17

Standardized Test Scores, Spring 1997, Grade 7, District 2

School-Class *(N)*	**SAT Applications: National Percentiles**					
	(*N*)	**Mean**	**St Dev**	**Minimum**	**Median**	**Maximum**
—MiC—						
Guggenheim-Keeton 1 (27)	22	50.86	23.24	16	51.0	98
Guggenheim-Keeton 2 (24)	20	48.40	23.88	8	44.0	91
Guggenheim-Teague 1 (27)	24	35.08	23.67	1	30.0	84
Guggenheim-Teague 2 (25)	21	43.85	23.10	4	40.0	77
HirschMetro-Draski 1 (26)	24	50.54	26.47	18	39.5	97
HirschMetro-Draski 2 (25)	14	37.07	26.99	6	28.0	96
HirschMetro-McFadden 1 (23)	20	42.60	21.41	13	41.5	82
HirschMetro-McFadden 2 (30)	26	46.00	22.29	10	47.0	89
—Conventional—						
Newberry-Cunningham 1 (15)	13	22.92	22.68	4	12.0	71
Newberry-Cunningham 2 (23)	17	24.00	14.72	3	20.0	50
Newberry-Stark 1 (26)	19	55.16	22.37	18	55.0	98

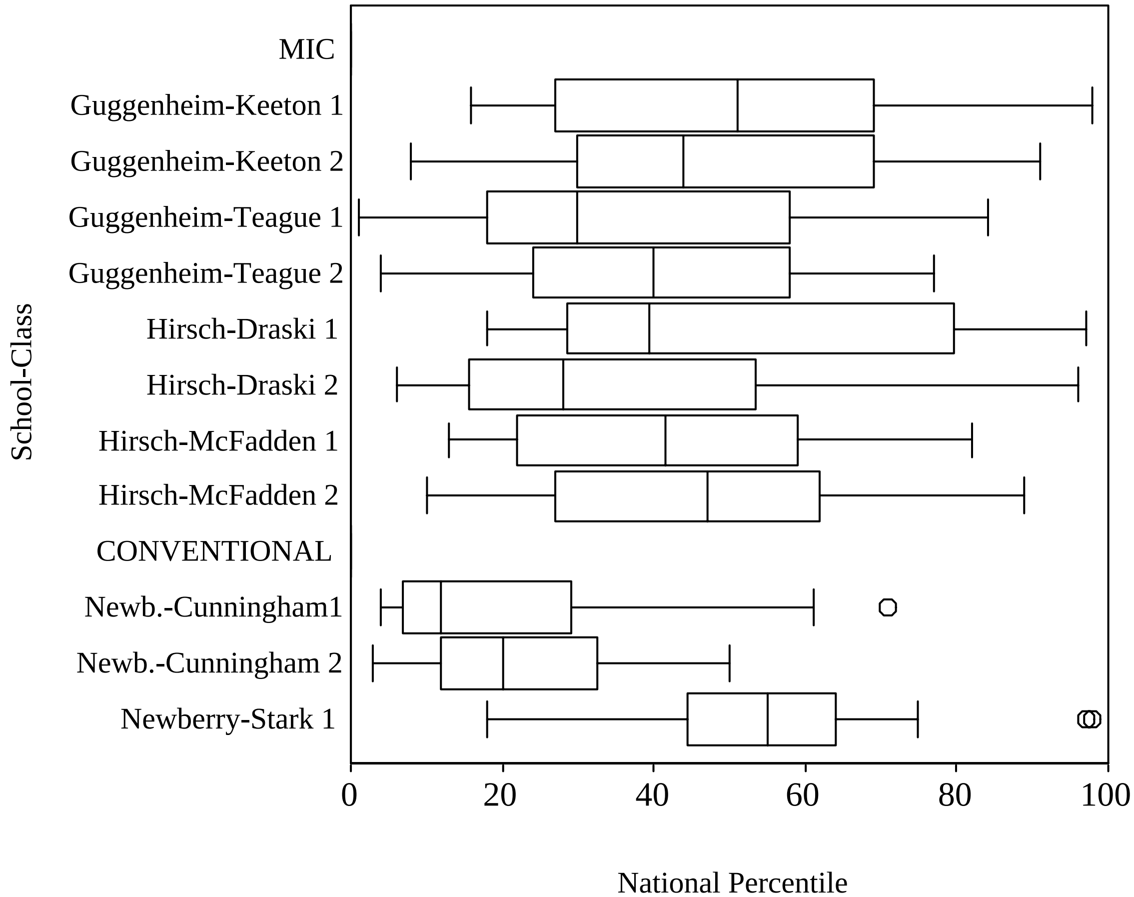


Figure 7. Box plots of class distributions on the Stanford Achievement Test (SAT) application subtest, Grade 7, District 2.

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The second performance indicator used in the study is the Collis/Romberg Mathematical Reasoning Test (Collis & Romberg, 1992). This test was administered to all students participating in the study. The information on this test includes scores related to four levels of reasoning (unistructural, multistructural, relational, and extended abstract), and responses for each level are scored from 0–5. Class means on all four levels of reasoning are given in Table 18. For all but one class, the means on unistructural level of reasoning are above 2.50, indicating that students were operating at this level on many items. Only Newberry-Cunningham 1 has a class mean below 2.50 (2.46). Even at this level, however, there is considerable variability in class means. The class means on the other scales indicate that, in all but one class (Newberry-Cunningham 2), some students were beginning to reason at a multistructural level.

Table 18

Class means on the Collis-Romberg Mathematical Problem-Solving Profiles, Grade 7, District 2

School-Class *(N)*	**Level of Reasoning**				
	(*N*)	**Uni-structural**	**Multi-structural**	**Relational**	**Extended Abstract**
—MiC—					
Guggenheim-Keeton 1 (27)	25	3.28	1.36	0.16	0.00
Guggenheim-Keeton 2 (24)	24	3.38	1.58	0.25	0.00
Guggenheim-Teague 1 (27)	26	3.15	1.04	0.27	0.00
Guggenheim-Teague 2 (25)	24	3.08	1.38	0.33	0.00
HirschMetro-Draski 1 (26)	22	3.55	1.32	0.36	0.00
HirschMetro-Draski 2 (25)	18	3.28	1.00	0.28	0.00
HirschMetro-McFadden 1 (23)	22	3.23	1.23	0.18	0.00
HirschMetro-McFadden 2 (30)	25	3.20	1.16	0.20	0.00
—Conventional—					
Newberry-Cunningham 1 (15)	13	2.46	1.08	0.08	0.00
Newberry-Cunningham 2 (23)	19	2.63	0.74	0.05	0.00
Newberry-Stark 1 (26)	16	3.25	1.31	0.44	0.00

(For more detailed information, See Table D2 in Appendix D.)

Because the standardized test scores show a similar pattern to those on the unistructural scale of the Collis/Romberg Test (see the scatter plot for means on both subscales in on the two measures in Figure 8), a correlation coefficient between the class unistructural and and applications means (*r* =.86) was calculated From this information it is apparent that there are two low performing class and nine average classes. The some of the variations, however, seem to be attributable to the different schools.

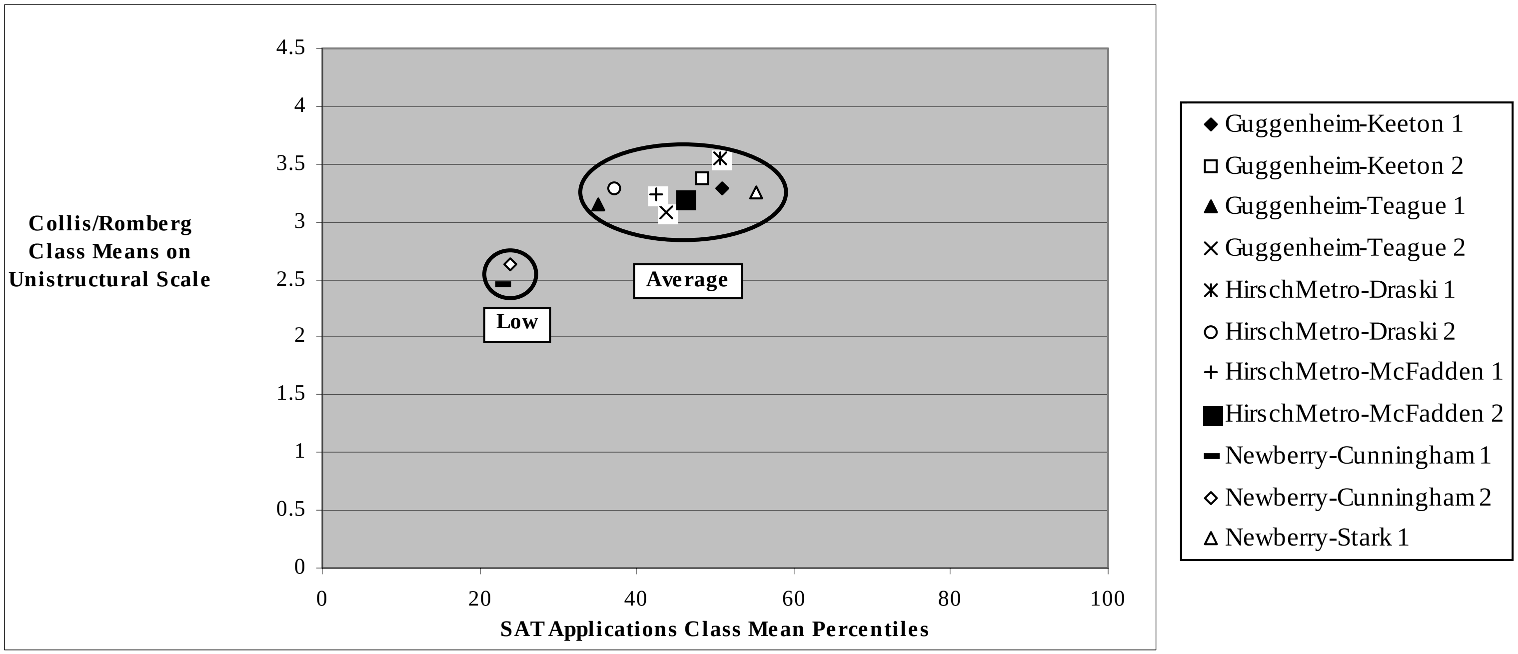


Figure 8. Scatter plot for class mean percentiles on the *TerraNova* test and the class means on the unistructural scale of the Collis/Romberg reasoning test, Grade 7, District 2.

Because the classes in District 2 varied on the two preceding achievement measures used in this study, either comparisons of student performances on outcome measures should be made only between classes in the same level of preceding achievement, or adjustments in outcome test scores should be made via covariance. In fact, because of this strong relationship between the two premeasures, only the standardized test scores should be considered as a potential covariate in order not to lose a degree of freedom in any statistical test about differences.

Finally, all students in the study responded to the questions in the *Student Attitude Inventory;* three components of which are summarized here.

First, the class means for student judgments on questions related to their effort, confidence, interest, usefulness, and ability to communicate mathematically are shown in Table 19. Each item was judged on a scale of 1–4 (1 = very true; 2 = true; 3 = not true; 4 = not true at all). Overall, the students in these classes judged the statements as true or very true, and there was little variation both between classes and within classes.

Table 19
Class Means on Student Judgment About Mathematics (Subscales of the Student Attitude Inventory), Grade 7, District 2

School-Class *(N)*	**Effort** *in mathematics*		**Confidence** *in ability to do mathematics*		**Interest** *in mathematics*		**Usefulness** *of mathematics*		**Ability to Communicate** *about mathematics*	
	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean
—MiC—										
Guggenheim-Keeton 1 (27)	23	2.07	23	2.25	24	2.42	24	1.98	23	1.91
Guggenheim-Keeton 2 (24)	21	2.08	22	2.24	23	2.37	22	1.89	22	2.14
Guggenheim-Teague 1 (27)	23	2.06	24	2.05	20	2.37	23	2.02	24	2.17
Guggenheim-Teague 2 (25)	21	1.95	23	1.96	20	2.11	21	1.85	22	2.18
HirschMetro-Draski 1 (26)	20	2.13	22	2.06	22	2.49	20	1.79	21	1.99
HirschMetro-Draski 2 (25)	19	2.05	18	2.20	16	2.16	18	1.93	17	1.88
HirschMetro-McFadden 1 (23)	22	1.93	21	2.06	22	2.23	22	1.74	20	1.84
HirschMetro-McFadden 2 (30)	28	1.73	28	1.96	27	1.98	27	1.75	28	1.79
—Conventional—										
Newberry-Cunningham 1 (15)	12	2.15	12	2.05	10	2.10	11	2.05	12	2.20
Newberry-Cunningham 2 (23)	19	2.07	18	2.02	19	2.06	19	2.00	18	2.09
Newberry-Stark 1 (26)	12	2.14	13	2.25	12	2.16	12	2.03	12	2.05

(For detailed information, see Table D3 in Appendix D.)

The one class (HirschMetro-McFadden 2) valued effort in mathematics class and had more interest in mathematics than other classes, while another class (HirschMetro-Draski 1) had less interest in mathematics than did students in other classes (see Figure 9).

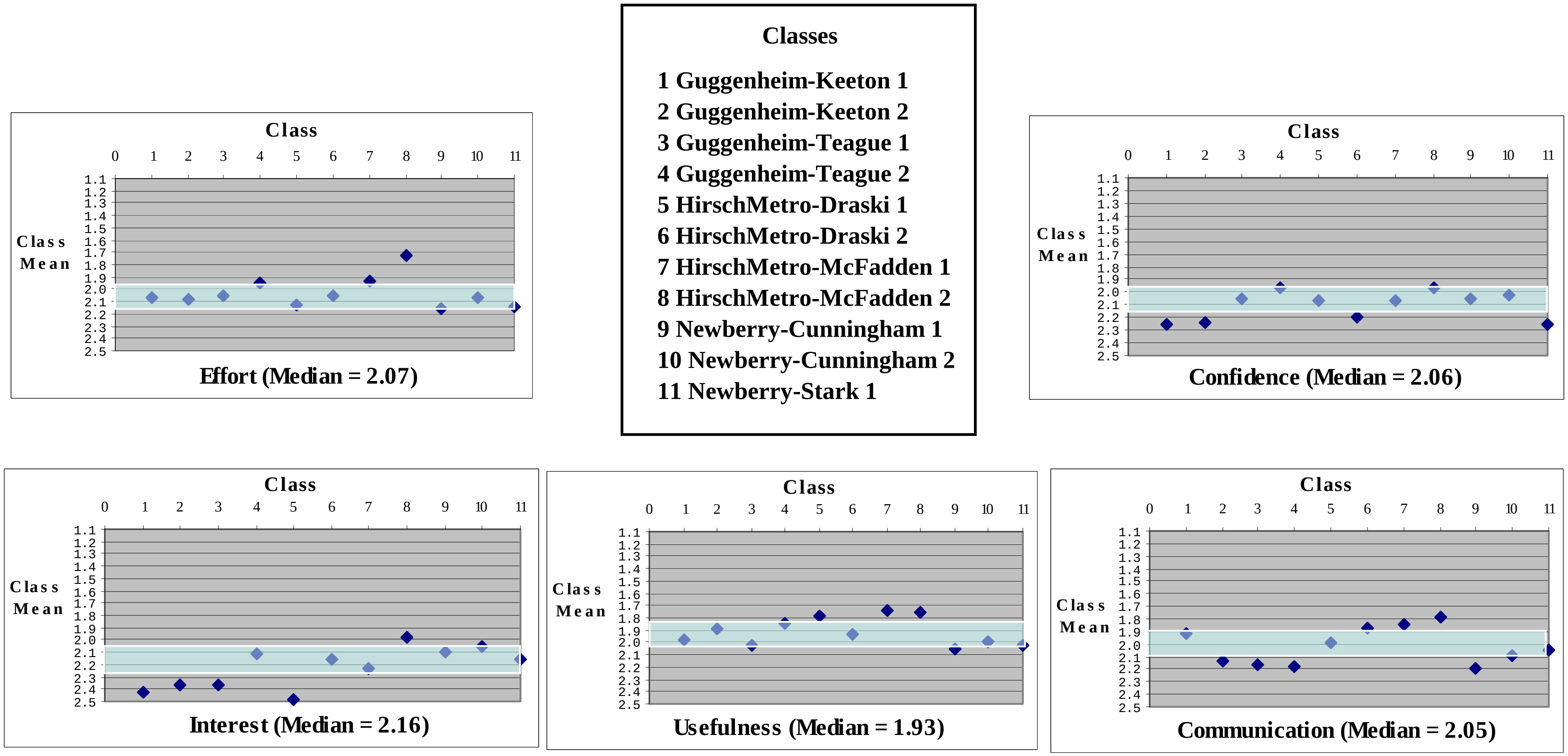


Figure 9. Plots showing class means on student judgments about mathematics, Grade 7, District 2. (Shaded areas show class medians ± 0.1.)

In the second component of the *Student Attitude Inventory*, students responded to 16 items related to general perceptions about mathematics (see Table D4 in Appendix D). Several items were reverse-scored due to wording of question. In general, little variance was seen in class means with respect to items related to general perceptions about mathematics. Students felt confident that they were able to learn new ideas in mathematics class (from 1.37, Hirsch Metro-Draski 2 and Newberry-Cunningham 2, to 1.88, Guggenheim-Keeton 2, on Item 3). Students thought it was acceptable to solve mathematics problems differently than their classmates (from 1.21, Guggenheim-Keeton 2, to 1.69, Guggenheim-Teague 1, on Item 16). However, students were less confident (from 1.36, Guggenheim-Teague 1, to 2.08, Newberry-Cunningham 1, on Item 4) that they could discover ways of solving problems that their teachers or their peers had not previously considered.

Students were confident that anyone who worked hard enough in mathematics class could be good at mathematics (from 1.14, Hirsch Metro-Draski 1, to 1.83, Newberry-Cunningham 1, on Item 11). Similarly, students disagreed that some students were naturally better, or worse, at mathematics than other students regardless of effort (from 2.62, Newberry-Stark 1, to 3.42, Newberry-Cunningham 1, on Item 37).

Students felt that knowing how to solve a problem was as important as determining the answer (from 1.48, Guggenheim-Keeton 2 and Hirsch Metro-McFadden 2, to 2.25, Newberry-Cunningham 1, on Item 53), although they felt that answering questions correctly in mathematics class require providing only numbers (from 1.65, Guggenheim-Teague 2, to 2.42, Newberry-Cunningham 1, on Item 38). Students thought that getting correct answers in mathematics class was at least as important as understanding why the answer was correct (from 2.09, Hirsch Metro-Draski 1, to 2.84, Newberry-Cunningham 2, on Item 27), although students felt that getting correct answers was more important than understanding a mathematics problem or the process of finding an answer (from 1.88, Guggenheim-Teague 1, to 2.79, Newberry-Cunningham 2, on Item 49). Students disagreed that mathematics was mostly learned by memorizing facts and rules (from 2.52, Guggenheim-Keeton 1, to 3.25, Newberry-Cunningham 1, on Item 55). They also disagreed that they would get correct answers to their teachers' questions if they memorized rules or facts (from 2.67, Newberry-Cunningham 1, to 3.30, Guggenheim-Keeton 2, on Item 44). Students disagreed that they did not know how to solve mathematics problems if they used calculators (from 2.24, Guggenheim-Keeton 1, to 3.09, Hirsch Metro-Draski 1, on Item 45) and that calculators always generated correct answers (from 2.08, Newberry-Cunningham 1, to 2.84, Guggenheim-Keeton 1 and Guggenheim-Teague 1, on Item 6).

Students felt that new mathematics topics were related to ones they had already studied (from 2.25, Guggenheim-Keeton 1, to 3.00, Guggenheim-Keeton 2, on Item 39). Students felt that mathematics was related to other school subjects (from 1.38, Guggenheim-Keeton 2, to 2.03, Hirsch Metro-McFadden 2, on Item 20), although they thought that mathematics was harder to understand than other school subjects (from 2.27, Guggenheim-Teague 2, to 3.00, Guggenheim-Keeton 1, on Item 28).

The third component involved students judging whether success or failure in mathematics could be attributed to teachers, ability, effort, or luck. The class means for these judgments are shown in Table 20. Each item was judged on a scale of 1–4 (1 = very true; 2 = true; 3 = not true; 4 = not true at all). All classes attributed success in mathematics to a combination of effort and ability, and failure to lack of effort.

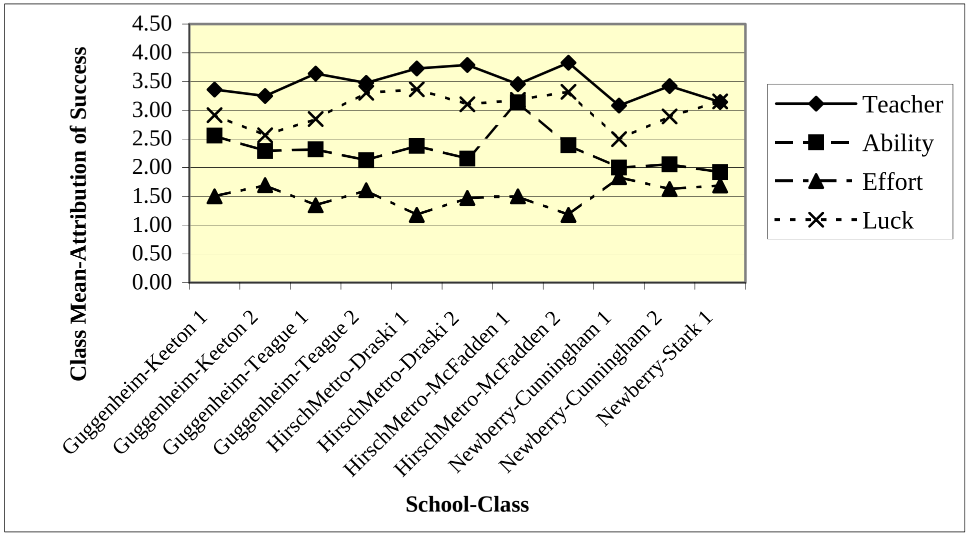
Table 20
Class Means on Student Attribution of Success or Failure in Mathematics, Grade 7, District 2

School-Class (*N*)	Success							
	Teacher		Ability		Effort		Luck	
	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean
—MiC—								
Guggenheim-Keeton 1 (27)	25	3.36	25	2.56	24	1.50	24	2.92
Guggenheim-Keeton 2 (24)	24	3.25	24	2.29	23	1.70	23	2.57
Guggenheim-Teague 1 (27)	25	3.64	25	2.32	26	1.35	26	2.85
Guggenheim-Teague 2 (25)	23	3.48	23	2.13	23	1.61	23	3.30
HirschMetro-Draski 1 (26)	22	3.73	21	2.38	22	1.18	22	3.36
HirschMetro-Draski 2 (25)	19	3.79	19	2.16	19	1.47	19	3.11
HirschMetro-McFadden 1 (23)	22	3.45	22	3.14	22	1.50	22	3.18
HirschMetro-McFadden 2 (30)	29	3.83	28	2.39	28	1.18	28	3.32
—Conventional—								
Newberry-Cunningham 1 (15)	12	3.08	12	2.00	12	1.83	12	2.50
Newberry-Cunningham 2 (23)	19	3.42	18	2.06	19	1.63	19	2.89
Newberry-Stark 1 (26)	14	3.14	13	1.92	13	1.69	13	3.15

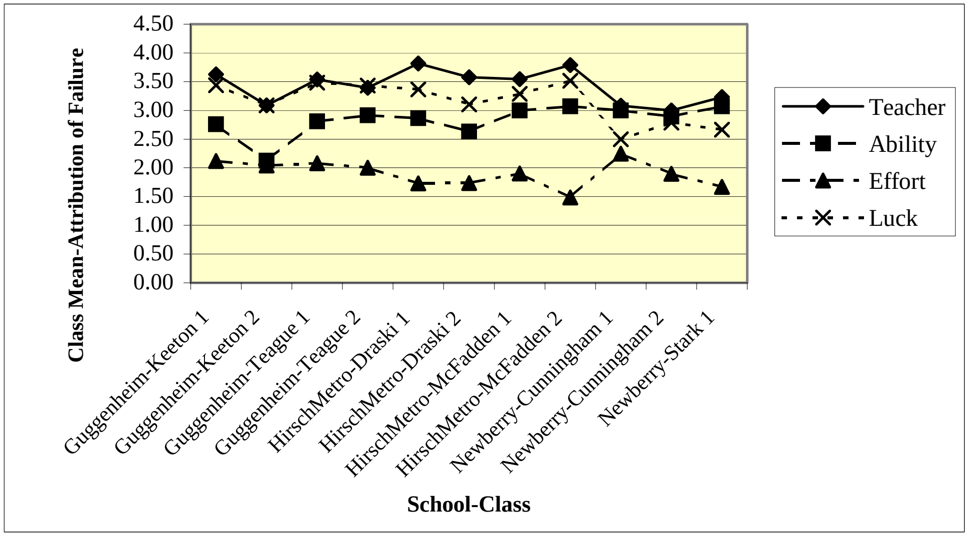
School-Class (*N*)	Failure							
	Teacher		Ability		Effort		Luck	
	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean
—MiC—								
Guggenheim-Keeton 1 (27)	24	3.63	25	2.76	25	2.12	25	3.44
Guggenheim-Keeton 2 (24)	23	3.09	24	2.13	23	2.04	23	3.09
Guggenheim-Teague 1 (27)	26	3.54	26	2.81	25	2.08	25	3.48
Guggenheim-Teague 2 (25)	23	3.39	23	2.91	23	2.00	23	3.43
HirschMetro-Draski 1 (26)	22	3.82	22	2.86	22	1.73	22	3.36
HirschMetro-Draski 2 (25)	19	3.58	19	2.63	19	1.74	19	3.11
HirschMetro-McFadden 1 (23)	22	3.55	22	3.00	21	1.90	21	3.29
HirschMetro-McFadden 2 (30)	28	3.79	29	3.07	29	1.48	29	3.52
—Conventional—								
Newberry-Cunningham 1 (15)	12	3.08	12	3.00	12	2.25	12	2.50
Newberry-Cunningham 2 (23)	19	3.00	19	2.89	19	1.89	19	2.79
Newberry-Stark 1 (26)	13	3.23	14	3.07	12	1.67	12	2.67

(For more detailed infomration, see Table D5 in Appendix D.)

Again, one of the two low-achieving classes (Newberry-Cunningham 1) was more inclined to attribute success to teachers, ability and effort and one class (HirschMetro-McFadden 1) was less inclined to attribute success to ability (see Figure 10). One class (Newberry-Cunningham 1) tended to attribute failure less to effort and more to luck (see Figure 10b).



(a)



(b)

Figure 10. Line graphs showing class means of student attribution of (a) success and (b) failure in mathematics, Grade 7, District 2.

In the fourth component of the *Student Attitude Inventory*, students listed things they associated with the word "mathematics" (see Table 21). Although the classes varied, students in all classes most frequently listed words associated with number, including operations with numbers. Students in Newberry-Cunningham 1 listed geometry-related words and students in Guggenheim-Keeton 2 listed problem solving-related words more often than students in other seventh-grade classes in this district. Also, more students in Guggenheim-Keeton 2, Guggenheim-Teague 2, and Hirsch Metro-Draski 1 listed negative emotive words than students in the other classes.

Table 21

Words Students Associated With "Mathematics," Grade 7, District 2

School-Class *(N)*	**Number of Responses[1] *(N)***	**Number[2] *(%)*[3]**	**Interest *(%)***	**Geometry *(%)***	**Negative Emotive Responses[4] *(%)***	**Thinking *(%)***	**Problem Solving *(%)***	**Algebra *(%)***	**Occupations *(%)***	**Miscellaneous *(%)***
—MiC—										
Guggenheim-Keeton 1 (25)	115	55	3	1	8	3	9	2	2	16
Guggenheim-Keeton 2 (22)	112	35	6	1	11	4	14	1	0	25
Guggenheim-Teague 1 (26)	103	63	4	6	9	3	5	2	0	5
Guggenheim-Teague 2 (19)	76	63	3	3	11	1	4	1	0	12
HirschMetro-Draski 1 (20)	97	55	0	10	10	4	4	1	1	12
HirschMetro-Draski 2 (18)	90	67	0	9	4	6	4	1	2	3
HirschMetro-McFadden 1 (20)	88	78	0	6	1	0	3	1	0	6
HirschMetro-McFadden 2 (28)	132	67	1	6	5	2	5	3	1	4
—Conventional—										
Newberry-Cunningham 1 (12)	33	52	0	27	3	0	3	0	0	3
Newberry-Cunningham 2 (17)	44	55	0	9	0	2	0	2	7	7
Newberry-Stark 1 (12)	55	71	4	9	2	2	0	4	0	4

[1] Students were asked to list the words they "think of when they hear the word mathematics."

[2] Responses included operations with numbers.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included "boring," "stupid," and statements of displeasure.

In the fifth component of the *Student Attitude Inventory,* students listed jobs other than teaching that required the use of mathematics (see Table 22). Although the classes varied, students in all classes most frequently listed service-related occupations, including retail sales, business, and food service, and financial-related occupations, such as accounting, banking, and insurance. Also, professional-related occupations, including medical fields, engineering, and law, were listed by students in Hirsch Metro-Draski 1, Hirsch Metro-McFadden 1 and 2, and Newberry-Stark 1 more often than by students in other classes.

Table 22
Nonteaching Jobs that Students Identified as Requiring Mathematics, Grade 7, District 2

School-Class *(N)*	**Number of Responses[1] *(N)***	**Services[2] *(%)*[3]**	**Financial[4] *(%)***	**Professional[5] *(%)***	**Science *(%)***	**Trades *(%)***	**Creative Arts *(%)***	**Government *(%)***	**Sports *(%)***	**Unreportable[6] *(%)***
—MiC—										
Guggenheim-Keeton 1 (25)	64	28	23	9	8	13	3	2	2	11
Guggenheim-Keeton 2 (22)	71	37	20	1	3	8	3	4	0	24
Guggenheim-Teague 1 (26)	75	31	17	9	5	11	7	0	0	15
Guggenheim-Teague 2 (19)	56	45	25	9	5	2	0	4	0	0
HirschMetro-Draski 1 (20)	73	29	11	16	5	10	8	4	4	4
HirschMetro-Draski 2 (18)	52	35	17	10	10	2	2	0	2	13
HirschMetro-McFadden 1 (20)	77	34	12	17	12	10	5	3	0	1
HirschMetro-McFadden 2 (28)	91	36	12	15	7	7	7	2	3	5
—Conventional—										
Newberry-Cunningham 1 (12)	20	35	35	10	0	0	0	5	0	15
Newberry-Cunningham 2 (17)	32	31	22	6	0	0	9	0	0	25
Newberry-Stark 1 (12)	38	26	21	24	5	3	0	3	0	13

[1] Students asked to list the jobs other than teaching that require mathematics.

[2] Responses included occupations in retail sales, business, and food service.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included occupations in accounting, banking, and insurance.

[5] Responses included occupations in medical fields, engineering, and law.

[6] Responses included teaching, thinking, and operations with numbers.

In the sixth component of the *Student Attitude Inventory*, students listed ways they used mathematics outside of class (see Table 23). Although the classes varied, students in all classes most frequently listed money-related ways, such as banking and shopping, and calculation. Also, more students in Guggenheim-Keeton 2 listed leisure-related ways; more students in Hirsch Metro-Draski 1 and Hirsch Metro-McFadden 1 listed measurement-related ways; and more students in Newberry-Cunningham 1 listed problem solving ways than students in the other classes.

Table 23

Percent of Ways Students Used Mathematics Outside of Class, District 2, Grade 7

School-Class *(N)*	**Number of Responses[1] *(N)***	**Monetary[2,3] *(%)***	**Calculation *(%)***	**Leisure *(%)***	**Measurement *(%)***	**Problem Solving *(%)***	**Unreportable[4] *(%)***
			—MiC—				
Guggenheim-Keeton 1 (25)	47	53	9	2	11	2	17
Guggenheim-Keeton 2 (22)	47	23	15	19	9	2	17
Guggenheim-Teague 1 (26)	36	36	19	0	14	8	11
Guggenheim-Teague 2 (19)	35	51	17	6	6	0	11
HirschMetro-Draski 1 (20)	35	43	11	3	31	3	6
HirschMetro-Draski 2 (18)	27	52	11	7	4	4	15
HirschMetro-McFadden 1 (20)	45	29	31	11	18	0	9
HirschMetro-McFadden 2 (28)	61	46	15	13	11	0	11
			—Conventional—				
Newberry-Cunningham 1 (12)	21	33	19	5	5	19	14
Newberry-Cunningham 2 (17)	18	22	17	11	6	0	39
Newberry-Stark 1 (12)	19	53	21	0	11	11	5

[1] Students were asked to describe how they would use mathematics outside of class.

[2] Percentage does not add to 100 due to number of unique responses.

[3] Responses included banking and shopping.

[4] Responses included occupations and school subjects.

Finally, all students in the study responded to items on the *Student Questionnaire*, five components of which are summarized here. The first component involved student judgments about the school subject they enjoyed the most (see Table 24). Students generally enjoyed art and physical education (PE) and, to a lesser extent, science and mathematics, classes than other school subjects.

Table 24
Student Preference Ranking of Classes, Grade 7, District 2

School-Class (N)	Subject *(%)*									
	SocStudies	**Science**	**Math**	**Reading**	**Writing**	**Art**	**Music**	**PE**	**Band**	**Other**
—MiC—										
Guggenheim-Keeton 1 (27)	0	16	8	0	0	8	4	20	16	28
Guggenheim-Keeton 2 (24)	13	17	0	0	8	21	0	13	8	21
Guggenheim-Teague 1 (27)	9	22	17	9	4	17	4	0	9	9
Guggenheim-Teague 2 (25)	9	4	35	0	0	13	4	9	4	22
HirschMetro-Draski 1 (26)	9	9	0	0	5	9	5	27	0	36
HirschMetro-Draski 2 (25)	11	6	0	0	0	11	17	33	0	22
HirschMetro-McFadden 1 (23)	9	18	27	0	0	14	0	23	0	9
HirschMetro-McFadden 2 (30)	3	10	17	7	0	7	14	14	0	28
—Conventional—										
Newberry-Cunningham 1 (15)	13	0	47	0	0	0	0	13	0	27
Newberry-Cunningham 2 (23)	10	10	40	5	0	5	0	5	0	25
Newberry-Stark 1 (26)	0	4	9	0	0	26	0	35	13	13

The second component involved student judgements about the frequency of talking about mathematics with classmates, friends, and other acquaintances on three questions (see Table 25). Response frequency (never, sometimes, often, very often) for each class was strikingly different.

Table 25

Student Judgment About Frequency of Communication About Mathematics, Grade 7, District 2

School-Class *(N)*	Mathematical Ideas and Problem Strategies					Homework Problems					Ways Mathematics is Used Outside of School				
	(*N*)	Never	Some-times	Often	Very Often	(*N*)	Never	Some-times	Often	Very Often	(*N*)	Never	Some-times	Often	Very Often
— MiC —															
Guggenheim-Keeton 1 (27)	25	8	48	32	12	25	4	44	28	24	25	28	40	16	16
Guggenheim-Keeton 2 (24)	24	21	54	21	4	24	4	33	42	21	23	26	48	13	13
Guggenheim-Teague 1 (27)	23	35	52	13	0	23	13	43	30	13	23	74	22	4	0
Guggenheim-Teague 2 (25)	22	9	59	32	0	23	9	30	35	26	23	30	30	39	0
HirschMetro-Draski 1 (26)	22	27	50	14	9	21	10	24	33	33	22	45	32	14	9
HirschMetro-Draski 2 (25)	18	11	72	17	0	25	12	32	40	16	18	39	39	0	22
HirschMetro-McFadden 1 (23)	22	9	41	32	18	27	11	41	33	15	22	23	45	18	14
HirschMetro-McFadden 2 (30)	29	17	55	21	7	26	4	35	38	23	29	38	34	10	17
—Conventional —															
Newberry-Cunningham 1 (15)	14	14	57	7	21	14	7	64	21	7	14	43	43	14	0
Newberry-Cunningham 2 (23)	20	10	60	15	15	20	10	55	20	15	20	15	35	20	30
Newberry-Stark 1 (26)	22	64	27	9	0	22	14	59	27	0	22	36	27	14	23

Note: Response rates designate class mean percents.

The third component involved student judgments about the things they liked the most about mathematics class (see Table 26). Although classes varied, students in classes at Guggenheim reported that they liked miscellaneous class activities and working with numbers and students in classes at Hirsch Metro indicated preferences for classwork and number.

Table 26
What Students Liked Most About Mathematics Class, Grade 7, District 2

School-Class *(N)*	Number of Responses[1] *(N)*	Number *(%)* [2]	Problem Solving *(%)*	Classwork *(%)*	Working With Others *(%)*	Miscellaneous[3] *(%)*	Negative Emotional Response[4] *(%)*	Positive Emotional Response[5] *(%)*
—MiC—								
Guggenheim-Keeton 1 (27)	71	13	7	7	8	48	3	1
Guggenheim-Keeton 2 (24)	66	15	8	15	3	14	0	6
Guggenheim-Teague 1 (27)	67	19	9	18	1	18	0	6
Guggenheim-Teague 2 (25)	58	22	12	9	3	19	0	10
HirschMetro-Draski 1 (26)	69	7	14	30	9	12	3	7
HirschMetro-Draski 2 (25)	59	15	7	10	14	8	0	10
HirschMetro-McFadden 1 (23)	64	20	16	17	2	13	0	9
HirschMetro-McFadden 2 (30)	81	30	16	9	4	9	0	6
—Conventional—								
Newberry-Cunningham 1 (15)[6]	--	--	--	--	--	--	--	--
Newberry-Cunningham 2 (13)[6]	--	--	--	--	--	--	--	--
Newberry-Stark 1 (26)[6]	--	--	--	--	--	--	--	--

[1] Students were asked to name three things they liked most about mathematics class.

[2] Percentage does not add to 100 due to number of unique responses.

[3] Responses included "teacher," "computer," and "warm-up activities."

[4] Responses included "hard," "boring," and "restrictive."

[5] Responses included "like it all" and "fun."

[6] Student questionaires were not submitted.

An additional pattern was revealed when examining student judgments about number (see Table 27). Students in most classes reported that they liked addition and multiplication, although the classes varied.

Table 27

What Students Liked Most About Mathematics Class, Grade 7, District 2 (continued)

School-Class *(N)*	**Number of Responses[1] *(N)***	**Addition *(%)***	**Subtraction *(%)***	**Multiplication *(%)***	**Division *(%)***	**Decimals *(%)***	**Fractions *(%)***	**Other[2] *(%)***
				—MiC—				
Guggenheim-Keeton 1 (27)	9	22	11	33	0	0	0	33
Guggenheim-Keeton 2 (24)	10	20	0	30	10	0	30	10
Guggenheim-Teague 1 (27)	13	31	8	15	8	8	15	15
Guggenheim-Teague 2 (25)	13	31	8	23	8	15	8	8
HirschMetro-Draski 1 (26)	5	40	0	40	20	0	0	0
HirschMetro-Draski 2 (25)	9	22	11	44	0	11	11	0
HirschMetro-McFadden 1 (23)	13	8	8	38	31	0	8	8
HirschMetro-McFadden 2 (30)	24	29	4	33	13	0	8	13
				—Conventional—				
Newberry-Cunningham 1 (15)[3]	--	--	--	--	--	--	--	--
Newberry-Cunningham 2 (13)[3]	--	--	--	--	--	--	--	--
Newberry-Stark 1 (26)[3]	--	--	--	--	--	--	--	--

[1] Students were asked to name three things they liked most about mathematics class.

[2] Responses included counting, average, estimation, least common denominator, least common multiple, money, rounding and time.

[3] Student questionaires were not submitted.

The fourth component involved student judgments about the things they disliked most about mathematics class (see Table 28). Most classes reported that they disliked working with numbers and class work more than anything else, although the classes varied.

Table 28
What Students Disliked Most About Mathematics Class, Grade 7, District 2

School-Class *(N)*	**Number of Responses[1] *(N)***	**Number *(%)*[2]**	**Classwork *(%)***	**Homework *(%)***	**Tests *(%)***	**Problem Solving *(%)***	**Book *(%)***	**Miscellaneous[3] *(%)***	**Negative Emotional Response[4] *(%)***	**Positive Emotional Response[5] *(%)***
—MiC—										
Guggenheim-Keeton 1 (27)	66	15	8	11	2	9	23	17	2	2
Guggenheim-Keeton 2 (24)	59	19	15	5	5	10	5	8	14	2
Guggenheim-Teague 1 (27)	58	5	22	16	3	2	2	10	10	0
Guggenheim-Teague 2 (25)	53	23	30	11	2	4	4	11	0	0
HirschMetro-Draski 1 (26)	61	10	23	16	15	8	5	3	7	0
HirschMetro-Draski 2 (25)	59	22	14	8	10	12	0	0	7	2
HirschMetro-McFadden 1 (23)	59	20	20	15	12	3	2	7	3	0
HirschMetro-McFadden 2 (30)	70	16	21	14	3	10	0	6	1	4
—Conventional—										
Newberry-Cunningham 1 (15)[6]	--	--	--	--	--	--	--	--	--	--
Newberry-Cunningham 2 (13)[6]	--	--	--	--	--	--	--	--	--	--
Newberry-Stark 1 (26)[6]	--	--	--	--	--	--	--	--	--	--

[1] Students were asked to name three things they disliked the most about mathematics class.

[2] Percentage does not add to 100 due to number of unique responses.

[3] Responses included "teacher," "computer," and "warm-up activities."

[4] Responses included "hard," "boring," and "restrictive."

[5] Responses included "like it all" and "fun."

[6] Student questionaires were not submitted.

An additional pattern was revealed when examining student judgments about number (see Table 29). Most classes reported that they disliked division, although the classes varied.

Table 29
What Students Disliked Most About Mathematics Class, Grade 7, District 2 (continued)

School-Class *(N)*	**Number of Responses[1] *(N)***	**Addition *(%)***	**Subtraction *(%)***	**Multiplication *(%)***	**Division *(%)***	**Decimals (%)**	**Fractions *(%)***	**Other[2] *(%)***
				—MiC—				
Guggenheim-Keeton 1 (27)	10	0	0	20	40	0	30	10
Guggenheim-Keeton 2 (24)	11	0	9	9	27	27	27	0
Guggenheim-Teague 1 (27)	3	0	0	33	33	33	0	0
Guggenheim-Teague 2 (25)	12	0	42	8	17	8	25	0
HirschMetro-Draski 1 (26)	6	0	33	0	17	0	50	0
HirschMetro-Draski 2 (25)	13	0	8	15	46	8	8	15
HirschMetro-McFadden 1 (23)	12	8	8	0	33	8	42	0
HirschMetro-McFadden 2 (30)	11	0	27	0	27	18	9	18
				—Conventional—				
Newberry-Cunningham 1 (15)[6]	--	--	--	--	--	--	--	--
Newberry-Cunningham 2 (13)[6]	--	--	--	--	--	--	--	--
Newberry-Stark 1 (26)[6]	--	--	--	--	--	--	--	--

[1] Students were asked to name three things they disliked the most about mathematics class.

[2] Responses included counting, average, estimation, least common denominator, least common multiple, money, rounding and time.

[3] Student questionaires were not submitted.

The fifth component involved student judgments about the ways mathematics helped them in other subjects (see Table 30). Students in most classes reported that mathematics was used in both general applications, such as estimating and calculating, and specific applications, such as measurement and problem solving. The classes varied in the percent of responses in these categories. Also, more of students in Guggenheim-Teague 1 responded that mathematics was no help to them than students in the other seventh-grade classes.

Table 30

Student Perception of the Usefulness of Mathematics in Other Classes, Grade 7, District 2

School-Class *(N)*	**Number of Responses[1] *(N)***	**General Applications[2] *(%)***	**Specific Applications[3] *(%)***	**Organization of Information *(%)***	**No Help *(%)***	**Miscellaneous *(%)***	**Inappropriate Responses[4] *(%)***
			—MiC—				
Guggenheim-Keeton 1 (27)	47	23	21	0	6	17	32
Guggenheim-Keeton 2 (24)	35	34	6	3	11	6	40
Guggenheim-Teague 1 (27)	37	27	11	3	19	3	38
Guggenheim-Teague 2 (25)	38	11	32	0	8	5	45
HirschMetro-Draski 1 (26)	47	23	32	2	4	2	36
HirschMetro-Draski 2 (25)	42	10	29	5	5	2	50
HirschMetro-McFadden 1 (23)	50	16	46	2	2	16	18
HirschMetro-McFadden 2 (30)	50	14	44	0	6	6	30
			—Conventional—				
Newberry-Cunningham 1 (15)[5]	--	--	--	--	--	--	--
Newberry-Cunningham 2 (13)[5]	--	--	--	--	--	--	--
Newberry-Stark 1 (26)[5]	--	--	--	--	--	--	--

[1] Students were asked to identify how their knowledge of mathematics and the way they learned mathematics helped them in other classes.

[2] Responses included "estimating" and "calculating."

[3] Responses included "measurement" and "problem solving."

[4] Responses included "not good at math", "need to know something", "it's easier and more fun", "not good ", etc.

[5] Students questionaires were not submitted.

District 3

In District 3, 7 seventh-grade classes participated in the study. In all of the classrooms, MiC was used. A summary of the variations in fixed characteristics is presented in Table 31. Calhoun North-Schroeder was a special education class.

Table 31
Fixed Characteristics, Grade 7, District 3

School-Class *(N)*	**Sex *(%)***		**Average Age *(years)***	**Language Preference *(%)* * *(self-identified)***		**Ethnicity *(%)*** *(self-identified)***				
	Female	**Male**		**English Preference**	**Non-Response**	**African American**	**Hispanic**	**White**	**Multi/Other**	**Non-Response**
—MiC—										
Calhoun North-Perry 1 (19)	42	58	12.07	89	5	0	5	84	5	5
Calhoun North-Perry 2 (22)	32	68	12.43	100	0	0	0	91	9	0
Calhoun North-Perry 3 (22)	32	68	12.39	100	0	0	0	91	9	0
Calhoun North-Perry 4 (21)	43	57	12.43	90	0	0	5	86	10	0
Calhoun North-Perry 5 (27)	52	48	12.19	96	0	0	0	93	7	0
Calhoun North-Perry 6 (22)	59	41	12.45	100	0	0	0	100	0	0
Calhoun North-Schroeder 1 (1)	0	100	11.83	100	0	0	0	100	0	0

* Percent does not add to 100% when students identified a language preference other than English.
** Percent on ethnicity was rounded off and does not always total 100. Multi/Other comprises Asian, Haitian, Native American, Multiracial and Other.
(For more detailed information, see Table E1 in Appendix E.)

In District 3, there was little variation in the class profiles. The number of students in a class varied from 1 to 22. The proportion of girls in a class varied from 0–59%. The average age in a class varied from 11.83 to 12.45, and English was the primary language for 89–100% of the students. The ethnicity in these classes is primarily White or Multiracial.

In District 3, two measures of prior mathematics performance were used as indicators of student prior performance. The first performance indicator was the summary of percentile scores for the students in the study classes on the standardized test administered by the district to all of its students, the TerraNova Mathematics Test (CTB/McGraw-Hill, 1997), which were forwarded to project staff. Summary means and standard deviations of the percentiles for each class on both the applications and computation subtests were reported in Table 32, and box plots are shown in Figure 11. The classes differed in average percentiles on this test. Mean percentiles range from 49.00 to 72.14 on the applications subtest and from 35.00 to 61.06 on the computations subtest. The box plots illustrate the within-class variation on this test in this district.

Table 32

Standardized Test Scores, Spring 1997, Grade 7, District 3

School-Class *(N)*	**TerraNova: National Percentiles**										
		Application					**Computation**				
	(*N*)	**Mean**	**StdDev**	**Mini-mum**	**Median**	**Maxi-mum**	**Mean**	**StdDev**	**Mini-mum**	**Median**	**Maxi-mum**
—MiC—											
Calhoun North-Perry 1 (19)	17	70.53	22.18	25	76.0	99	61.06	21.86	28	65.0	90
Calhoun North-Perry 2 (22)	19	68.63	24.90	15	76.0	99	51.94	27.26	13	52.0	90
Calhoun North-Perry 3 (22)	22	72.14	19.21	20	74.5	98	50.23	24.32	5	47.0	98
Calhoun North-Perry 4 (21)	20	70.20	19.10	27	74.5	99	57.20	20.12	14	62.5	84
Calhoun North-Perry 5 (27)	23	66.91	22.19	21	72.0	97	54.96	21.46	15	56.0	90
Calhoun North-Perry 6 (22)	20	71.25	22.54	21	75.0	99	55.20	27.77	4	58.5	98
Calhoun North-Schroeder (1)	1	49.00	--	49	49.0	49	35.00	--	35	35.0	35

(For more detailed information, see Table E2 in Appendix E.)

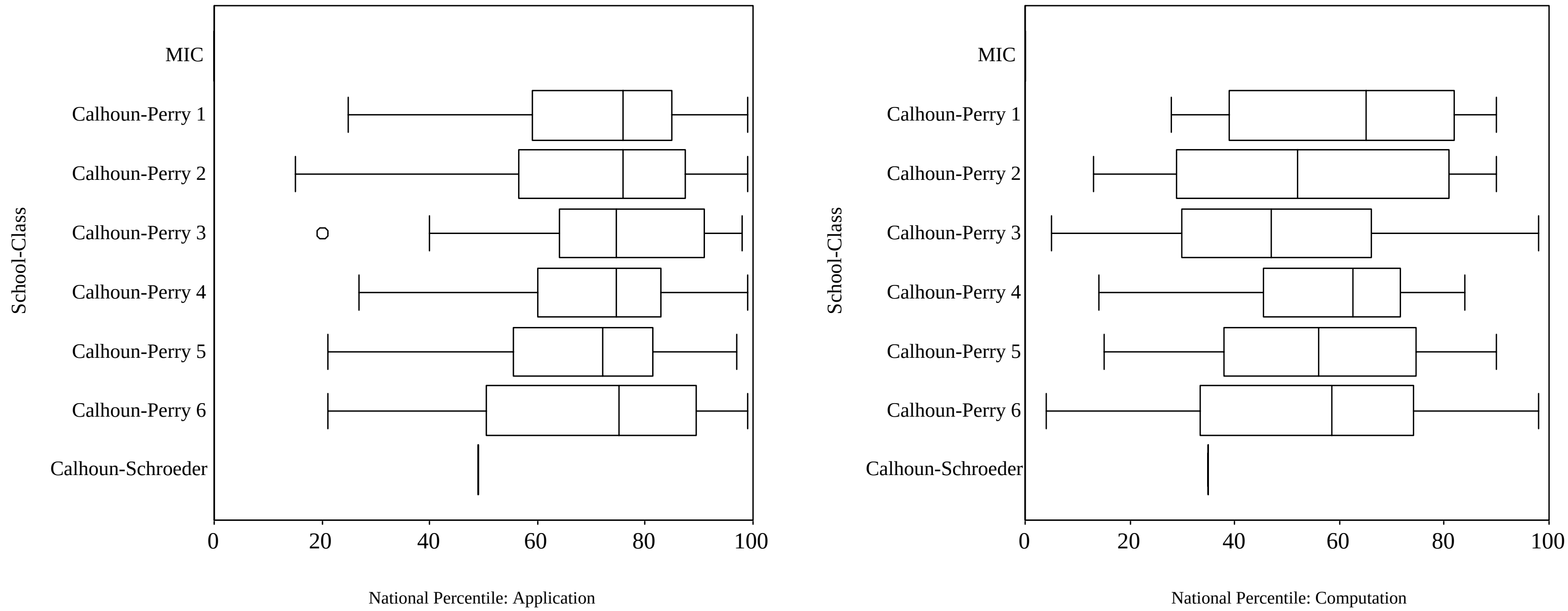


Figure 11. Box plots of class distributions on the *TerraNova* application and computation subtests, Grade 7, District 3.

The second performance indicator used in the study is the Collis/Romberg Mathematical Reasoning Test (Collis & Romberg, 1992). This test was administered to all students participating in the study. The information on this test includes scores related to four levels of reasoning (unistructural, multistructural, relational, and extended abstract), and responses for each level are scored from 0–5. Class means on all four levels of reasoning are given in Table 33. For all classes, the means on unistructural level of reasoning are well above 2.50, indicating that students were operating at this level on many items. Even at this level, however, there is considerable variability in class means. The class means on the other scales indicate that many students in all classes are beginning to reason at a multistructural level, and only a very small number of students exhibit reasoning at either relational or extended abstract levels. (Note the relatively high scores of Calhoun North-Perry 1 and Calhoun North-Perry 6.)

Table 33

Class means on the Collis-Romberg Mathematical Problem-Solving Profiles, Grade 7, District 3

School-Class *(N)*	Level of Reasoning				
	(*N*)	**Uni-structural**	**Multi-structural**	**Relational**	**Extended Abstract**
	—MiC—				
Calhoun North-Perry 1 (19)	18	3.89	2.06	1.00	0.11
Calhoun North-Perry 2 (22)	20	3.50	1.95	0.85	0.10
Calhoun North-Perry 3 (22)	21	4.10	2.43	0.71	0.05
Calhoun North-Perry 4 (21)	21	3.67	1.90	0.81	0.05
Calhoun North-Perry 5 (27)	25	3.64	1.92	0.76	0.12
Calhoun North-Perry 6 (22)	20	3.95	2.25	1.15	0.15
Calhoun North-Schroeder 1	1	4.00	1.00	0.00	0.00

(For more detailed information, see Table E3 in Appendix E.)

Because the standardized test scores show a similar pattern to those on the unistructural scale of the Collis/Romberg Test (see the scatter plot for means on the two measures in Figure 12), a correlation coefficient between the class means of the two measures was calculated on the applications subtest (r = -.19), and on the computations subtest (r = -.34). From this information, it is apparent that one class is average and the rest of the classes are high average classes.

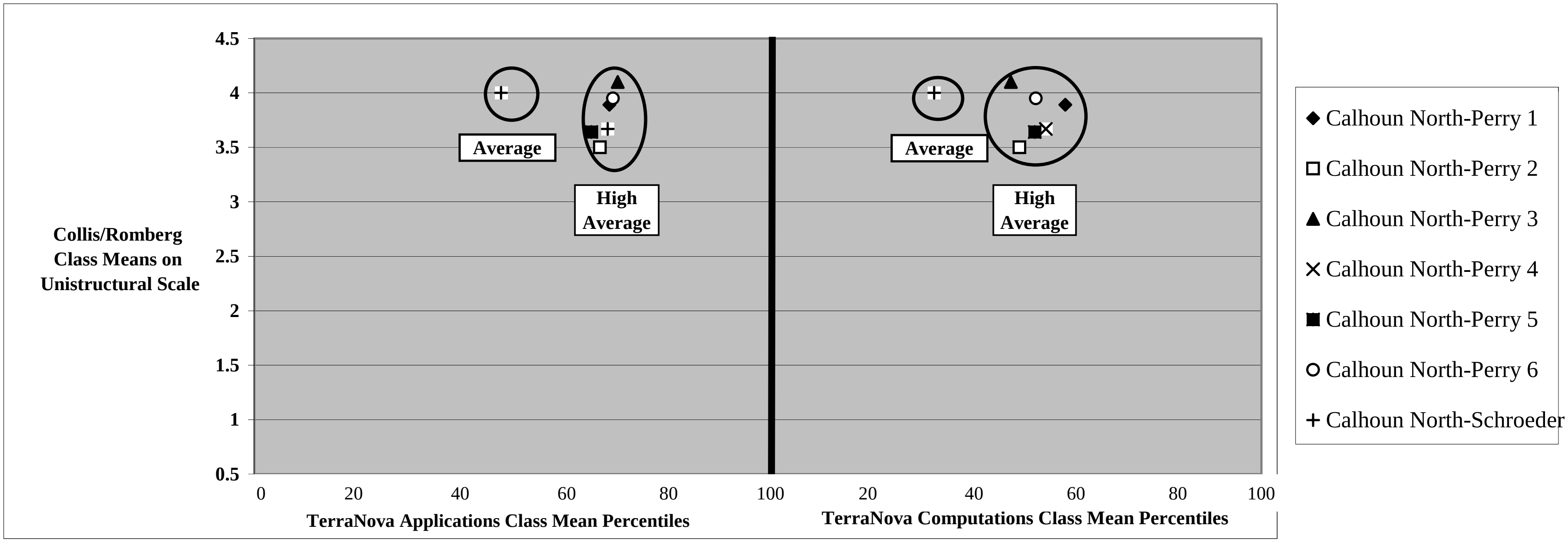


Figure 12. Scatter plot for class mean percentiles on the *TerraNova* test and the class means on the unistructural scale of the Collis/Romberg reasoning test, Grade 7, District 3.

Finally, all students in the study responded to the questions in the *Student Attitude Inventory;* six components are summarized here.

First, the class means for student judgments on items related to their effort, confidence, interest, usefulness, and ability to communicate mathematically are shown in Table 34. Each item was judged on a scale of 1–4 (1 = very true; 2 = true; 3 = not true; 4 = not true at all). Overall, the students in these classes judged the statements as true or very true, and there was little variation both between classes.

Table 34
Class Means on Student Judgment About Mathematics (Subscales of the Student Attitude Inventory), Grade 7, District 3

School-Class *(N)*	**Effort** *in mathematics*		**Confidence** *in ability to do mathematics*		**Interest** *in mathematics*		**Usefulness** *of mathematics*		**Ability to Communicate** *about mathematics*	
	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean
—MiC—										
Calhoun North-Perry 1 (19)	18	2.15	18	1.94	16	2.18	16	1.90	18	2.02
Calhoun North-Perry 2 (22)	19	1.94	20	2.00	19	2.48	19	1.86	19	1.86
Calhoun North-Perry 3 (22)	18	1.80	20	1.88	18	2.17	19	1.79	17	1.99
Calhoun North-Perry 4 (21)	20	1.88	21	1.93	21	2.35	19	1.88	20	1.99
Calhoun North-Perry 5 (27)	24	1.74	24	1.80	24	2.14	23	1.64	24	1.76
Calhoun North-Perry 6 (22)	21	1.87	22	1.79	21	2.02	18	1.61	18	1.85
Calhoun North-Schroeder (1)	1	2.83	1	2.20	1	3.13	1	2.50	1	2.29

(For detailed information, see Table E4 in Appendix E.)

The class scoring low on preceding achievement (Calhoun North-Schroeder, the special education class), however, tended to value their effort in mathematics less, to have less confidence to do mathematics, to believe mathematics is less useful to them, and to value their ability to communicate in mathematics less than did students in the other classes (see Figure 13).

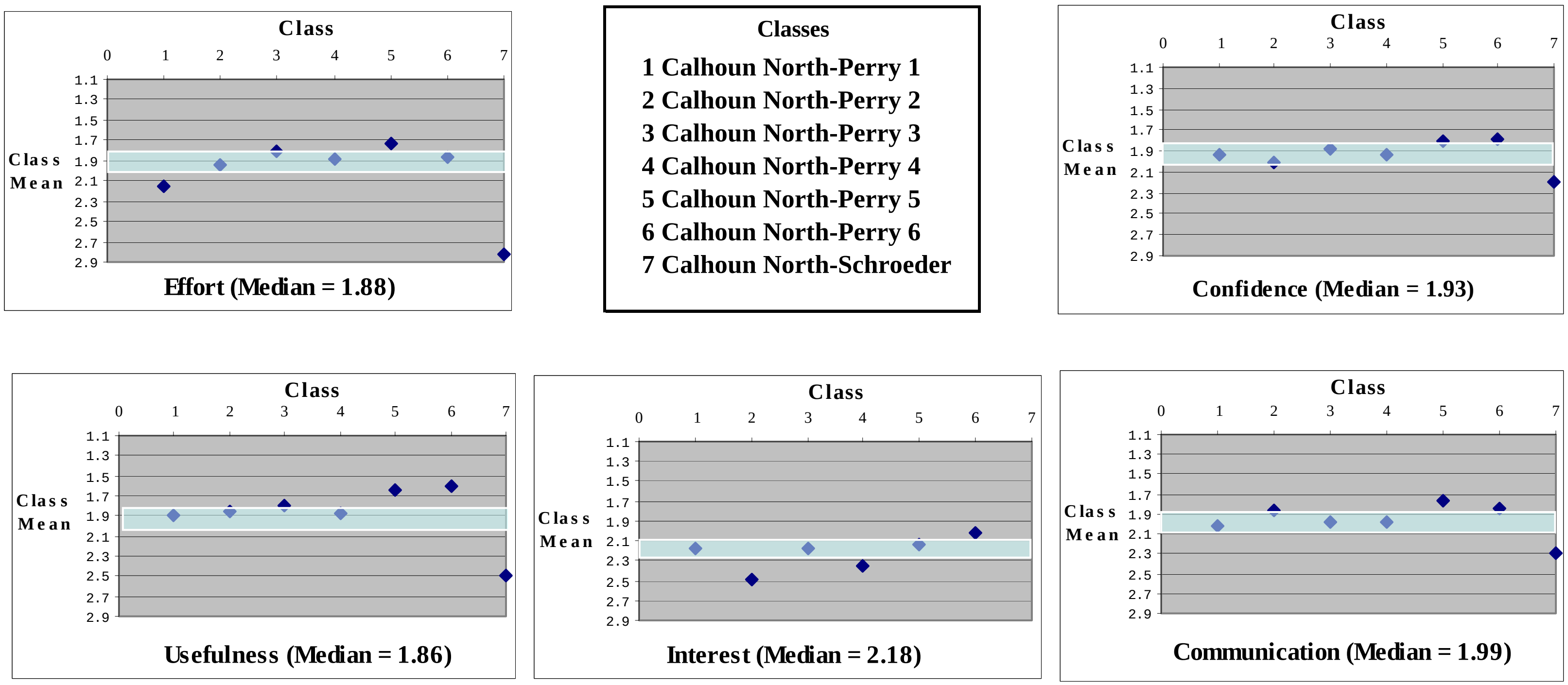


Figure 13. Plots showing class means on student judgments about mathematics, Grade 7, District 3. (Shaded areas show class medians ± 0.1.)

In the second component of the *Student Attitude Inventory*, students responded to 16 items related to general perceptions about mathematics (see Table E5 in Appendix E). Several items were reverse-scored due to wording of questions. Although little variance was seen among means of Calhoun North-Perry's classes, the ratings provided by Calhoun North-Schroeder 1, a special education student, generally were more negative than mean ratings of the other classes. When the ratings provided by the special education student varied greatly from the class means, the results from both the special education student and the class means are listed in this discussion. In general, students felt confident that they were able to learn new ideas in mathematics class (from 1.42, Calhoun North-Perry 5, to 1.76, Calhoun North-Perry 3, on Item 3). Students thought it was acceptable to solve mathematics problems differently than their classmates (from 1.00, Calhoun North-Schroeder 1, to 1.43, Calhoun North-Perry 3, on Item 16). However, students were less confident (from 1.32, Calhoun North-Perry 6, to 2.00, Calhoun North-Schroeder 1, on Item 4) that they could discover ways of solving problems that their teachers or their peers had not previously considered.

Students were confident that anyone who worked hard enough in mathematics class could be good at mathematics (from 1.00, Calhoun North-Perry 5, to 2.00, Calhoun North-Schroeder 1 (excluding the special education student, 1.33 Calhoun North-Perry 1), on Item 11). Similarly, students disagreed that some students were naturally better, or worse, at mathematics than other students regardless of effort (from 2.76, Calhoun North-Perry 4, to 3.23, Calhoun North-Perry 5, on Item 37).

Students felt that knowing how to solve a problem was as important as determining the answer (from 1.33, Calhoun North-Perry 1 and Calhoun North-Perry 4, to 3.00, Calhoun North-Schroeder 1 (excluding the special education student, 1.50, Calhoun North-Perry 2, on Item 53), although they felt that answering questions correctly in mathematics class require providing only numbers (from 1.37, Calhoun North-Perry 2, to 3.00, Calhoun North-Schroeder 1 (excluding the special education student, 2.00, Calhoun North-Perry 4, on Item 38). Students thought that getting correct answers in mathematics class was at least as important as understanding why the answer was correct (from 2.08, Calhoun North-Perry 5, to 3.00, Calhoun North-Schroeder 1, on Item 27), although students felt that getting correct answers was more important than understanding a mathematics problem or the process of finding an answer (from 1.41, Calhoun North-Perry 6, to 2.06, Calhoun North-Perry 1, on Item 49). Students disagreed that mathematics was mostly learned by memorizing facts and rules (from 2.55, Calhoun North-Perry 6, to 4.00, Calhoun North-Schroeder 1 (excluding the special education student, 2.80 Calhoun North-Perry 2), on Item 55). They also disagreed that they would get correct answers to their teachers' questions if they had memorized rules or facts (from 2.00, Calhoun North-Schroeder 1 (excluding the special education student, 2.80 Calhoun North-Perry 5), to 3.45, Calhoun North-Perry 3, on Item 44). Students disagreed that they did not know how to solve mathematics problems if they found they had to use calculators (from 2.00, Calhoun North-Schroeder 1, to 2.83, Calhoun North-Perry 1, on Item 45) and that calculators always generated correct answers (from 1.81, Calhoun North-Perry 5, to 4.00, Calhoun North-Schroeder 1 (excluding the special education student, 2.83, Calhoun North-Perry 1), on Item 6).

Students felt that new mathematics topics were related to ones they had already studied (from 2.12, Calhoun North-Perry 5, to 3.00, Calhoun North-Schroeder 1 (excluding the special education student, 2.43 Calhoun North-Perry 4), on Item 39). Students felt that mathematics was related to other school subjects (from 1.45, Calhoun North-Perry 6, to 4.00, Calhoun North-Schroeder 1 (excluding the special education student, 1.95 Calhoun North-Perry 2), on Item 20), although they thought that mathematics was harder to understand than other school subjects (from 2.56, Calhoun North-Perry 1, to 3.00, Calhoun North-Schroeder 1, on Item 28).

The third component involved students judging whether success or failure in mathematics could be attributed to teachers, ability, effort, or luck. The class means for these judgments are shown in Table 35. Each item was judged on a scale of 1–4 (1 = very true; 2 = true; 3 = not true; 4 = not true at all). All classes attributed success in mathematics to a combination of effort and ability, and failure to lack of effort.

Table 35
Class Means on Student Attribution of Success or Failure in Mathematics, Grade 7, District 3

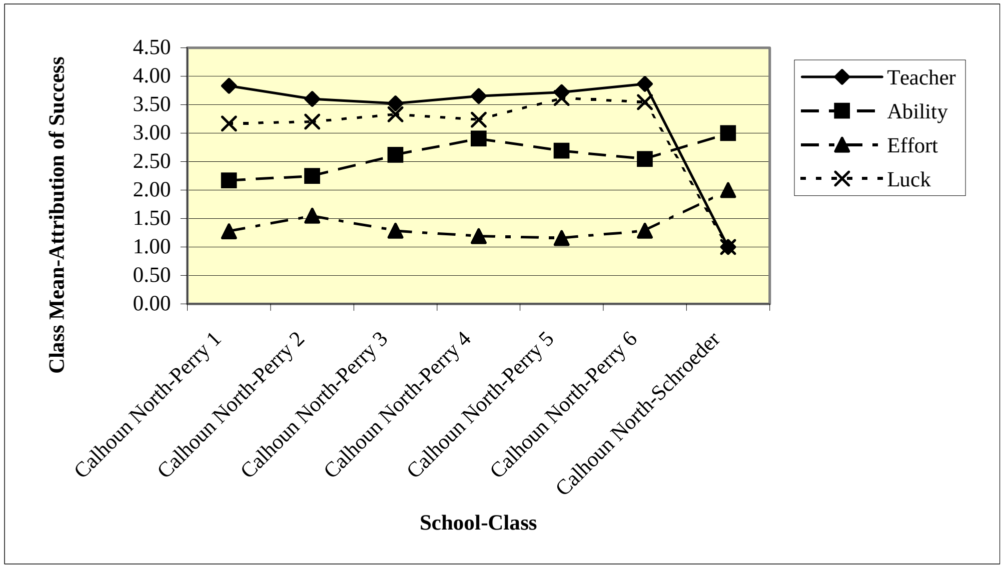
School-Class (*N*)	Success							
	Teacher		Ability		Effort		Luck	
	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean
—*MiC*—								
Calhoun North-Perry 1 (19)	18	3.83	18	2.17	18	1.28	18	3.17
Calhoun North-Perry 2 (22)	20	3.60	20	2.25	20	1.55	20	3.20
Calhoun North-Perry 3 (22)	21	3.52	21	2.62	21	1.29	21	3.33
Calhoun North-Perry 4 (21)	20	3.65	21	2.90	21	1.19	21	3.24
Calhoun North-Perry 5 (27)	25	3.72	26	2.69	25	1.16	26	3.62
Calhoun North-Perry 6 (22)	22	3.86	22	2.55	21	1.29	22	3.55
Calhoun North-Schroeder 1 (1)	1	1.00	1	3.00	1	2.00	1	1.00

School-Class (*N*)	Failure							
	Teacher		Ability		Effort		Luck	(*N*)
	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean		Mean
—*MiC*—								
Calhoun North-Perry 1 (19)	18	3.56	18	3.06	17	1.94	18	3.28
Calhoun North-Perry 2 (22)	20	3.75	20	3.00	20	2.15	20	3.30
Calhoun North-Perry 3 (22)	20	3.70	21	3.14	18	1.89	20	3.50
Calhoun North-Perry 4 (21)	21	3.71	21	2.95	21	1.90	21	3.48
Calhoun North-Perry 5 (27)	26	3.77	26	3.08	25	1.84	25	3.68
Calhoun North-Perry 6 (22)	22	3.73	22	3.36	22	2.14	22	3.59
Calhoun North-Schroeder 1 (1)	1	1.00	1	2.00	1	2.00	1	2.00

(For more detailed information, see Table E6 in Appendix E.)

Again, the low class (Calhoun North-Schroeder) was more inclined to attribute success to teachers and luck (see Figure 14a), and more inclined to attribute failure mostly to ability, but also to teacher and effort. (see Figure 14b).

(a)



(b)

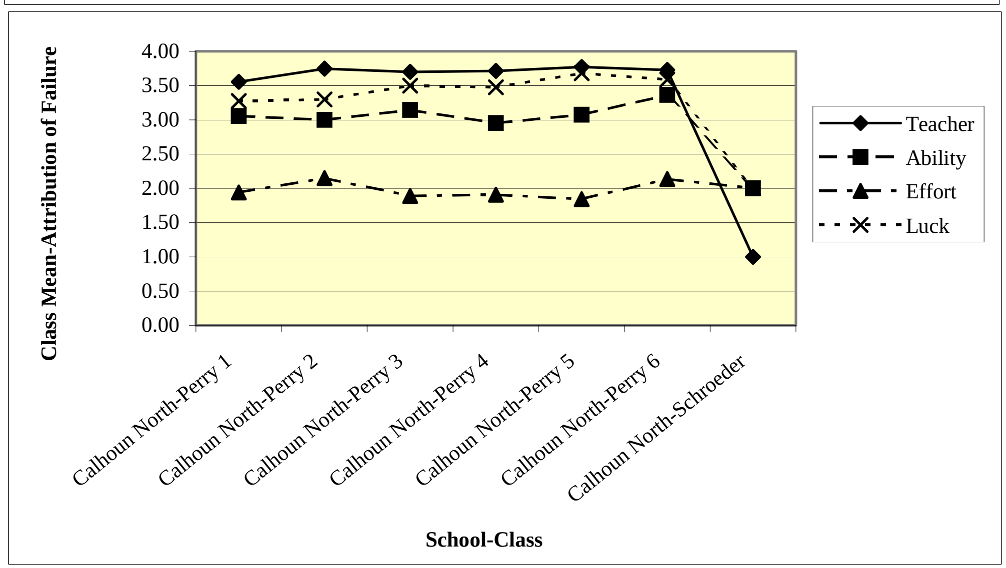


Figure 14. Line graphs showing class means of student attribution of (a) success and (b) failure in mathematics, Grade 7, District 3.

In the fourth component of the *Student Attitude Inventory*, students listed things they associated with the word "mathematics" (see Table 36). Although classes varied, students in all classes most frequently listed number, including operations with numbers.

Table 36

Words Students Associated With "Mathematics," Grade 7, District 3

School-Class *(N)*	**Number of Responses[1] *(N)***	**Number[2] *(%)*[3]**	**Interest *(%)***	**Geometry *(%)***	**Negative Emotive Responses[4] *(%)***	**Thinking *(%)***	**Problem Solving *(%)***	**Algebra *(%)***	**Occupations *(%)***	**Miscellaneous *(%)***
					—MiC—					
Calhoun North-Perry 1 (18)	78	54	4	6	3	4	4	6	0	18
Calhoun North-Perry 2 (20)	122	66	1	6	2	3	3	6	0	11
Calhoun North-Perry 3 (19)	95	63	1	3	2	2	4	5	0	12
Calhoun North-Perry 4 (21)	105	71	0	9	6	0	5	2	0	7
Calhoun North-Perry 5 (25)	122	69	3	5	2	2	2	3	0	7
Calhoun North-Perry 6 (21)	134	64	3	2	4	1	7	8	0	7
Calhoun North-Schroeder 1 (1)	1	0	0	0	0	0	0	0	0	0

[1] Students were asked to list the words they "think of when they hear the word mathematics."

[2] Responses included operations with numbers.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included "boring," "stupid," and statements of displeasure.

In the fifth component of the *Student Attitude Inventory,* students listed jobs other than teaching that required the use of mathematics (see Table 37). Although classes varied, students in most classes most frequently listed service-related occupations, including retail sales, business, and food service; financial-related occupations, such as accounting, banking, and insurance; professional-related occupations, including medical fields, engineering, and law, and trades-related occupations.

Table 37
Nonteaching Jobs that Students Identified as Requiring Mathematics, Grade 7, District 3

School-Class *(N)*	**Number of Responses[1] *(N)***	**Services[2] *(%)* [3]**	**Financial[4] *(%)***	**Professional[5] *(%)***	**Science *(%)***	**Trades *(%)***	**Creative Arts *(%)***	**Government *(%)***	**Sports *(%)***	**Unreportable[6] *(%)***
—MiC—										
Calhoun North-Perry 1 (18)	47	28	17	6	11	19	9	0	0	4
Calhoun North-Perry 2 (20)	64	27	14	11	2	16	3	0	0	19
Calhoun North-Perry 3 (19)	51	22	27	14	0	12	4	0	6	8
Calhoun North-Perry 4 (21)	62	34	11	6	15	8	8	0	0	11
Calhoun North-Perry 5 (25)	92	25	14	16	5	14	8	1	1	3
Calhoun North-Perry 6 (21)	75	25	17	11	3	21	8	1	4	4
Calhoun North-Schroeder 1 (1)	2	0	0	0	0	50	0	0	0	50

[1] Students asked to list the jobs other than teaching that require mathematics.

[2] Responses included occupations in retail sales, business, and food service.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included occupations in accounting, banking, and insurance.

[5] Responses included occupations in medical fields, engineering, and law.

[6] Responses included teaching, thinking, and operations with numbers.

In the sixth component of the *Student Attitude Inventory*, students listed ways they used mathematics outside of class (see Table 38). Although classes varied, students in most classes most frequently listed money-related ways, such as banking and shopping, and calculation-related ways. Also, students in Calhoun North-Perry 3 and 6 listed leisure-related ways and students in Calhoun North-Perry 5 listed measurement-related ways are more often than students in the other classes.

Table 38

Ways Students Used Mathematics Outside of Class, Grade 7, District 3

School-Class *(N)*	**Number of Responses[1] *(N)***	**Monetary[2] *(%)*[3]**	**Calculation *(%)***	**Leisure *(%)***	**Measurement *(%)***	**Problem Solving *(%)***	**Unreportable[4] *(%)***
			—MiC—				
Calhoun North-Perry 1 (18)	32	41	22	6	13	0	13
Calhoun North-Perry 2 (20)	40	23	20	15	15	8	13
Calhoun North-Perry 3 (19)	36	25	22	19	8	3	11
Calhoun North-Perry 4 (21)	32	34	25	9	9	6	6
Calhoun North-Perry 5 (25)	52	29	13	15	19	4	10
Calhoun North-Perry 6 (21)	43	30	12	23	12	0	14
Calhoun North-Schroeder 1 (1)	1	0	0	0	0	0	0

[1] Students were asked to describe how they would use mathematics outside of class.

[2] Responses included banking and shopping.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included occupations and nonmathematics school subjects.

Finally, all students in the study responded to items on the *Student Questionnaire*, five components of which are summarized here. The first component involved student judgments about the school subject they enjoyed the most (see Table 39). Generally, students reported that they enjoyed science and art classes more than other school subjects.

Table 39
Student Preference Ranking of Classes, Grade 7, District 3

School-Class (N)	Subject *(%)*									
	SocStudies	**Science**	**Math**	**Reading**	**Writing**	**Art**	**Music**	**PE**	**Band**	**Other**
—MiC—										
Calhoun North-Perry 1 (19)	17	28	22	0	0	6	0	11	6	11
Calhoun North-Perry 2 (22)	0	30	5	10	0	20	0	15	15	5
Calhoun North-Perry 3 (22)	10	20	20	5	5	15	0	15	5	5
Calhoun North-Perry 4 (21)	5	38	5	5	10	24	5	0	0	10
Calhoun North-Perry 5 (27)	13	17	13	0	8	21	0	13	13	4
Calhoun North-Perry 6 (22)	50	32	9	0	0	5	0	5	0	0
Calhoun North-Schroeder 1 (1)	0	0	0	0	0	0	0	0	100	0

The second component involved student judgments about their frequency of talking about mathematics with classmates, friends, and other acquaintances on three questions. Response frequency (never, sometimes, often, very often) for each class was strikingly different across questions and across classes (see Table 40).

Table 40

Student Judgment About Frequency of Communication About Mathematics, Grade 7, District 3

School-Class *(N)*	**Mathematical Ideas and Problem Strategies**					**Homework Problems**					**Ways Mathematics is Used Outside of School**				
	(*N*)	**Never**	**Some-times**	**Often**	**Very Often**	**(*N*)**	**Never**	**Some-times**	**Often**	**Very Often**	**(*N*)**	**Never**	**Some-times**	**Often**	**Very Often**
¾ MiC¾															
Calhoun North-Perry 1 (19)	18	22	50	11	17	18	0	39	44	17	18	50	44	0	6
Calhoun North-Perry 2 (22)	20	50	40	10	0	20	0	40	35	25	20	65	30	5	0
Calhoun North-Perry 3 (22)	20	10	55	30	5	20	10	35	45	10	20	65	20	15	0
Calhoun North-Perry 4 (21)	19	21	58	16	5	20	5	30	45	20	20	55	30	10	5
Calhoun North-Perry 5 (27)	24	0	79	21	0	24	0	54	38	8	24	54	29	8	8
Calhoun North-Perry 6 (22)	21	14	57	24	5	22	0	36	36	27	21	38	48	10	5
Calhoun North-Schroeder 1 (1)	1	100	0	0	0	1	0	100	0	0	1	100	0	0	0

<u>Note</u>: Response rates designate class mean percents.

The third component involved student judgments about the things they liked the most about mathematics class (see Table 41). Students in most classes reported positive emotive responses and preferences for miscellaneous class activities, although the classes varied. Calhoun North-Schroeder's special education student preferred number.

Table 41

What Students Liked Most About Mathematics Class, Grade 7, District 3

School-Class *(N)*	**Number of Responses[1] *(N)***	**Number *(%)*[2]**	**Problem Solving *(%)***	**Classwork *(%)***	**Working With Others *(%)***	**Miscellaneous[3] *(%)***	**Negative Emotional Response[4] *(%)***	**Positive Emotional Response[5] *(%)***
—MiC—								
Calhoun North-Perry 1 (19)	48	8	6	19	8	17	0	8
Calhoun North-Perry 2 (22)	58	3	5	17	9	22	0	16
Calhoun North-Perry 3 (22)	61	13	3	7	10	16	7	20
Calhoun North-Perry 4 (21)	60	5	7	7	10	20	0	15
Calhoun North-Perry 5 (27)	77	12	16	6	9	17	0	14
Calhoun North-Perry 6 (22)	64	17	3	8	13	17	0	17
Calhoun North-Schroeder 1 (1)	4	50	0	0	0	25	0	0

[1] Students were asked to name three things they liked most about mathematics class.

[2] Percentage does not add to 100 due to number of unique responses.

[3] Responses included "teacher," "computer," and "warm-up activities."

[4] Responses included "hard," "boring," and "restrictive."

[5] Responses included "like it all" and "fun."

The number of responses for number-related categories was too small to make inferences about student preferences (see Table 42).

Table 42

What Students Liked Most About Mathematics Class, Grade 7, District 3 (continued)

School-Class *(N)*	**Number of Responses[1] *(N)***	**Addition *(%)***	**Subtraction *(%)***	**Multiplication *(%)***	**Division *(%)***	**Decimals *(%)***	**Fractions *(%)***	**Other[2] *(%)***
			—MiC—					
Calhoun North-Perry 1 (19)	4	0	0	50	0	0	25	25
Calhoun North-Perry 2 (22)	2	0	0	0	50	0	50	0
Calhoun North-Perry 3 (22)	8	13	13	38	13	0	13	13
Calhoun North-Perry 4 (21)	3	33	0	0	0	0	33	33
Calhoun North-Perry 5 (27)	9	11	11	44	11	0	11	11
Calhoun North-Perry 6 (22)	11	18	18	45	9	0	0	9
Calhoun North-Schroeder 1 (1)	2	0	0	50	0	0	0	50

[1] Students were asked to name three things they liked most about mathematics class.

[2] Responses included counting, average, estimation, least common denominator, least common multiple, money, rounding and time.

The fourth component involved student judgments about the things they disliked most about mathematics class (see Table 43). Students in most classes reported that they disliked working with numbers, although the classes varied.

Table 43

What Students Disliked Most About Mathematics Class, Grade 7, District 3

School-Class *(N)*	**Number of Responses[1] *(N)***	**Number *(%)* [2]**	**Classwork *(%)***	**Homework *(%)***	**Tests *(%)***	**Problem Solving *(%)***	**Book *(%)***	**Miscellaneous [3] *(%)***	**Negative Emotional Response[4] *(%)***	**Positive Emotional Response[5] *(%)***
					—MiC—					
Calhoun North-Perry 1 (19)	45	18	18	18	9	9	4	9	2	2
Calhoun North-Perry 2 (22)	57	12	16	21	7	12	0	9	4	0
Calhoun North-Perry 3 (22)	55	22	7	13	9	7	2	9	9	4
Calhoun North-Perry 4 (21)	57	12	7	16	5	12	0	23	14	0
Calhoun North-Perry 5 (27)	70	17	17	9	9	4	3	16	4	3
Calhoun North-Perry 6 (22)	56	11	4	5	7	18	7	18	5	4
Calhoun North-Schroeder 1 (1)	1	0	0	0	0	0	0	0	100	0

[1] Students were asked to name three things they disliked the most about mathematics class.

[2] Percentage does not add to 100 due to number of unique responses.

[3] Responses included "teacher," "computer," and "warm-up activities."

[4] Responses included "hard," "boring," and "restrictive."

[5] Responses included "like it all" and "fun."

An additional pattern was revealed when examining student judgments about number (see Table 44). Students in most classes reported that they disliked division, although the classes varied.

Table 44
What Students Disliked Most About Mathematics Class, Grade 7, District 3 (continued)

School-Class *(N)*	**Number of Responses[1] *(N)***	**Addition *(%)***	**Subtraction *(%)***	**Multiplication *(%)***	**Division *(%)***	**Decimals *(%)***	**Fractions *(%)***	**Other[2] *(%)***
—MiC—								
Calhoun North-Perry 1 (19)	8	0	0	13	25	13	38	13
Calhoun North-Perry 2 (22)	7	0	0	14	14	0	14	57
Calhoun North-Perry 3 (22)	12	0	8	8	42	0	0	42
Calhoun North-Perry 4 (21)	7	0	0	29	29	14	14	14
Calhoun North-Perry 5 (27)	12	8	8	0	33	0	33	17
Calhoun North-Perry 6 (22)	6	0	0	0	33	17	17	33
Calhoun North-Schroeder 1 (1)	0	--	--	--	--	--	--	--

[1] Students were asked to name three things they disliked the most about mathematics class.

[2] Responses included counting, average, estimation, least common denominator, least common multiple, money, rounding and time.

The fifth component involved student judgments about the ways mathematics helped them in other subjects (see Table 45). Although classes varied, students in most classes reported that mathematics was used in both general applications, such as estimating and calculating, and specific applications, such as measurement and problem solving. Also, most classes indicated that mathematics was not helpful in other subjects.

Table 45

Student Perception of the Usefulnesss of Mathematics in Other Classes, Grade 7, District 3

School-Class *(N)*	**Number of Responses[1] *(N)***	**General Applications[2] *(%)***	**Specific Applications[3] *(%)***	**Organization of Information *(%)***	**No Help *(%)***	**Miscellaneous *(%)***	**Inappropriate Responses[4] *(%)***
			—MiC—				
Calhoun North-Perry 1 (19)	24	13	33	0	17	8	29
Calhoun North-Perry 2 (22)	28	11	32	0	14	7	32
Calhoun North-Perry 3 (22)	32	25	34	3	13	0	25
Calhoun North-Perry 4 (21)	35	17	11	3	23	6	40
Calhoun North-Perry 5 (27)	44	16	27	2	20	2	32
Calhoun North-Perry 6 (22)	36	11	28	3	11	6	42
Calhoun North-Schroeder 1 (1)	1	0	0	0	100	0	0

[1] Students were asked to identify how their knowledge of mathematics and the way they learned mathematics helped them in other classes.

[2] Responses included "estimating" and "calculating."

[3] Responses included "measurement" and "problem solving."

[4] Responses included "not good at math", "need to know something", "it's easier and more fun", "not good ", etc.

District 4

In District 4, 6 seventh-grade classes participated in the study. MiC was used all of the classrooms. A summary of the variations in fixed characteristics is presented in Table 46.

Table 46
Fixed Characteristics, Grade 7, District 4

School-Class *(N)*	**Sex *(%)***		**Average Age *(years)***	**Language Preference *(%)* *** *(self-identified)*		**Ethnicity *(%)***** ***(self-identified)***				
	Female	**Male**		**English Preference**	**Non-Response**	**African American**	**Hispanic**	**White**	**Multi/Other**	**Non-Response**
—MiC—										
Kelvyn Park-Finn 1 (30)	53	47	12.16	83	10	27	17	7	43	7
Kelvyn Park-Finn 2 (24)	54	46	12.39	88	4	13	17	0	67	4
Kelvyn Park-Woodward 1 (27)	52	48	11.97	85	15	19	22	4	29	26
Kelvyn Park-Woodward 2 (28)	46	54	12.71	61	18	21	25	0	36	18
Kelvyn Park-Yackle 1 (23)	48	52	12.19	83	13	39	17	0	26	17
Kelvyn Park-Yackle 2 (20)	55	45	12.41	85	15	10	50	5	20	15

* Percent does not add to 100% when students identified a language preference other than English.
** Percent on ethnicity was rounded off and does not always total 100. Multi/Other comprises Asian, Haitian, Native American, Multiracial and Other.
(For more detailed information, see Table F1 in Appendix F.)

In District 4, there was considerable variation in the class profiles. The number of students in a class varied from 20 to 30. The proportion of boys to girls was similar across classes. The average age in a class ranged from 11.97 to 12.71, and English was the primary language for 61–88% of the students. The ethnicity in these classes, however, varied considerably (10–39% African American, 17–50% Hispanic, 0–7% White, and 20–67% Multi-racial/Other).

In District 4, two measures of prior mathematics performance were used as indicators of student prior performance. The first performance indicator was the summary of percentile scores for the students in the study classes on the standardized test administered by the district to all of its students, the California Achievement Test (CTB/McGraw-Hill, 1992), which were forwarded to project staff. Summary means and standard deviations of the percentiles for each class are reported in Table 47, and box plots are shown in Figure 15. Clearly, the classes differed in average percentiles on this test. Mean percentiles range from 26.74 to 73.29, and the box plots illustrate the vast between-class variation on this test in this district. (Note the relatively narrow range of scores in Kelvyn Park-Woodward 2, and Kelvyn Park-Yackle 1.)

Table 47
Standardized Test Scores, Spring 1997, Grade 7, District 4

School-Class *(N)*	**CAT**					
	National Percentile					
	(*N*)	**Mean**	**StDev**	**Minimum**	**Median**	**Maximum**
—MiC—						
Kelvyn Park-Finn 1 (30)	26	70.65	18.42	21	72	96
Kelvyn Park-Finn 2 (24)	22	55.59	24.21	19	58	95
Kelvyn Park-Woodward 1 (27)	22	64.32	16.66	25	66	96
Kelvyn Park-Woodward 2 (28)	23	26.74	15.37	2	28	55
Kelvyn Park-Yackle 1 (23)	17	73.29	20.17	38	77	99
Kelvyn Park-Yackle 2 (20)	13	50.08	23.12	25	45	95

(For more detailed information, See Table F2 in Appendix F.)

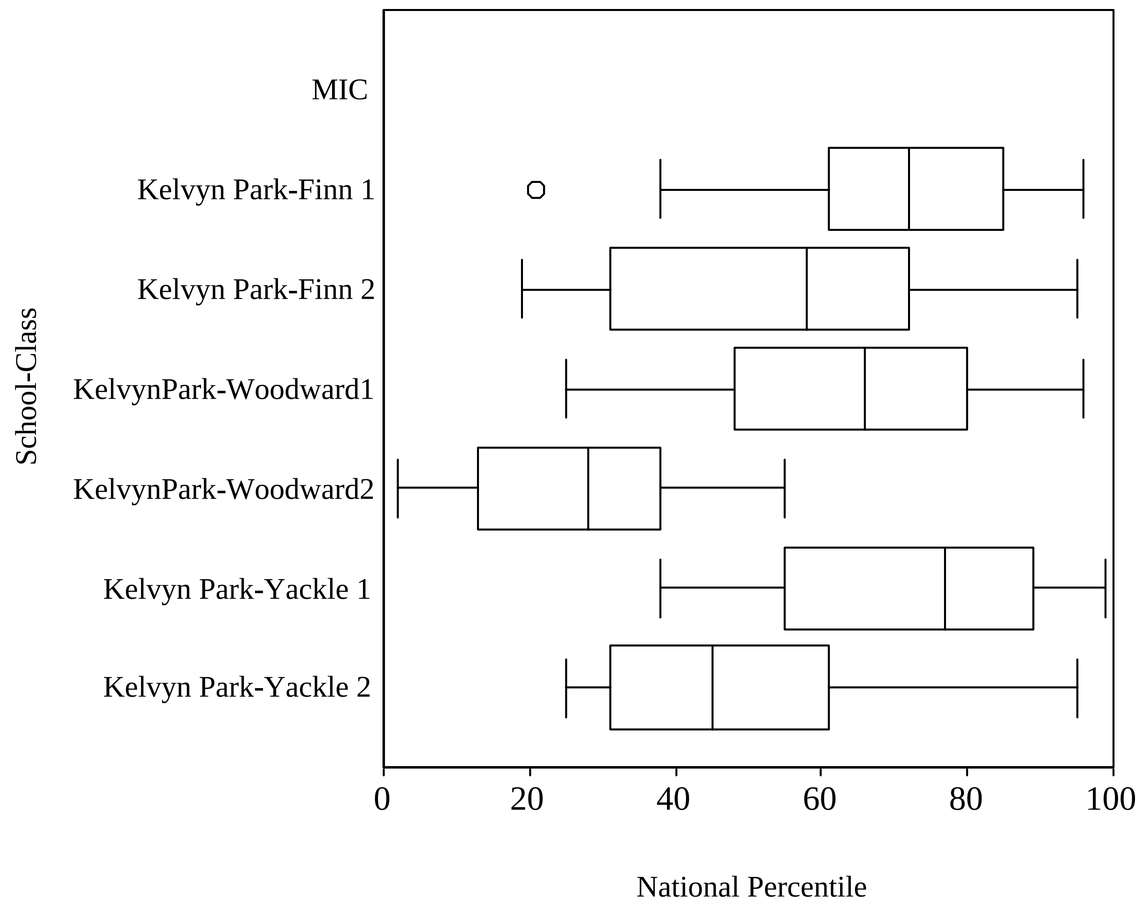


Figure 15. Box plots of class distributions on the CAT test, Grade 7, District 4.

The second performance indicator used in the study is the Collis/Romberg Mathematical Reasoning Test (Collis & Romberg, 1992). This test was administered to all students participating in the study. The information on this test includes scores related to four levels of reasoning (unistructural, multistructural, relational, and extended abstract), and responses for each level are scored from 0–5. Class means on all four levels of reasoning are given in Table 48. For all but one class the means on unistructural level of reasoning are above 2.50, indicating that students were operating at this level on many items. Only Kelvyn Park-Woodward 2 has a class mean below 2.50 (2.33). Even at this level, however, there is considerable variability in class means. The means on the other scales indicate that in all but one class (Kelvyn Park-Woodward 2) were many students beginning to reason at a multistructural level, and only a very small number of students exhibit reasoning at either relational or extended abstract levels. (Note the relatively high scores of Kelvyn Park-Finn 1.)

Table 48
Class means on the Collis-Romberg Mathematical Problem-Solving Profiles, Grade 7, District 4

School-Class *(N)*	Level of Reasoning				
	(N)	Uni-structural	Multi-structural	Relational	Extended Abstract
—MiC—					
Kelvyn Park-Finn 1 (30)	28	3.86	2.29	1.11	0.14
Kelvyn Park-Finn 2 (24)	24	3.42	1.29	0.29	0.00
Kelvyn Park-Woodward 1 (27)	18	3.56	1.17	0.11	0.00
Kelvyn Park-Woodward 2 (28)	24	2.33	0.67	0.08	0.00
Kelvyn Park-Yackle 1 (23)	19	3.26	1.53	0.68	0.05
Kelvyn Park-Yackle 2 (20)	17	3.00	1.06	0.24	0.06

(For more detailed information, see Table F3 in Appendix F.)

Because the standardized test scores show a similar pattern to those on the unistructural scale of the Collis/Romberg Test (see the scatter plot for means on the two measures in Figure 16), a correlation coefficient between the class means of the two measures was calculated (r = .88). From this information, it is apparent that there is one low performing class and five high average classes.

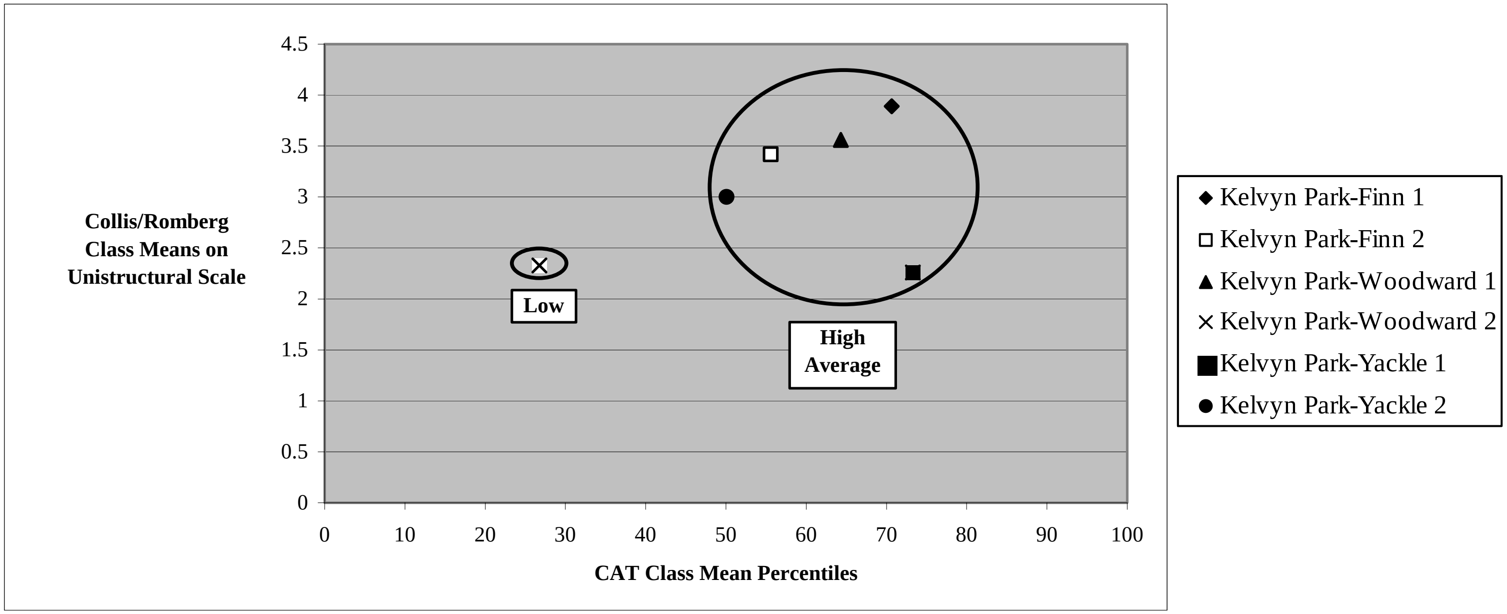


Figure 16. Scatter plot for class mean percentiles on the CAT test and the class means on the unistructural scale of the Collis/Romberg reasoning test, Grade 7, District 4.

Because the classes in District 4 varied so much on the two preceding achievement measures used in this study, either comparisons of student performances on outcome measures should be made only between classes in the same level of preceding achievement, or adjustments in outcome test scores should be made via covariance. In fact, because of this strong relationship between the two premeasures, only the standardized test scores should be considered as a potential covariate in order not to lose a degree of freedom in any statistical test about differences.

Finally, all students in the study responded to the items in the *Student Attitude Inventory;* six components are summarized here.

First, the class means for student judgments on items related to their effort, confidence, interest, usefulness, and ability to communicate mathematically are shown in Table 49. Each item was judged on a scale of 1–4 (1 = very true; 2 = true; 3 = not true; 4 = not true at all). Overall, the students in these classes judged the statements as true, and there was little variation within classes.

Table 49
Class Means on Student Judgment About Mathematics (Subscales of the Student Attitude Inventory), Grade 7, District 4

School-Class *(N)*	**Effort** *in mathematics*		**Confidence** *in ability to do mathematics*		**Interest** *in mathematics*		**Usefulness** *of mathematics*		**Ability to Communicate** *about mathematics*	
	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean	(*N*)	Mean
—MiC—										
Kelvyn Park-Finn 1 (30)	26	1.69	27	1.66	27	1.73	26	1.54	26	1.69
Kelvyn Park-Finn 2 (24)	20	1.85	22	1.97	20	2.21	17	1.74	18	1.79
Kelvyn Park-Woodward 1 (27)	19	1.68	19	1.81	18	1.78	19	1.62	17	1.60
Kelvyn Park-Woodward 2 (28)	20	1.70	24	2.13	23	2.09	23	1.91	22	1.88
Kelvyn Park-Yackle 1 (23)	17	1.61	18	1.66	17	1.84	18	1.58	17	1.76
Kelvyn Park-Yackle 2 (20)	11	1.91	12	1.82	10	2.10	10	1.74	12	2.02

(For more detailed information, see Table F4 in Appendix F.)

The class low on preceding achievement (Kelvyn Park-Woodward 2), however, tended both to be less confident in their ability to do mathematics and to believe mathematics less useful to them than did students in the other classes (see Figure 17).

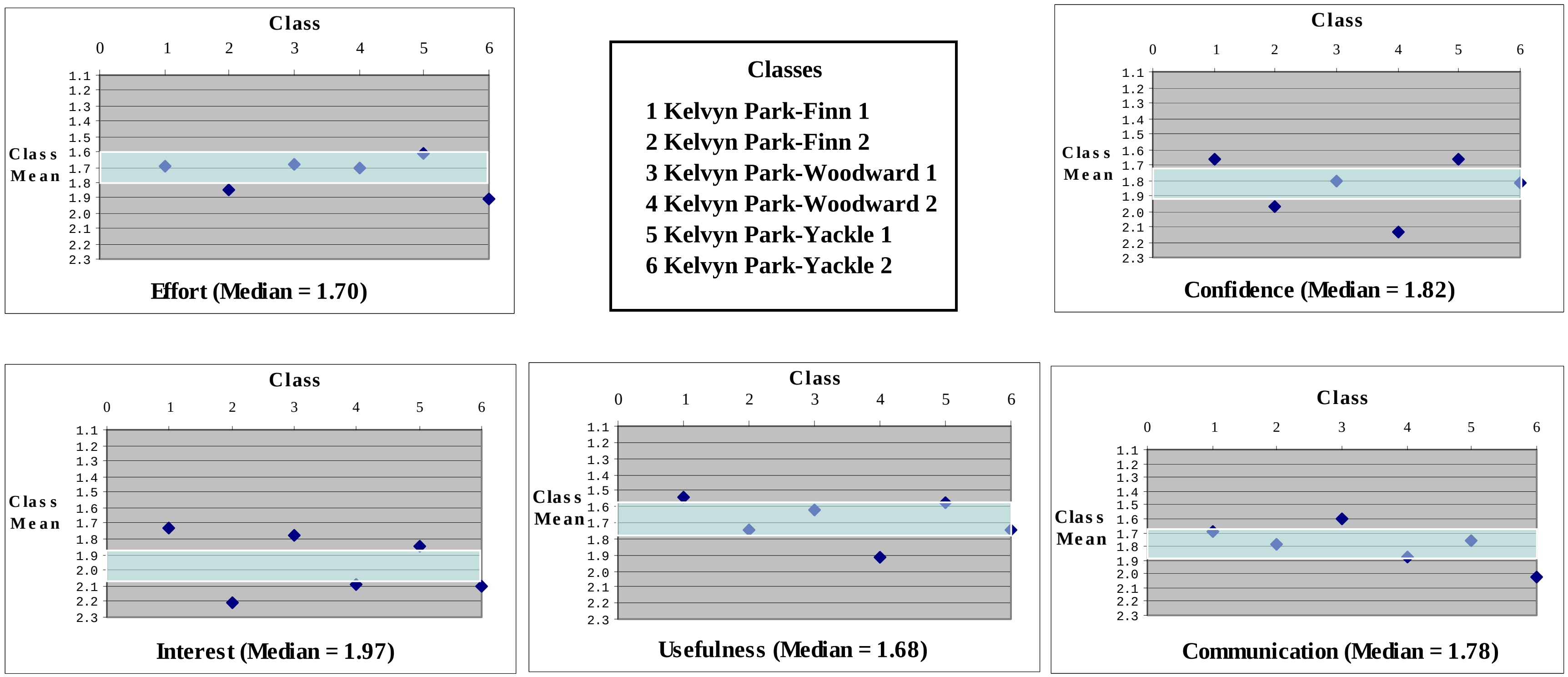


Figure 17. Plots showing class means on student judgments about mathematics, Grade 7, District 4. (Shaded areas show class medians $\pm$ 0.1.)

In the second component of the *Student Attitude Inventory*, students responded to 16 items related to general perceptions about mathematics (see Table F5 in Appendix F). Several items were reverse-scored due to wording of question. In general, little variance was seen among class means with respect to items related to general perceptions about mathematics. Students felt very confident that they were able to learn new ideas in mathematics class (from 1.22, Kelvyn Park-Finn 1, to 1.39, Kelvyn Park-Woodward 1, on Item 3). Students thought it was acceptable to solve mathematics problems differently than their classmates (from 1.13, Kelvyn Park-Finn 2, to 1.54, Kelvyn Park-Woodward 2, on Item 16). However, students were less confident (from 1.44, Kelvyn Park-Yackle 1, to 1.88, Kelvyn Park-Finn 2, on Item 4) that they could discover ways of solving problems that their teachers or their peers had not previously considered.

Students were confident that anyone who worked hard enough in mathematics class could be good at mathematics (from 1.06, Kelvyn Park-Yackle 1, to 1.54, Kelvyn Park-Woodward 2, on Item 11). Similarly, students disagreed that some students were naturally better, or worse, at mathematics than other students regardless of effort (from 2.13, Kelvyn Park-Finn 2, to 3.08, Kelvyn Park-Woodward 2, on Item 37).

Students felt that knowing how to solve a problem was as important as determining the answer (from 1.26, Kelvyn Park-Finn 1, to 2.04, Kelvyn Park-Woodward 2, on Item 53), although they felt that answering questions correctly in mathematics class require providing only numbers (from 1.15, Kelvyn Park-Finn 1, to 2.33, Kelvyn Park-Yackle 2, on Item 38). Students thought that getting correct answers in mathematics class was at least as important as understanding why the answer was correct (from 1.78, Kelvyn Park-Finn 1, to 2.73, Kelvyn Park-Yackle 2, on Item 27), although students felt that getting correct answers was more important than understanding a mathematics problem or the process of finding an answer (from 1.26, Kelvyn Park-Finn 1, to 2.42, Kelvyn Park-Yackle 2, on Item 49). Students disagreed that mathematics was mostly learned by memorizing facts and rules (from 2.48, Kelvyn Park-Finn 2, to 3.11, Kelvyn Park-Finn 1 and Kelvyn Park-Yackle 1, on Item 55). They also disagreed that they would get correct answers to their teachers' questions if they memorized rules or facts (from 3.17, Kelvyn Park-Yackle 1, to 3.58, Kelvyn Park-Woodward 1, on Item 44). Students disagreed that they did not know how to solve mathematics problems if they found they had to use calculators (from 2.45, Kelvyn Park-Finn 2, to 3.39, Kelvyn Park-Yackle 1, on Item 45) and that calculators always generated correct answers (from 1.95, Kelvyn Park-Woodward 1, to 2.83, Kelvyn Park-Yackle 1, on Item 6).

Students felt that new mathematics topics were related to ones they had already studied (from 2.00, Kelvyn Park-Finn 1, to 2.46, Kelvyn Park-Woodward 2, on Item 39). Students felt that mathematics was related to other school subjects (from 1.28, Kelvyn Park-Yackle 1, to 2.08, Kelvyn Park-Yackle 2, on Item 20), although they thought that mathematics was harder to understand than other school subjects (from 2.00, Kelvyn Park-Yackle 2, to 2.65, Kelvyn Park-Finn 2, on Item 28).

The third component involved students judging whether success or failure in mathematics could be attributed to teachers, ability, effort, or luck. The class means for these judgments are shown in Table 50. Each item was judged on a scale of 1–4 (1 = very true; 2 = true; 3 = not true; 4 = not true at all). All classes attributed success in mathematics to a combination of effort and ability, and failure to lack of effort.

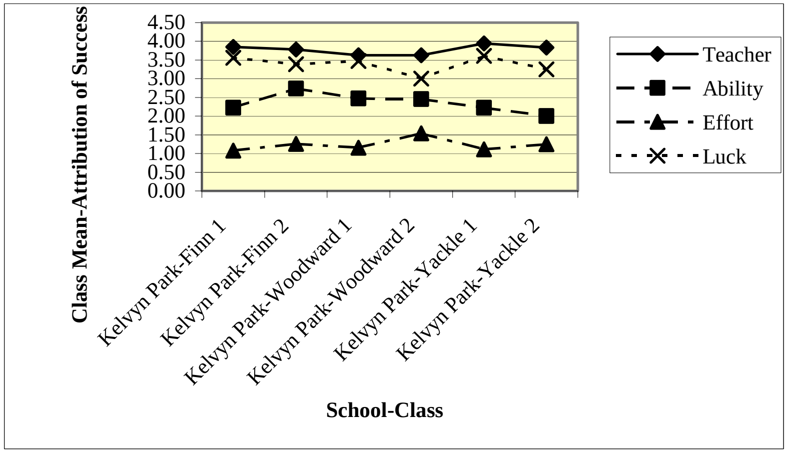
Table 50
Class Means on Student Attribution of Success or Failure in Mathematics, Grade 7, District 4

School-Class (*N*)	**Success**							
	Teacher		**Ability**		**Effort**		**Luck**	
	(*N*)	**Mean**	**(*N*)**	**Mean**	**(*N*)**	**Mean**	**(*N*)**	**Mean**
—MiC—								
Kelvyn Park-Finn 1 (30)	27	3.85	27	2.22	27	1.07	27	3.56
Kelvyn Park-Finn 2 (24)	23	3.78	23	2.74	23	1.26	23	3.39
Kelvyn Park-Woodward 1 (27)	19	3.63	19	2.47	19	1.16	19	3.47
Kelvyn Park-Woodward 2 (28)	24	3.63	24	2.46	24	1.54	24	3.00
Kelvyn Park-Yackle 1 (23)	18	3.94	18	2.22	18	1.11	18	3.61
Kelvyn Park-Yackle 2 (20)	12	3.83	12	2.00	12	1.25	12	3.25

School-Class (*N*)	**Failure**							
	Teacher		**Ability**		**Effort**		**Luck**	
	(*N*)	**Mean**	**(*N*)**	**Mean**	**(*N*)**	**Mean**	**(*N*)**	**Mean**
—MiC—								
Kelvyn Park-Finn 1 (30)	27	3.78	27	3.00	27	1.52	27	3.67
Kelvyn Park-Finn 2 (24)	22	3.64	24	2.92	20	2.45	21	3.67
Kelvyn Park-Woodward 1 (27)	19	3.58	19	3.00	19	1.53	19	3.42
Kelvyn Park-Woodward 2 (28)	23	3.57	24	2.92	23	2.00	24	3.29
Kelvyn Park-Yackle 1 (23)	18	3.83	18	3.28	18	1.50	18	3.89
Kelvyn Park-Yackle 2 (20)	12	3.67	11	2.91	12	2.25	11	3.45

The similarity in class means on these scales is shown in Figure 18a and 18b.

(a)



(b)

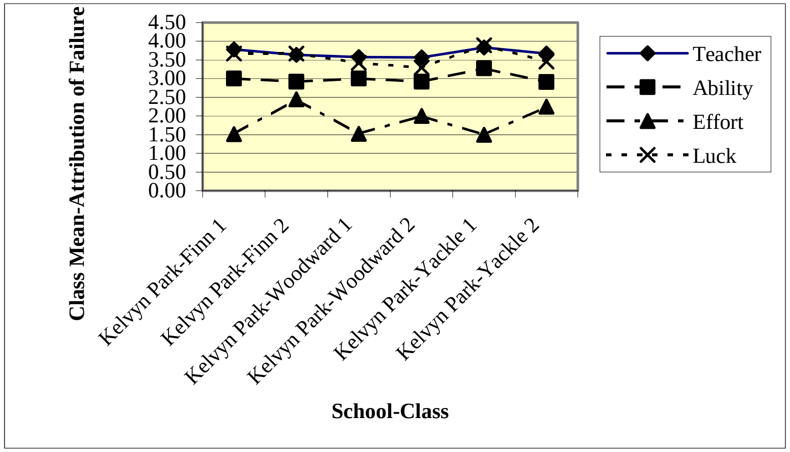


Figure 18. Line graphs showing class means of student attribution of (a) success and (b) failure in mathematics, Grade 7, District 4.

In the fourth component of the *Student Attitude Inventory*, students listed things they thought of when they heard the word "mathematics" (see Table 51). Although classes varied, students in all classes frequently listed words associated with number, including operations with numbers. Students in Kelvyn Park-Woodward 2 listed geometry-related words and students in Kelvyn Park-Yackle 1 listed thinking-related words more often than students in other seventh-grade classes in this district.

Table 51
Words Students Associated With "Mathematics," Grade 7, District 4

School-Class *(N)*	**Number of Responses[1] *(N)***	**Number[2] *(%)*[3]**	**Interest *(%)***	**Geometry *(%)***	**Negative Emotive Responses[4] *(%)***	**Thinking *(%)***	**Problem Solving *(%)***	**Algebra *(%)***	**Occupations *(%)***	**Miscellaneous *(%)***
					—MiC—					
Kelvyn Park-Finn 1 (27)	158	65	2	6	2	2	2	1	3	8
Kelvyn Park-Finn 2 (17)	99	66	3	2	9	4	1	3	1	8
Kelvyn Park-Woodward 1 (19)	111	77	1	5	0	1	2	5	0	4
Kelvyn Park-Woodward 2 (24)	87	49	2	10	2	6	6	2	5	10
Kelvyn Park-Yackle 1 (18)	84	52	5	5	2	14	2	5	0	11
Kelvyn Park-Yackle 2 (12)	48	81	0	4	0	2	0	2	0	2

[1] Students were asked to list the words they "think of when they hear the word mathematics."

[2] Responses included operations with numbers.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included "boring," "stupid," and statements of displeasure.

In the fifth component of the *Student Attitude Inventory*, students listed jobs other than teaching that required the use of mathematics (see Table 52). Although classes varied, students in all classes frequently listed service-related occupations, including retail sales, business, and food service, and financial-related occupations, such as accounting, banking, and insurance. Also, students in Kelvyn Park-Woodward 1 and Kelvyn Park-Yackle 2 listed professional-related occupations, including medical fields, engineering, and law, more often than students in other classes.

Table 52
Nonteaching Jobs that Students Identified as Requiring Mathematics, Grade 7, District 4

School-Class *(N)*	**Number of Responses[1] *(N)***	**Services[2] *(%)*[3]**	**Financial[4] *(%)***	**Professional[5] *(%)***	**Science *(%)***	**Trades *(%)***	**Creative Arts *(%)***	**Government *(%)***	**Sports *(%)***	**Unreportable[6] *(%)***
—MiC—										
Kelvyn Park-Finn 1 (27)	98	22	22	10	10	13	4	2	0	7
Kelvyn Park-Finn 2 (17)	53	34	13	9	13	8	2	2	2	6
Kelvyn Park-Woodward 1 (19)	66	24	20	21	6	0	3	0	9	6
Kelvyn Park-Woodward 2 (24)	66	30	6	8	5	12	8	2	8	14
Kelvyn Park-Yackle 1 (18)	47	32	26	9	11	4	2	0	0	9
Kelvyn Park-Yackle 2 (12)	26	27	31	15	8	0	0	0	0	8

[1] Students asked to list the jobs other than teaching that require mathematics.

[2] Responses included occupations in retail sales, business, and food service.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included occupations in accounting, banking, and insurance.

[5] Responses included occupations in medical fields, engineering, and law.

[6] Responses included teaching, thinking, and operations with numbers.

In the sixth component of the *Student Attitude Inventory*, students listed ways they used mathematics outside of class (see Table 53). Although classes varied, students in all classes frequently listed money-related ways, such as banking and shopping. Also, students in Kelvyn Park-Finn 2 and Kelvyn Park-Woodward 1 listed calculation-related ways more often than students in the other classes; and students in Kelvyn Park-Yackle 2 listed leisure-related ways more often than students in the other classes.

Table 53

Ways Students Used Mathematics Outside of Class, Grade 7, District 4

School-Class *(N)*	**Number of Responses[1] *(N)***	**Monetary[2] *(%)* [3]**	**Calculation *(%)***	**Leisure *(%)***	**Measurement *(%)***	**Problem Solving *(%)***	**Unreportable[4] *(%)***
			—MiC—				
Kelvyn Park-Finn 1 (27)	49	47	8	16	6	0	18
Kelvyn Park-Finn 2 (17)	26	31	23	12	12	4	15
Kelvyn Park-Woodward 1 (19)	33	45	27	3	0	3	21
Kelvyn Park-Woodward 2 (24)	31	48	10	0	6	0	35
Kelvyn Park-Yackle 1 (18)	19	58	5	11	5	0	11
Kelvyn Park-Yackle 2 (12)	16	50	6	19	6	0	19

[1] Students were asked to describe how they would use mathematics outside of class.

[2] Responses included banking and shopping.

[3] Percentage does not add to 100 due to number of unique responses.

[4] Responses included occupations and nonmathematics school subjects.

Finally, all students in the study responded to items on the *Student Questionnaire*, five components of which are summarized here. The first component involved student judgments about the school subject they enjoyed the most (see Table 54). Students generally reported that they liked mathematics, physical education (PE), and science classes more than other school subjects.

Table 54
Student Preference Ranking of Classes, Grade 7, District 4

School-Class (N)	**Subject *(%)***									
	SocStudies	**Science**	**Math**	**Reading**	**Writing**	**Art**	**Music**	**PE**	**Band**	**Other**
—MiC—										
Kelvyn Park-Finn 1 (30)	7	4	26	4	4	7	7	26	4	11
Kelvyn Park-Finn 2 (24)	13	17	13	0	13	4	4	26	0	9
Kelvyn Park-Woodward 1 (27)	25	13	38	6	0	0	0	6	0	13
Kelvyn Park-Woodward 2 (28)	23	14	9	14	5	5	5	5	0	23
Kelvyn Park-Yackle 1 (23)	6	12	12	0	0	6	18	29	0	18
Kelvyn Park-Yackle 2 (20)	7	29	29	0	0	21	0	14	0	0

The third component involved student judgments about their frequency of talking about mathematics with classmates, friends, and other acquaintances on three questions. Response frequency (never, sometimes, often, very often) for each class was strikingly different across questions and across classes (see Table 55).

Table 55

Student Judgment About Frequency of Communication About Mathematics, Grade 7, District 4

School-Class *(N)*	**Mathematical Ideas and Problem Strategies**					**Homework Problems**					**Ways Mathematics is Used Outside of School**				
	(*N*)	**Never**	**Some-times**	**Often**	**Very Often**	**(*N*)**	**Never**	**Some-times**	**Often**	**Very Often**	**(*N*)**	**Never**	**Some-times**	**Often**	**Very Often**
— MiC —															
Kelvyn Park-Finn 1 (30)	27	11	56	26	7	27	15	30	41	15	27	11	67	19	4
Kelvyn Park-Finn 2 (24)	23	4	70	13	13	23	9	13	43	35	23	17	52	13	17
Kelvyn Park-Woodward 1 (27)	14	14	50	29	7	14	21	29	36	14	14	29	71	0	0
Kelvyn Park-Woodward 2 (28)	22	0	59	23	18	21	5	24	43	29	21	29	29	24	19
Kelvyn Park-Yackle 1 (23)	17	12	41	35	12	17	0	6	35	59	17	65	18	6	12
Kelvyn Park-Yackle 2 (20)	14	7	57	21	14	14	14	29	43	14	14	14	50	29	7

Note: Response rates designate class mean percents.

The third component involved student judgments about the things they liked the most about mathematics class (see Table 56). Although the classes varied, students in most classes reported that they liked working with numbers, in the percent of responses for this category.

Table 56

What Students Liked Most About Mathematics Class, Grade 7, District 4

School-Class *(N)*	**Number of Responses[1] *(N)***	**Number *(%)*[2]**	**Problem Solving *(%)***	**Classwork *(%)***	**Working With Others *(%)***	**Miscellaneous[3] *(%)***	**Negative Emotional Response[4] *(%)***	**Positive Emotional Response[5] *(%)***
—MiC—								
Kelvyn Park-Finn 1 (30)	85	39	4	7	7	9	0	4
Kelvyn Park-Finn 2 (24)	57	21	7	14	2	9	7	5
Kelvyn Park-Woodward 1 (27)	43	16	5	2	0	28	2	5
Kelvyn Park-Woodward 2 (28)	56	43	7	0	2	11	2	5
Kelvyn Park-Yackle 1 (23)	57	60	0	2	4	2	0	0
Kelvyn Park-Yackle 2 (20)	36	36	0	0	6	3	0	8

[1] Students were asked to name three things they liked most about mathematics class.

[2] Percentage does not add to 100 due to number of unique responses.

[3] Responses included "teacher," "computer," and "warm-up activities."

[4] Responses included "hard," "boring," and "restrictive."

[5] Responses included "like it all" and "fun."

Additional patterns were revealed when examining student judgments about number (see Table 57). Kelvyn Park-Woodward 1 and 2 reported preferences for addition and multiplication whereas the other classes indicated preferences for other number-related concepts. Also, most classes reported preferences for working with fractions.

Table 57
What Students Liked Most About Mathematics Class, Grade 7, District 4 (continued)

School-Class *(N)*	**Number of Responses[1] *(N)***	**Addition *(%)***	**Subtraction *(%)***	**Multiplication *(%)***	**Division *(%)***	**Decimals *(%)***	**Fractions *(%)***	**Other[2] *(%)***
—MiC—								
Kelvyn Park-Finn 1 (30)	33	9	6	9	12	0	3	61
Kelvyn Park-Finn 2 (24)	12	8	0	0	8	0	17	67
Kelvyn Park-Woodward 1 (27)	7	14	14	29	0	29	14	0
Kelvyn Park-Woodward 2 (28)	24	29	17	13	13	0	17	13
Kelvyn Park-Yackle 1 (23)	34	3	3	21	9	9	15	41
Kelvyn Park-Yackle 2 (20)	13	8	0	31	0	0	23	38

[1] Students were asked to name three things they liked most about mathematics class.

[2] Responses included counting, average, estimation, least common denominator, least common multiple, money, rounding and time.

The fourth component involved student judgments about the things they disliked most about mathematics class (see Table 58). All classes reported that they disliked working with numbers, although the classes varied.

Table 58

What Students Disliked Most About Mathematics Class, Grade 7, District 4

School-Class *(N)*	**Number of Responses[1] *(N)***	**Number *(%)* [2]**	**Classwork *(%)***	**Homework *(%)***	**Tests *(%)***	**Problem Solving *(%)***	**Book *(%)***	**Miscellaneous [3] *(%)***	**Negative Emotional Response[4] *(%)***	**Positive Emotional Response[5] *(%)***
—MiC—										
Kelvyn Park-Finn 1 (30)	79	38	18	8	6	4	0	10	5	6
Kelvyn Park-Finn 2 (24)	56	32	20	9	2	4	2	13	9	4
Kelvyn Park-Woodward 1 (27)	42	19	2	10	0	2	2	12	10	2
Kelvyn Park-Woodward 2 (28)	49	14	12	14	8	0	0	8	4	12
Kelvyn Park-Yackle 1 (23)	48	60	2	10	2	4	0	4	0	2
Kelvyn Park-Yackle 2 (20)	34	26	3	6	3	6	0	3	6	6

[1] Students were asked to name three things they disliked the most about mathematics class.

[2] Percentage does not add to 100 due to number of unique responses.

[3] Responses included "teacher," "computer," and "warm-up activities."

[4] Responses included "hard," "boring," and "restrictive."

[5] Responses included "like it all" and "fun."

Additional patterns were revealed when examining student judgments about number (see Table 59). Students in most classes reported that they disliked division and working with fractions, although the classes varied in the percent of responses in these categories.

Table 59
What Students Disliked Most About Mathematics Class, Grade 7, District 4 (continued)

School-Class *(N)*	**Number of Responses[1] *(N)***	**Addition *(%)***	**Subtraction *(%)***	**Multiplication *(%)***	**Division *(%)***	**Decimals (%)**	**Fractions *(%)***	**Other[2] *(%)***
—MiC—								
Kelvyn Park-Finn 1 (30)	30	7	0	3	10	27	30	23
Kelvyn Park-Finn 2 (24)	18	6	11	11	22	17	11	22
Kelvyn Park-Woodward 1 (27)	8	13	13	13	13	0	25	25
Kelvyn Park-Woodward 2 (28)	7	0	14	29	43	14	0	0
Kelvyn Park-Yackle 1 (23)	29	3	17	3	10	7	21	38
Kelvyn Park-Yackle 2 (20)	9	11	0	0	33	11	22	22

[1] Students were asked to name three things they disliked the most about mathematics class.

[2] Responses included counting, average, estimation, least common denominator, least common multiple, money, rounding and time.

The fifth component involved student judgments about the ways mathematics helped them in other subjects (see Table 60). Although classes varied, students most classes reported that mathematics was used in both general applications, such as estimating and calculating, and specific applications, such as measurement and problem solving.

Table 60

Student Perception of the Usefulness of Mathematics in Other Classes, Grade 7, District 4

School-Class *(N)*	**Number of Responses[1] *(N)***	**General Applications[2] *(%)***	**Specific Applications[3] *(%)***	**Organization of Information *(%)***	**No Help *(%)***	**Miscellaneous *(%)***	**Inappropriate Responses[4] *(%)***
			—MiC—				
Kelvyn Park-Finn 1 (30)	58	29	43	2	0	5	21
Kelvyn Park-Finn 2 (24)	50	16	46	2	2	16	18
Kelvyn Park-Woodward 1 (27)	33	12	12	0	12	3	61
Kelvyn Park-Woodward 2 (28)	37	22	19	0	3	3	54
Kelvyn Park-Yackle 1 (23)	26	27	19	4	8	4	38
Kelvyn Park-Yackle 2 (20)	28	7	50	0	0	0	43

[1] Students were asked to identify how their knowledge of mathematics and the way they learned mathematics helped them in other classes.

[2] Responses included "estimating" and "calculating."

[3] Responses included "measurement" and "problem solving."

[4] Responses included "not good at math", "need to know something", "it's easier and more fun", "not good ", etc.

Summary

This working paper described the background characteristics of the 34 seventh-grade classes in the four school districts involved in the longitudinal/cross-sectional study of the impact of *Mathematics in Context* on student performance. The classes contained 12-year-old students with a comparable number of boys and girls in Districts 1 and 4 and more uneven assignment of boys and girls in Districts 2 and 3. The ethnicity of students in the classes and in the districts varied with more African American and White students in most District 1 classes, Hispanic and Multiracial students in District 2 classes, White students in District 3 classes, and African American, Hispanic, and Multiracial students in District 4.

Classes showed between-class and within-class variation on measures of prior achievement (*TerraNova* in Districts 1 and 3, *Stanford Mathematics Achievement Test* in District 2, and *California Achievement Test* in District 4). On the *Collis-Romberg Mathematical Problem Solving Profiles*, most students exhibited unistructural reasoning, many students began to reason at the multistructural level, and few students demonstrated reasoning at relational or extended abstract levels. Classifying classes in terms of both tests yielded a picture of low, average, and high average classes in District 1; low and average classes in District 2; average (special education class) and high average classes in District 3; and low and high average classes in District 4.

Class means on the *Student Attitude Inventory* were very similar across districts. Students believed that they would succeed in mathematics class if they put forth the effort. They felt confident in their abilities to do mathematics and communicate mathematically. Students were interested in mathematics, and they felt that mathematics was useful in their daily lives. The exception was the special education student in District 3 who valued effort less, was less confident in abilities to do mathematics and communicate mathematically, and felt that mathematics was less useful than other students at this grade level. Students attributed success in mathematics to a combination of effort and ability, and failure to lack of effort. Students most frequently associated number-related items with mathematics and identified service- and financial-related occupations as those that required mathematics. Students noted monetary- and calculation-related uses of mathematics outside of school.

Class means on the *Student Questionnaire* were similar across districts. Students most enjoyed Physical Education and Art classes. In mathematics class, they most liked miscellaneous classroom activities and disliked division. Students also reported that they used mathematics in other classes in general applications such as estimating and calculating and in specific applications such as measurement and problem solving.

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APPENDIX A

STUDENT BACKGROUND

A Longitudinal/Cross-Sectional Study of the Impact of *Mathematics in Context* on Student Mathematical Performance

Student Questionnaire

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Shafer, M. C. (1997). *Student questionnaire* (*Mathematics in Context* Longitudinal/Cross-Sectional Study Working Paper No. 2). Madison, WI: University of Wisconsin–Madison.

The development of this instrument was supported by a grant from the National Science Foundation #REC-9553889 and the Wisconsin Center for Education Research, School of Education, University of Wisconsin-Madison. Any opinions, findings, or conclusions are those of the author(s) and do not necessarily reflect the views of the supporting agencies.

Description of Student Questionnaire

The Student Questionnaire was designed to gather information on students' fixed characteristics, their interest in mathematics class, the nature of their communication about mathematics, and ways they use mathematics in other classes. Items 3, 6, 7, 8, 10, 11, 12, 13, 14, and 15 on the Student Questionnaire were adapted from Webb & Dowling (1993).

The purpose of the first section of the Student Questionnaire is to collect information about students' names, date of birth, and schools attended. On Items 1–3, students list their (a) first name, last name, and middle initial; (b) date of birth; and (c) grade level during the current school year. Students' date of birth was useful in calculating the mean age of each class and in tracking individual students over time, particularly when they have common names (e.g., Juan Perez, Jack Smith) or when they used nicknames one year and formal names another (e.g., Kathy, Kathleen). On Item 4, students entered the name of the school they attended in the current school year and the city and state in which the school was located. During the second and third years of the study, students also entered the name of the school they had attended in the previous school year. This information was especially important for tracking fifth-grade students who were promoted to middle school and for students in districts with high mobility rates (e.g., Districts 2, 4). On Item 5, students entered the name of their teacher.

In the second section of the Student Questionnaire, information was gathered on students' fixed characteristics. On Item 6, students identified their sex. On Item 7, students identified their ethnicity. Based on input from district personnel involved in the longitudinal study, two categories were added prior to the first administration of the questionnaire: Multiracial and Haitian. Students were also given the option of specifying inclusion in a second group. Analysis of these responses proved difficult for two reasons. First, some students marked Multiracial and indicated "White" and an ethnic group such as "Italian." These responses were coded as "White." Some students circled two categories such as "Hispanic" and "White." These responses were coded "Multiracial." Other students listed religions such as Muslim. These responses were coded as "Other." In the analysis of these data, responses for students who participated in the longitudinal study for two years or for three years were reviewed together to look for consistency in responses. On Item 8, students circled whether they thought they communicated better in English or another language.

The purpose of the third section of the Student Questionnaire was to collect information about students' favorite subjects, which was addressed in Item 9. Students circled the school subject they enjoyed the most: social studies, science, math, reading, writing, art, music, physical education, band, or self-identified subject.

In the fourth section of the Student Questionnaire, Items 10–12, students identified the frequency with which they talked about three items with their classmates, friends, or acquaintances about: (a) mathematical ideas and ways to solve problems, (b) mathematical problems assigned for homework, and (c) ways that mathematics was used outside of school. Students circled a response on a scale that included Never, Sometimes, Often, and Very Often.

In the final section of the Student Questionnaire, students responded to three open-ended questions. On Item 13, students listed three things they enjoyed most, and on Item 14 three things they enjoyed least about their mathematics class. On item 15, students identified ways their knowledge of mathematics and the way they learned mathematics helped them in other classes. Responses from students in Grades 5, 6, and 7 were very similar across grade levels. Because of the amount of time and resources used to code and synthesize responses to Items 13–15 for the first year of the study, responses on these items were not summarized for the following two years.

The Student Questionnaire was administered in the fall of each study year (see directions for administering the Student Questionnaire in this appendix). Teachers were instructed to assist students in completing Items 6–12 and to encourage students to complete Items 13–15.

Reference

Webb, N. L., & Dowling, M. (1993). *Evaluation study of the interactive mathematics program (IMP): A preliminary report on the results of questionnaires administered to teachers, students, and parents*. Madison, WI: University of Wisconsin–Madison.

Student Questionnaire

The Student Questionnaire is designed to collect information about students' background and their interests in studying mathematics. The Student Questionnaire should take less than one class period to complete.

Please ask students to clearly print their names and other requested information for Items 1–5.

Please assist students in circling the appropriate information for Items 6–8. Students may also need assistance in circling their responses to Items 9–12. Please encourage students to complete Items 13–15.

If a student is absent, please arrange for the student to complete the Student Questionnaire as soon as possible after returning to school.

After administering the questionnaire, please check that all students have clearly printed their names on the front of the questionnaire. Enclose the questionnaires (both completed and unused copies) in the provided envelopes for mailing to Madison.

We appreciate the work you have done in gathering information during the *Mathematics in Context* longitudinal study. We thank you for your continued participation and support.

Sincerely,

The Staff of the *Mathematics in Context* Longitudinal Study

Today's Date ____________________

STUDENT QUESTIONNAIRE

Please answer the questions on both sides of this paper as thoroughly as you can. Your responses will not affect your grade in any way, so answer as honestly as you can. When you finish answering all the questions, return this form to your teacher. Thank you for completing the information on this questionnaire.

1. Your Name:

____

Last name First name Middle Initial

2. Date of birth: ________________________

Month - Day - Year

3. What grade are you in? ____________ grade

4. Name of your school **THIS YEAR** ______________________________________

City: ______________________ State: ______________________

Name of your school **LAST YEAR** ______________________________________

City: ______________________ State: ______________________

5. Name of your teacher ____

6. What is your gender? (circle one)

Female …………………….. 1 Male…………………….. 2

7. How do you best describe yourself? (Circle as many as apply)

African American ………………….…. 1
American Indian, Eskimo, or Aleut … 2
Asian or Pacific Islander ……………… 3
Hispanic ………………………………. 4
White …………………………………. 5
Multiracial ……………………………. 6
Haitian ……………………………….. 7
Other (specify) ____________________ 8

8. Do you communicate better in English than in any other language? (Circle one)

Yes…………………………….. 1 No ……………………….. 2

9. What class or subject area do you enjoy studying most? (Circle one)

Social Studies ……………..	1
Science ……………………	2
Math ………………………	3
Reading ……………………	4
Writing …………………….	5
Art …………………………	6
Music ………………………	7
Physical Education ………...	8
Band ………………………..	9
Other (specify) ______________	10

About how often do you talk about the following topics with your classmates, friends, and other acquaintances? (Please circle one for each item)

	Never	Sometimes	Often	Very Often
10. Mathematical ideas and ways to solve problems.	0	1	2	3
11. Mathematical problems assigned for homework.	0	1	2	3
12. The ways that mathematics is used outside of school.	0	1	2	3

13. What are three things that you enjoy the <u>most</u> about math class?

____

____

____

____

14. What are three things that you enjoy the <u>least</u> about math class?

____

____

____

____

15. How has your knowledge of mathematics and the way you learn mathematics helped you in other classes such as science and social studies?

____

____

____

____

Appendix B

STUDENT ATTITUDE INVENTORY

A Longitudinal/Cross-Sectional Study of the Impact of *Mathematics in Context* on Student Mathematical Performance

Student Attitude Inventory

(Working Paper #7)

Mary C. Shafer, Lesley R. Wagner, and Jon Davis

Wisconsin Center for Education Research
University of Wisconsin–Madison

Shafer, M. C., Wagner, L. R., & Davis, J. (1997). *Student attitude inventory* (*Mathematics in Context* Longitudinal/Cross-Sectional Study Working Paper No. 7). Madison, WI: University of Wisconsin-Madison.

The development of this instrument was supported by a grant from the National Science Foundation #REC-9553889 and by the Wisconsin Center for Education Research, School of Education, University of Wisconsin-Madison. Any opinions, findings or conclusions are those of the author(s) and do not necessarily reflect the views of the supporting agencies.

Description of Student Attitude Inventory

The Student Attitude Inventory was designed to characterize the attitudes of middle-school students toward mathematics and toward themselves as learners of mathematics. The Student Attitude Inventory is composed of two sections: statements rated on a Likert scale, and open-response items. The first section of the Student Attitude Inventory is a set of statements written to reflect important constructs related to students' attitudes and beliefs about mathematics and themselves as learners of mathematics. The statements were grouped into seven subscales: effort to succeed in mathematics, interest in and excitement about mathematics, confidence in learning mathematics, communication of mathematical ideas, usefulness of mathematics, general perceptions about mathematics and learners of mathematics, and attribution of success and failure in perceptions of mathematics. The statements on the attitude instrument are collections of items used in previous research on student attitudes (Dossey, Mullis, Gorman, & Latham, 1994; Fennema & Sherman, 1986; Kloosterman & Stage, 1992; Schoenfeld, 1989). These items were reworded to update the terminology and to facilitate their use with younger audiences than those for which they were originally intended. New items were also composed to reflect current constructs of import within the reform movement, (e.g., technology, communication, collaboration). Each subscale consist of from 5–16 statements worded to show eiher positive or negative attitudes relevant ‘to the context’ of the subscale.

Following Schoenfeld (1989), each statement was accompanied by a 4-point Likert scale indicating student level of agreement: “very true," “sort of true,” “not very true,” “not true at all.” The direction of the scoring weights assigned to the response categories depends on whether a particular statement was worded favorably or unfavorably (Edwards & Porter, 1972). If a statement was worded favorably, scoring weights assigned to the four categories would be 1 for "Very True," 2 for "Sort of True," 3 for "Not Very True," and 4 for "Not True at All." If a statement reflected a “negative” attitude, the direction of the scoring weights was reversed (e.g., "Not True at All" received a score of 1, and so on). Thus a reflected “negative” attitude ratings on two related but contradictory statements should have resulted in approximately the same score. Computing the mean score of the subscale provided an overall indication of the individual's attitudes with respect to a particular subscale. In this attitude inventory, students had relatively low scores if their responses to students reflected a positive attitude and relatively high scores if their responses reflected a negative attitude to a given subscale. Conversely, students will have relatively high scores.

Pilot-test. Initially, 75 statements reflecting the beliefs represented in the seven subscales were written. Nine educators (classroom teachers, professors, and graduate students) then read through the 75 statements and sorted them into subscales. Statements categorized into subscales with 79% or more agreement maintained their initial placement in the subscales. Items with less than 79% agreement were reworded, moved to a different subscale, or dropped. Sixty-five items remained and were randomly distributed throughout the inventory with efforts made to avoid using items from the same subscale in succession. The instrument was then pilot-tested in both reform and conventional elementary- and middle-school classrooms to test for reliability. A time limit was not given for completing the inventory; administration typically took between 20 and 30 minutes. Inter-item correlation, squared multiple correlation, and reliability (Cronbach’s alpha) were calculated for each subscale after a given item was removed from it. As a result, the inventory was pared down to 60 Likert-scale items.

Subscales

Effort. The effort subscale measured students' belief that with sufficient effort, anyone could learn mathematics and improve their mathematical abilities. The subscale included the following statements:

2. If I try hard, I can do well in math.
21. If a problem we worked on in math doesn't get solved during class, I still think about it after class is over and try to figure it out even if the teacher didn't tell me to.
33. If I don't understand a math problem, I give up without trying very hard to figure it out.
43. If I can't solve a math problem right away, I give up after a few minutes.
46. If I have trouble figuring out a problem right away, I don't like to stop working on it until I get an answer that makes sense.
58. I try not to do more work in math than I have to.

Interest in and excitement about learning mathematics. The interest subscale measured students' enjoyment of learning mathematics. The subscale included the following statements:

1. I like mathematics.
10. I like learning new things in math.
13. Math is so hard to do, it isn't any fun.
17. I don't understand why some people seem to think math is fun.
24. I like to work on new math problems that are different from others that I have worked on before.
34. Math is my favorite class.
57. Learning mathematics is not interesting to me.

Confidence. The confidence subscale measured students' confidence in their abilities to learn mathematics and perform well on mathematical tasks. The subscale included the following statements:

9. I usually do not know the answers to the questions my teacher asks in math class.
18. I'm not the type of person who does well in math.
25. I don't get worried if my first plan to solve a problem doesn't work, since I know many ways to try to figure problems out.
31. Even if I don't understand a math problem right away, I know I will be able to figure it out if I work at it.
42. I am certain that I can do well in math classes that I will take later on in school.

Communication. The communication subscale measured students' beliefs about the importance of communication in developing mathematical understanding, both for the individual and for shared understanding in the classroom community. The subscale also measured students' beliefs about the teacher's interest in student ideas about mathematical content. The subscale included the following statements:

12. My classmates contribute important ideas which help me understand mathematics.
23. I have many chances during math class to answer questions and explain my ideas to my teacher and classmates.
29. I don't take part in discussions during math class very often.
32. I can learn a lot by working with other people to solve math problems.
35. Being able to explain your ideas clearly is an important part of learning mathematics.
47. I like to share my ideas during class discussions in math.
56. My teacher thinks my ideas about math.

Usefulness of mathematics. The usefulness subscale measured students' beliefs about the relevance of mathematics to daily life and about the usefulness of mathematics in helping people to acquire and succeed in jobs. The subscale included the following statements:

5. When I finish school, mathematics will not be important in my life.
15. Mathematics helps me make sense of things in the world.
19. Mathematics is important only because it is a subject I have to take in school.
26. I never see mathematics being used except when I'm in math class.
40. Knowing mathematics is not necessary in getting a good job.
50. I would like a job that uses mathematics often.
60. Mathematics is useful in everyone's life.

General perceptions. The general perception subscale measured attitudes related to calculator use, the nature of mathematics (problem solving versus facts or rules), the learning of mathematics (the importance of understanding a concept versus arriving at an answer), and connections of mathematics to other school subjects. One item related to confidence (Item 3) and two items related to effort (Items 11 and 37) were also included in the general perception subscale. When these items were included in the effort and confidence subscales, the reliability of each subscale was compromised. These items, however, were not deleted from the attitude inventory because of their significance in characterizing student attitudes toward mathematics.

Two items per concept were included in the general perceptions subscale to assure consistency of student responses (e.g., "Anyone who works hard enough can be good at math, no matter how hard a person works" and "Some people are just naturally good at math and some are just not"). Taken together, the items on the general perception subscale form a profile of a student's general conceptions of mathematics. The results in the general perception subscale, however, cannot be aggregated across items because the individual items cover a wide range of tangentially related conceptions; a mean score for the subscale would not yield meaningful results.

The general perceptions subscale measured students' beliefs about the nature of mathematics and the role of calculators in problem solving and in supporting accurate calculations. The subscale included the following statements:

3. I feel sure that I'm able to learn new ideas in math class.
4. In mathematics, you can discover new ways of solving problems that the teacher or your classmates may not have thought of.
16. It's okay if I solve a math problem differently than my classmates do.
11. Anyone who works hard enough can be good at math.
37. No matter how hard a person works, some people are just naturally good at math and some are just not.
53. Knowing how to solve a problem is as important as getting the answer.
38. Answering questions correctly in math means only giving a number.
27. Understanding why an answer is right is not as important as getting the right answer.
49. It really doesn't matter if you understand a math problem or how you get an answer as long as the answer you get is right.
55. Mathematics is mostly learned by memorizing facts and rules.
44. When my teacher asks a question, I will get it right if I had memorized the correct rule or fact.
45. If you have to use a calculator to solve a problem, you don't really understand how to do the problem.
6. If I use a calculator to solve a problem, I can be sure it will always give me the right answer.
20. Mathematics is not related to any of my other school subjects.
39. Each new math topic I study is not related to ones I have learned before.
28. Mathematics is more difficult to understand than other subjects.

Attribution. The attributions subscale measured students' beliefs about the internal factors (ability and effort) or external factors (teacher or luck) that influenced their success and failure in mathematics. This subscale was composed of 10 items in four categories that characterized students' beliefs about the causes of their success or failure in mathematics. The ability category included items that elicited students' attribution of success or failure related to innate possession or lack of skill, talent, or the capacity to understand mathematics. The effort category was composed of items that measured the student's attribution of success or failure related to time and effort invested in studying mathematics and the student's attention to accuracy. The teacher category contained items that indicated whether a student attributed success or failure to the teacher's partiality toward that student. The luck category included items that related to students' attribution of success or failure to chance. Two items per category were included in the attributions subscale (see Table 1) to assure consistency of student responses (e.g., "When I do well in math, it's because the teacher likes me" and "When I don't do well in math, it's because the teacher doesn't like me"). Two additional items (Items 8 and 54) were included as fillers to support the results of the effort and luck categories.

Table 1
Categorization of Items in the Attribution Subscale

Attribution	Success	Failure
Teacher	14. When I do well in math, it's because the teacher likes me.	36. When I don't do well in math, it's because the teacher doesn't like me.
Ability	7. When I do well in math, it's because I'm naturally a good math student.	22. When I don't do well in math, it's because I'm not good at math.
Effort	41. When I do well in math, it's because I have worked hard.	59. When I don't do well in math, it's because I haven't studied hard enough.
Luck	30. When I do well in math, it's because I was lucky.	48. When I don't do well in math, it's because I was unlucky.

Fillers:
54. When I do well in math, I'm never sure how it happened.
8. When I don't do well in math, it's because I was careless.

Similar to the general perception subscale, the results of the attribution subscale cannot be aggregated across items. The individual items measured attribution of success or failure in relation to four distinct constructs. Furthermore, items worded to reflect a "negative" attitude were not reverse-scored. In the case of attribution, the response to a particular item indicates whether the student attributes success or failure in mathematics to a particular cause. For two related items that are compatible, one coded for success and one coded for failure, we expect the scores to be the same. Aggregating the results into a mean score for the subscale would not yield meaningful results.

Open-Response Items

In the second section of the Student Attitude Inventory, four open-ended items were included to allow students to provide more extensive answers on their ideas about mathematics and its uses outside of school. For Item 1, students listed words they associated with "mathematics." For Item 2, students listed occupations besides teaching that they believed required the use of mathematics. For Item 3, students described ways they used mathematics outside of class. For Item 4, students described other ways people might use mathematics. Responses for Item 4 did not reveal any information different from Item 2. Therefore, responses to Item 4 were not coded or summarized. Responses from students in Grades 5, 6, and 7 were similar across grade levels. Because of the amount of time and resources used to code and synthesize responses to Items 1–3 for the first year of the study, responses to these items and Item 4 were not summarized for the second and third years of the study.

Administration in the Study

In the first year of the study, the Student Attitude Inventory was administered in September and May. The fall administration of the inventory was used as background information. The spring administration from the first study year was used as background information for the second year, in combination with the results of the inventory for students who began the study in the second year. The spring administration from the second study year was used as background information for the third year. The final administration of the Student Attitude Inventory occurred in the spring of the third study year. The results of this administration will be used for comparison purposes.

References

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Schoenfeld, A. (1989). Explorations of students’ mathematical beliefs and behavior. *Journal for Research in Mathematics Education*, *20*(4), 338–355.

Student Attitude Inventory

The Student Attitude Inventory was designed to elicit information related to seven subscales including effort to learn mathematics, interest and excitement about mathematics, and general perceptions of the nature of mathematics.

The Student Attitude Inventory will take one (45-minute) class period to administer. When you administer the assessment, please read the instruction page aloud as the students follow along. (The instruction page is on the booklet cover.) In Part I, students circle the number under the answer that tells best what they think or feel for each statement. In Part II, students complete four open-response questions.

All students should indicate the date they completed the inventory. In the event a student is no longer in your class, please indicate that on the booklet and return the booklet with the class set. We have enclosed a few extra booklets for you in case your class enrollment has changed. If students use the extra booklets, please make sure that name, school, and teacher blanks are completed.

If students are absent on the days you administer the inventory, please arrange for these students to complete the inventory as soon as possible after they return to school.

Enclose the questionnaires (both completed and unused copies) in the provided envelopes for mailing to Madison.

We appreciate the work you have done in gathering information during the *Mathematics in Context* Longitudinal Study. We thank you for your continued participation and support.

Sincerely,

The Staff of the *Mathematics in Context* Longitudinal Study

Student Attitude Inventory

Student Name ____

Teacher Name ____

School ____

Date ____

On the following pages you will find some statements about math. This is NOT a test. There are no right or wrong answers. Your teacher will not see your answers, and your answers will not affect your grade. We are interested in your opinions and your ideas about math, so answer the questions as honestly as you can.

DIRECTIONS:

Part I:
You will be asked to tell how much you agree or disagree with statements about math. Each statement is followed by four numbers. For each statement, decide which answer best shows how you feel. Then, circle the number under the answer that tells best what you think or feel. Circle only one number for each statement.

Sometimes you might be given a statement such as:

	very true	sort of true	not very true	not true at all
Red is a beautiful color.	1	2	3	4

If you think this statement is very true, circle the number 1.
If you think this statement is sort of true, circle the number 2.
If you think this statement is not very true, circle the number 3.
If you think this statement is not true at all, circle the number 4.

Here is a practice question for you.

Suppose you are given the statement:

	very true	sort of true	not very true	not true at all
It is more fun to play outdoors than indoors.	1	2	3	4

If you think that this statement is very true, circle the number 1.
If you think that this statement is sort of, but not always, true, circle the number 2.
If you think that this statement is not very true, but you don't disagree with it entirely, circle the number 3.
If you think that this statement is not true at all, circle the number 4.

Think carefully about each statement, but do not spend too much time on any one statement. If you are not sure of an answer, skip it and come back to it once you have answered all the other questions. However, make sure you answer ALL the questions. Remember to choose the answer that tells best how YOU feel about each statement. The only right answers are the ones that you believe are true.

Part II:
You will be asked a question about mathematics. Please give a short answer for each question. You do not have to write in complete sentences.

Part I. Select the answer that tells best how you feel about each statement. Circle only one answer for each statement.

		very true	sort of true	not very true	not true at all
1.	I like mathematics.	1	2	3	4
2.	If I try hard, I can do well in math.	1	2	3	4
3.	I feel sure that I am able to learn new ideas in math class.	1	2	3	4
4.	In mathematics, you can discover new ways of solving problems that the teacher or your classmates may not have thought of.	1	2	3	4
5.	When I finish school, mathematics will not be important in my life.	1	2	3	4
6.	If I use a calculator to solve a problem, I can be sure it will always give me the right answer.	1	2	3	4
7.	When I do well in math, it's because I'm naturally a good math student.	1	2	3	4
8.	When I don't do well in math, it's because I was careless.	1	2	3	4
9.	I usually do not know the answers to the questions my teacher asks in math class.	1	2	3	4
10.	I like learning new things in math.	1	2	3	4
11.	Anyone who works hard enough can be good at math.	1	2	3	4
12.	My classmates contribute important ideas which help me understand mathematics.	1	2	3	4
13	Math is so hard to do, it isn't any fun.	1	2	3	4
14.	When I do well in math, it's because the teacher likes me.	1	2	3	4
15.	Mathematics helps me make sense of things in the world.	1	2	3	4

	very true	sort of true	not very true	not true at all
16. It’s okay if I solve a math problem differently than my classmates do.	1	2	3	4
17. I don’t understand why some people seem to think math is fun.	1	2	3	4
18. I’m not the type of person who does well in math.	1	2	3	4
19. Mathematics is important only because it is a subject I have to take in school.	1	2	3	4
20. Mathematics is not related to any of my other school subjects.	1	2	3	4
21. If a problem we worked on in math doesn’t get solved during class, I still think about it after class is over and try to figure it out even if the teacher didn’t tell me to.	1	2	3	4
22. When I don’t do well in math, it’s because I’m not good at math.	1	2	3	4
23. I have many chances during math class to answer questions and explain my ideas to my teacher and classmates.	1	2	3	4
24. I like to work on new math problems that are different from others that I have worked on before.	1	2	3	4
25. I don’t get worried if my first plan to solve a problem doesn’t work, since I know many ways to try to figure problems out.	1	2	3	4
26. I never see mathematics being used except when I’m in math class.	1	2	3	4
27. Understanding why an answer is right is not as important as getting the right answer.	1	2	3	4
28. Mathematics is more difficult to understand than other subjects.	1	2	3	4
29. I don’t take part in discussions during math class very often.	1	2	3	4

		very true	sort of true	not very true	not true at all
30.	When I do well in math, it's because I was lucky.	1	2	3	4
31.	Even if I don't understand a math problem right away, I know I will be able to figure it out if I work at it.	1	2	3	4
32.	I can learn a lot by working with other people to solve math problems.	1	2	3	4
33.	If I don't understand a math problem, I give up without trying very hard to figure it out.	1	2	3	4
34.	Math is my favorite class.	1	2	3	4
35.	Being able to explain your ideas clearly is an important part of learning mathematics.	1	2	3	4
36.	When I don't do well in math, it's because the teacher doesn't like me.	1	2	3	4
37.	No matter how hard a person works, some people are just naturally good at math and some are just not.	1	2	3	4
38.	Answering questions correctly in math means only giving a number.	1	2	3	4
39.	Each new math topic I study is not related to ones I have learned before.	1	2	3	4
40.	Knowing mathematics is not necessary to get a good job.	1	2	3	4
41.	When I do well in math, it's because I have worked hard.	1	2	3	4
42.	I am certain that I can do well in math classes that I will take later on in school.	1	2	3	4
43.	If I can't solve a math problem right away, I give up after a few minutes.	1	2	3	4

		very true	sort of true	not very true	not true at all
44.	When my teacher asks a question I will get it right if I have memorized the correct rule or fact.	1	2	3	4
45.	If you have to use a calculator to solve a problem, you don't really understand how to do the problem.	1	2	3	4
46.	If I have trouble figuring out a problem right away, I don't like to stop working on it until I get an answer that makes sense.	1	2	3	4
47.	I like to share my ideas during class discussions in math.	1	2	3	4
48.	When I don't do well in math, it's because I was unlucky.	1	2	3	4
49.	It really doesn't matter if you understand a math problem or how you get an answer as long as the answer you get is right.	1	2	3	4
50.	I would like a job that uses mathematics often.	1	2	3	4
51.	Mathematics is boring.	1	2	3	4
52.	I work hard at mathematics because I know that it will be useful for me.	1	2	3	4
53.	Knowing how to solve a problem is as important as getting the answer.	1	2	3	4
54.	When I do well in math, I'm never sure how it happened.	1	2	3	4
55.	Mathematics is mostly learned by memorizing facts and rules.	1	2	3	4
56.	My teacher thinks my ideas about math are important.	1	2	3	4
57.	Learning mathematics is not interesting to me.	1	2	3	4
58.	I try not to do more work in math than I have to.	1	2	3	4
59.	When I don't do well in math, it's because I haven't studied hard enough.	1	2	3	4
60.	Mathematics is useful in everyone's life.	1	2	3	4

Part II. Please give a short answer to each of the following questions in the space following the question. You do not have to write in complete sentences.

1. List words that you think of when you hear “mathematics.”

2. List jobs besides teaching that require mathematics.

3. Describe how you use mathematics outside of class.

4. Describe other ways people might use mathematics.

APPENDIX C

GRADE 5, DISTRICT 1

Table C1

Fixed Characteristics, Grade 5, District 1

School-Class *(N)*	Sex		Ethnicity								
	Female	Male	African American	Native American	Asian	Hispanic	White	Multi-racial	Haitian	Other	Non-Response
—MiC—											
Banneker-Greene 1 (22)	11	11	18%	0%	0%	0%	36%	27%	0%	0%	18%
Beethoven-Kipling 1 (26)	14	12	4%	0%	4%	4%	69%	15%	0%	0%	4%
Beethoven-LaSalle 1 (33)	15	18	0%	0%	9%	0%	79%	6%	0%	0%	6%
Beethoven-Linne 1 (13)	10	3	77%	0%	0%	0%	15%	8%	0%	0%	0%
Dewey-Hamilton 1 (21)	10	11	33%	0%	0%	10%	48%	10%	0%	0%	0%
Dewey-Mitchell 1 (18)	9	9	22%	0%	0%	11%	56%	11%	0%	0%	0%
Dewey-Mitchell 2 (19)	8	11	42%	0%	0%	16%	32%	5%	0%	0%	5%
Dewey-Mitchell 3 (18)	7	11	56%	0%	0%	17%	28%	0%	0%	0%	0%
—Conventional—											
Dewey-Kershaw 1 (24)	11	13	21%	0%	0%	13%	50%	17%	0%	0%	0%
River Forest-Fulton 1 (31)	14	17	6%	0%	0%	0%	65%	23%	0%	0%	6%

Table C2

Standardized Test Scores, Spring 1997, Grade 5, District 1

School-Class (*N*)	TerraNova											
	Scale Score						National Percentile					
	(*N*)	Mean	StDev	Minimum	Median	Maximum	(*N*)	Mean	StDev	Minimum	Median	Maximum
—MiC—												
Banneker-Greene 1 (22)	14	629.43	20.06	593	630.0	656	15	52.53	18.50	21	52.0	79
Beethoven-Kipling 1 (26)	25	648.84	16.66	621	646.0	686	25	70.76	14.27	44	70.0	95
Beethoven-LaSalle 1 (33)	28	686.79	23.69	655	683.5	759	30	92.37	5.88	78	94.0	99
Beethoven-Linne 1 (13)	11	593.73	19.72	566	600.0	621	11	24.09	12.49	9	26.0	44
Dewey-Hamilton 1 (21)	17	625.53	22.67	560	631.0	656	18	50.28	18.13	8	49.5	79
Dewey-Mitchell 1 (18)	16	643.50	22.52	615	642.0	693	16	64.88	18.97	38	66.0	97
Dewey-Mitchell 2 (19)	14	616.71	20.46	587	617.0	652	14	39.29	17.51	18	39.0	75
Dewey-Mitchell 3 (18)	17	598.47	24.65	541	599.0	640	17	28.53	16.13	4	25.0	64
—Conventional—												
Dewey-Kershaw 1 (24)	12	663.08	16.03	641	665.5	689	21	73.57	19.81	27	74.0	99
River Forest-Fulton 1 (31)	28	668.36	30.30	621	664.0	770	30	82.67	13.61	44	86.5	99

Table C3

Results of the Collis-Romberg Mathematical Problem-Solving Profiles, Grade 5, District 1

School-Class (*N*)	Level of Student Performance									
	Prestructural	**Unistructural**		**Multistructural**		**Relational**		**Extended Abstract**		**No Response**
	(%)	**(%)**	**Ave.**	**(%)**	**Ave.**	**(%)**	**Ave.**	**(%)**	**Ave.**	**(%)**
—MiC—										
Banneker-Greene (19)			2.84		1.47		0.16		0.00	
Number	21.1%	47.4%		15.8%		15.8%		0.0%		0.0%
Algebra	47.4%	47.4%		0.0%		0.0%		0.0%		5.3%
Space	15.8%	31.6%		52.6%		0.0%		0.0%		0.0%
Measurement	21.1%	5.3%		63.2%		0.0%		0.0%		10.5%
Chance & Data	78.9%	0.0%		0.0%		0.0%		0.0%		21.1%
Beethoven-Kipling (24)			3.00		1.63		0.13		0.00	
Number	12.5%	41.7%		37.5%		8.3%		0.0%		0.0%
Algebra	37.5%	62.5%		0.0%		0.0%		0.0%		0.0%
Space	29.2%	12.5%		54.2%		4.2%		0.0%		0.0%
Measurement	25.0%	8.3%		54.2%		0.0%		0.0%		12.5%
Chance & Data	62.5%	12.5%		0.0%		0.0%		0.0%		25.0%
Beethoven-LaSalle (32)			3.84		2.31		0.94		0.06	
Number	6.3%	46.9%		31.3%		12.5%		3.1%		0.0%
Algebra	18.8%	81.3%		0.0%		0.0%		0.0%		0.0%
Space	12.5%	6.3%		28.1%		50.0%		3.1%		0.0%
Measurement	3.1%	9.4%		71.9%		12.5%		0.0%		3.1%
Chance & Data	53.1%	21.9%		9.4%		6.3%		0.0%		9.4%
Beethoven-Linne (13)			2.46		1.00		0.92		0.00	
Number	0.0%	76.9%		0.0%		23.1%		0.0%		0.0%
Algebra	46.2%	53.8%		0.0%		0.0%		0.0%		0.0%
Space	15.40%	15.40%		7.70%		61.50%		0.00%		0.00%
Measurement	7.70%	0.00%		7.70%		0.00%		0.00%		84.60%
Chance & Data	8.3%	0.0%		0.0%		0.0%		0.0%		91.7%
Dewey-Hamilton (20)			3.00		1.55		0.10		0.00	
Number	25.0%	60.0%		10.0%		5.0%		0.0%		0.0%
Algebra	30.0%	70.0%		0.0%		0.0%		0.0%		0.0%
Space	35.0%	10.0%		50.0%		5.0%		0.0%		0.0%
Measurement	20.0%	0.0%		80.0%		0.0%		0.0%		0.0%
Chance & Data	80.0%	5.0%		5.0%		0.0%		0.0%		10.0%

Table C3 *(continued)*

School-Class (*N*)	Prestructural	Unistructural		Multistructural		Relational		Extended Abstract		No Response
	Level of Student Performance									
	(%)	(%)	Ave.	(%)	Ave.	(%)	Ave.	(%)	Ave.	(%)
—MiC (continued)—										
Dewey-Mitchell 1 (18)			3.17		1.61		0.28		0.00	
Number	0.0%	44.4%		38.9%		16.7%		0.0%		0.0%
Algebra	61.1%	38.9%		0.0%		0.0%		0.0%		0.0%
Space	22.2%	38.9%		27.8%		11.1%		0.0%		0.0%
Measurement	16.7%	16.7%		66.7%		0.0%		0.0%		0.0%
Chance & Data	77.8%	16.7%		0.0%		0.0%		0.0%		5.6%
Dewey-Mitchell 2 (18)			3.22		1.00		0.00		0.00	
Number	5.6%	94.4%		0.0%		0.0%		0.0%		0.0%
Algebra	22.2%	77.8%		0.0%		0.0%		0.0%		0.0%
Space	38.9%	22.2%		38.9%		0.0%		0.0%		0.0%
Measurement	27.8%	11.1%		61.1%		0.0%		0.0%		0.0%
Chance & Data	72.2%	22.2%		0.0%		0.0%		0.0%		5.6%
Dewey-Mitchell 3 (18)			2.56		0.67		0.06		0.00	
Number	33.3%	61.1%		0.0%		5.6%		0.0%		0.0%
Algebra	38.9%	61.1%		0.0%		0.0%		0.0%		0.0%
Space	50.0%	33.3%		16.7%		0.0%		0.0%		0.0%
Measurement	33.3%	27.8%		38.9%		0.0%		0.0%		0.0%
Chance & Data	88.9%	5.6%		5.6%		0.0%		0.0%		0.0%
Conventional										
Dewey-Kershaw (22)			3.14		1.73		0.41		0.05	
Number	4.5%	54.5%		18.2%		18.2%		0.0%		4.5%
Algebra	36.4%	54.5%		0.0%		0.0%		0.0%		9.1%
Space	9.1%	13.6%		59.1%		9.1%		4.5%		4.5%
Measurement	18.2%	13.6%		54.5%		9.1%		0.0%		4.5%
Chance & Data	77.3%	4.5%		0.0%		0.0%		0.0%		18.2%
River Forest-Fulton (30)			4.17		2.17		0.80		0.07	
Number	0.0%	43.3%		23.3%		30.0%		3.3%		0.0%
Algebra	6.7%	93.3%		0.0%		0.0%		0.0%		0.0%
Space	6.7%	10.0%		50.0%		33.3%		0.0%		0.0%
Measurement	20.0%	23.3%		53.3%		3.3%		0.0%		0.0%
Chance & Data	53.3%	30.0%		6.7%		10.0%		0.0%		0.0%

Table C4

Student Data From Subscales of the Student Attitude Inventory, Grade 5, District 1

School-Class *(N)*	**Subscale *(1 = very true; 4 = not true at all)***				
	Effort	**Confidence**	**Interest**	**Usefulness**	**Communication**
			—MiC—		
Banneker-Greene (22)					
Count	15	17	15	15	16
Mean	1.59	1.80	1.60	1.67	1.82
Median	1.33	1.80	1.25	1.50	1.86
Minimum	1.00	1.00	1.00	1.25	1.14
Maximum	3.00	2.80	3.00	2.75	2.43
Standard Deviation	0.52	0.54	0.59	0.44	0.37
Beethoven-Kipling (26)					
Count	23	21	23	23	20
Mean	1.60	1.69	1.53	1.43	1.59
Median	1.50	1.60	1.38	1.38	1.50
Minimum	1.17	1.00	1.00	1.00	1.00
Maximum	2.83	2.40	2.50	2.00	2.43
Standard Deviation	0.34	0.37	0.41	0.27	0.33
Beethoven-LaSalle (33)					
Count	31	29	29	31	31
Mean	1.69	1.52	1.47	1.32	1.69
Median	1.67	1.60	1.25	1.25	1.57
Minimum	1.00	1.00	1.00	1.00	1.00
Maximum	2.50	2.40	2.25	2.25	3.00
Standard Deviation	0.34	0.38	0.40	0.30	0.49
Beethoven-Linne (13)					
Count	10	12	10	11	10
Mean	1.77	2.07	1.55	1.83	1.73
Median	1.58	2.10	1.31	1.63	1.79
Minimum	1.00	1.40	1.00	1.25	1.00
Maximum	2.83	2.60	3.00	2.75	2.86
Standard Deviation	0.67	0.50	0.67	0.49	0.53
Dewey-Hamilton (21)					
Count	19	20	20	18	19
Mean	1.53	1.61	1.66	1.44	1.68
Median	1.33	1.60	1.50	1.38	1.57
Minimum	1.00	1.00	1.00	1.13	1.14
Maximum	2.83	2.60	3.88	2.13	3.14
Standard Deviation	0.53	0.53	0.78	0.28	0.47

Table C4 *(continued)*

School-Class *(N)*	Subscale *(1 = very true; 4 = not true at all)*				
	Effort	**Confidence**	**Interest**	**Usefulness**	**Communication**
—MiC—					
Dewey-Mitchell 1 (18)					
Count	18	18	18	18	17
Mean	1.67	1.74	1.49	1.61	1.53
Median	1.67	1.80	1.31	1.63	1.43
Minimum	1.00	1.00	1.00	1.00	1.14
Maximum	2.83	2.80	3.13	2.25	2.14
Standard Deviation	0.51	0.40	0.56	0.38	0.35
Dewey-Mitchell 2 (19)					
Count	12	17	17	16	14
Mean	1.53	1.79	1.44	1.59	1.60
Median	1.58	1.80	1.38	1.63	1.50
Minimum	1.00	1.40	1.00	1.00	1.00
Maximum	2.00	2.40	2.38	2.25	2.57
Standard Deviation	0.36	0.31	0.29	0.50	0.50
Dewey-Mitchell 3 (18)					
Count	17	18	18	17	17
Mean	1.51	1.96	1.63	1.98	1.66
Median	1.67	1.90	1.56	2.00	1.71
Minimum	1.00	1.00	1.00	1.13	1.14
Maximum	2.17	2.60	2.38	3.25	2.29
Standard Deviation	0.39	0.52	0.41	0.53	0.38
—Conventional—					
Dewey-Kershaw (24)					
Count	20	21	19	18	18
Mean	1.48	1.57	1.47	1.52	1.49
Median	1.50	1.60	1.38	1.38	1.36
Minimum	1.00	1.00	1.00	1.00	1.00
Maximum	2.33	2.80	2.00	3.38	2.43
Standard Deviation	0.43	0.45	0.32	0.55	0.47
River Forest-Fulton (31)					
Count	28	29	29	28	29
Mean	1.61	1.49	1.55	1.38	1.74
Median	1.50	1.40	1.50	1.38	1.71
Minimum	1.00	1.00	1.00	1.00	1.14
Maximum	2.33	2.20	2.50	2.25	2.86
Standard Deviation	0.39	0.38	0.41	0.26	0.39

Table C5

Class Means on General Perceptions of the Student Attitude Inventory, Grade 5, District 1

School-Class *(N)*	3			4			6			11			16			20			27			28		
	(N)	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD
—MiC—																								
Banneker-Greene 1 (22)	17	1.53	0.80	17	1.65	0.79	17	2.65	1.22	17	1.00	0.00	17	1.24	0.56	17	2.29	1.21	17	2.71	1.21	17	1.82	1.01
Beethoven-Kipling 1 (26)	23	1.30	0.56	23	1.35	0.49	22	2.41	1.05	23	1.00	0.00	23	1.26	0.54	23	1.35	0.57	23	2.52	1.12	23	2.22	0.67
Beethoven-LaSalle 1 (33)	32	1.28	0.68	32	1.47	0.72	32	2.47	0.95	32	1.28	0.68	32	1.06	0.25	31	1.39	0.56	32	1.63	0.98	31	2.16	0.82
Beethoven-Linne 1 (13)	12	1.58	0.90	13	1.69	0.95	13	2.54	1.13	11	1.09	0.30	13	1.54	0.97	12	2.08	1.16	13	2.69	1.25	13	2.00	1.15
Dewey-Hamilton 1 (21)	20	1.25	0.44	20	1.40	0.60	19	2.58	1.22	20	1.10	0.31	20	1.05	0.22	20	1.80	1.24	20	2.00	0.97	20	2.30	1.08
Dewey-Mitchell 1 (18)	18	1.06	0.24	18	1.78	0.88	18	2.72	0.89	18	1.11	0.32	18	1.28	0.46	18	1.56	0.92	18	2.17	0.92	18	2.28	0.89
Dewey-Mitchell 2 (19)	17	1.18	0.39	18	1.33	0.49	18	2.72	1.07	18	1.17	0.71	18	1.50	0.86	18	1.56	0.92	18	2.44	1.29	17	1.88	0.93
Dewey-Mitchell 3 (18)	18	1.17	0.38	18	1.67	0.84	18	3.44	0.78	18	1.11	0.32	18	1.06	0.24	18	2.33	1.28	18	2.83	0.86	18	2.06	1.06
—Conventional—																								
Dewey-Kershaw 1 (24)	21	1.14	0.48	22	1.18	0.50	22	2.82	0.96	22	1.23	0.75	22	1.18	0.50	22	1.45	0.96	21	2.57	1.29	22	2.68	1.13
River Forest-Fulton 1 (31)	30	1.20	0.41	30	1.67	0.66	29	2.31	0.89	30	1.30	0.53	30	1.27	0.52	30	1.53	0.68	30	2.20	1.30	29	2.38	0.82

School-Class (N)	37			38			39			44			45			49			53			55		
	(N)	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD
—MiC—																								
Banneker-Greene 1 (22)	17	3.53	0.87	17	1.88	0.99	17	2.47	1.07	17	3.18	0.73	17	3.12	0.60	17	2.59	1.23	17	1.29	0.69	17	2.65	0.86
Beethoven-Kipling 1 (26)	23	2.65	1.27	23	1.17	0.39	23	2.13	1.01	23	3.35	0.78	22	3.27	0.77	23	2.13	1.14	23	1.48	0.79	23	2.78	1.04
Beethoven-LaSalle 1 (33)	32	2.63	1.07	32	1.25	0.44	31	2.03	0.91	31	2.87	0.92	32	2.91	0.93	32	1.25	0.44	30	1.40	0.56	32	2.50	0.92
Beethoven-Linne 1 (13)	12	3.08	1.08	12	2.33	1.15	11	3.18	0.87	13	3.31	0.95	13	2.77	1.09	13	2.92	0.95	13	1.69	1.03	13	2.92	1.04
Dewey-Hamilton 1 (21)	20	2.70	1.17	20	1.50	0.76	20	2.30	1.03	20	3.00	1.12	20	2.85	1.23	20	1.80	0.95	20	1.70	0.98	20	2.85	1.14
Dewey-Mitchell 1 (18)	18	3.11	0.58	18	1.50	0.79	17	2.06	1.09	18	3.00	0.69	18	2.44	1.10	18	2.33	1.03	18	1.56	0.70	18	2.72	1.02
Dewey-Mitchell 2 (19)	18	3.11	1.02	18	1.78	0.88	17	2.35	1.11	18	3.22	0.88	18	2.94	1.00	18	2.28	1.27	18	1.61	0.85	18	2.89	1.08
Dewey-Mitchell 3 (18)	18	3.11	1.02	18	2.11	1.18	17	2.71	1.10	18	3.33	0.97	18	3.17	1.20	17	2.65	1.11	17	1.53	0.72	18	2.72	1.02
—Conventional—																								
Dewey-Kershaw 1 (24)	22	2.68	1.09	22	1.14	0.35	21	2.14	1.01	20	2.85	0.93	20	2.75	1.29	20	1.75	1.12	20	1.25	0.55	20	2.45	1.15
River Forest-Fulton 1 (31)	29	2.69	1.00	28	1.43	0.57	29	1.62	0.78	29	2.83	0.93	29	3.17	0.85	29	1.38	0.62	29	1.41	0.78	29	2.24	0.95

Table C5 *(continued)*

Key

3. I feel sure that I am able to learn new ideas in math class. *(confidence in ability to learn mathematics)*
4. In mathematics, you can discover new ways of solving problems that the teacher or your classmates may not have thought of. *(problem solving)*
6.* If I use a calculator to solve a problem, I can be sure it will always give me the right answer. *(calculator use)*
11. Anyone who works hard enough can be good at math. *(effort)*
16. It's okay if I solve a math problem differently than my classmates do. *(problem solving)*
20.* Mathematics is not related to any of my other school subjects. *(connection to other school subjects)*
27.* Understanding why an answer is right is not as important as getting the right answer. *(understanding vs. answer)*
28.* Mathematics is more difficult to understand than other subjects. *(connection to other school subjects)*
37.* No matter how hard a person works, some people are just naturally good at math and some are just not. *(effort)*
38.* Answering questions correctly in math means only giving a number. *(process vs. answer)*
39.* Each new math topic I study is not related to ones I have learned before. *(connection among mathematics topics)*
44.* When my teacher asks a question I will get it right if I have memorized the correct rule or fact. *(mathematics as facts or rules)*
45.* If you have to use a calculator to solve a problem, you don't really understand how to do the problem. *(calculator use)*
49.* It really doesn't matter if you understand a math problem or how you get an answer as long as the answer you get is right. *(understanding vs. answer)*
53. Knowing how to solve a problem is as important as getting the answer. *(process vs. answer)*
55.* Mathematics is mostly learned by memorizing facts and rules. *(mathematics as facts or rules)*

* Reverse-scored due to wording of question.

Table C6

Class Means on Student Attribution of Success or Failure in Mathematics, Grade 5, District 1

School-Class (*N*)	Success											
	Teacher			Ability			Effort			Luck		
	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD
—MiC—												
Banneker-Greene 1 (22)	17	3.82	0.39	17	2.41	1.06	17	1.06	0.24	17	3.35	1.00
Beethoven-Kipling 1 (26)	23	3.65	0.71	23	2.04	0.93	23	1.09	0.29	23	3.65	0.49
Beethoven-LaSalle 1 (33)	32	3.91	0.30	32	2.34	1.07	32	1.38	0.66	32	3.63	0.49
Beethoven-Linne 1 (13)	13	3.08	1.32	13	1.77	1.09	12	1.33	0.89	12	3.25	0.97
Dewey-Hamilton 1 (21)	20	3.75	0.72	20	2.15	1.09	20	1.40	0.82	20	3.30	0.98
Dewey-Mitchell 1 (18)	18	3.56	0.86	18	1.78	0.81	18	1.22	0.55	18	3.17	0.99
Dewey-Mitchell 2 (19)	18	3.39	0.98	18	1.72	0.67	17	1.12	0.33	18	3.39	0.78
Dewey-Mitchell 3 (18)	18	2.67	1.41	18	1.44	0.78	18	1.33	0.97	18	2.50	1.10
—Conventional—												
Dewey-Kershaw 1 (24)	22	3.55	0.67	22	2.50	1.10	22	1.05	0.21	22	3.77	0.53
River Forest-Fulton 1 (31)	28	3.64	0.68	29	2.17	0.76	28	1.18	0.48	29	3.76	0.44

School-Class (*N*)	Failure											
	Teacher			Ability			Effort			Luck		
	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD
—MiC—												
Banneker-Greene 1 (22)	17	3.94	0.24	17	3.53	0.87	17	2.24	0.90	17	3.71	0.85
Beethoven-Kipling 1 (26)	23	3.96	0.21	23	3.50	0.74	23	1.70	0.88	23	3.74	0.45
Beethoven-LaSalle 1 (33)	32	3.94	0.25	31	3.65	0.61	30	2.07	0.94	31	3.74	0.51
Beethoven-Linne 1 (13)	12	3.83	0.39	12	3.25	0.97	13	2.54	1.27	13	3.69	0.48
Dewey-Hamilton 1 (21)	20	3.95	0.22	20	3.15	0.93	19	2.32	1.00	20	3.70	0.57
Dewey-Mitchell 1 (18)	18	3.83	0.38	18	3.11	0.68	18	1.72	0.75	18	3.56	0.62
Dewey-Mitchell 2 (19)	18	3.61	0.92	18	3.06	1.21	18	1.78	1.06	17	3.59	0.87
Dewey-Mitchell 3 (18)	18	3.72	0.75	18	2.44	1.29	18	2.17	1.15	18	3.50	1.04
—Conventional—												
Dewey-Kershaw 1 (24)	21	3.86	0.48	22	3.50	0.67	20	1.80	0.89	20	3.80	0.52
River Forest-Fulton 1 (31)	29	3.93	0.26	30	3.67	0.66	29	1.90	0.72	29	3.86	0.44

APPENDIX C

GRADE 6, DISTRICT 1

Table C1

Fixed Characteristics, Grade 6, District 1

School-Class *(N)*	Sex		Ethnicity								
	F	M	African American	Native American	Asian	Hispanic	White	Multiracial	Haitian	Other	Non-Response
—MiC—											
Fernwood-Lee/Weatherspoon 1 (28)	17	11	14%	0%	4%	14%	54%	7%	0%	0%	7%
Fernwood-Lee/Weatherspoon 2 (28)	12	16	18%	0%	4%	11%	39%	25%	0%	0%	4%
Fernwood-Lee/Weatherspoon 3 (25)	11	14	8%	4%	0%	12%	60%	16%	0%	0%	0%
VonHumboldt-Brown 1 (23)	10	13	30%	0%	0%	0%	65%	4%	0%	0%	0%
VonHumboldt-Brown 2 (19)	9	10	37%	0%	0%	5%	42%	11%	0%	0%	5%
VonHumboldt-Brown 3 (29)	16	13	28%	3%	0%	3%	59%	3%	0%	0%	3%
VonHumboldt-Harvey 1 (28)	15	13	14%	0%	0%	4%	57%	11%	0%	4%	11%
VonHumboldt-Harvey 2 (26)	14	12	15%	4%	0%	0%	69%	12%	0%	0%	0%
VonHumboldt-Harvey 3 (31)	16	15	32%	0%	0%	3%	48%	6%	0%	0%	10%
—Conventional—											
Addams-Tallackson 1 (20)	9	11	20%	0%	0%	10%	45%	25%	0%	0%	0%
Wacker-Krittendon 1 (26)	12	14	35%	4%	0%	0%	46%	12%	0%	0%	4%
Wacker-Krittendon 2 (23)	7	16	39%	0%	0%	0%	39%	17%	0%	4%	0%
Wacker-Krittendon 3 (22)	9	13	41%	0%	0%	5%	41%	5%	0%	5%	5%

Table C2

Standardized Test Scores, Spring 1997, Grade 6, District 1

School-Class *(N)*	TerraNova											
	Scale Score						National Percentile					
	(*N*)	Mean	StDev	Minimum	Median	Maximum	(*N*)	Mean	StDev	Minimum	Median	Maximum
—MiC—												
Fernwood-Lee/Weatherspoon 1 (28)	21	631.52	24.37	592	625.0	686	22	39.27	20.57	12	36.0	86
Fernwood-Lee/Weatherspoon 2 (28)	18	637.61	33.35	593	632.5	698	20	42.55	26.42	12	34.5	92
Fernwood-Lee/Weatherspoon 3 (25)	19	652.79	35.62	586	669.0	690	19	59.00	28.82	10	73.0	88
VonHumboldt-Brown 1 (23)	11	634.55	31.94	577	638.0	696	15	44.87	22.42	7	46.0	91
VonHumboldt-Brown 2 (19)	10	624.80	23.18	589	625.0	655	14	29.29	17.20	11	28.0	59
VonHumboldt-Brown 3 (29)	11	642.55	33.36	564	650.0	690	18	49.00	25.84	5	50.5	89
VonHumboldt-Harvey 1 (28)	17	639.12	23.14	598	643.0	678	22	46.05	19.26	15	48.0	81
VonHumboldt-Harvey 2 (26)	16	654.50	32.20	582	661.0	703	23	53.17	28.32	9	60.0	94
VonHumboldt-Harvey 3 (32)	16	634.81	50.48	459	645.0	682	22	46.59	21.25	1	49.5	83
—Conventional—												
Addams-Tallackson 1 (20)	10	638.90	37.09	582	638.0	702	11	43.27	29.30	6	41.0	94
Wacker-Krittendon 1 (26)	14	631.71	21.29	581	636.0	661	14	39.86	15.81	8	42.0	66
Wacker-Krittendon 2 (23)	10	634.70	16.45	609	641.5	651	13	35.15	17.14	1	35.0	55
Wacker-Krittendon 3 (21)	11	625.00	28.20	587	617.0	682	16	33.31	19.92	10	27.0	83

Table C3

Sixth-Grade Class Results on the Collis-Romberg Mathematical Problem-Solving Profiles, Grade 6, District 1

School-Class (*N*)	Level of Student Performance									No Response
	Prestructural	Unistructural		Multistructural		Relational		Extended Abstract		
	(%)	(%)	Ave.	(%)	Ave.	(%)	Ave.	(%)	Ave.	
—*MiC*—										
Fernwood-Weatherspoon 1 (26)			3.19		1.15		0.35		0.00	
Number	11.5%	73.1%		3.8%		11.5%		0.0%		0.0%
Algebra	46.2%	53.8%		0.0%		0.0%		0.0%		0.0%
Space	19.2%	30.8%		42.3%		7.7%		0.0%		0.0%
Measurement	42.3%	19.2%		34.6%		3.8%		0.0%		0.0%
Chance & Data	61.5%	26.9%		0.0%		11.5%		0.0%		0.0%
Fernwood-Weatherspoon 2 (26)			3.15		1.27		0.19		0.00	
Number	11.5%	73.1%		11.5%		3.8%		0.0%		0.0%
Algebra	34.6%	65.4%		0.0%		0.0%		0.0%		0.0%
Space	7.7%	38.5%		50.0%		0.0%		0.0%		3.8%
Measurement	46.2%	3.8%		38.5%		11.5%		0.0%		0.0%
Chance & Data	80.8%	7.7%		7.7%		3.8%		0.0%		0.0%
Fernwood-Weatherspoon 3 (25)			3.12		1.44		0.52		0.12	
Number	28.0%	48.0%		8.0%		8.0%		8.0%		0.0%
Algebra	36.0%	64.0%		0.0%		0.0%		0.0%		0.0%
Space	8.0%	28.0%		40.0%		20.0%		0.0%		4.0%
Measurement	32.0%	20.0%		36.0%		8.0%		4.0%		0.0%
Chance & Data	80.0%	8.0%		8.0%		4.0%		0.0%		0.0%
Von Humboldt-Brown 1 (12)			3.17		1.42		0.25		0.00	
Number	0.0%	75.0%		16.7%		8.3%		0.0%		0.0%
Algebra	41.7%	58.3%		0.0%		0.0%		0.0%		0.0%
Space	16.7%	16.7%		50.0%		8.3%		0.0%		8.3%
Measurement	16.7%	16.7%		50.0%		8.3%		0.0%		8.3%
Chance & Data	75.0%	0.0%		8.3%		0.0%		0.0%		16.7%
Von Humboldt-Brown 2 (15)			2.43		0.73		0.27		0.00	
Number	0.0%	66.7%		0.0%		26.7%		0.0%		6.7%
Algebra	66.7%	26.7%		0.0%		0.0%		0.0%		6.7%
Space	20.0%	40.0%		26.7%		0.0%		0.0%		13.3%
Measurement	40.0%	13.3%		20.0%		0.0%		0.0%		26.7%
Chance & Data	53.3%	6.7%		0.0%		0.0%		0.0%		40.0%
Von Humboldt-Brown 3 (28)			2.89		1.36		0.36		0.00	
Number	17.9%	60.7%		36.0%		17.9%		0.0%		0.0%
Algebra	21.4%	67.9%		3.6%		0.0%		0.0%		7.1%
Space	21.4%	10.7%		46.4%		17.9%		0.0%		3.6%
Measurement	7.1%	10.7%		46.4%		0.0%		0.0%		35.7%
Chance & Data	39.3%	3.6%		0.0%		0.0%		0.0%		57.1%

Table C3 *(continued)*

School-Class (*N*)	Level of Student Performance									No Response
	Prestructural	Unistructural		Multistructural		Relational		Extended Abstract		
	(%)	(%)	Ave.	(%)	Ave.	(%)	Ave.	(%)	Ave.	
—MiC (continued)—										
Von Humboldt-Harvey 1 (25)			2.76		0.80		0.12		0.04	
Number	16.0%	68.0%		4.0%		8.0%		4.0%		0.0%
Algebra	48.0%	52.0%		0.0%		0.0%		0.0%		0.0%
Space	24.0%	36.0%		40.0%		0.0%		0.0%		0.0%
Measurement	40.0%	36.0%		20.0%		0.0%		0.0%		4.0%
Chance & Data	80.0%	4.0%		4.0%		0.0%		0.0%		12.0%
Von Humboldt-Harvey 2 (20)			2.75		1.30		0.40		0.05	
Number	15.0%	50.0%		5.0%		25.0%		5.0%		0.0%
Algebra	40.0%	50.0%		5.0%		0.0%		0.0%		5.0%
Space	20.0%	25.0%		45.0%		5.0%		0.0%		5.0%
Measurement	30.0%	10.0%		35.0%		5.0%		0.0%		20.0%
Chance & Data	35.0%	10.0%		0.0%		0.0%		0.0%		55.0%
Von Humboldt-Harvey 3 (27)			2.81		0.93		0.22		0.04	
Number	7.4%	66.7%		14.8%		7.4%		3.7%		0.0%
Algebra	37.0%	63.0%		0.0%		0.0%		0.0%		0.0%
Space	18.5%	25.9%		40.7%		11.1%		0.0%		3.7%
Measurement	51.9%	22.2%		14.8%		0.0%		0.0%		11.1%
Chance & Data	74.1%	11.1%		0.0%		0.0%		0.0%		14.8%
—Conventional—										
Addams-Tallackson 1 (18)			2.67		1.00		0.22		0.00	
Number	16.7%	61.1%		11.1%		5.6%		0.0%		5.6%
Algebra	16.7%	72.2%		0.0%		0.0%		0.0%		11.1%
Space	44.4%	11.1%		22.2%		16.7%		0.0%		5.6%
Measurement	27.8%	16.7%		44.4%		0.0%		0.0%		11.1%
Chance & Data	72.2%	5.6%		0.0%		0.0%		0.0%		22.2%
Wacker-Krittendon 1 (24)			2.67		0.75		0.08		0.00	
Number	4.2%	87.5%		4.2%		4.2%		0.0%		0.0%
Algebra	33.3%	66.7%		0.0%		0.0%		0.0%		0.0%
Space	29.2%	16.7%		33.3%		4.2%		0.0%		16.7%
Measurement	29.2%	16.7%		29.2%		0.0%		0.0%		25.0%
Chance & Data	58.3%	4.2%		0.0%		0.0%		0.0%		37.5%
Wacker-Krittendon 2 (22)			2.38		0.77		0.00		0.00	
Number	13.6%	68.2%		13.6%		0.0%		0.0%		4.5%
Algebra	45.5%	50.0%		0.0%		0.0%		0.0%		4.5%
Space	50.0%	13.6%		27.3%		0.0%		4.5%		4.5%
Measurement	45.5%	13.6%		31.8%		0.0%		0.0%		9.1%
Chance & Data	63.6%	13.6%		0.0%		0.0%		0.0%		22.7%
Wacker-Krittendon 3 (20)			2.90		1.20		0.25		0.00	
Number	5.0%	65.0%		10.0%		20.0%		0.0%		0.0%
Algebra	40.0%	55.0%		0.0%		0.0%		0.0%		5.0%
Space	35.0%	10.0%		50.0%		0.0%		0.0%		5.0%
Measurement	30.0%	35.0%		30.0%		0.0%		0.0%		5.0%
Chance & Data	70.0%	10.0%		0.0%		5.0%		0.0%		15.0%

Table C4

Student Data From Subscales of the Student Attitude Inventory, Grade 6, District 1

School-Class *(N)*	**Subscale *(1 = very true; 4 = not true at all)***				
	Effort	**Confidence**	**Interest**	**Usefulness**	**Communication**
—MiC—					
Fernwood-Weatherspoon 1 (28)					
Count	22	23	24	20	24
Mean	2.02	2.15	2.10	1.68	1.90
Median	2.00	2.20	1.94	1.56	1.93
Minimum	1.00	1.00	1.13	1.13	1.14
Maximum	3.33	3.60	3.75	3.63	3.00
Standard Deviation	0.70	0.65	0.77	0.58	0.51
Fernwood-Weatherspoon 2 (28)					
Count	23	24	22	21	23
Mean	1.88	2.03	2.16	1.76	1.87
Median	1.83	2.00	2.19	1.75	2.00
Minimum	1.17	1.20	1.00	1.00	1.00
Maximum	2.83	2.80	2.88	2.50	2.57
Standard Deviation	0.41	0.44	0.45	0.47	0.42
Fernwood-Weatherspoon 3 (25)					
Count	24	23	23	22	23
Mean	1.77	1.92	1.83	1.65	1.77
Median	1.67	1.80	1.75	1.63	1.71
Minimum	1.00	1.00	1.13	1.00	1.00
Maximum	2.67	3.00	2.88	2.75	2.57
Standard Deviation	0.47	0.52	0.56	0.47	0.44
Von Humboldt Middle-Brown 1 (23)					
Count	20	20	18	19	18
Mean	1.83	1.93	2.28	1.80	1.88
Median	1.67	1.90	2.25	1.88	1.86
Minimum	1.33	1.20	1.13	1.00	1.14
Maximum	3.33	3.00	3.75	2.75	2.86
Standard Deviation	0.50	0.40	0.73	0.52	0.50
Von Humboldt Middle-Brown 2 (19)					
Count	15	16	15	15	15
Mean	2.03	2.18	2.41	2.08	1.90
Median	2.00	2.00	2.50	2.13	1.71
Minimum	1.33	1.60	1.63	1.13	1.43
Maximum	3.33	3.20	3.25	2.75	3.00
Standard Deviation	0.61	0.48	0.51	0.47	0.50
Von Humboldt Middle-Brown 3 (29)					
Count	22	22	21	21	22
Mean	2.33	2.20	2.45	2.03	2.25
Median	2.25	2.20	2.50	2.00	2.14
Minimum	1.33	1.00	1.13	1.00	1.14
Maximum	3.67	3.60	3.88	3.25	3.29
Standard Deviation	0.74	0.65	0.80	0.59	0.63

Table C4 *(continued)*

School-Class *(N)*	Subscale (1 = very true; 4 = not true at all)				
	Effort	**Confidence**	**Interest**	**Usefulness**	**Communication**
—MiC (continued)—					
Von Humboldt Middle-Harvey 1 (28)					
Count	21	23	24	21	22
Mean	1.99	2.12	2.22	2.07	2.00
Median	1.67	2.00	2.25	2.00	2.00
Minimum	1.00	1.00	1.00	1.25	1.43
Maximum	4.00	4.00	4.00	4.00	3.14
Standard Deviation	0.85	0.58	0.80	0.70	0.47
Von Humboldt Middle-Harvey 2 (26)					
Count	19	21	19	20	21
Mean	2.18	2.26	2.45	1.91	2.12
Median	2.00	2.00	2.13	1.88	2.00
Minimum	1.00	1.00	1.00	1.13	1.14
Maximum	3.50	4.00	4.00	3.25	4.00
Standard Deviation	0.69	0.74	0.80	0.46	0.75
Von Humboldt Middle-Harvey 3 (31)					
Count	24	25	24	23	24
Mean	1.94	1.90	1.99	1.87	2.03
Median	1.83	1.80	1.75	1.88	2.00
Minimum	1.00	1.00	1.00	1.00	1.29
Maximum	3.17	3.00	4.00	3.25	3.00
Standard Deviation	0.61	0.55	0.82	0.60	0.51
—Conventional—					
Addams-Tallackson 1 (20)					
Count	16	16	16	16	17
Mean	1.98	1.98	1.95	1.62	2.03
Median	1.83	2.20	1.81	1.56	2.14
Minimum	1	1	1	1	1.14
Maximum	3.33	2.8	3.25	2.13	2.71
Standard Deviation	0.68	0.60	0.61	0.35	0.51
Wacker-Krittendon 1 (26)					
Count	21	20	22	20	22
Mean	1.89	1.94	1.94	1.74	1.71
Median	2.00	2.00	1.94	1.69	1.71
Minimum	1	1	1	1	1
Maximum	2.67	3.2	3.25	2.63	2.86
Standard Deviation	0.52	0.59	0.60	0.55	0.45
Wacker-Krittendon 2 (23)					
Count	20	18	20	17	20
Mean	1.79	1.93	1.81	1.90	1.86
Median	1.83	1.90	1.50	1.75	1.86
Minimum	1	1	1.13	1.13	1.14
Maximum	2.67	2.8	3.75	3	2.71
Standard Deviation	0.50	0.47	0.72	0.54	0.40
Wacker-Krittendon 3 (22)					
Count	15	16	14	11	12
Mean	1.89	1.79	1.78	1.56	1.73
Median	2.00	1.80	1.81	1.38	1.71
Minimum	1.17	1	1	1	1
Maximum	2.67	2.8	3	2.5	2.43
Standard Deviation	0.40	0.55	0.54	0.48	0.42

Table C5

Class Means on General Perception Items of the Student Attitude Inventory, Grade 6, District 1

School-Class *(N)*	Item Number *(see Key)* 3			4			6			11			16			20			27			28		
	(N)	**Mean**	**StD**	*(N)*	**Mean**	**StD**	*(N)*	**Mean**	**StD**	*(N)*	**Mean**	**StD**	*(N)*	**Mean**	**StD**	*(N)*	**Mean**	**StD**	*(N)*	**Mean**	**StD**	*(N)*	**Mean**	**StD**
—MiC—																								
Fernwood-Lee/Weatherspoon 1 (28)	24	1.42	0.83	25	1.44	0.58	24	2.46	0.98	25	1.20	0.41	25	1.24	0.44	25	1.88	1.05	24	2.08	1.25	25	2.80	1.12
Fernwood-Lee/Weatherspoon 2 (28)	26	1.58	0.64	24	1.75	1.03	27	2.67	0.83	27	1.41	0.80	27	1.22	0.51	27	2.00	0.88	26	2.65	1.16	26	2.54	1.03
Fernwood-Lee/Weatherspoon 3 (25)	22	1.36	0.58	25	1.64	0.86	24	2.96	0.81	23	1.09	0.29	25	1.56	0.87	24	1.79	1.18	25	2.28	1.21	25	2.64	1.08
VonHumboldt-Brown 1 (23)	21	1.86	1.01	22	1.45	0.74	21	2.29	0.96	22	1.09	0.29	21	1.29	0.72	22	1.82	1.14	21	2.10	1.22	22	2.73	0.88
VonHumboldt-Brown 2 (19)	15	1.20	0.41	16	1.75	0.77	16	2.44	1.15	16	1.44	0.63	16	1.25	0.45	16	1.75	0.93	16	2.25	1.29	16	2.75	1.13
VonHumboldt-Brown 3 (29)	22	1.64	0.79	23	1.91	0.90	23	2.48	1.04	22	1.64	0.95	23	1.30	0.76	23	1.83	0.98	23	2.39	1.16	23	2.91	0.95
VonHumboldt-Harvey 1 (28)	26	1.58	0.95	26	1.77	0.95	26	2.46	1.03	25	1.36	0.76	25	1.36	0.64	26	1.81	1.02	25	2.64	1.11	26	2.46	1.27
VonHumboldt-Harvey 2 (26)	20	1.70	0.92	22	1.95	1.09	22	2.41	1.05	21	1.38	0.80	22	1.36	0.90	22	1.95	1.05	22	2.18	1.18	22	2.73	0.94
VonHumboldt-Harvey 3 (31)	24	1.54	0.66	25	1.72	0.79	25	2.68	1.11	25	1.32	0.75	25	1.40	0.76	25	1.84	0.99	25	2.60	1.38	25	2.24	1.05
—Conventional—																								
Addams-Tallackson 1 (20)	17	1.88	0.93	18	1.89	1.08	18	2.22	1.11	17	1.41	0.62	18	1.56	0.78	18	1.56	1.10	18	2.89	1.13	17	2.47	1.01
Wacker-Krittendon 1 (26)	22	1.09	0.29	23	1.70	0.76	23	2.57	1.04	23	1.04	0.21	23	1.52	0.90	23	1.70	0.82	23	1.87	1.06	23	2.61	0.99
Wacker-Krittendon 2 (23)	20	1.35	0.59	19	1.63	0.76	20	2.60	0.94	20	1.10	0.31	20	1.20	0.41	20	2.40	1.23	20	2.75	1.29	20	2.25	1.02
Wacker-Krittendon 3 (22)	16	1.25	0.45	17	1.59	0.80	15	2.80	0.68	17	1.29	0.77	17	1.18	0.39	17	2.06	1.20	17	2.53	1.07	17	2.24	1.20

School-Class *(N)*	37			38			39			44			45			49			53			55		
	(N)	**Mean**	**StD**	*(N)*	**Mean**	**StD**	*(N)*	**Mean**	**StD**	*(N)*	**Mean**	**StD**	*(N)*	**Mean**	**StD**	*(N)*	**Mean**	**StD**	*(N)*	**Mean**	**StD**	*(N)*	**Mean**	**StD**
—MiC—																								
Fernwood-Lee/Weatherspoon 1 (28)	25	2.80	1.12	24	2.08	1.18	21	2.52	0.87	25	3.16	1.03	24	2.79	1.02	25	1.96	1.17	25	1.76	1.01	25	3.08	1.00
Fernwood-Lee/Weatherspoon 2 (28)	26	3.15	0.92	26	2.04	0.82	26	2.46	1.07	24	3.08	0.72	23	2.96	0.77	23	2.13	0.97	24	1.29	0.55	24	3.04	0.95
Fernwood-Lee/Weatherspoon 3 (25)	25	2.56	1.16	25	1.80	1.08	25	2.56	0.82	24	3.17	0.92	25	2.52	1.05	25	2.12	1.24	25	1.48	0.82	25	2.60	0.96
VonHumboldt-Brown 1 (23)	21	3.10	1.04	21	1.62	0.80	21	2.29	1.15	21	3.14	1.01	21	2.86	1.11	21	2.10	1.18	21	1.62	0.97	21	2.76	1.09
VonHumboldt-Brown 2 (19)	16	3.31	0.79	16	1.63	0.89	16	2.75	0.93	16	2.88	1.02	16	2.63	0.89	16	2.50	1.21	15	1.87	1.06	15	2.67	1.11
VonHumboldt-Brown 3 (29)	23	3.26	0.69	23	1.65	0.93	23	2.43	0.95	23	2.78	0.95	23	2.39	1.03	23	2.39	1.16	22	1.68	0.72	23	2.52	1.08
VonHumboldt-Harvey 1 (28)	24	3.38	0.97	23	1.74	0.96	24	2.71	0.86	25	3.28	1.06	25	2.84	0.99	25	2.40	1.12	24	1.58	0.72	25	2.76	1.13
VonHumboldt-Harvey 2 (26)	21	2.95	1.12	21	1.81	0.87	20	2.50	0.89	21	2.33	1.06	20	2.70	1.08	21	1.67	0.86	21	1.86	1.01	21	2.48	1.12
VonHumboldt-Harvey 3 (32)	25	3.00	1.00	25	1.84	1.14	25	2.44	1.04	25	2.88	1.01	25	2.76	1.16	24	2.33	1.17	24	2.21	1.10	24	2.42	0.93
—Conventional—																								
Addams-Tallackson 1 (20)	18	3.00	0.97	18	1.94	1.16	18	3.00	0.84	18	2.89	0.83	17	2.59	1.00	18	1.83	1.04	18	1.39	0.70	18	2.67	0.97
Wacker-Krittendon 1 (26)	21	3.00	1.10	23	1.96	1.02	22	2.68	1.17	22	2.77	0.97	22	2.95	1.00	21	1.95	1.02	22	1.45	0.86	21	3.05	1.07
Wacker-Krittendon 2 (23)	20	3.05	0.89	20	1.95	1.10	19	3.05	0.91	20	2.85	0.81	20	2.70	1.08	20	2.35	0.99	20	1.65	0.67	20	2.90	1.07
Wacker-Krittendon 3 (21)	17	2.82	1.01	17	1.59	0.87	17	2.18	1.13	17	2.94	0.97	17	2.65	1.00	17	2.06	1.14	17	1.65	1.00	16	2.81	1.05

Table C5 *(continued)*

Key

3. I feel sure that I am able to learn new ideas in math class. *(confidence in ability to learn mathematics)*
4. In mathematics, you can discover new ways of solving problems that the teacher or your classmates may not have thought of. *(problem solving)*
6.* If I use a calculator to solve a problem, I can be sure it will always give me the right answer. *(calculator use)*
11. Anyone who works hard enough can be good at math. *(effort)*
16. It's okay if I solve a math problem differently than my classmates do. *(problem solving)*
20.* Mathematics is not related to any of my other school subjects. *(connection to other school subjects)*
27.* Understanding why an answer is right is not as important as getting the right answer. *(understanding vs. answer)*
28.* Mathematics is more difficult to understand than other subjects. *(connection to other school subjects)*
37.* No matter how hard a person works, some people are just naturally good at math and some are just not. *(effort)*
38.* Answering questions correctly in math means only giving a number. *(process vs. answer)*
39.* Each new math topic I study is not related to ones I have learned before. *(connection among mathematics topics)*
44.* When my teacher asks a question I will get it right if I have memorized the correct rule or fact. *(mathematics as facts or rules)*
45.* If you have to use a calculator to solve a problem, you don't really understand how to do the problem. *(calculator use)*
49.* It really doesn't matter if you understand a math problem or how you get an answer as long as the answer you get is right. *(understanding vs. answer)*
53. Knowing how to solve a problem is as important as getting the answer. *(process vs. answer)*
55.* Mathematics is mostly learned by memorizing facts and rules. *(mathematics as facts or rules)*

* Reverse-scored due to wording of question.

Table C6

Class Means on Student Attribution of Success or Failure in Mathematics, Grade 6, District 1

School-Class (*N*)	Success											
	Teacher			Ability			Effort			Luck		
	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD
—MiC—												
Fernwood-Lee/Weatherspoon 1 (28)	25	3.60	0.91	24	2.25	1.03	25	1.20	0.65	25	2.96	1.14
Fernwood-Lee/Weatherspoon 2 (28)	26	3.42	0.81	26	2.12	0.71	25	1.36	0.57	26	3.15	0.78
Fernwood-Lee/Weatherspoon 3 (25)	25	3.36	0.99	25	2.40	0.91	25	1.28	0.68	25	3.12	0.97
VonHumboldt-Brown 1 (23)	22	3.91	0.29	22	2.18	1.14	21	1.19	0.51	21	3.29	1.10
VonHumboldt-Brown 2 (19)	15	3.60	1.06	16	2.44	0.96	16	1.13	0.50	16	3.25	1.00
VonHumboldt-Brown 3 (29)	23	3.70	0.56	23	2.57	1.12	23	1.74	0.96	23	3.00	1.17
VonHumboldt-Harvey 1 (28)	23	3.61	0.78	26	2.77	0.95	23	1.78	1.13	25	2.88	1.27
VonHumboldt-Harvey 2 (26)	22	3.73	0.63	21	2.71	0.96	21	1.48	0.93	21	3.19	0.98
VonHumboldt-Harvey 3 (31)	25	3.56	0.92	25	2.36	0.99	25	1.68	1.11	25	3.20	1.04
—Conventional—												
Addams-Tallackson 1 (20)	18	3.56	0.86	17	2.47	1.12	18	1.44	0.70	18	2.94	1.26
Wacker-Krittendon 1 (26)	23	3.70	0.76	23	2.22	1.09	22	1.45	0.86	23	3.09	1.16
Wacker-Krittendon 2 (23)	20	3.55	0.89	19	2.16	1.07	20	1.25	0.55	20	3.15	1.18
Wacker-Krittendon 3 (22)	17	3.24	1.09	15	2.00	0.93	17	1.47	0.62	17	3.41	0.94

School-Class (*N*)	Failure											
	Teacher			Ability			Effort			Luck		
	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD
—MiC—												
Fernwood-Lee/Weatherspoon 1 (28)	25	3.48	1.00	25	2.48	1.08	25	2.20	1.12	25	3.36	0.99
Fernwood-Lee/Weatherspoon 2 (28)	26	3.42	0.76	27	2.59	1.08	24	2.08	0.97	23	3.30	0.93
Fernwood-Lee/Weatherspoon 3 (25)	25	3.44	1.12	25	2.92	1.04	25	2.00	0.96	25	3.40	0.96
VonHumboldt-Brown 1 (23)	21	3.86	0.36	22	2.77	1.19	20	2.05	1.05	21	3.52	0.93
VonHumboldt-Brown 2 (19)	16	3.44	1.09	16	2.75	1.18	15	2.33	0.82	16	3.19	0.98
VonHumboldt-Brown 3 (29)	23	3.35	1.03	23	2.96	0.98	23	2.13	1.10	23	3.13	1.18
VonHumboldt-Harvey 1 (28)	24	3.42	1.06	26	2.92	1.02	25	1.80	1.12	25	3.12	1.20
VonHumboldt-Harvey 2 (26)	21	3.67	0.80	22	2.82	1.18	21	2.10	1.09	20	3.15	1.14
VonHumboldt-Harvey 3 (31)	25	3.52	0.92	25	3.36	0.86	24	2.25	0.94	24	3.58	0.83
—Conventional—												
Addams-Tallackson 1 (20)	18	3.56	0.78	18	2.72	1.07	18	2.00	0.91	18	3.67	0.59
Wacker-Krittendon 1 (26)	23	3.26	1.05	23	3.13	1.01	20	1.80	0.95	21	3.33	1.02
Wacker-Krittendon 2 (23)	20	3.60	0.94	20	2.65	0.99	20	2.10	1.29	20	3.20	0.95
Wacker-Krittendon 3 (22)	17	3.47	0.94	17	3.06	1.20	16	2.19	0.91	17	3.71	0.59

APPENDIX C

GRADE 7, DISTRICT 1

Table C1

Fixed Characteristics, Grade 7, District 1

School-Class *(N)*	**Sex**		**Ethnicity** *(self-identified)*								
	Female	**Male**	**African American**	**Native American**	**Asian**	**Hispanic**	**White**	**Multi-racial**	**Haitian**	**Other**	**Non-Response**
—MiC—											
Fernwood-Heath 1 (30)	15	15	10%	0%	0%	13%	53%	10%	0%	0%	13%
Fernwood-Heath 2 (23)	15	8	13%	0%	0%	13%	48%	17%	0%	0%	9%
VonHumboldt-Donnely 1 (25)	11	14	12%	0%	0%	4%	64%	16%	0%	0%	4%
VonHumboldt-Donnely 2 (23)	12	11	13%	9%	0%	4%	65%	4%	0%	0%	4%
VonHumboldt-Donnely 3 (23)	12	11	26%	0%	4%	9%	57%	0%	0%	0%	4%
—Conventional—											
Addams-St.James 1 (20)	16	4	5%	0%	0%	10%	80%	5%	0%	0%	0%
Addams-St.James 2 (19)	12	7	21%	0%	0%	0%	58%	16%	0%	5%	0%
Wacker-McLaughlin 1 (24)	11	13	42%	0%	0%	0%	54%	0%	0%	0%	4%
Wacker-McLaughlin 2 (16)	7	9	25%	0%	0%	0%	56%	13%	0%	0%	6%
Wacker-McLaughlin 3 (16)	8	8	13%	0%	0%	0%	81%	6%	0%	0%	0%

Table C2

Standardized Test Scores, Spring 1997, Grade 7, District 1

School-Class *(N)*	**TerraNova**											
	Scale Score						**National Percentile**					
	(*N*)	**Mean**	**StDev**	**Mini-mum**	**Median**	**Maxi-mum**	**(*N*)**	**Mean**	**StDev**	**Mini-mum**	**Median**	**Maxi-mum**
—MiC—												
Fernwood-Heath 1 (30)	17	650.23	38.73	585	653.0	720	23	42.65	25.33	5	43.0	94
Fernwood-Heath 2 (23)	7	672.29	29.08	635	658.0	706	18	47.44	24.87	4	43.0	90
VonHumboldt-Donnely 1 (25)	3	701.00	13.89	692	694.0	717	18	49.17	34.40	2	38.5	93
VonHumboldt-Donnely 2 (23)	5	641.00	23.59	603	650.0	665	21	47.48	25.66	2	43.0	97
VonHumboldt-Donnely 3 (23)	8	660.50	31.09	615	658.5	711	19	49.84	22.44	9	46.0	91
—Conventional—												
Addams-St.James 1 (20)	16	679.38	31.10	619	683.0	730	16	66.5	25.20	17	72.0	96
Addams-St.James 2 (19)	15	670.33	20.54	643	669.0	706	17	60.53	19.27	34	58.0	89
Wacker-McLaughlin 1 (24)	14	652.29	32.34	561	656.5	697	18	43.22	24.54	1	46.0	84
Wacker-McLaughlin 2 (16)	6	628.17	26.57	588	630.5	665	13	30.92	18.31	5	25.0	62
Wacker-McLaughlin 3 (16)	5	655.60	16.28	632	654.0	676	11	46.72	19.21	18	44.0	70

Table C3

Class Results on the Collis-Romberg Mathematical Problem-Solving Profiles, Grade 7, District 1

School-Class *(N)*	Level of Student Performance									No Response
	Prestructural	Unistructural		Multistructural		Relational		Extended Abstract		
	(%)	(%)	Ave.	(%)	Ave.	(%)	Ave.	(%)	Ave.	
—MiC—										
Fernwood-Heath 1 (26)			3.04		1.38		0.38		0.00	
Number	11.5%	65.4%		7.7%		11.5%		3.8%		0.0%
Algebra	46.2%	53.8%		0.0%		0.0%		0.0%		0.0%
Space	15.4%	15.4%		46.2%		19.2%		0.0%		3.8%
Measurement	26.9%	15.4%		42.3%		3.8%		0.0%		11.5%
Chance & Data	65.4%	15.4%		3.8%		0.0%		0.0%		15.4%
Fernwood-Heath 2 (22)			3.41		1.68		0.45		0.05	
Number	4.5%	59.1%		22.7%		9.1%		4.5%		0.0%
Algebra	27.3%	72.7%		0.0%		0.0%		0.0%		0.0%
Space	27.3%	9.1%		50.0%		13.6%		0.0%		0.0%
Measurement	27.3%	22.7%		36.4%		13.6%		0.0%		0.0%
Chance & Data	63.6%	9.1%		13.6%		4.5%		0.0%		9.1%
Von Humboldt-Donnely 1 (23)			3.17		1.65		0.74		0.13	
Number	17.4%	52.2%		4.3%		17.4%		8.7%		0.0%
Algebra	34.8%	60.9%		0.0%		0.0%		0.0%		4.3%
Space	4.3%	21.7%		43.5%		21.7%		4.3%		4.3%
Measurement	30.4%	8.7%		39.1%		13.0%		0.0%		8.7%
Chance & Data	69.6%	13.0%		0.0%		8.7%		0.0%		8.7%
Von Humboldt-Donnely 2 (21)			3.24		1.33		0.33		0.05	
Number	9.5%	66.7%		9.5%		4.8%		4.8%		4.8%
Algebra	28.6%	57.1%		0.0%		0.0%		0.0%		14.3%
Space	4.8%	19.0%		52.4%		19.0%		0.0%		4.8%
Measurement	28.6%	19.0%		38.1%		4.8%		0.0%		9.5%
Chance & Data	61.9%	28.6%		0.0%		0.0%		0.0%		9.5%
Von Humboldt-Donnely 3 (23)			3.00		1.18		0.32		0.09	
Number	4.5%	63.6%		18.2%		9.1%		0.0%		4.5%
Algebra	36.4%	54.5%		0.0%		0.0%		0.0%		9.1%
Space	22.7%	22.7%		36.4%		4.5%		9.1%		4.5%
Measurement	27.3%	27.3%		31.8%		0.0%		0.0%		13.6%
Chance & Data	63.6%	4.5%		0.0%		9.1%		0.0%		22.7%

Table C3 *(continued)*

School-Class *(N)*	**Level of Student Performance**									**No Response**
	Prestructural	**Unistructural**		**Multistructural**		**Relational**		**Extended Abstract**		
	(%)	**(%)**	**Ave.**	**(%)**	**Ave.**	**(%)**	**Ave.**	**(%)**	**Ave.**	
					—Conventional—					
Addams-St. James 1 (20)			4.10		2.20		1.25		0.05	
Number	0.0%	35.0%		25.0%		40.0%		0.0%		0.0%
Algebra	10.0%	90.0%		0.0%		0.0%		0.0%		0.0%
Space	0.0%	0.0%		40.0%		60.0%		0.0%		0.0%
Measurement	25.0%	20.0%		50.0%		0.0%		0.0%		5.0%
Chance & Data	45.0%	15.0%		5.0%		25.0%		0.0%		10.0%
Addams-St. James 2 (19)			3.47		1.79		0.89		0.11	
Number	0.0%	52.6%		21.1%		15.8%		10.5%		0.0%
Algebra	36.8%	57.9%		0.0%		0.0%		0.0%		5.3%
Space	15.8%	15.8%		21.1%		47.4%		0.0%		0.0%
Measurement	26.3%	15.8%		42.1%		15.8%		0.0%		0.0%
Chance & Data	52.6%	26.3%		5.3%		0.0%		0.0%		15.8%
Wacker-McLaughlin 1 (21)			3.19		1.24		0.33		0.00	
Number	33.3%	52.4%		0.0%		14.3%		0.0%		0.0%
Algebra	23.8%	76.2%		0.0%		0.0%		0.0%		0.0%
Space	14.3%	28.6%		52.4%		4.8%		0.0%		0.0%
Measurement	33.3%	23.8%		38.1%		4.8%		0.0%		0.0%
Chance & Data	71.4%	14.3%		0.0%		9.5%		0.0%		4.8%
Wacker-McLaughlin 2 (15)			2.53		1.07		0.07		0.00	
Number	20.0%	60.0%		0.0%		0.0%		0.0%		0.0%
Algebra	60.0%	40.0%		0.0%		0.0%		0.0%		0.0%
Space	13.3%	13.3%		66.7%		6.7%		0.0%		0.0%
Measurement	73.3%	6.7%		13.3%		0.0%		0.0%		6.7%
Chance & Data	66.7%	13.3%		0.0%		6.7%		0.0%		13.3%
Wacker-McLaughlin 3 (16)			2.73		1.27		0.33		0.00	
Number	0.0%	73.3%		13.3%		13.3%		0.0%		0.0%
Algebra	46.7%	46.7%		0.0%		0.0%		0.0%		6.7%
Space	40.0%	0.0%		40.0%		13.3%		0.0%		6.7%
Measurement	46.7%	13.3%		33.3%		6.7%		0.0%		0.0%
Chance & Data	66.7%	20.0%		0.0%		0.0%		0.0%		13.3%

Table C4

Student Data From Subscales of the Student Attitude Inventory, Grade 7, District 1

School-Class (*N*)		**Subscale (*1 = very true; 4 = not true at all*)**			
	Effort	**Confidence**	**Interest**	**Usefulness**	**Communication**
		—MiC—			
Fernwood-Heath 1 (30)					
Count	24	25	23	23	23
Mean	2.09	2.05	2.20	1.77	1.76
Median	2.00	2.00	2.25	1.75	1.71
Minimum	1.00	1.00	1.00	1.00	1.00
Maximum	4.00	3.20	3.63	3.63	3.14
Standard Deviation	0.63	0.58	0.66	0.56	0.51
Fernwood-Heath 2 (23)					
Count	17	18	15	17	16
Mean	2.07	1.98	1.98	1.68	1.86
Median	2.00	2.00	2.00	1.75	1.79
Minimum	1.00	1.00	1.13	1.13	1.14
Maximum	3.67	2.80	3.00	2.25	2.86
Standard Deviation	0.78	0.55	0.64	0.41	0.54
Von Humboldt-Donnely 1 (25)					
Count	11	12	12	11	12
Mean	1.80	1.98	2.25	1.86	2.08
Median	1.83	2.30	2.38	2.00	2.21
Minimum	1.00	1.20	1.00	1.00	1.14
Maximum	2.67	2.60	3.63	3.00	2.86
Standard Deviation	0.66	0.64	0.94	0.66	0.60
Von Humboldt-Donnely 2 (23)					
Count	10	15	11	10	11
Mean	2.42	2.45	2.74	1.94	2.16
Median	2.25	2.20	2.75	2.00	2.29
Minimum	1.50	1.80	2.00	1.25	1.57
Maximum	3.83	3.60	4.00	2.88	2.57
Standard Deviation	0.65	0.53	0.62	0.47	0.35
Von Humboldt-Donnely 3 (23)					
Count	18	18	18	17	18
Mean	2.10	2.02	2.32	2.03	2.03
Median	2.17	2.00	2.31	2.00	1.86
Minimum	1.00	1.00	1.25	1.13	1.43
Maximum	2.83	3.00	3.50	2.88	3.14
	0.60	0.56	0.58	0.52	0.46

Table C4 *(continued)*

School-Class *(N)*	**Subscale *(1 = very true; 4 = not true at all)***				
	Effort	**Confidence**	**Interest**	**Usefulness**	**Communication**
—Conventional—					
Addams-St. James 1 (20)					
Count	19	19	18	18	18
Mean	2.11	1.92	2.19	1.78	1.85
Median	1.83	1.80	2.19	1.56	1.71
Minimum	1.17	1.40	1.00	1.00	1.29
Maximum	3.17	2.40	3.63	3.00	2.86
Standard Deviation	0.57	0.33	0.78	0.57	0.41
Addams-St. James 2 (19)					
Count	17	18	18	18	18
Mean	1.98	1.84	2.08	1.69	1.82
Median	2.00	1.70	2.19	1.69	1.86
Minimum	1.00	1.20	1.00	1.00	1.00
Maximum	3.17	2.80	3.38	2.63	2.71
Standard Deviation	0.56	0.48	0.74	0.42	0.50
Wacker-McLaughlin 1 (24)					
Count	20	21	20	19	20
Mean	2.03	1.79	2.08	1.76	2.03
Median	2.00	1.80	1.75	1.63	1.93
Minimum	1.00	1.00	1.00	1.00	1.00
Maximum	4.00	3.40	3.63	2.88	4.00
Standard Deviation	0.71	0.58	0.85	0.51	0.64
Wacker-McLaughlin 2 (16)					
Count	12	10	11	11	12
Mean	2.01	2.04	2.26	1.85	1.86
Median	2.08	2.20	2.50	1.63	1.79
Minimum	1.00	1.20	1.00	1.25	1.29
Maximum	2.67	2.60	3.13	2.88	2.71
Standard Deviation	0.51	0.53	0.81	0.51	0.49
Wacker-McLaughlin 3 (16)					
Count	10	10	10	9	10
Mean	1.53	1.64	1.71	1.46	1.84
Median	1.42	1.50	1.31	1.25	1.86
Minimum	1.00	1.00	1.00	1.00	1.14
Maximum	2.50	3.00	2.75	2.25	2.57
Standard Deviation	0.53	0.60	0.68	0.47	0.41

Table C5

Class Means on General Perceptions Items of the Student Attitude Inventory, Grade 7, District 1

School-Class *(N)*	3			4			6			11			16			20			27			28		
	(N)	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**
—MiC—																								
Fernwood-Heath 1 (30)	26	1.65	0.94	26	1.46	0.86	26	2.00	0.94	26	1.38	0.90	26	1.15	0.37	26	1.46	0.90	26	2.50	1.14	26	2.46	1.03
Fernwood-Heath 2 (23)	20	1.45	0.51	21	1.67	0.80	21	2.38	1.12	21	1.29	0.46	21	1.48	0.93	20	1.50	0.76	21	2.33	1.02	21	2.62	0.97
VonHumboldt-Donnely 1 (25)	15	1.73	0.80	15	1.73	0.80	15	2.40	1.12	14	1.43	0.65	15	1.27	0.46	15	1.80	0.77	15	1.93	1.16	15	2.60	0.74
VonHumboldt-Donnely 2 (23)	18	1.94	0.80	17	1.88	0.78	18	1.94	0.80	18	1.39	0.78	18	1.39	0.50	18	1.78	1.00	17	2.59	1.00	16	2.94	0.93
VonHumboldt-Donnely 3 (23)	21	1.67	0.86	20	1.60	0.68	20	2.30	1.03	21	1.33	0.48	20	1.10	0.31	19	2.05	1.08	19	2.58	1.17	19	2.89	0.94
—Conventional—																								
Addams-St.James 1 (20)	18	1.28	0.46	19	1.95	0.62	19	2.16	0.96	19	1.42	0.61	19	1.68	0.82	19	1.37	0.68	19	1.79	1.08	19	2.68	0.89
Addams-St.James 2 (19)	18	1.44	0.62	18	1.89	0.90	18	2.44	0.98	18	1.11	0.32	19	1.32	0.58	19	1.26	0.56	19	1.68	0.89	19	2.47	1.07
Wacker-McLaughlin 1 (24)	22	1.45	0.74	22	1.68	0.78	22	2.27	0.98	22	1.55	0.96	22	1.50	0.74	22	1.59	1.05	22	2.45	1.10	22	2.05	1.25
Wacker-McLaughlin 2 (16)	11	1.45	0.52	12	1.83	0.72	12	2.92	1.16	12	1.50	0.80	12	1.25	0.45	11	1.91	1.04	11	2.64	0.92	12	3.00	1.13
Wacker-McLaughlin 3 (16)	11	1.36	0.50	11	1.45	0.52	11	2.64	0.92	11	1.36	0.92	11	1.27	0.47	11	1.64	0.81	11	2.27	1.10	11	1.91	1.38

School-Class *(N)*	37			38			39			44			45			49			53			55		
	(N)	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**
—MiC—																								
Fernwood-Heath 1 (30)	26	2.85	1.12	26	1.77	0.99	25	2.40	0.91	26	3.27	0.87	26	2.96	1.08	26	1.88	0.99	26	1.62	0.94	26	2.58	1.21
Fernwood-Heath 2 (23)	21	2.67	0.91	20	1.85	1.04	20	2.35	1.04	18	3.33	0.84	18	2.33	1.08	18	1.94	1.00	19	2.00	0.82	19	2.89	0.81
VonHumboldt-Donnely 1 (25)	13	3.15	0.99	12	2.08	0.90	12	2.25	0.87	12	2.92	1.00	12	2.08	1.08	11	1.82	0.75	12	1.67	0.98	12	2.83	1.03
VonHumboldt-Donnely 2 (23)	15	3.13	0.74	15	1.73	0.80	15	1.93	0.88	12	3.00	0.95	11	2.64	1.29	11	2.27	1.10	11	1.55	0.69	11	2.73	1.10
VonHumboldt-Donnely 3 (23)	19	2.95	1.03	19	1.89	1.05	19	2.16	0.76	18	2.89	0.90	18	2.83	1.04	18	2.06	0.94	18	1.78	0.81	18	3.00	0.91
—Conventional—																								
Addams-St.James 1 (20)	19	2.58	0.96	19	1.53	0.70	19	2.16	0.90	19	2.79	0.63	19	2.32	1.00	19	1.74	0.93	19	1.63	0.76	18	2.78	0.65
Addams-St.James 2 (19)	19	2.58	1.22	19	1.47	0.61	19	2.16	0.96	19	3.00	1.00	19	1.95	0.91	19	1.74	0.93	18	1.56	0.92	19	2.89	0.81
Wacker-McLaughlin 1 (24)	22	2.95	1.17	22	1.41	0.73	21	1.86	1.20	22	3.00	1.02	22	2.45	0.86	21	1.90	1.00	20	1.80	1.06	21	2.57	0.93
Wacker-McLaughlin 2 (16)	12	3.50	0.80	12	2.00	1.04	12	2.58	1.08	12	2.92	1.08	11	2.55	0.93	12	2.75	1.14	12	1.50	0.67	12	2.75	0.87
Wacker-McLaughlin 3 (16)	10	2.60	1.07	10	1.20	0.63	10	1.70	0.48	10	3.30	0.48	9	2.22	1.09	10	1.40	0.97	10	1.40	0.52	10	2.40	1.17

Table C5 *(continued)*

Key

3. I feel sure that I am able to learn new ideas in math class. *(confidence in ability to learn mathematics)*
4. In mathematics, you can discover new ways of solving problems that the teacher or your classmates may not have thought of. *(problem solving)*
6.* If I use a calculator to solve a problem, I can be sure it will always give me the right answer. *(calculator use)*
11. Anyone who works hard enough can be good at math. *(effort)*
16. It's okay if I solve a math problem differently than my classmates do. *(problem solving)*
20.* Mathematics is not related to any of my other school subjects. *(connection to other school subjects)*
27.* Understanding why an answer is right is not as important as getting the right answer. *(understanding vs. answer)*
28.* Mathematics is more difficult to understand than other subjects. *(connection to other school subjects)*
37.* No matter how hard a person works, some people are just naturally good at math and some are just not. *(effort)*
38.* Answering questions correctly in math means only giving a number. *(process vs. answer)*
39.* Each new math topic I study is not related to ones I have learned before. *(connection among mathematics topics)*
44.* When my teacher asks a question I will get it right if I have memorized the correct rule or fact. *(mathematics as facts or rules)*
45.* If you have to use a calculator to solve a problem, you don't really understand how to do the problem. *(calculator use)*
49.* It really doesn't matter if you understand a math problem or how you get an answer as long as the answer you get is right. *(understanding vs. answer)*
53. Knowing how to solve a problem is as important as getting the answer. *(process vs. answer)*
55.* Mathematics is mostly learned by memorizing facts and rules. *(mathematics as facts or rules)*

* Reverse-scored due to wording of question.

Table C6

Class Means on Student Attribution of Success or Failure in Mathematics, Grade 7, District 1

School-Class (*N*)	Success											
	Teacher			Ability			Effort			Luck		
	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD
—MiC—												
Fernwood-Heath 1 (30)	26	3.73	0.67	26	2.42	1.27	26	1.31	0.84	26	3.19	0.98
Fernwood-Heath 2 (23)	20	3.45	0.69	21	2.33	1.02	21	1.57	0.87	21	2.81	0.98
VonHumboldt-Donnely 1 (25)	15	3.47	0.92	15	2.07	0.80	12	1.50	0.90	13	3.08	1.12
VonHumboldt-Donnely 2 (23)	18	3.83	0.38	18	2.94	0.87	15	1.73	0.96	16	2.69	0.95
VonHumboldt-Donnely 3 (23)	21	3.19	1.03	21	2.29	0.78	19	1.84	0.76	19	2.58	1.07
—Conventional—												
Addams-St.James 1 (20)	19	3.79	0.54	19	2.53	1.02	19	1.37	0.50	19	3.42	0.69
Addams-St.James 2 (19)	17	3.71	0.77	18	2.61	0.92	19	1.42	0.84	19	3.53	0.70
Wacker-McLaughlin 1 (24)	22	3.55	0.86	22	2.41	1.05	21	1.67	1.02	22	3.55	0.74
Wacker-McLaughlin 2 (16)	12	3.58	0.79	12	2.92	1.16	12	1.33	0.65	11	3.27	0.79
Wacker-McLaughlin 3 (16)	11	3.45	0.93	11	2.27	0.79	10	1.30	0.67	10	3.50	0.71

School-Class (*N*)	Failure											
	Teacher			Ability			Effort			Luck		
	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD
—MiC—												
Fernwood-Heath 1 (30)	26	3.62	0.90	26	2.96	1.08	26	2.08	1.16	26	3.58	0.86
Fernwood-Heath 2 (23)	20	3.60	0.60	20	3.10	1.02	18	2.22	1.17	19	3.47	0.70
VonHumboldt-Donnely 1 (25)	13	3.46	0.88	15	3.07	0.96	12	2.25	1.06	12	3.17	1.03
VonHumboldt-Donnely 2 (23)	15	3.53	0.64	17	2.82	0.95	11	2.09	0.94	11	3.00	1.00
VonHumboldt-Donnely 3 (23)	19	3.53	0.84	20	2.50	0.89	18	1.94	1.00	18	3.00	1.08
—Conventional—												
Addams-St.James 1 (20)	19	3.53	0.90	19	3.26	0.65	18	1.72	0.57	18	3.61	0.61
Addams-St.James 2 (19)	19	4.00	0.00	19	3.42	0.84	18	1.78	0.88	19	3.79	0.42
Wacker-McLaughlin 1 (24)	22	3.82	0.50	22	3.27	1.12	21	2.29	0.96	21	3.33	0.86
Wacker-McLaughlin 2 (16)	12	3.58	0.79	11	2.91	1.22	12	2.25	1.14	12	2.75	1.14
Wacker-McLaughlin 3 (16)	10	4.00	0.00	11	3.73	0.47	10	2.10	0.99	10	3.90	0.32

APPENDIX D

GRADE 5, DISTRICT 2

Table D1

Fixed Characteristics, Grade 5, District 2

School-Class *(N)*	Sex		Ethnicity								
	Female	Male	African American	Native American	Asian	Hispanic	White	Multi-racial	Haitian	Other	Non-Response
—MiC—											
Armstrong-Murphy 1 (34)	19	15	15%	0%	0%	32%	35%	9%	0%	9%	0%
Armstrong-Nash 1 (29)	15	14	10%	0%	0%	17%	17%	24%	0%	21%	10%
Ogden-Fiske 1 (30)	10	20	0%	0%	0%	73%	10%	17%	0%	0%	0%
Ogden-Fiske 2 (24)	11	13	0%	0%	0%	58%	8%	29%	0%	4%	0%
Ogden-Piccolo 1 (27)	16	11	0%	0%	0%	67%	22%	11%	0%	0%	0%
Ogden-Piccolo 2 (23)	13	10	4%	0%	0%	52%	17%	22%	0%	0%	4%
Ogden-Piccolo 3 (25)	10	15	4%	0%	0%	52%	24%	16%	0%	0%	4%
—Conventional—											
VonSteuben-Gant 1 (38)	14	24	3%	0%	0%	18%	24%	21%	0%	34%	0%
VonSteuben-Gant 2 (37)	17	20	0%	3%	0%	30%	32%	19%	0%	16%	0%

Table D2

Results of the Collis-Romberg Mathematical Problem-Solving Profiles, Grade 5, District 2

School-Class (*N*)	Level of Student Performance									
	Prestructural	**Unistructural**		**Multistructural**		**Relational**		**Extended Abstract**		**No Response**
	(%)	**(%)**	**Ave.**	**(%)**	**Ave.**	**(%)**	**Ave.**	**(%)**	**Ave.**	**(%)**
—MiC—										
Armstrong-Murphy (32)			3.81		1.25		0.34		0.06	
Number	6.3%	71.9%		3.1%		15.6%		3.1%		0.0%
Algebra	15.6%	84.4%		0.0%		0.0%		0.0%		0.0%
Space	6.3%	37.5%		50.0%		6.3%		0.0%		0.0%
Measurement	31.3%	21.9%		43.8%		3.1%		0.0%		0.0%
Chance & Data	56.3%	40.6%		0.0%		0.0%		3.1%		0.0%
Armstrong-Nash (23)			3.70		1.26		0.17		0.00	
Number	4.3%	87.0%		0.0%		8.7%		0.0%		0.0%
Algebra	17.4%	82.6%		0.0%		0.0%		0.0%		0.0%
Space	13.0%	26.1%		52.2%		8.7%		0.0%		0.0%
Measurement	4.3%	39.1%		56.5%		0.0%		0.0%		0.0%
Chance & Data	82.6%	8.7%		0.0%		0.0%		0.0%		8.7%
Ogden-Fiske 1 (30)			2.43		0.93		0.10		0.00	
Number	26.7%	60.0%		6.7%		6.7%		0.0%		0.0%
Algebra	60.0%	40.0%		0.0%		0.0%		0.0%		0.0%
Space	40.0%	20.0%		36.7%		0.0%		0.0%		3.3%
Measurement	36.7%	20.0%		40.0%		0.0%		0.0%		3.3%
Chance & Data	73.3%	10.0%		0.0%		3.3%		0.0%		13.3%
Ogden-Fiske 2 (21)			2.57		0.86		0.10		0.00	
Number	14.3%	71.4%		4.8%		9.5%		0.0%		0.0%
Algebra	57.1%	33.3%		0.0%		0.0%		0.0%		9.5%
Space	33.3%	33.3%		33.3%		0.0%		0.0%		0.0%
Measurement	52.4%	9.5%		38.1%		0.0%		0.0%		0.0%
Chance & Data	57.1%	23.8%		0.0%		0.0%		0.0%		19.0%
Ogden-Piccolo 1 (26)			2.69		1.00		0.12		0.04	
Number	30.8%	57.7%		3.8%		3.8%		3.8%		0.0%
Algebra	46.2%	50.0%		0.0%		0.0%		0.0%		3.8%
Space	38.5%	15.4%		38.5%		3.8%		0.0%		3.8%
Measurement	19.2%	34.6%		38.5%		0.0%		0.0%		7.7%
Chance & Data	73.1%	7.7%		7.7%		0.0%		0.0%		11.5%

Table D2 *(continued)*

School-Class (*N*)	**Prestructural** (%)	**Unistructural** (%)	**Unistructural** Ave.	**Multistructural** (%)	**Multistructural** Ave.	**Relational** (%)	**Relational** Ave.	**Extended Abstract** (%)	**Extended Abstract** Ave.	**No Response** (%)
				—MiC—						
Ogden-Piccolo 2 (22)			2.64		0.95		0.05		0.00	
Number	18.2%	72.7%		4.5%		4.5%		0.0%		0.0%
Algebra	54.5%	45.5%		0.0%		0.0%		0.0%		0.0%
Space	22.7%	36.4%		40.9%		0.0%		0.0%		0.0%
Measurement	45.5%	9.1%		45.5%		0.0%		0.0%		0.0%
Chance & Data	90.9%	4.5%		0.0%		0.0%		0.0%		4.5%
Ogden-Piccolo 3 (25)			3.08		1.20		0.20		0.04	
Number	24.0%	56.0%		12.0%		4.0%		4.0%		0.0%
Algebra	32.0%	68.0%		0.0%		0.0%		0.0%		0.0%
Space	16.0%	32.0%		44.0%		8.0%		0.0%		0.0%
Measurement	40.0%	16.0%		44.0%		0.0%		0.0%		0.0%
Chance & Data	68.0%	16.0%		0.0%		4.0%		0.0%		12.0%
				—Conventional—						
Von Steuben-Gant 1 (24)			2.88		1.21		0.29		0.00	
Number	25.0%	54.2%		4.2%		16.7%		0.0%		0.0%
Algebra	33.3%	58.3%		0.0%		0.0%		0.0%		8.3%
Space	8.3%	25.0%		50.0%		8.3%		0.0%		8.3%
Measurement	29.2%	20.8%		37.5%		0.0%		0.0%		12.5%
Chance & Data	50.0%	16.7%		0.0%		4.2%		0.0%		29.2%
Von Steuben-Gant 2 (31)			2.65		1.00		0.39		0.00	
Number	16.1%	64.5%		3.2%		9.7%		6.5%		0.0%
Algebra	16.1%	71.0%		0.0%		0.0%		0.0%		12.9%
Space	32.3%	12.9%		29.0%		22.6%		0.0%		3.2%
Measurement	29.0%	12.9%		25.8%		6.5%		0.0%		25.8%
Chance & Data	48.4%	3.2%		3.2%		0.0%		0.0%		45.2%

Table D3

Student Data From Subscales of the Student Attitude Inventory, Grade 5, District 2

School-Class (N)	Subscale (1 = very true; 4 = not true at all)				
	Effort	**Confidence**	**Interest**	**Usefulness**	**Communication**
			—MiC—		
Armstrong-Murphy (34)					
Count	25	27	24	26	28
Mean	1.69	1.99	1.92	1.77	1.86
Median	1.50	1.80	1.81	1.69	1.64
Minimum	1.00	1.40	1.00	1.13	1.00
Maximum	2.83	2.80	3.00	3.13	3.43
Standard Deviation	0.55	0.47	0.52	0.53	0.59
Armstrong-Nash (29)					
Count	20	19	19	19	18
Mean	1.62	1.73	1.92	1.74	1.86
Median	1.58	1.80	2.00	1.75	1.86
Minimum	1.00	1.00	1.00	1.00	1.00
Maximum	2.50	2.60	3.25	2.75	2.71
Standard Deviation	0.47	0.47	0.68	0.43	0.54
Ogden-Fiske 1 (30)					
Count	18	18	18	18	19
Mean	1.88	2.04	1.94	1.81	1.85
Median	1.83	1.90	1.88	2.00	2.00
Minimum	1.00	1.20	1.00	1.00	1.00
Maximum	2.67	3.00	3.13	2.75	2.71
Standard Deviation	0.51	0.49	0.72	0.53	0.47
Ogden-Fiske 2 (24)					
Count	17	18	17	16	17
Mean	1.65	1.78	1.67	1.48	1.84
Median	1.67	1.70	1.63	1.44	1.86
Minimum	1.00	1.00	1.25	1.00	1.14
Maximum	2.50	2.80	2.50	2.25	2.57
Standard Deviation	0.47	0.52	0.36	0.36	0.44
Ogden-Piccolo 1 (27)					
Count	21	23	21	21	19
Mean	1.70	1.80	1.49	1.58	1.77
Median	1.67	1.60	1.50	1.50	2.00
Minimum	1.00	1.00	1.00	1.00	1.14
Maximum	2.50	3.00	2.50	2.38	2.14
Standard Deviation	0.50	0.58	0.44	0.44	0.35

Table D3 *(continued)*

School-Class (N)	**Subscale** *(1 = very true; 4 = not true at all)*				
	Effort	**Confidence**	**Interest**	**Usefulness**	**Communication**
—MiC (continued)—					
Ogden-Piccolo 2 (23)					
Count	20	20	19	19	20
Mean	1.71	2.05	1.41	1.57	1.71
Median	1.75	2.00	1.25	1.50	1.57
Minimum	1.00	1.00	1.00	1.00	1.00
Maximum	2.67	3.60	2.38	2.50	3.00
Standard Deviation	0.48	0.64	0.42	0.42	0.54
Ogden-Piccolo 3 (25)					
Count	25	24	24	23	25
Mean	1.75	1.94	1.80	1.62	1.84
Median	1.67	1.80	1.69	1.50	1.71
Minimum	1.00	1.00	1.00	1.00	1.00
Maximum	3.00	3.60	3.25	2.88	3.00
Standard Deviation	0.56	0.62	0.60	0.53	0.57
—Conventional—					
Von Steuben-Gant 1 (38)					
Count	16	15	15	15	16
Mean	1.68	1.84	1.69	1.51	1.82
Median	1.58	1.80	1.63	1.38	1.71
Minimum	1.00	1.40	1.00	1.00	1.00
Maximum	2.50	3.20	2.50	2.25	2.71
Standard Deviation	0.47	0.50	0.50	0.39	0.44
Von Steuben-Gant 2 (37)					
Count	24	23	25	23	23
Mean	1.97	2.00	1.87	1.71	1.77
Median	2.00	2.00	1.75	1.75	1.71
Minimum	1.17	1.20	1.00	1.00	1.00
Maximum	3.83	3.00	3.50	2.88	3.00
Standard Deviation	0.57	0.52	0.75	0.50	0.48

Table D4

Class Means on General Perceptions of the Student Attitude Inventory, Grade 5, District 2

School-Class *(N)*	3			4			6			11			16			20			27			28		
	(N)	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD
—MiC—																								
Armstrong-Murphy 1 (34)	30	1.50	0.68	30	1.73	0.91	30	2.67	1.21	29	1.34	0.77	29	1.17	0.38	29	2.00	1.20	29	2.45	1.18	29	2.59	1.15
Armstrong-Nash 1 (29)	20	1.40	0.50	19	1.42	0.61	19	2.74	1.19	20	1.00	0.00	20	1.10	0.31	19	1.42	0.90	20	2.25	1.29	20	2.60	1.27
Ogden-Fiske 1 (30)	26	1.58	0.95	26	1.69	0.79	26	2.58	1.06	26	1.38	0.90	25	1.64	0.81	24	2.08	1.10	25	2.56	1.16	25	2.08	1.19
Ogden-Fiske 2 (24)	20	1.10	0.31	20	1.55	0.89	20	2.60	1.31	20	1.30	0.92	20	1.50	0.83	20	2.10	1.17	20	2.35	1.23	19	2.37	1.26
Ogden-Piccolo 1 (27)	26	1.23	0.65	26	1.73	0.78	26	3.00	0.94	26	1.12	0.59	26	1.35	0.49	26	2.35	1.23	26	2.62	1.20	26	1.88	1.03
Ogden-Piccolo 2 (23)	22	1.32	0.78	22	1.82	0.91	22	3.18	0.85	21	1.00	0.00	22	1.45	0.74	20	2.10	1.21	22	2.55	1.18	22	2.18	1.10
Ogden-Piccolo 3 (25)	25	1.60	0.76	25	1.64	0.99	24	3.08	0.97	25	1.16	0.37	24	1.79	0.93	24	2.08	0.93	25	2.16	1.25	25	2.40	1.12
—Conventional—																								
VonSteuben-Gant 1 (38)	16	1.31	0.60	17	1.88	1.11	17	2.41	0.80	17	1.18	0.53	17	1.59	0.87	17	1.88	0.93	17	2.18	1.13	17	2.29	1.05
VonSteuben-Gant 2 (37)	24	1.33	0.70	25	1.80	0.91	25	3.00	0.91	24	1.08	0.41	25	1.64	0.95	25	2.08	1.04	25	2.00	1.15	25	2.48	1.00

School-Class (N)	37			38			39			44			45			49			53			55		
	(N)	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	Std Dev
—MiC—																								
Armstrong-Murphy 1 (34)	30	2.53	1.11	30	1.93	1.14	28	2.29	1.12	29	3.41	0.78	29	2.90	1.18	29	2.24	1.18	29	1.52	0.91	29	2.97	1.15
Armstrong-Nash 1 (29)	20	3.00	1.34	20	1.75	0.97	20	2.40	1.31	20	3.65	0.49	19	2.68	1.20	20	2.05	1.23	19	1.63	1.01	20	3.40	0.82
Ogden-Fiske 1 (30)	23	2.83	1.19	23	2.04	1.11	23	2.30	1.02	21	3.43	0.75	21	3.10	1.09	21	1.81	1.17	21	1.43	0.81	21	3.05	1.20
Ogden-Fiske 2 (24)	20	2.90	1.02	19	2.11	1.29	19	3.05	1.08	19	3.53	0.77	19	3.11	1.24	19	2.26	1.24	18	1.39	0.61	18	3.50	0.79
Ogden-Piccolo 1 (27)	24	2.88	0.99	25	1.96	1.10	24	2.63	1.21	24	3.50	0.78	24	3.13	1.03	24	2.83	1.09	24	1.38	0.77	22	3.18	1.14
Ogden-Piccolo 2 (23)	22	3.23	1.07	22	2.00	1.11	21	3.00	1.05	21	3.00	0.95	21	2.86	1.11	20	2.20	1.15	20	1.70	1.08	20	3.05	1.00
Ogden-Piccolo 3 (25)	25	3.00	1.08	25	1.72	0.98	25	2.44	1.08	25	3.24	1.05	25	2.92	1.08	25	2.20	1.15	25	1.28	0.46	24	3.21	0.98
—Conventional—																								
VonSteuben-Gant 1 (38)	16	2.63	0.96	16	1.69	0.87	16	2.38	1.02	17	3.06	0.83	17	2.76	0.90	17	1.76	0.97	17	1.29	0.47	17	2.88	0.93
VonSteuben-Gant 2 (37)	24	2.13	0.85	24	1.42	0.58	24	2.17	0.96	25	3.12	1.01	25	2.88	1.20	25	1.56	0.87	25	1.52	0.96	25	2.68	0.90

Table D4 *(continued)*

Key

3. I feel sure that I am able to learn new ideas in math class. *(confidence in ability to learn mathematics)*
4. In mathematics, you can discover new ways of solving problems that the teacher or your classmates may not have thought of. *(problem solving)*
6.* If I use a calculator to solve a problem, I can be sure it will always give me the right answer. *(calculator use)*
11. Anyone who works hard enough can be good at math. *(effort)*
16. It's okay if I solve a math problem differently than my classmates do. *(problem solving)*
20.* Mathematics is not related to any of my other school subjects. *(connection to other school subjects)*
27.* Understanding why an answer is right is not as important as getting the right answer. *(understanding vs. answer)*
28.* Mathematics is more difficult to understand than other subjects. *(connection to other school subjects)*
37.* No matter how hard a person works, some people are just naturally good at math and some are just not. *(effort)*
38.* Answering questions correctly in math means only giving a number. *(process vs. answer)*
39.* Each new math topic I study is not related to ones I have learned before. *(connection among mathematics topics)*
44.* When my teacher asks a question I will get it right if I have memorized the correct rule or fact. *(mathematics as facts or rules)*
45.* If you have to use a calculator to solve a problem, you don't really understand how to do the problem. *(calculator use)*
49.* It really doesn't matter if you understand a math problem or how you get an answer as long as the answer you get is right. *(understanding vs. answer)*
53. Knowing how to solve a problem is as important as getting the answer. *(process vs. answer)*
55.* Mathematics is mostly learned by memorizing facts and rules. *(mathematics as facts or rules)*

* Reverse-scored due to wording of question.

Table D5

Class Means on Student Attribution of Success or Failure in Mathematics, Grade 5, District 2

School-Class (*N*)	Success											
	Teacher			Ability			Effort			Luck		
	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD
—MiC—												
Armstrong-Murphy 1 (34)	29	3.55	0.83	29	2.00	0.93	29	1.21	0.56	30	3.30	0.99
Armstrong-Nash 1 (29)	19	3.63	0.96	20	1.80	0.89	20	1.50	0.89	20	3.50	0.95
Ogden-Fiske 1 (30)	26	3.42	0.81	26	1.96	0.96	23	1.39	0.78	25	2.64	1.29
Ogden-Fiske 2 (24)	20	3.05	1.05	20	1.50	0.83	19	1.11	0.32	20	3.10	1.12
Ogden-Piccolo 1 (27)	26	3.38	0.94	26	1.54	0.71	24	1.13	0.61	26	2.85	1.26
Ogden-Piccolo 2 (23)	22	3.32	0.99	22	2.14	1.04	21	1.19	0.51	22	2.64	1.22
Ogden-Piccolo 3 (25)	25	3.48	0.82	25	1.96	0.93	25	1.28	0.68	25	3.20	0.96
—Conventional—												
VonSteuben-Gant 1 (38)	17	3.71	0.59	17	2.12	0.70	16	1.25	0.45	17	3.59	0.62
VonSteuben-Gant 2 (37)	25	3.84	0.47	25	2.28	0.84	24	1.29	0.69	25	3.32	0.90

School-Class (*N*)	Failure											
	Teacher			Ability			Effort			Luck		
	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD
—MiC—												
Armstrong-Murphy 1 (34)	29	3.66	0.72	29	3.31	0.93	29	1.86	1.09	29	3.45	0.91
Armstrong-Nash 1 (29)	20	3.45	1.05	20	2.95	1.19	19	1.89	0.99	19	3.58	0.96
Ogden-Fiske 1 (30)	23	3.22	1.17	25	2.56	1.26	21	1.62	0.8	21	3.10	0.94
Ogden-Fiske 2 (24)	20	3.45	0.94	20	2.65	1.18	18	1.44	0.70	19	3.63	0.83
Ogden-Piccolo 1 (27)	24	3.79	0.59	26	2.54	1.17	22	1.82	1.01	24	3.50	0.88
Ogden-Piccolo 2 (23)	22	3.68	0.84	22	2.55	1.06	20	1.65	0.93	20	3.30	1.08
Ogden-Piccolo 3 (25)	25	3.76	0.83	25	2.40	1.08	24	1.71	1.00	25	3.56	0.82
—Conventional—												
VonSteuben-Gant 1 (38)	16	3.56	0.89	17	3.35	0.86	17	2.12	0.99	17	3.35	0.93
VonSteuben-Gant 2 (37)	24	3.83	0.56	24	3.13	0.95	25	1.84	0.85	24	3.58	0.78

APPENDIX D

GRADE 6, DISTRICT 2

Table D1

Fixed Characteristics, Grade 6, District 2

School-Class *(N)*	Sex		Ethnicity								
	F	M	African American	Native American	Asian	Hispanic	White	Multiracial	Haitian	Other	Non-Response
—MiC—											
Guggenheim-Broughton 1 (26)	12	14	27%	0%	0%	31%	19%	15%	0%	0%	8%
Guggenheim-Broughton 2 (14)	5	9	36%	0%	0%	21%	36%	7%	0%	0%	0%
Guggenheim-Dillard 1 (27)	18	9	11%	0%	0%	19%	37%	26%	0%	4%	4%
Guggenheim-Dillard 2 (16)	10	6	13%	6%	0%	31%	25%	13%	0%	6%	6%
HirschMetro-Davenport 1 (22)	15	7	0%	0%	0%	68%	0%	27%	0%	5%	0%
HirschMetro-Davenport 2 (26)	15	11	4%	0%	0%	69%	4%	23%	0%	0%	0%
HirschMetro-Holland 1 (27)	19	8	4%	0%	0%	81%	0%	7%	0%	4%	4%
HirschMetro-Holland 2 (27)	16	11	4%	0%	0%	63%	15%	15%	0%	0%	4%
—Conventional—											
Newberry-Renlund 1 (29)	13	16	14%	3%	0%	38%	10%	28%	0%	3%	3%
Newberry-Rhaney 1 (37)	16	21	30%	3%	0%	32%	3%	19%	0%	0%	14%

Table D2

Results on the Collis-Romberg Mathematical Problem-Solving Profiles, Grade 6, District 2

School-Class (*N*)	Level of Student Performance									No Response
	Prestructural	Unistructural		Multistructural		Relational		Extended Abstract		
	(%)	(%)	Ave.	(%)	Ave.	(%)	Ave.	(%)	Ave.	
—MiC—										
Guggenheim-Broughton 1 (22)			2.64		0.73		0.09		0.00	
Number	13.6%	72.7%		9.1%		4.5%		0.0%		0.0%
Algebra	40.9%	54.5%		0.0%		0.0%		0.0%		4.5%
Space	22.7%	27.3%		40.9%		4.5%		0.0%		4.5%
Measurement	45.5%	36.4%		13.6%		0.0%		0.0%		4.5%
Chance & Data	81.0%	14.3%		0.0%		0.0%		4.8%		0.0%
Guggenheim-Broughton 2 (13)			2.27		0.54		0.00		0.00	
Number	0.0%	84.6%		0.0%		0.0%		0.0%		15.4%
Algebra	53.8%	23.1%		0.0%		0.0%		0.0%		23.1%
Space	30.8%	23.1%		15.4%		0.0%		0.0%		30.8%
Measurement	23.1%	7.7%		38.5%		0.0%		0.0%		30.8%
Chance & Data	61.5%	0.0%		0.0%		0.0%		0.0%		38.5%
Guggenheim-Dillard 1 (20)			2.61		1.30		0.30		0.05	
Number	0.0%	50.0%		15.0%		20.0%		5.0%		10.0%
Algebra	35.0%	45.0%		0.0%		0.0%		0.0%		20.0%
Space	10.0%	0.0%		55.0%		5.0%		0.0%		30.0%
Measurement	20.0%	5.0%		30.0%		0.0%		0.0%		45.0%
Chance & Data	30.0%	5.0%		0.0%		0.0%		0.0%		65.0%
Guggenheim-Dillard 2 (13)			3.08		1.08		0.15		0.00	
Number	15.4%	84.6%		0.0%		0.0%		0.0%		0.0%
Algebra	53.8%	46.2%		0.0%		0.0%		0.0%		0.0%
Space	7.7%	30.8%		46.2%		15.4%		0.0%		0.0%
Measurement	30.8%	15.4%		46.2%		0.0%		0.0%		7.7%
Chance & Data	46.2%	23.1%		0.0%		0.0%		0.0%		30.8%
Hirsch Metro-Davenport 1 (22)			3.09		1.27		0.18		0.00	
Number	27.3%	36.4%		18.2%		18.2%		0.0%		0.0%
Algebra	27.3%	72.7%		0.0%		0.0%		0.0%		0.0%
Space	22.7%	31.8%		40.9%		0.0%		0.0%		4.5%
Measurement	36.4%	13.6%		45.5%		0.0%		0.0%		4.5%
Chance & Data	50.0%	27.3%		4.5%		0.0%		0.0%		18.2%
Hirsch Metro-Davenport 2 (26)			2.58		0.92		0.08		0.00	
Number	50.0%	34.6%		7.7%		7.7%		0.0%		0.0%
Algebra	46.2%	46.2%		0.0%		0.0%		0.0%		7.7%
Space	34.6%	23.1%		34.6%		3.8%		0.0%		3.8%
Measurement	42.3%	15.4%		38.5%		0.0%		0.0%		3.8%
Chance & Data	84.6%	3.8%		0.0%		0.0%		0.0%		11.5%

Table D2 *(continued)*

School-Class (*N*)	Level of Student Performance									No Response
	Prestructural	**Unistructural**		**Multistructural**		**Relational**		**Extended Abstract**		
	(%)	**(%)**	**Ave.**	**(%)**	**Ave.**	**(%)**	**Ave.**	**(%)**	**Ave.**	
—MiC (continued)—										
Hirsch Metro-Holland 1 (27)			2.89		1.07		0.15		0.00	
Number	7.4%	70.4%		14.8%		7.4%		0.0%		0.0%
Algebra	55.6%	44.4%		0.0%		0.0%		0.0%		0.0%
Space	25.9%	22.2%		44.4%		7.4%		0.0%		0.0%
Measurement	51.9%	18.5%		29.6%		0.0%		0.0%		0.0%
Chance & Data	70.4%	22.2%		3.7%		0.0%		0.0%		3.7%
Hirsch Metro-Holland 2 (24)			3.25		1.54		0.46		0.00	
Number	8.3%	45.8%		16.7%		29.2%		0.0%		0.0%
Algebra	41.7%	58.3%		0.0%		0.0%		0.0%		0.0%
Space	12.5%	20.8%		50.0%		16.7%		0.0%		0.0%
Measurement	37.5%	20.8%		41.7%		0.0%		0.0%		0.0%
Chance & Data	70.8%	25.0%		0.0%		0.0%		0.0%		4.2%
—Conventional—										
Newberry-Renlund (26)			3.50		1.62		0.27		0.04	
Number	7.7%	61.5%		15.4%		11.5%		3.8%		0.0%
Algebra	19.2%	80.8%		0.0%		0.0%		0.0%		0.0%
Space	26.9%	11.5%		50.0%		7.7%		0.0%		3.8%
Measurement	23.1%	11.5%		61.5%		3.8%		0.0%		0.0%
Chance & Data	61.5%	23.1%		7.7%		0.0%		0.0%		7.7%
Newberry-Rhaney* (25)			1.32 (1.94)*		0.44 (0.65)*		0.04		0.00	
Number	12.0%	48.0%		4.0%		4.0%		0.0%		32.0%
Algebra	36.0%	20.0%		0.0%		0.0%		0.0%		44.0%
Space	32.0%	8.0%		24.0%		0.0%		0.0%		36.0%
Measurement	44.0%	8.0%		12.0%		0.0%		0.0%		36.0%
Chance & Data	64.0%	0.0%		0.0%		0.0%		0.0%		36.0%

*Although there were 37 students in Rhaney's class, only 25 tests were submitted to the project for scoring, and 8 of these were incomplete.
Apparently, eight students had been given a test with a missing page.
Several unsuccessful attempts were made to have the rest of the class take the Collis-Romberg Profile.
The averages reported here are based on the scores of the students who actually took these sections of the test.

Table D3

Student Data From Subscales of the Student Attitude Inventory, Grade 6, District 2

School-Class *(N)*	**Subscale *(1 = very true; 4 = not true at all)***				
	Effort	**Confidence**	**Interest**	**Usefulness**	**Communication**
—MiC—					
Guggenheim-Broughton 1 (26)					
Count	22	22	19	22	22
Mean	2.09	2.28	2.44	2.18	2.28
Median	2.00	2.40	2.50	2.13	2.43
Minimum	1.00	1.40	1.38	1.25	1.00
Maximum	3.50	3.20	3.13	3.50	3.00
Standard Deviation	0.57	0.50	0.43	0.53	0.54
Guggenheim-Broughton 2 (14)					
Count	11	12	12	12	12
Mean	2.05	2.23	2.24	1.98	2.06
Median	2.00	2.40	2.38	1.81	2.07
Minimum	1.17	1.20	1.25	1.25	1.57
Maximum	3.17	3.00	3.00	3.38	3.14
Standard Deviation	0.61	0.59	0.55	0.60	0.45
Guggenheim-Dillard 1 (27)					
Count	24	23	23	24	23
Mean	1.99	2.04	2.25	1.76	1.91
Median	1.92	2.00	2.38	1.63	1.71
Minimum	1.17	1.20	1.00	1.00	1.00
Maximum	3.17	3.00	3.75	2.88	3.14
Standard Deviation	0.50	0.40	0.76	0.47	0.51
Guggenheim-Dillard 2 (16)					
Count	13	12	12	13	12
Mean	1.86	1.78	2.02	1.58	1.81
Median	2.00	1.90	2.00	1.63	1.79
Minimum	1.17	1.00	1.13	1.00	1.43
Maximum	2.33	2.40	3.13	2.13	2.29
Standard Deviation	0.38	0.45	0.59	0.34	0.31
Hirsch Metro-Davenport 1 (22)					
Count	21	21	20	20	20
Mean	1.88	2.13	1.98	1.81	2.06
Median	1.83	2.20	1.88	1.63	2.00
Minimum	1.00	1.20	1.00	1.13	1.14
Maximum	3.00	3.80	3.38	3.25	3.00
Standard Deviation	0.60	0.59	0.67	0.62	0.55
Hirsch Metro-Davenport 2 (26)					
Count	25	23	22	23	25
Mean	1.91	2.17	2.32	1.71	1.89
Median	1.83	2.20	2.44	1.50	1.86
Minimum	1.00	1.00	1.00	1.00	1.29
Maximum	3.00	3.40	3.38	2.75	2.43
Standard Deviation	0.53	0.58	0.58	0.52	0.32

Table D3 *(continued)*

School-Class *(N)*	**Subscale *(1 = very true; 4 = not true at all)***				
	Effort	**Confidence**	**Interest**	**Usefulness**	**Communication**
—MiC (continued)—					
Hirsch Metro-Holland 1 (27)					
Count	24	26	26	26	25
Mean	1.65	2.04	1.85	1.55	1.81
Median	1.58	2.00	1.75	1.56	1.71
Minimum	1.00	1.40	1.13	1.13	1.00
Maximum	3.00	3.00	3.00	2.50	3.00
Standard Deviation	0.51	0.41	0.57	0.34	0.51
Hirsch Metro-Holland 2 (27)					
Count	20	19	20	17	18
Mean	1.73	1.97	2.01	1.65	1.80
Median	1.75	2.00	2.06	1.63	1.79
Minimum	1.00	1.00	1.00	1.25	1.14
Maximum	2.50	2.60	2.88	2.38	2.71
Standard Deviation	0.41	0.45	0.52	0.35	0.35
—Conventional—					
Newberry-Renlund (29)					
Count	22	23	23	21	23
Mean	1.89	1.82	1.92	1.64	1.86
Median	1.83	1.80	1.88	1.50	1.86
Minimum	1.17	1.00	1.13	1.13	1.14
Maximum	3.50	3.00	3.63	3.00	2.86
Standard Deviation	0.59	0.53	0.59	0.44	0.38
Newberry-Rhaney (37)					
Count	13	17	13	13	15
Mean	2.21	2.33	2.24	2.39	2.16
Median	2.33	2.20	2.25	2.38	2.00
Minimum	1.50	1.40	1.25	1.63	1.43
Maximum	2.67	3.40	3.13	3.13	3.00
Standard Deviation	0.35	0.50	0.45	0.45	0.50

Table D4

Class Means on General Perception Items of the Student Attitude Inventory, Grade 6, District 2

School-Class *(N)*	**Item Number *(see Key)***																							
	3			**4**			**6**			**11**			**16**			**20**			**27**			**28**		
	(N)	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**
—MiC—																								
Guggenheim-Broughton 1 (26)	20	1.35	0.67	20	1.80	0.70	20	2.75	0.72	20	1.35	0.59	20	1.50	0.76	19	2.00	0.94	20	2.85	1.18	20	2.50	1.05
Guggenheim-Broughton 2 (14)	12	1.75	0.75	12	1.75	0.87	12	2.75	1.06	12	1.50	0.90	12	1.25	0.45	12	1.83	0.94	12	2.58	1.08	11	2.36	1.21
Guggenheim-Dillard 1 (27)	24	1.71	0.95	24	1.54	0.66	24	2.21	0.98	24	1.17	0.48	24	1.42	0.65	23	1.39	0.78	24	2.42	1.18	24	2.50	1.14
Guggenheim-Dillard 2 (16)	13	1.38	0.51	13	1.31	0.48	13	2.85	0.80	13	1.15	0.55	13	1.23	0.44	13	1.46	0.88	13	2.69	1.25	13	2.54	1.27
HirschMetro-Davenport 1 (22)	19	1.63	0.76	21	1.57	0.93	21	2.95	1.12	21	1.38	0.67	20	1.60	0.68	21	1.71	0.96	20	2.15	0.99	21	2.38	0.86
HirschMetro-Davenport 2 (26)	24	1.67	0.87	24	1.71	0.75	25	2.80	0.91	25	1.24	0.60	26	1.46	0.81	26	1.54	0.86	25	2.40	1.04	25	2.48	1.16
HirschMetro-Holland 1 (27)	25	1.60	0.71	26	1.65	0.80	25	3.32	0.69	26	1.08	0.27	27	1.44	0.80	27	1.81	0.96	27	2.04	1.09	26	2.23	0.95
HirschMetro-Holland 2 (27)	21	1.57	0.51	21	1.71	0.64	21	2.81	1.08	21	1.10	0.30	22	1.64	0.79	22	1.95	0.95	22	1.73	0.98	21	2.24	1.00
—Conventional—																								
Newberry-Renlund 1 (29)	23	1.22	0.42	24	1.67	0.87	24	2.63	1.10	24	1.13	0.45	24	1.42	0.93	24	1.33	0.76	24	2.21	1.38	23	2.09	1.08
Newberry-Rhaney 1 (37)	27	1.41	0.64	28	1.68	0.86	28	2.61	1.10	26	1.27	0.67	28	1.79	0.96	26	2.19	1.13	23	2.52	1.20	26	2.88	0.99

School-Class *(N)*	**37**			**38**			**39**			**44**			**45**			**49**			**53**			**55**		
	(N)	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**
—MiC—																								
Guggenheim-Broughton 1 (26)	19	3.05	0.91	19	2.21	0.92	19	2.63	1.01	19	3.00	0.82	19	3.16	0.83	19	2.16	1.07	19	1.63	0.76	19	2.68	0.82
Guggenheim-Broughton 2 (14)	12	3.08	0.79	12	1.67	0.89	12	2.33	0.98	12	3.17	0.72	12	3.33	0.78	12	2.83	1.11	12	1.67	0.78	12	3.25	0.87
Guggenheim-Dillard 1 (27)	24	2.83	1.09	24	1.79	1.02	23	2.17	0.94	24	3.21	0.83	24	2.42	1.02	24	1.88	1.08	24	1.17	0.38	24	2.88	1.08
Guggenheim-Dillard 2 (16)	13	2.77	1.09	13	1.69	0.95	13	2.69	0.85	13	3.23	0.73	13	2.85	1.14	13	2.08	1.32	13	1.15	0.38	13	2.77	1.17
HirschMetro-Davenport 1 (22)	21	2.71	1.10	21	1.62	0.80	21	2.52	0.87	21	2.95	1.02	20	2.95	0.94	21	2.19	0.98	21	1.67	0.86	20	2.90	1.12
HirschMetro-Davenport 2 (26)	25	2.76	1.13	26	1.81	0.94	26	2.65	0.98	26	3.19	0.85	26	2.81	0.90	26	2.46	1.03	26	1.73	1.04	26	2.96	0.96
HirschMetro-Holland 1 (27)	27	2.93	1.21	27	1.52	0.85	27	2.67	1.04	27	2.96	1.13	27	3.19	0.83	27	2.41	1.25	27	1.26	0.53	27	3.00	0.83
HirschMetro-Holland 2 (27)	21	3.00	0.89	21	1.90	0.89	21	2.43	0.75	21	3.43	0.60	22	3.05	0.90	22	1.59	0.85	22	1.59	0.80	22	3.23	0.81
—Conventional—																								
Newberry-Renlund 1 (29)	24	2.92	1.25	24	1.46	0.72	24	2.04	1.04	24	3.50	0.72	24	2.96	1.16	24	1.75	1.11	23	1.48	0.90	23	2.78	1.04
Newberry-Rhaney 1 (37)	20	3.00	1.12	19	2.95	1.08	19	2.53	1.12	18	3.06	1.21	18	2.78	1.00	17	2.41	1.18	18	1.89	1.08	17	2.71	1.10

Table D4 *(continued)*

Key

3. I feel sure that I am able to learn new ideas in math class. *(confidence in ability to learn mathematics)*
4. In mathematics, you can discover new ways of solving problems that the teacher or your classmates may not have thought of. *(problem solving)*
6.* If I use a calculator to solve a problem, I can be sure it will always give me the right answer. *(calculator use)*
11. Anyone who works hard enough can be good at math. *(effort)*
16. It's okay if I solve a math problem differently than my classmates do. *(problem solving)*
20.* Mathematics is not related to any of my other school subjects. *(connection to other school subjects)*
27.* Understanding why an answer is right is not as important as getting the right answer. *(understanding vs. answer)*
28.* Mathematics is more difficult to understand than other subjects. *(connection to other school subjects)*
37.* No matter how hard a person works, some people are just naturally good at math and some are just not. *(effort)*
38.* Answering questions correctly in math means only giving a number. *(process vs. answer)*
39.* Each new math topic I study is not related to ones I have learned before. *(connection among mathematics topics)*
44.* When my teacher asks a question I will get it right if I have memorized the correct rule or fact. *(mathematics as facts or rules)*
45.* If you have to use a calculator to solve a problem, you don't really understand how to do the problem. *(calculator use)*
49.* It really doesn't matter if you understand a math problem or how you get an answer as long as the answer you get is right. *(understanding vs. answer)*
53. Knowing how to solve a problem is as important as getting the answer. *(process vs. answer)*
55.* Mathematics is mostly learned by memorizing facts and rules. *(mathematics as facts or rules)*

* Reverse-scored due to wording of question.

Table D5

Class Means on Student Attribution of Success or Failure in Mathematics, Grade 6, District 2

School-Class (*N*)	Success											
	Teacher			Ability			Effort			Luck		
	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD
—MiC—												
Guggenheim-Broughton 1 (26)	22	3.14	1.04	21	2.33	1.11	22	1.91	0.92	22	2.68	1.13
Guggenheim-Broughton 2 (14)	12	3.33	0.78	12	2.25	0.97	12	1.42	0.51	12	2.58	1.16
Guggenheim-Dillard 1 (27)	24	3.71	0.55	24	2.00	0.93	24	1.08	0.28	24	3.25	0.79
Guggenheim-Dillard 2 (16)	13	3.23	1.01	12	2.17	0.94	13	1.38	0.65	13	2.92	1.26
HirschMetro-Davenport 1 (22)	21	3.81	0.40	20	2.20	0.83	21	1.38	0.74	21	3.19	0.93
HirschMetro-Davenport 2 (26)	24	3.42	1.06	25	2.20	0.87	26	1.42	0.86	26	2.69	1.26
HirschMetro-Holland 1 (27)	26	3.62	0.80	26	2.12	0.99	27	1.19	0.48	27	3.22	0.85
HirschMetro-Holland 2 (27)	21	3.19	0.87	21	2.10	0.83	21	1.14	0.36	21	3.10	0.70
—Conventional—												
Newberry-Renlund 1 (29)	24	3.79	0.59	23	1.87	0.97	24	1.25	0.68	24	3.46	0.72
Newberry-Rhaney 1 (37)	28	2.89	1.23	28	2.11	1.13	18	1.72	0.96	22	2.36	1.14

School-Class (*N*)	Failure											
	Teacher			Ability			Effort			Luck		
	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD
—MiC—												
Guggenheim-Broughton 1 (26)	22	2.91	1.02	22	2.27	0.94	21	1.95	0.97	22	2.73	1.03
Guggenheim-Broughton 2 (14)	12	3.33	0.89	12	2.75	1.06	12	2.42	1.00	11	3.18	1.08
Guggenheim-Dillard 1 (27)	24	3.79	0.41	24	2.71	1.12	24	1.96	0.81	24	3.63	0.77
Guggenheim-Dillard 2 (16)	13	3.85	0.38	13	3.08	0.95	13	2.46	1.20	13	3.46	0.97
HirschMetro-Davenport 1 (22)	21	3.62	0.92	21	3.00	0.84	21	2.19	1.17	21	3.52	0.68
HirschMetro-Davenport 2 (26)	26	3.27	1.19	24	2.46	0.98	26	1.85	0.97	26	2.88	1.31
HirschMetro-Holland 1 (27)	27	3.70	0.67	27	2.37	1.04	27	1.59	0.97	27	3.59	0.75
HirschMetro-Holland 2 (27)	19	3.84	0.37	22	2.86	0.99	22	1.50	0.74	22	3.64	0.49
—Conventional—												
Newberry-Renlund 1 (29)	24	4.00	0.00	24	3.04	0.95	23	1.70	0.88	23	3.87	0.34
Newberry-Rhaney 1 (37)	21	2.62	1.16	27	2.81	1.00	14	2.14	1.17	18	2.67	1.28

APPENDIX D

GRADE 7, DISTRICT 2

Table D1
Fixed Characteristics, Grade 7, District 2

School-Class *(N)*	**Sex**		**Ethnicity** *(self-identified)*								
	F	**M**	**African American**	**Native American**	**Asian**	**Hispanic**	**White**	**Multiracial**	**Haitian**	**Other**	**Non-Response**
—MiC—											
Guggenheim-Keeton 1 (27)	18	9	11%	0%	0%	30%	41%	11%	0%	0%	7%
Guggenheim-Keeton 2 (24)	11	13	21%	8%	0%	25%	29%	8%	0%	4%	0%
Guggenheim-Teague 1 (27)	14	13	22%	7%	0%	22%	26%	19%	0%	0%	4%
Guggenheim-Teague 2 (25)	16	9	20%	0%	4%	36%	12%	16%	4%	0%	8%
HirschMetro-Draski 1 (26)	10	16	4%	0%	0%	54%	4%	27%	0%	0%	12%
HirschMetro-Draski 2 (25)	9	16	0%	0%	0%	52%	4%	24%	0%	0%	20%
HirschMetro-McFadden 1 (23)	11	12	0%	0%	0%	83%	4%	13%	0%	0%	0%
HirschMetro-McFadden 2 (30)	15	15	0%	0%	0%	77%	3%	17%	0%	0%	3%
—Conventional—											
Newberry-Cunningham 1 (15)	4	11	40%	0%	0%	47%	7%	7%	0%	0%	0%
Newberry-Cunningham 2 (23)	14	9	35%	0%	0%	43%	4%	4%	0%	0%	13%
Newberry-Stark 1 (26)	13	13	23%	0%	0%	42%	8%	19%	0%	0%	8%

Table D2

Class Results on the Collis-Romberg Mathematical Problem-Solving Profiles, Grade 7, District 2

School-Class (*N*)	Level of Student Performance									No Response
	Prestructural	Unistructural		Multistructural		Relational		Extended Abstract		
	(%)	(%)	Ave.	(%)	Ave.	(%)	Ave.	(%)	Ave.	
—MiC—										
Guggenheim-Keeton 1 (25)			3.28		1.36		0.16		0.00	
Number	8.0%	68.0%		12.0%		12.0%		0.0%		0.0%
Algebra	16.0%	84.0%		0.0%		0.0%		0.0%		0.0%
Space	12.0%	0.0%		76.0%		4.0%		0.0%		8.0%
Measurement	28.0%	24.0%		32.0%		0.0%		0.0%		16.0%
Chance & Data	68.0%	16.0%		0.0%		0.0%		0.0%		16.0%
Guggenheim-Keeton 2 (24)			3.38		1.58		0.25		0.00	
Number	4.2%	83.3%		4.2%		8.3%		0.0%		0.0%
Algebra	25.0%	66.7%		0.0%		4.2%		0.0%		4.2%
Space	4.2%	12.5%		70.8%		8.3%		0.0%		4.2%
Measurement	33.3%	4.2%		58.3%		0.0%		0.0%		4.2%
Chance & Data	70.8%	12.5%		0.0%		4.2%		0.0%		12.5%
Guggenheim-Teague 1 (26)			3.15		1.04		0.27		0.00	
Number	11.5%	80.8%		0.0%		7.7%		0.0%		0.0%
Algebra	46.2%	53.8%		0.0%		0.0%		0.0%		0.0%
Space	26.9%	34.6%		34.6%		3.8%		0.0%		0.0%
Measurement	23.1%	23.1%		42.3%		11.5%		0.0%		0.0%
Chance & Data	69.2%	15.4%		0.0%		3.8%		0.0%		11.5%
Guggenheim-Teague 2 (24)			3.08		1.38		0.33		0.00	
Number	12.5%	75.0%		4.2%		8.3%		0.0%		0.0%
Algebra	50.0%	41.7%		0.0%		0.0%		0.0%		8.3%
Space	16.7%	12.5%		54.2%		12.5%		0.0%		4.2%
Measurement	20.8%	20.8%		41.7%		12.5%		0.0%		4.2%
Chance & Data	70.8%	20.8%		4.2%		0.0%		0.0%		4.2%
Hirsch Metro-Draski 1 (22)			3.55		1.32		0.36		0.00	
Number	4.5%	81.8%		4.5%		9.1%		0.0%		0.0%
Algebra	22.7%	77.3%		0.0%		0.0%		0.0%		0.0%
Space	18.2%	13.6%		50.0%		18.2%		0.0%		0.0%
Measurement	36.4%	18.2%		40.9%		0.0%		0.0%		4.5%
Chance & Data	54.5%	31.8%		0.0%		9.1%		0.0%		4.5%
Hirsch Metro-Draski 2 (18)			3.28		1.00		0.28		0.00	
Number	5.6%	83.3%		5.6%		5.6%		0.0%		0.0%
Algebra	22.2%	77.8%		0.0%		0.0%		0.0%		0.0%
Space	33.3%	16.7%		38.9%		11.1%		0.0%		0.0%
Measurement	44.4%	33.3%		16.7%		5.6%		0.0%		0.0%
Chance & Data	66.7%	22.2%		5.6%		5.6%		0.0%		0.0%

Table D2 *(continued)*

School-Class *(N)*	Level of Student Performance									No Response
	Prestructural	Unistructural		Multistructural		Relational		Extended Abstract		
	(%)	(%)	Ave.	(%)	Ave.	(%)	Ave.	(%)	Ave.	
—MiC (continued)—										
Hirsch Metro-McFadden 1 (22)			3.23		1.23		0.18		0.00	
Number	4.5%	77.3%		9.1%		4.5%		0.0%		4.5%
Algebra	13.6%	68.2%		0.0%		0.0%		0.0%		18.2%
Space	13.6%	18.2%		54.5%		4.5%		0.0%		9.1%
Measurement	27.3%	18.2%		40.9%		9.1%		0.0%		4.5%
Chance & Data	59.1%	18.2%		0.0%		0.0%		0.0%		22.7%
Hirsch Metro-McFadden 2 (25)			3.20		1.16		0.20		0.00	
Number	8.0%	72.0%		12.0%		4.0%		0.0%		4.0%
Algebra	32.0%	56.0%		0.0%		0.0%		0.0%		12.0%
Space	12.0%	24.0%		48.0%		16.0%		0.0%		0.0%
Measurement	36.0%	28.0%		36.0%		0.0%		0.0%		0.0%
Chance & Data	68.0%	24.0%		0.0%		0.0%		0.0%		8.0%
—Conventional—										
Newberry-Cunningham 1 (13)			2.46		1.08		0.08		0.00	
Number	23.1%	76.9%		0.0%		0.0%		0.0%		0.0%
Algebra	61.5%	38.5%		0.0%		0.0%		0.0%		0.0%
Space	15.4%	30.8%		46.2%		7.7%		0.0%		0.0%
Measurement	53.8%	7.7%		38.5%		0.0%		0.0%		0.0%
Chance & Data	84.6%	0.0%		0.0%		0.0%		0.0%		15.4%
Newberry-Cunningham 2 (19)			2.63		0.74		0.05		0.00	
Number	10.5%	84.2%		0.0%		5.3%		0.0%		0.0%
Algebra	47.4%	47.4%		0.0%		0.0%		0.0%		5.3%
Space	36.8%	26.3%		31.6%		0.0%		0.0%		5.3%
Measurement	42.1%	15.8%		36.8%		0.0%		0.0%		5.3%
Chance & Data	52.6%	15.8%		0.0%		0.0%		0.0%		31.6%
Newberry-Stark (16)			3.25		1.31		0.44		0.00	
Number	12.5%	62.5%		12.5%		12.5%		0.0%		0.0%
Algebra	31.3%	62.5%		0.0%		0.0%		0.0%		6.3%
Space	6.3%	31.3%		43.8%		18.8%		0.0%		0.0%
Measurement	37.5%	18.8%		31.3%		12.5%		0.0%		0.0%
Chance & Data	62.5%	18.8%		0.0%		0.0%		0.0%		18.8%

Table D3

Student Data From Subscales of the Student Attitude Inventory, Grade 7, District 2

School-Class *(N)*		**Subscale *(1 = very true; 4 = not true at all)***				
		Effort	**Confidence**	**Interest**	**Usefulness**	**Communication**
—MiC—						
Guggenheim-Keeton 1 (27)						
	Count	23	23	24	24	23
	Mean	2.07	2.25	2.42	1.98	1.91
	Median	2.00	2.20	2.56	2.00	1.86
	Minimum	1.50	1.60	1.00	1.13	1.00
	Maximum	3.00	3.80	3.50	2.88	3.00
	Standard Deviation	0.46	0.53	0.67	0.53	0.48
Guggenheim-Keeton 2 (24)						
	Count	21	22	23	22	22
	Mean	2.08	2.24	2.37	1.89	2.14
	Median	2.17	2.20	2.38	1.81	2.07
	Minimum	1.00	1.20	1.38	1.25	1.00
	Maximum	3.00	3.40	3.88	2.88	3.43
	Standard Deviation	0.57	0.57	0.58	0.49	0.59
Guggenheim-Teague 1 (27)						
	Count	23	24	20	23	24
	Mean	2.06	2.05	2.37	2.02	2.17
	Median	2.00	2.00	2.50	2.00	2.21
	Minimum	1.00	1.20	1.00	1.38	1.29
	Maximum	2.67	3.00	3.50	3.13	3.00
	Standard Deviation	0.40	0.49	0.76	0.44	0.41
Guggenheim-Teague 2 (25)						
	Count	21	23	20	21	22
	Mean	1.95	1.96	2.11	1.85	2.18
	Median	2.00	2.00	1.94	1.88	2.14
	Minimum	1.17	1.00	1.25	1.13	1.29
	Maximum	2.83	3.00	3.75	3.13	3.00
	Standard Deviation	0.53	0.51	0.71	0.55	0.37
Hirsch Metro-Draski 1 (26)						
	Count	20	22	22	20	21
	Mean	2.13	2.06	2.49	1.79	1.99
	Median	2.17	2.00	2.31	1.63	2.00
	Minimum	1.00	1.00	1.63	1.25	1.14
	Maximum	3.50	2.80	4.00	3.50	3.14
	Standard Deviation	0.69	0.50	0.68	0.54	0.54
Hirsch Metro-Draski 2 (25)						
	Count	19	18	16	18	17
	Mean	2.05	2.20	2.16	1.93	1.88
	Median	2.17	2.10	2.19	1.88	1.86
	Minimum	1.00	1.60	1.25	1.25	1.43
	Maximum	3.00	3.40	3.13	2.50	2.29
	Standard Deviation	0.52	0.47	0.53	0.37	0.29

Table D3 *(continued)*

School-Class *(N)*	**Subscale *(1 = very true; 4 = not true at all)***				
	Effort	**Confidence**	**Interest**	**Usefulness**	**Communication**
—MiC (continued)—					
Hirsch Metro-McFadden 1 (23)					
Count	22	21	22	22	20
Mean	1.93	2.06	2.23	1.74	1.87
Median	1.75	2.20	2.19	1.75	1.86
Minimum	1.17	1.00	1.38	1.13	1.14
Maximum	3.17	2.80	3.00	2.63	3.29
Standard Deviation	0.59	0.51	0.48	0.35	0.51
Hirsch Metro-McFadden 2 (30)					
Count	28	28	27	27	28
Mean	1.73	1.96	1.98	1.75	1.79
Median	1.67	2.00	1.88	1.63	1.64
Minimum	1.00	1.00	1.00	1.00	1.00
Maximum	3.00	2.80	3.50	2.75	3.14
Standard Deviation	0.50	0.47	0.64	0.51	0.56
—Conventional—					
Newberry-Cunningham 1 (15)					
Count	12	12	10	11	12
Mean	2.15	2.05	2.10	2.05	2.20
Median	2.25	2.10	2.13	1.88	2.29
Minimum	1.00	1.00	1.25	1.13	1.29
Maximum	3.17	3.00	3.50	3.50	4.00
Standard Deviation	0.56	0.53	0.69	0.72	0.67
Newberry-Cunningham 2 (23)					
Count	19	18	19	19	18
Mean	2.07	2.02	2.06	2.00	2.09
Median	2.00	2.00	2.25	1.88	2.00
Minimum	1.00	1.00	1.13	1.13	1.00
Maximum	3.00	3.00	2.75	2.88	3.71
Standard Deviation	0.49	0.54	0.51	0.49	0.65
Newberry-Stark (26)					
Count	12	13	12	12	12
Mean	2.14	2.25	2.16	2.03	2.05
Median	2.33	2.00	2.31	2.19	2.00
Minimum	1.17	1.20	1.25	1.25	1.71
Maximum	2.83	3.40	2.88	2.63	2.71
Standard Deviation	0.47	0.75	0.66	0.49	0.34

Table D4

Class Means on General Perceptions Items of the Student Attitude Inventory, Grade 7, District 2

School-Class *(N)*	3			4			6			11			16			20			27			28		
	(N)	**Mean**	**StD**	*(N)*	**Mean**	**StD**	*(N)*	**Mean**	**StD**	*(N)*	**Mean**	**StD**	*(N)*	**Mean**	**StD**	*(N)*	**Mean**	**StD**	*(N)*	**Mean**	**StD**	*(N)*	**Mean**	**StD**
—MiC—																								
Guggenheim-Keeton 1 (27)	24	1.79	0.88	25	1.84	0.90	25	2.84	0.94	24	1.33	0.70	25	1.44	0.71	25	1.40	0.65	25	2.16	1.07	25	3.00	1.00
Guggenheim-Keeton 2 (24)	24	1.88	0.95	24	1.71	1.00	24	2.67	0.96	23	1.35	0.83	24	1.21	0.41	24	1.38	0.65	23	2.83	1.19	24	2.92	0.97
Guggenheim-Teague 1 (27)	25	1.40	0.50	25	1.36	0.70	25	2.84	1.07	25	1.20	0.41	26	1.69	0.93	26	1.88	1.07	26	2.42	1.14	26	2.31	1.09
Guggenheim-Teague 2 (25)	22	1.45	0.80	23	1.43	0.59	23	2.48	1.08	22	1.32	0.57	23	1.57	0.59	23	1.61	0.84	22	2.32	0.84	22	2.27	1.12
HirschMetro-Draski 1 (26)	22	1.36	0.58	22	1.82	0.73	21	2.19	1.03	22	1.14	0.47	22	1.41	0.67	22	1.73	0.94	22	2.09	1.15	22	2.50	1.01
HirschMetro-Draski 2 (25)	19	1.37	0.60	19	1.42	0.77	19	2.58	0.96	19	1.16	0.37	19	1.53	0.77	19	1.79	0.79	18	2.17	1.15	19	2.89	0.88
HirschMetro-McFadden 1 (23)	22	1.73	0.77	22	1.77	0.97	22	2.36	1.05	22	1.23	0.61	22	1.64	0.85	22	1.82	1.05	22	2.50	0.80	22	2.55	0.96
HirschMetro-McFadden 2 (30)	29	1.52	0.57	29	1.69	1.00	29	2.45	1.12	29	1.34	0.81	29	1.38	0.56	29	2.03	1.02	27	2.37	0.97	29	2.48	1.06
—Conventional—																								
Newberry-Cunningham 1 (15)	12	1.67	0.65	12	2.08	1.31	12	2.08	1.00	12	1.83	1.19	12	1.25	0.45	12	2.00	1.13	12	2.25	1.14	12	2.75	1.06
Newberry-Cunningham 2 (23)	19	1.37	0.76	19	1.58	0.69	19	2.74	1.05	19	1.37	0.68	19	1.58	0.90	19	2.00	1.05	19	2.84	0.90	19	2.63	1.07
Newberry-Stark 1 (26)	13	1.46	0.52	14	1.93	0.73	14	2.43	1.09	14	1.36	0.63	14	1.57	0.51	14	1.57	0.85	14	2.14	0.95	14	2.50	1.02

School-Class *(N)*	37			38			39			44			45			49			53			55		
	(N)	**Mean**	**StD**	*(N)*	**Mean**	**StD**	*(N)*	**Mean**	**StD**	*(N)*	**Mean**	**StD**	*(N)*	**Mean**	**StD**	*(N)*	**Mean**	**StD**	*(N)*	**Mean**	**StD**	*(N)*	**Mean**	**StD**
—MiC—																								
Guggenheim-Keeton 1 (27)	24	3.29	0.95	24	1.83	0.87	24	2.25	1.07	25	2.84	1.07	25	2.24	1.13	25	1.92	1.00	25	1.88	0.97	25	2.52	1.08
Guggenheim-Keeton 2 (24)	23	3.35	0.78	23	2.00	1.04	22	3.00	1.02	23	3.30	0.70	22	2.91	0.92	23	2.30	1.18	23	1.48	0.59	23	2.91	0.79
Guggenheim-Teague 1 (27)	26	3.08	0.98	26	1.92	0.80	24	2.42	0.88	25	3.24	0.88	25	2.64	1.08	25	1.88	0.83	25	1.52	0.71	25	2.92	0.86
Guggenheim-Teague 2 (25)	23	2.65	0.98	23	1.65	0.78	23	2.43	0.90	23	3.04	0.98	23	2.78	0.95	23	2.43	1.16	23	1.74	0.75	23	2.78	0.95
HirschMetro-Draski 1 (26)	22	2.86	0.99	22	1.82	1.01	21	2.57	0.93	22	3.23	0.61	22	3.09	1.02	22	2.00	1.15	21	1.57	0.87	22	3.00	1.11
HirschMetro-Draski 2 (25)	19	2.68	0.89	19	2.05	0.91	19	2.68	1.16	19	3.00	1.00	19	2.89	0.99	19	2.47	1.31	19	1.53	0.77	19	2.84	1.07
HirschMetro-McFadden 1 (23)	22	2.64	1.05	22	1.77	0.92	22	2.32	0.99	22	3.05	1.13	22	2.41	1.01	22	2.36	1.22	22	1.55	0.80	22	2.64	0.95
HirschMetro-McFadden 2 (30)	28	2.96	1.17	28	1.89	0.99	28	2.64	0.95	29	3.07	1.03	29	2.72	1.10	28	2.25	1.17	29	1.48	0.74	29	3.24	1.02
—Conventional—																								
Newberry-Cunningham 1 (15)	12	3.42	0.51	12	2.42	1.31	12	2.58	1.16	12	2.67	0.98	12	2.42	0.90	11	2.73	1.10	12	2.25	1.36	12	3.25	0.97
Newberry-Cunningham 2 (23)	18	3.00	0.91	19	2.16	1.12	19	2.37	0.96	19	3.16	0.76	19	3.00	0.88	19	2.79	1.08	19	1.68	0.75	19	3.00	0.94
Newberry-Stark 1 (26)	13	2.62	0.96	13	2.00	0.71	13	2.69	0.95	13	2.92	0.64	13	2.85	0.80	12	1.92	0.67	12	1.58	0.67	12	3.17	0.94

Table D4 *(continued)*

Key
3. I feel sure that I am able to learn new ideas in math class. *(confidence in ability to learn mathematics)*
4. In mathematics, you can discover new ways of solving problems that the teacher or your classmates may not have thought of. *(problem solving)*
6.* If I use a calculator to solve a problem, I can be sure it will always give me the right answer. *(calculator use)*
11. Anyone who works hard enough can be good at math. *(effort)*
16. It's okay if I solve a math problem differently than my classmates do. *(problem solving)*
20.* Mathematics is not related to any of my other school subjects. *(connection to other school subjects)*
27.* Understanding why an answer is right is not as important as getting the right answer. *(understanding vs. answer)*
28.* Mathematics is more difficult to understand than other subjects. *(connection to other school subjects)*
37.* No matter how hard a person works, some people are just naturally good at math and some are just not. *(effort)*
38.* Answering questions correctly in math means only giving a number. *(process vs. answer)*
39.* Each new math topic I study is not related to ones I have learned before. *(connection among mathematics topics)*
44.* When my teacher asks a question I will get it right if I have memorized the correct rule or fact. *(mathematics as facts or rules)*
45.* If you have to use a calculator to solve a problem, you don't really understand how to do the problem. *(calculator use)*
49.* It really doesn't matter if you understand a math problem or how you get an answer as long as the answer you get is right. *(understanding vs. answer)*
53. Knowing how to solve a problem is as important as getting the answer. *(process vs. answer)*
55.* Mathematics is mostly learned by memorizing facts and rules. *(mathematics as facts or rules)*

* Reverse-scored due to wording of question.

Table D5

Class Means on Student Attribution of Success or Failure in Mathematics, Grade 7, District 2

School-Class (*N*)	Success											
	Teacher			Ability			Effort			Luck		
	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD
—MiC—												
Guggenheim-Keeton 1 (27)	25	3.36	0.95	25	2.56	1.08	24	1.50	0.66	24	2.92	1.02
Guggenheim-Keeton 2 (24)	24	3.25	0.90	24	2.29	0.95	23	1.70	0.88	23	2.57	1.04
Guggenheim-Teague 1 (27)	25	3.64	0.76	25	2.32	0.90	26	1.35	0.56	26	2.85	1.16
Guggenheim-Teague 2 (25)	23	3.48	0.79	23	2.13	0.92	23	1.61	0.94	23	3.30	0.93
HirschMetro-Draski 1 (26)	22	3.73	0.55	21	2.38	1.07	22	1.18	0.39	22	3.36	0.66
HirschMetro-Draski 2 (25)	19	3.79	0.42	19	2.16	1.01	19	1.47	1.02	19	3.11	0.88
HirschMetro-McFadden 1 (23)	22	3.45	0.91	22	3.14	0.83	22	1.50	0.91	22	3.18	1.05
HirschMetro-McFadden 2 (30)	29	3.83	0.47	28	2.39	0.92	28	1.18	0.55	28	3.32	0.94
—Conventional—												
Newberry-Cunningham 1 (15)	12	3.08	0.90	12	2.00	0.95	12	1.83	1.03	12	2.50	1.09
Newberry-Cunningham 2 (23)	19	3.42	0.69	18	2.06	0.87	19	1.63	0.83	19	2.89	1.15
Newberry-Stark 1 (26)	14	3.14	1.29	13	1.92	0.76	13	1.69	0.75	13	3.15	1.07

School-Class (*N*)	Failure											
	Teacher			Ability			Effort			Luck		
	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD
—MiC—												
Guggenheim-Keeton 1 (27)	24	3.63	0.77	25	2.76	0.97	25	2.12	1.05	25	3.44	0.82
Guggenheim-Keeton 2 (24)	23	3.09	1.12	24	2.13	0.80	23	2.04	0.88	23	3.09	1.00
Guggenheim-Teague 1 (27)	26	3.54	0.86	26	2.81	0.98	25	2.08	0.91	25	3.48	0.71
Guggenheim-Teague 2 (25)	23	3.39	0.84	23	2.91	0.90	23	2.00	1.00	23	3.43	0.95
HirschMetro-Draski 1 (26)	22	3.82	0.39	22	2.86	1.08	22	1.73	0.94	22	3.36	0.90
HirschMetro-Draski 2 (25)	19	3.58	0.84	19	2.63	1.07	19	1.74	0.81	19	3.11	1.05
HirschMetro-McFadden 1 (23)	22	3.55	0.96	22	3.00	0.98	21	1.90	1.04	21	3.29	0.78
HirschMetro-McFadden 2 (30)	28	3.79	0.50	29	3.07	1.07	29	1.48	0.83	29	3.52	0.87
—Conventional—												
Newberry-Cunningham 1 (15)	12	3.08	0.90	12	3.00	0.95	12	2.25	1.14	12	2.50	1.17
Newberry-Cunningham 2 (23)	19	3.00	1.20	19	2.89	0.99	19	1.89	0.88	19	2.79	1.18
Newberry-Stark 1 (26)	13	3.23	1.09	14	3.07	1.07	12	1.67	0.78	12	2.67	0.98

APPENDIX E

GRADE 5, DISTRICT 3

Table E1

Fixed Characteristics, Grade 5, District 3

School-Class *(N)*	Sex		Ethnicity								
	Female	Male	African American	Native American	Asian	Hispanic	White	Multi-racial	Haitian	Other	Non-Response
—MiC—											
Taft-Allen 1 (19)	9	10	0%	0%	0%	0%	95%	5%	0%	0%	0%
Taft-Cameron 1 (23)	10	13	0%	0%	0%	0%	91%	9%	0%	0%	0%
Taft-Cooper 1 (23)	12	11	0%	0%	0%	4%	70%	26%	0%	0%	0%
Taft-DeLaCruz 1 (21)	9	12	0%	0%	0%	10%	86%	5%	0%	0%	0%
Taft-Dodge 1 (23)	12	11	0%	0%	0%	4%	87%	0%	0%	4%	4%
Taft-Edgebrook 1 (23)	11	12	0%	9%	0%	0%	48%	39%	0%	0%	4%

Table E2

Standardized Test Scores, Spring 1997, Grade 5, District 3

School-Class *(N)*	TerraNova: National Percentiles																	
	Application						Computation						Composite					
	(*N*)	Mean	StDev	Mini-mum	Median	Maxi-mum	(*N*)	Mean	StDev	Mini-mum	Median	Maxi-mum	(*N*)	Mean	StdDev	Mini-mum	Median	Maxi-mum
—MiC—																		
Taft-Allen 1 (19)	16	63.81	22.65	25	72.5	99	7	63.00	28.07	23	58	99	7	63.29	25.71	29	66	99
Taft-Cameron 1 (23)	20	66.65	23.38	23	63.5	99	11	52.06	23.67	18	59	82	11	61.64	24.08	33	68	99
Taft-Cooper 1 (23)	21	46.00	24.83	5	41	92	13	42.54	30.90	4	37	95	13	45.00	29.77	4	40	91
Taft-DeLaCruz 1 (21)	18	58.22	21.76	5	57	97	13	56.54	23.93	13	66	96	13	59.85	24.29	7	62	97
Taft-Dodge 1 (23)	19	50.16	26.19	9	49	99	14	40.36	27.35	10	46	97	14	43.50	23.55	8	42.5	94
Taft-Edgebrook 1 (24)	21	58.67	27.38	13	62	99	12	64.08	30.68	12	71	99	12	64.92	29.83	11	74.5	99

Table E3

Results of the Collis-Romberg Mathematical Problem-Solving Profiles, Grade 5, District 3

School-Class (*N*)	Level of Student Performance									
	Prestructural	**Unistructural**		**Multistructural**		**Relational**		**Extended Abstract**		**No Response**
	(%)	**(%)**	**Ave.**	**(%)**	**Ave.**	**(%)**	**Ave.**	**(%)**	**Ave.**	**(%)**
—MiC—										
Taft-Allen (18)			3.05		1.53		0.42		0.05	
Number	27.8%	50.0%		16.7%		5.6%		0.0%		0.0%
Algebra	27.8%	72.2%		0.0%		0.0%		0.0%		0.0%
Space	11.1%	5.6%		66.7%		11.1%		0.0%		5.6%
Measurement	16.7%	22.2%		33.3%		22.2%		0.0%		5.3%
Chance & Data	72.2%	5.6%		0.0%		5.6%		0.0%		16.7%
Taft-Cameron (23)			3.26		1.52		0.26		0.00	
Number	17.4%	73.9%		0.0%		8.7%		0.0%		0.0%
Algebra	21.7%	73.9%		0.0%		0.0%		0.0%		4.3%
Space	21.7%	13.0%		47.8%		8.7%		0.0%		8.7%
Measurement	26.1%	0.0%		69.6%		4.3%		0.0%		0.0%
Chance & Data	65.2%	13.0%		8.7%		4.3%		0.0%		8.7%
Taft-Cooper (23)			3.04		1.57		0.04		0.00	
Number	17.4%	60.9%		17.4%		0.0%		0.0%		4.3%
Algebra	43.5%	47.8%		0.0%		0.0%		0.0%		8.7%
Space	17.4%	4.3%		73.9%		4.3%		0.0%		0.0%
Measurement	13.0%	26.1%		56.5%		0.0%		0.0%		4.3%
Chance & Data	73.9%	4.3%		8.7%		0.0%		0.0%		13.0%
Taft-DeLaCruz (20)			2.40		1.00		0.35		0.00	
Number	5.0%	55.0%		20.0%		20.0%		0.0%		0.0%
Algebra	20.0%	65.0%		0.0%		0.0%		0.0%		15.0%
Space	10.0%	5.0%		40.0%		15.0%		0.0%		30.0%
Measurement	10.0%	10.0%		5.0%		0.0%		0.0%		75.0%
Chance & Data	15.0%	0.0%		0.0%		0.0%		0.0%		85.0%
Taft-Dodge (22)			2.64		1.18		0.36		0.05	
Number	22.7%	45.5%		13.6%		13.6%		0.0%		4.5%
Algebra	36.4%	54.5%		4.5%		0.0%		0.0%		4.5%
Space	22.7%	13.6%		36.4%		9.1%		4.5%		13.6%
Measurement	50.0%	9.1%		31.8%		4.5%		0.0%		4.5%
Chance & Data	27.3%	18.2%		0.0%		4.5%		0.0%		50.0%
Taft-Edgebrook (23)			3.23		1.68		0.41		0.09	
Number	21.7%	39.1%		13.0%		17.4%		4.3%		4.3%
Algebra	30.4%	65.2%		0.0%		0.0%		0.0%		4.3%
Space	8.7%	8.7%		69.9%		0.0%		0.0%		13.0%
Measurement	21.7%	21.7%		43.5%		4.3%		0.0%		8.7%
Chance & Data	60.9%	17.4%		4.3%		8.7%		0.0%		8.7%

Table E4

Student Data From Subscales of the Student Attitude Inventory, Grade 5, District 3

School-Class *(N)*	**Subscale *(1 = very true; 4 = not true at all)***				
	Effort	**Confidence**	**Interest**	**Usefulness**	**Communication**
			—MiC—		
Taft-Allen (19)					
Count	17	17	14	15	15
Mean	1.83	1.78	1.95	1.82	1.71
Median	1.67	1.80	1.69	1.63	1.71
Minimum	1.33	1.00	1.13	1.00	1.14
Maximum	2.83	2.80	4.00	3.38	2.29
Standard Deviation	0.49	0.52	0.79	0.62	0.36
Taft-Cameron (23)					
Count	20	21	21	21	21
Mean	1.70	1.56	1.83	1.71	1.84
Median	1.50	1.40	1.63	1.63	1.86
Minimum	1.00	1.00	1.00	1.00	1.14
Maximum	2.83	3.20	3.75	2.50	2.86
Standard Deviation	0.52	0.61	0.79	0.47	0.44
Taft-Cooper (23)					
Count	18	18	19	18	18
Mean	1.69	1.73	1.83	1.58	1.71
Median	1.67	1.60	1.75	1.44	1.57
Minimum	1.00	1.00	1.00	1.13	1.14
Maximum	3.17	3.20	4.00	3.00	3.14
Standard Deviation	0.58	0.63	0.79	0.53	0.51
Taft-DeLaCruz (21)					
Count	17	20	15	17	20
Mean	1.62	1.64	1.79	1.61	1.65
Median	1.50	1.50	1.63	1.38	1.57
Minimum	1.00	1.00	1.00	1.13	1.00
Maximum	2.67	2.60	3.25	2.88	2.71
Standard Deviation	0.54	0.54	0.71	0.48	0.46
Taft-Dodge (23)					
Count	19	19	18	17	18
Mean	1.83	1.85	1.83	1.83	1.76
Median	1.83	1.80	1.81	1.88	1.71
Minimum	1.00	1.00	1.00	1.00	1.00
Maximum	3.50	3.00	3.00	3.00	2.43
Standard Deviation	0.65	0.59	0.60	0.58	0.43
Taft-Edgebrook (23)					
Count	23	23	23	21	22
Mean	1.58	1.63	1.75	1.48	1.69
Median	1.58	1.70	1.44	1.38	1.57
Minimum	1.00	1.00	1.00	1.00	1.00
Maximum	2.83	2.40	4.00	2.88	2.57
Standard Deviation	0.41	0.42	0.77	0.40	0.44

Table E5

Class Means on General Perceptions of the Student Attitude Inventory, Grade 5, District 3

School-Class *(N)*	Item Number *(see Key)* 3			4			6			11			16			20			27			28		
	(N)	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD
—MiC—																								
Taft-Allen 1 (19)	16	1.69	0.95	18	1.78	0.88	18	3.06	0.73	18	1.50	0.86	18	1.11	0.32	18	2.17	1.10	18	2.94	1.21	18	2.50	1.25
Taft-Cameron 1 (23)	23	1.48	0.59	23	2.00	0.90	23	2.70	0.97	23	1.17	0.39	23	1.52	0.67	23	1.70	1.11	22	2.14	1.21	23	1.96	1.02
Taft-Cooper 1 (23)	21	1.38	0.67	22	1.59	0.80	21	3.00	0.95	21	1.10	0.30	22	1.14	0.35	23	1.83	0.98	22	2.68	1.13	23	2.26	0.86
Taft-DeLaCruz 1 (21)	20	1.40	0.68	20	1.80	1.01	20	3.00	0.86	20	1.20	0.52	20	1.50	0.89	20	1.75	0.79	20	2.90	1.21	20	2.15	0.93
Taft-Dodge 1 (23)	22	1.18	0.39	21	1.71	0.64	22	3.18	0.96	22	1.14	0.35	20	1.15	0.37	20	2.25	1.16	20	2.40	1.14	20	2.65	0.99
Taft-Edgebrook 1 (23)	23	1.46	0.72	23	1.67	0.82	23	2.92	0.93	24	1.42	0.93	23	1.17	0.38	23	1.63	0.88	21	2.19	1.21	23	1.88	0.95

School-Class (N)	37			38			39			44			45			49			53			55		
	(N)	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD
—MiC—																								
Taft-Allen 1 (19)	18	2.89	1.23	18	1.83	1.10	18	2.06	1.00	17	2.71	0.85	17	2.94	1.03	17	1.82	1.01	17	1.76	1.03	17	2.94	0.90
Taft-Cameron 1 (23)	22	2.59	0.91	22	1.41	0.67	22	2.18	0.96	22	3.23	0.53	22	2.50	1.10	22	1.45	0.67	22	1.50	0.74	22	2.64	0.95
Taft-Cooper 1 (23)	21	3.24	0.83	21	1.95	0.86	20	2.15	0.99	21	3.14	0.91	22	3.00	0.93	21	2.24	1.04	22	1.77	0.87	22	2.91	0.92
Taft-DeLaCruz 1 (21)	20	3.00	1.12	20	1.70	0.86	20	2.05	1.05	20	1.75	0.85	20	2.70	1.13	19	2.16	1.07	20	1.80	1.01	20	2.65	0.88
Taft-Dodge 1 (23)	21	2.95	0.97	21	1.81	0.87	21	2.05	1.07	22	3.18	0.96	22	3.09	0.97	21	2.14	1.06	21	1.76	1.00	21	3.24	0.89
Taft-Edgebrook 1 (23)	23	2.92	1.10	23	1.70	0.88	22	2.05	1.09	23	2.96	0.95	23	3.25	0.99	23	1.92	1.14	23	1.08	0.28	23	3.21	0.78

Table E5 *(continued)*

Key

3. I feel sure that I am able to learn new ideas in math class. *(confidence in ability to learn mathematics)*
4. In mathematics, you can discover new ways of solving problems that the teacher or your classmates may not have thought of. *(problem solving)*
6.* If I use a calculator to solve a problem, I can be sure it will always give me the right answer. *(calculator use)*
11. Anyone who works hard enough can be good at math. *(effort)*
16. It's okay if I solve a math problem differently than my classmates do. *(problem solving)*
20.* Mathematics is not related to any of my other school subjects. *(connection to other school subjects)*
27.* Understanding why an answer is right is not as important as getting the right answer. *(understanding vs. answer)*
28.* Mathematics is more difficult to understand than other subjects. *(connection to other school subjects)*
37.* No matter how hard a person works, some people are just naturally good at math and some are just not. *(effort)*
38.* Answering questions correctly in math means only giving a number. *(process vs. answer)*
39.* Each new math topic I study is not related to ones I have learned before. *(connection among mathematics topics)*
44.* When my teacher asks a question I will get it right if I have memorized the correct rule or fact. *(mathematics as facts or rules)*
45.* If you have to use a calculator to solve a problem, you don't really understand how to do the problem. *(calculator use)*
49.* It really doesn't matter if you understand a math problem or how you get an answer as long as the answer you get is right. *(understanding vs. answer)*
53. Knowing how to solve a problem is as important as getting the answer. *(process vs. answer)*
55.* Mathematics is mostly learned by memorizing facts and rules. *(mathematics as facts or rules)*

* Reverse-scored due to wording of question.

Table E6

Class Means on Student Attribution of Success or Failure in Mathematics, Grade 5, District 3

School-Class (*N*)	**Success**											
	Teacher			**Ability**			**Effort**			**Luck**		
	(*N*)	**Mean**	**StD**	**(*N*)**	**Mean**	**StD**	**(*N*)**	**Mean**	**StD**	**(*N*)**	**Mean**	**StD**
—MiC—												
Taft-Allen 1 (19)	18	3.94	0.24	18	2.44	0.98	18	1.39	0.78	18	3.11	1.02
Taft-Cameron 1 (23)	23	3.83	0.49	23	1.91	0.73	22	1.41	0.73	22	3.32	0.99
Taft-Cooper 1 (23)	21	3.76	0.77	22	1.86	0.83	21	1.38	0.74	21	2.90	1.00
Taft-DeLaCruz 1 (21)	19	3.74	0.65	20	2.15	0.81	20	1.45	0.76	20	3.55	0.69
Taft-Dodge 1 (23)	22	3.18	1.18	22	2.09	0.75	20	1.40	0.60	21	2.90	1.04
Taft-Edgebrook 1 (23)	23	3.71	0.62	23	2.17	1.01	23	1.25	0.61	23	3.42	0.97

School-Class (*N*)	**Failure**											
	Teacher			**Ability**			**Effort**			**Luck**		
	(*N*)	**Mean**	**StD**	**(*N*)**	**Mean**	**StD**	**(*N*)**	**Mean**	**StD**	**(*N*)**	**Mean**	**StD**
—MiC—												
Taft-Allen 1 (19)	18	3.89	0.47	18	3.00	1.08	17	2.35	0.86	17	3.59	0.71
Taft-Cameron 1 (23)	22	4.00	0.00	23	3.57	0.79	22	2.05	0.90	22	3.50	0.80
Taft-Cooper 1 (23)	21	3.86	0.48	23	3.13	0.97	22	2.32	0.89	22	3.59	0.67
Taft-DeLaCruz 1 (21)	20	4.00	0.00	19	3.37	0.96	20	2.50	1.10	20	3.80	0.52
Taft-Dodge 1 (23)	21	3.52	0.75	20	2.85	1.18	21	2.10	1.00	22	3.18	0.85
Taft-Edgebrook 1 (23)	23	4.00	0.00	23	3.21	1.02	23	2.57	0.99	23	3.67	0.64

APPENDIX E

GRADE 6, DISTRICT 3

Table E1

Fixed Characteristics, Grade 6, District 3

School-Class (*N*)	Sex		Ethnicity								
	F	M	African American	Native American	Asian	Hispanic	White	Multiracial	Haitian	Other	Non-Response
—MiC—											
Calhoun North-Bragg 1 (24)	14	10	0%	0%	0%	0%	96%	4%	0%	0%	0%
Calhoun North-Bragg 2 (21)	10	11	0%	0%	0%	5%	81%	14%	0%	0%	0%
Calhoun North-Schlueter 1 (23)	12	11	0%	0%	0%	4%	96%	0%	0%	0%	0%
Calhoun North-Schlueter 2 (20)	11	9	0%	0%	0%	0%	95%	0%	0%	0%	5%
Calhoun North-Solomon 1 (21)	11	10	0%	0%	0%	5%	81%	10%	0%	0%	5%
Calhoun North-Solomon 2 (22)	12	10	0%	0%	0%	0%	95%	0%	0%	0%	5%
Calhoun North-Tierney 1 (24)	14	10	0%	0%	0%	8%	79%	13%	0%	0%	0%
Calhoun North-Vetter 1 (7)	1	6	0%	0%	0%	0%	86%	14%	0%	0%	0%

Table E2

Standardized Test Scores, Spring 1997, Grade 6, District 3

School-Class (*N*)	TerraNova: National Percentiles															
	(*N*)	Application					Computation					Composite				
		Mean	StDev	Mini-mum	Median	Maxi-mum	Mean	StDev	Mini-mum	Median	Maxi-mum	Mean	StDev	Mini-mum	Median	Maxi-mum
—MiC—																
Calhoun North-Bragg 1 (24)	23	56.74	19.90	22	55.0	92	49.61	24.55	5	51.0	96	54.13	21.17	10	55.0	94
Calhoun North-Bragg 2 (21)	18	59.61	26.30	9	66.5	92	47.83	24.95	11	40.5	93	55.44	26.69	9	57.0	91
Calhoun North-Schlueter 1 (23)	22	48.73	19.53	14	44.0	92	44.50	19.11	14	49.5	72	47.32	19.02	14	49.0	76
Calhoun North-Schlueter 2 (20)	18	59.78	19.66	14	63.5	88	52.56	18.29	29	52.0	85	57.72	17.35	22	55.5	86
Calhoun North-Solomon 1 (21)	20	47.10	26.74	1	44.0	96	40.00	27.27	2	33.5	91	44.30	27.99	1	43.5	86
Calhoun North-Solomon 2 (22)	20	47.55	23.71	14	46.5	96	43.45	20.98	4	39.0	79	44.70	21.99	18	37.5	90
Calhoun North-Tierney 1 (24)	22	59.68	24.25	12	59.0	97	54.18	25.17	6	61.0	87	58.18	25.80	13	63.5	95
Calhoun North-Vetter 1 (7)	7	9.43	6.55	2	7.0	19	6.29	4.03	1	6.0	14	5.00	2.65	1	5.0	9

Table E3

Class Results on the Collis-Romberg Mathematical Problem-Solving Profiles, Grade 6, District 3

School-Class (*N*)	Level of Student Performance									No Response
	Prestructural	Unistructural		Multistructural		Relational		Extended Abstract		
	(%)	(%)	Ave.	(%)	Ave.	(%)	Ave.	(%)	Ave.	
				—*MiC*—						
Calhoun North-Bragg 1 (21)			3.81		1.89		0.76		0.05	
Number	9.5%	61.9%		0.0%		28.6%		0.0%		0.0%
Algebra	33.3%	66.7%		0.0%		0.0%		0.0%		0.0%
Space	4.8%	9.5%		61.9%		23.8%		0.0%		0.0%
Measurement	9.5%	33.3%		38.1%		19.0%		0.0%		0.0%
Chance & Data	52.4%	23.8%		9.5%		4.8%		0.0%		9.5%
Calhoun North-Bragg 2 (21)			3.71		1.90		0.52		0.10	
Number	23.8%	47.6%		4.8%		23.8%		0.0%		0.0%
Algebra	19.0%	76.2%		4.8%		0.0%		0.0%		0.0%
Space	4.8%	9.5%		61.9%		14.3%		9.5%		0.0%
Measurement	19.0%	9.5%		61.9%		4.8%		0.0%		4.8%
Chance & Data	61.9%	28.6%		4.8%		0.0%		0.0%		4.8%
Calhoun North-Schuelter 1 (20)			3.05		1.40		0.25		0.05	
Number	30.0%	45.0%		5.0%		10.0%		5.0%		5.0%
Algebra	25.0%	70.0%		0.0%		0.0%		0.0%		5.0%
Space	10.0%	15.0%		55.0%		10.0%		0.0%		10.0%
Measurement	40.0%	10.0%		50.0%		0.0%		0.0%		0.0%
Chance & Data	60.0%	25.0%		5.0%		0.0%		0.0%		10.0%
Calhoun North-Schuelter 2 (17)			3.76		1.59		0.06		0.00	
Number	5.9%	70.6%		23.5%		0.0%		0.0%		0.0%
Algebra	5.9%	82.4%		0.0%		0.0%		0.0%		11.8%
Space	17.6%	17.6%		52.9%		0.0%		0.0%		11.8%
Measurement	5.9%	17.6%		64.7%		5.9%		0.0%		5.9%
Chance & Data	23.5%	29.4%		11.8%		0.0%		0.0%		35.3%
Calhoun North-Solomon 1 (17)			3.53		1.88		0.53		0.06	
Number	17.6%	41.2%		23.5%		11.8%		5.9%		0.0%
Algebra	11.8%	82.4%		0.0%		0.0%		0.0%		5.9%
Space	0.0%	5.9%		64.7%		23.5%		0.0%		5.9%
Measurement	5.9%	29.4%		47.1%		11.8%		0.0%		5.9%
Chance & Data	76.5%	23.5%		0.0%		0.0%		0.0%		0.0%
Calhoun North-Solomon 2 (18)			4.00		2.00		0.61		0.06	0.0%
Number	22.2%	50.0%		22.2%		5.6%		0.0%		0.0%
Algebra	5.9%	94.4%		0.0%		0.0%		0.0%		0.0%
Space	0.0%	11.1%		50.0%		27.8%		5.6%		5.6%
Measurement	5.6%	22.2%		61.1%		5.6%		0.0%		5.6%
Chance & Data	55.6%	27.8%		0.0%		16.7%		0.0%		0.0%
Calhoun North-Tierny (21)			3.67		1.76		0.43		0.00	
Number	19.0%	66.7%		4.8%		9.5%		0.0%		0.0%
Algebra	33.3%	66.7%		0.0%		0.0%		0.0%		0.0%
Space	0.0%	4.8%		81.0%		14.3%		0.0%		0.0%
Measurement	33.3%	19.0%		42.9%		4.8%		0.0%		0.0%
Chance & Data	47.6%	33.3%		4.8%		14.3%		0.0%		0.0%
Calhoun North-Vetter (7)			2.00		0.57		0.00		0.00	
Number	28.6%	71.4%		0.0%		0.0%		0.0%		0.0%
Algebra	71.4%	14.3%		0.0%		0.0%		0.0%		14.3%
Space	57.1%	14.3%		14.3%		0.0%		0.0%		14.3%
Measurement	28.6%	28.6%		42.9%		0.0%		0.0%		0.0%
Chance & Data	71.4%	14.3%		0.0%		0.0%		0.0%		14.3%

Table E4

Student Data From Subscales of the Student Attitude Inventory, Grade 6, District 3

School-Class *(N)*		**Subscale *(1 = very true; 4 = not true at all)***				
		Effort	**Confidence**	**Interest**	**Usefulness**	**Communication**
—MiC—						
Calhoun North-Bragg 1 (24)						
	Count	14	21	18	17	19
	Mean	1.68	1.98	2.48	1.70	1.85
	Median	1.67	2.00	2.69	1.63	1.86
	Minimum	1.00	1.00	1.00	1.13	1.00
	Maximum	2.50	3.00	3.38	2.75	2.86
	Standard Deviation	0.41	0.46	0.64	0.39	0.44
Calhoun North-Bragg 2 (21)						
	Count	19	19	19	16	18
	Mean	1.98	1.95	2.07	1.77	1.98
	Median	1.83	1.80	2.00	1.69	1.93
	Minimum	1.33	1.20	1.00	1.13	1.29
	Maximum	2.83	2.80	3.38	2.75	2.57
	Standard Deviation	0.42	0.50	0.71	0.50	0.42
Calhoun North-Schuelter 1 (23)						
	Count	19	20	19	20	19
	Mean	1.89	1.87	2.21	1.59	1.80
	Median	1.83	1.80	2.25	1.50	1.71
	Minimum	1.17	1.40	1.25	1.13	1.29
	Maximum	3.00	2.60	3.13	2.38	2.57
	Standard Deviation	0.54	0.32	0.56	0.28	0.37
Calhoun North-Schuelter 2 (20)						
	Count	19	19	19	19	17
	Mean	1.64	1.74	1.92	1.47	1.66
	Median	1.67	1.80	1.88	1.50	1.71
	Minimum	1.00	1.00	1.00	1.00	1.14
	Maximum	2.17	2.40	3.13	2.00	2.57
	Standard Deviation	0.34	0.46	0.76	0.36	0.42
Calhoun North-Solomon 1 (21)						
	Count	17	17	13	16	17
	Mean	1.69	1.75	2.17	1.82	1.83
	Median	1.67	1.60	2.50	1.75	1.86
	Minimum	1.00	1.00	1.00	1.13	1.14
	Maximum	2.33	2.40	3.00	3.38	2.86
	Standard Deviation	0.36	0.50	0.74	0.52	0.42
Calhoun North-Solomon 2 (22)						
	Count	18	17	17	18	17
	Mean	1.56	1.74	2.04	1.76	1.91
	Median	1.33	1.80	2.13	1.81	2.00
	Minimum	1.00	1.00	1.13	1.13	1.00
	Maximum	2.83	3.00	3.00	3.00	3.00
	Standard Deviation	0.50	0.58	0.64	0.45	0.59
Calhoun North-Tierny (24)						
	Count	23	23	23	20	22
	Mean	1.70	1.73	2.15	1.83	1.72
	Median	1.50	1.60	2.25	1.94	1.71
	Minimum	1.00	1.00	1.00	1.00	1.00
	Maximum	2.67	2.80	3.50	3.00	2.43
	Standard Deviation	0.46	0.54	0.80	0.57	0.34
Calhoun North-Vetter (7)						
	Count	7	6	7	7	7
	Mean	2.26	2.67	2.36	2.11	2.22
	Median	2.33	2.60	2.13	2.00	2.29
	Minimum	1.67	2.00	1.00	1.25	1.57
	Maximum	3.00	3.60	3.50	3.13	3.00
	Standard Deviation	0.53	0.53	0.87	0.72	0.58

Table E5

Class Means on General Perception Items of the Student Attitude Inventory, Grade 6, District 3

School-Class *(N)*	3 *(N)*	3 Mean	3 StD	4 *(N)*	4 Mean	4 StD	6 *(N)*	6 Mean	6 StD	11 *(N)*	11 Mean	11 StD	16 *(N)*	16 Mean	16 StD	20 *(N)*	20 Mean	20 StD	27 *(N)*	27 Mean	27 StD	28 *(N)*	28 Mean	28 StD
—MiC—																								
Calhoun North-Bragg 1 (24)	20	1.50	0.76	21	1.62	0.74	20	2.70	0.86	21	1.19	0.40	21	1.43	0.51	20	2.80	1.11	19	2.58	1.02	21	1.76	1.00
Calhoun North-Bragg 2 (21)	20	1.35	0.67	20	1.80	0.70	20	2.75	0.72	20	1.35	0.59	20	1.50	0.76	19	2.00	0.94	20	2.85	1.18	20	2.50	1.05
Calhoun North-Schlueter 1 (23)	19	1.26	0.56	20	1.85	0.88	19	2.53	1.07	20	1.15	0.37	20	1.35	0.49	20	1.65	0.99	20	2.15	1.23	20	2.85	1.18
Calhoun North-Schlueter 2 (20)	19	1.53	0.70	19	1.32	0.67	19	2.74	0.99	19	1.00	0.00	19	1.16	0.37	19	1.47	0.90	19	2.11	1.15	19	2.32	1.11
Calhoun North-Solomon 1 (21)	17	1.35	0.61	17	1.82	0.88	17	2.76	0.66	16	1.31	0.70	17	1.35	0.61	17	1.76	1.20	16	2.00	1.10	17	2.65	1.00
Calhoun North-Solomon 2 (22)	17	1.29	0.59	18	1.61	0.61	18	2.72	1.02	18	1.22	0.73	18	1.06	0.24	18	1.72	0.75	18	2.39	0.98	18	2.50	1.04
Calhoun North-Tierney 1 (24)	22	1.36	0.58	23	1.96	0.88	23	2.48	0.95	22	1.32	0.57	23	1.43	0.73	23	1.87	0.87	23	2.48	1.27	23	2.57	0.90
Calhoun North-Vetter 1 (7)	7	2.14	1.21	7	1.43	0.53	7	2.29	1.38	7	1.14	0.38	7	1.71	1.11	7	1.71	1.11	7	2.71	1.25	7	2.57	1.27

School-Class *(N)*	37 *(N)*	37 Mean	37 StD	38 *(N)*	38 Mean	38 StD	39 *(N)*	39 Mean	39 StD	44 *(N)*	44 Mean	44 StD	45 *(N)*	45 Mean	45 StD	49 *(N)*	49 Mean	49 StD	53 *(N)*	53 Mean	53 StD	55 *(N)*	55 Mean	55 StD
—MiC—																								
Calhoun North-Bragg 1 (24)	21	2.86	1.15	21	1.67	0.80	21	2.80	0.98	0	0.00	0.00	20	2.70	0.86	20	1.75	1.02	20	1.55	0.76	19	3.16	0.76
Calhoun North-Bragg 2 (21)	19	3.05	0.91	19	2.21	0.92	19	2.63	1.01	19	3.00	0.82	19	3.16	0.83	19	2.16	1.07	19	1.63	0.76	19	2.68	0.82
Calhoun North-Schlueter 1 (23)	20	3.30	0.98	20	1.55	0.69	20	2.15	0.99	20	3.15	1.04	20	2.60	1.10	20	1.20	0.52	19	1.53	0.96	20	2.75	1.07
Calhoun North-Schlueter 2 (20)	19	3.42	0.77	19	1.32	0.75	19	1.89	0.81	18	3.17	0.79	18	2.78	1.17	19	1.47	0.90	19	1.26	0.65	19	2.84	1.01
Calhoun North-Solomon 1 (21)	17	2.59	1.06	17	1.59	0.94	17	2.06	0.66	17	2.82	0.88	17	2.29	0.85	17	1.47	0.72	17	1.41	0.62	17	2.94	0.97
Calhoun North-Solomon 2 (22)	18	3.17	1.10	18	1.17	0.38	18	2.00	0.91	18	3.17	0.79	18	3.11	0.96	18	1.56	0.92	18	1.33	0.49	18	2.56	0.92
Calhoun North-Tierney 1 (24)	23	2.83	0.98	22	1.45	0.80	23	2.43	0.84	23	3.00	0.90	23	2.74	1.01	23	1.52	0.85	23	1.26	0.54	23	3.13	0.76
Calhoun North-Vetter 1 (7)	7	2.57	1.51	7	2.00	1.15	7	2.00	0.82	7	2.71	1.60	7	3.00	1.15	7	2.14	1.21	7	1.57	0.79	7	3.14	1.21

Table E5 *(continued)*

Key

3. I feel sure that I am able to learn new ideas in math class. *(confidence in ability to learn mathematics)*
4. In mathematics, you can discover new ways of solving problems that the teacher or your classmates may not have thought of. *(problem solving)*
6.* If I use a calculator to solve a problem, I can be sure it will always give me the right answer. *(calculator use)*
11. Anyone who works hard enough can be good at math. *(effort)*
16. It's okay if I solve a math problem differently than my classmates do. *(problem solving)*
20.* Mathematics is not related to any of my other school subjects. *(connection to other school subjects)*
27.* Understanding why an answer is right is not as important as getting the right answer. *(understanding vs. answer)*
28.* Mathematics is more difficult to understand than other subjects. *(connection to other school subjects)*
37.* No matter how hard a person works, some people are just naturally good at math and some are just not. *(effort)*
38.* Answering questions correctly in math means only giving a number. *(process vs. answer)*
39.* Each new math topic I study is not related to ones I have learned before. *(connection among mathematics topics)*
44.* When my teacher asks a question I will get it right if I have memorized the correct rule or fact. *(mathematics as facts or rules)*
45.* If you have to use a calculator to solve a problem, you don't really understand how to do the problem. *(calculator use)*
49.* It really doesn't matter if you understand a math problem or how you get an answer as long as the answer you get is right. *(understanding vs. answer)*
53. Knowing how to solve a problem is as important as getting the answer. *(process vs. answer)*
55.* Mathematics is mostly learned by memorizing facts and rules. *(mathematics as facts or rules)*

* Reverse-scored due to wording of question.

Table E6

Class Means on Student Attribution of Success or Failure in Mathematics, Grade 6, District 3

School-Class (*N*)	Success											
	Teacher			Ability			Effort			Luck		
	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD
—MiC—												
Calhoun North-Bragg 1 (24)	21	3.81	0.68	20	2.70	0.86	20	1.10	0.31	21	3.43	0.51
Calhoun North-Bragg 2 (21)	20	3.55	0.83	19	2.26	0.81	19	1.26	0.45	20	3.05	0.94
Calhoun North-Schlueter 1 (23)	20	3.80	0.52	20	2.25	1.02	20	1.05	0.22	20	3.45	0.76
Calhoun North-Schlueter 2 (20)	18	3.39	0.85	19	2.32	1.00	19	1.21	0.54	19	3.63	0.50
Calhoun North-Solomon 1 (21)	17	3.65	0.79	17	2.59	1.06	17	1.18	0.39	17	3.41	0.80
Calhoun North-Solomon 2 (22)	18	3.94	0.24	17	2.41	0.80	18	1.17	0.38	18	3.78	0.43
Calhoun North-Tierney 1 (24)	23	3.87	0.34	23	2.17	1.03	23	1.30	0.70	23	3.39	0.78
Calhoun North-Vetter 1 (7)	6	3.17	1.33	7	3.00	1.15	7	2.43	1.51	7	2.86	1.07
School-Class (*N*)	**Failure**											
	Teacher			**Ability**			**Effort**			**Luck**		
	(*N*)	**Mean**	**StD**	**(*N*)**	**Mean**	**StD**	**(*N*)**	**Mean**	**StD**	**(*N*)**	**Mean**	**StD**
—MiC—												
Calhoun North-Bragg 1 (24)	19	3.89	0.32	21	2.86	0.96	19	1.79	0.63	20	3.70	0.80
Calhoun North-Bragg 2 (21)	19	3.63	0.83	20	2.95	1.10	19	2.26	0.93	19	3.32	0.82
Calhoun North-Schlueter 1 (23)	20	3.90	0.45	19	3.00	1.15	20	1.75	0.91	20	3.45	0.89
Calhoun North-Schlueter 2 (20)	19	3.84	0.37	19	3.37	0.68	19	1.84	0.76	19	3.89	0.32
Calhoun North-Solomon 1 (21)	17	3.88	0.33	17	3.06	0.97	17	1.94	1.09	17	3.65	0.49
Calhoun North-Solomon 2 (22)	18	3.83	0.51	18	3.22	0.81	18	2.06	0.87	18	4.00	0.00
Calhoun North-Tierney 1 (24)	23	3.74	0.75	23	3.36	0.85	23	2.30	0.88	23	3.74	0.54
Calhoun North-Vetter 1 (7)	7	3.29	1.25	7	3.00	1.41	7	2.43	1.51	7	1.71	1.11

APPENDIX E

GRADE 7, DISTRICT 3

Table E1

Fixed Characteristics, Grade 7, District 3

School-Class *(N)*	**Sex**		**Ethnicity** *(self-identified)*								
	F	**M**	**African American**	**Native American**	**Asian**	**Hispanic**	**White**	**Multiracial**	**Haitian**	**Other**	**Non-Response**
—MiC—											
Calhoun North-Perry 1 (19)	8	11	0%	0%	0%	5%	84%	5%	0%	0%	5%
Calhoun North-Perry 2 (22)	7	15	0%	0%	0%	0%	91%	9%	0%	0%	0%
Calhoun North-Perry 3 (22)	7	15	0%	0%	0%	0%	91%	9%	0%	0%	0%
Calhoun North-Perry 4 (21)	9	12	0%	0%	0%	5%	86%	10%	0%	0%	0%
Calhoun North-Perry 5 (27)	14	13	0%	0%	0%	0%	93%	7%	0%	0%	0%
Calhoun North-Perry 6 (22)	13	9	0%	0%	0%	0%	100%	0%	0%	0%	0%
Calhoun North-Schroeder 1 (1)	0	1	0%	0%	0%	0%	100%	0%	0%	0%	0%

Table E2

Standardized Test Scores, Spring 1997, Grade 7, District 3

School-Class *(N)*	**TerraNova: National Percentiles**															
	(*N*)	**Application**					**Computation**					**Composite**				
		Mean	**StdDev**	**Mini-mum**	**Median**	**Maxi-mum**	**Mean**	**StdDev**	**Mini-mum**	**Median**	**Maxi-mum**	**Mean**	**StdDev**	**Mini-mum**	**Median**	**Maxi-mum**
—MiC—																
Calhoun North-Perry 1 (19)	17	70.53	22.18	25	76.0	99	61.06	21.86	28	65.0	90	67.18	21.52	25	73.0	96
Calhoun North-Perry 2 (22)	19	68.63	24.90	15	76.0	99	51.94	27.26	13	52.0	90	62.78	24.47	19	69.0	98
Calhoun North-Perry 3 (22)	22	72.14	19.21	20	74.5	98	50.23	24.32	5	47.0	98	61.55	21.41	21	59.5	97
Calhoun North-Perry 4 (21)	20	70.20	19.10	27	74.5	99	57.20	20.12	14	62.5	84	65.65	19.52	19	65.5	97
Calhoun North-Perry 5 (27)	23	66.91	22.19	21	72.0	97	54.96	21.46	15	56.0	90	62.00	21.00	17	62.0	92
Calhoun North-Perry 6 (22)	20	71.25	22.54	21	75.0	99	55.20	27.77	4	58.5	98	64.10	26.77	13	73.0	99
Calhoun North-Schroeder (1)	1	49.00	--	49	49.0	49	35.00	--	35	35.0	35	42.00	--	42	42.0	42

Table E3

Class Results on the Collis-Romberg Mathematical Problem-Solving Profiles, Grade 7, District 3

School-Class (*N*)	Level of Student Performance									No Response
	Prestructural	Unistructural		Multistructural		Relational		Extended Abstract		
	(%)	(%)	Ave.	(%)	Ave.	(%)	Ave.	(%)	Ave.	
—MiC—										
Calhoun North-Perry 1 (18)			3.89		2.06		1.00		0.11	
Number	5.6%	50.0%		11.1%		27.8%		5.6%		0.0%
Algebra	0.0%	100.0%		0.0%		0.0%		0.0%		0.0%
Space	11.1%	11.1%		50.0%		22.2%		5.6%		0.0%
Measurement	22.2%	5.6%		50.0%		22.2%		0.0%		0.0%
Chance & Data	66.7%	5.6%		5.6%		16.7%		0.0%		5.6%
Calhoun North-Perry 2 (20)			3.50		1.95		0.85		0.10	
Number	15.0%	55.0%		20.0%		5.0%		5.0%		0.0%
Algebra	45.0%	50.0%		0.0%		0.0%		0.0%		5.0%
Space	5.0%	10.0%		45.0%		35.0%		5.0%		0.0%
Measurement	35.0%	15.0%		35.0%		15.0%		0.0%		0.0%
Chance & Data	35.0%	25.0%		15.0%		15.0%		0.0%		10.0%
Calhoun North-Perry 3 (21)			4.10		2.43		0.71		0.05	
Number	19.0%	38.1%		28.6%		9.5%		4.8%		0.0%
Algebra	4.8%	95.2%		0.0%		0.0%		0.0%		0.0%
Space	0.0%	4.8%		71.4%		23.8%		0.0%		0.0%
Measurement	14.3%	14.3%		57.1%		14.3%		0.0%		0.0%
Chance & Data	42.9%	19.0%		14.3%		19.0%		0.0%		4.8%
Calhoun North-Perry 4 (21)			3.67		1.90		0.81		0.05	
Number	4.8%	57.1%		19.0%		19.0%		0.0%		0.0%
Algebra	28.6%	71.4%		0.0%		0.0%		0.0%		0.0%
Space	14.3%	14.3%		33.3%		38.1%		0.0%		0.0%
Measurement	28.1%	14.3%		47.6%		9.5%		0.0%		0.0%
Chance & Data	61.9%	19.0%		4.8%		14.3%		0.0%		0.0%
Calhoun North-Perry 5 (25)			3.64		1.92		0.76		0.12	
Number	24.0%	56.0%		12.0%		4.0%		4.0%		0.0%
Algebra	24.0%	68.0%		0.0%		0.0%		4.0%		4.0%
Space	4.0%	8.0%		60.0%		24.0%		4.0%		0.0%
Measurement	20.0%	4.0%		52.0%		24.0%		0.0%		0.0%
Chance & Data	68.0%	20.0%		0.0%		12.0%		0.0%		0.0%
Calhoun North-Perry 6 (20)			3.95		2.25		1.15		0.15	
Number	0.0%	60.0%		20.0%		15.0%		5.0%		0.0%
Algebra	20.0%	75.0%		0.0%		0.0%		0.0%		5.0%
Space	5.0%	15.0%		25.0%		45.0%		10.0%		0.0%
Measurement	20.0%	10.0%		55.0%		10.0%		5.0%		0.0%
Chance & Data	35.0%	20.0%		5.0%		30.0%		0.0%		10.0%
Calhoun North-Schroeder (1)			4.00		1.00		0.00		0.00	
Number	0.0%	100.0%		0.0%		0.0%		0.0%		0.0%
Algebra	0.0%	100.0%		0.0%		0.0%		0.0%		0.0%
Space	0.0%	100.0%		0.0%		0.0%		0.0%		0.0%
Measurement	0.0%	0.0%		100.0%		0.0%		0.0%		0.0%
Chance & Data	100.0%	0.0%		0.0%		0.0%		0.0%		0.0%

Table E4

Student Data From Subscales of the Student Attitude Inventory, Grade 7, District 3

School-Class *(N)*	**Subscale *(1 = very true; 4 = not true at all)***				
	Effort	**Confidence**	**Interest**	**Usefulness**	**Communication**
—MiC—					
Calhoun North-Perry 1 (19)					
Count	18	18	16	16	18
Mean	2.15	1.94	2.18	1.90	2.02
Median	1.92	1.80	2.19	1.81	1.93
Minimum	1.17	1.20	1.13	1.25	1.29
Maximum	3.67	3.40	3.38	3.25	3.29
Standard Deviation	0.70	0.69	0.67	0.52	0.49
Calhoun North-Perry 2 (22)					
Count	19	20	19	19	19
Mean	1.94	2.00	2.48	1.86	1.86
Median	2.00	2.00	2.50	1.75	1.86
Minimum	1.00	1.00	1.25	1.00	1.00
Maximum	3.33	3.60	4.00	3.50	2.71
Standard Deviation	0.52	0.65	0.81	0.54	0.52
Calhoun North-Perry 3 (22)					
Count	18	20	18	19	17
Mean	1.80	1.88	2.17	1.79	1.99
Median	1.75	1.80	2.19	1.63	1.86
Minimum	1.00	1.00	1.00	1.13	1.57
Maximum	2.67	4.00	3.50	3.75	3.43
Standard Deviation	0.46	0.69	0.64	0.60	0.47
Calhoun North-Perry 4 (21)					
Count	20	21	21	19	20
Mean	1.88	1.93	2.35	1.88	1.99
Median	1.92	2.20	2.38	1.88	2.00
Minimum	1.33	1.00	1.00	1.13	1.14
Maximum	2.83	2.60	3.63	3.13	2.86
Standard Deviation	0.43	0.48	0.66	0.59	0.49
Calhoun North-Perry 5 (27)					
Count	24	24	24	23	24
Mean	1.74	1.80	2.14	1.64	1.76
Median	1.67	1.80	2.38	1.63	1.71
Minimum	1.00	1.00	1.00	1.00	1.14
Maximum	3.17	2.60	3.13	2.25	2.43
Standard Deviation	0.43	0.46	0.65	0.39	0.36
Calhoun North-Perry 6 (22)					
Count	21	22	21	18	18
Mean	1.87	1.79	2.02	1.61	1.85
Median	2.00	1.80	2.13	1.63	1.79
Minimum	1.00	1.00	1.00	1.00	1.14
Maximum	2.67	3.00	3.38	2.75	2.43
Standard Deviation	0.49	0.59	0.71	0.45	0.38
Calhoun North-Schroeder (1)					
Count	1	1	1	1	1
Mean	2.83	2.20	3.13	2.50	2.29
Median	NOT APPLICABLE				
Minimum	2.83	2.20	3.13	2.50	2.29
Maximum	2.83	2.20	3.13	2.50	2.29
Standard Deviation	NOT APPLICABLE				

Table E5

Class Means on General Perceptions Items of the Student Attitude Inventory, Grade 7, District 3

School-Class *(N)*	**Item Number *(see Key)***																							
	3			**4**			**6**			**11**			**16**			**20**			**27**			**28**		
	(N)	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**
—MiC—																								
Calhoun North-Perry 1 (19)	17	1.65	0.70	17	1.82	0.73	18	2.83	0.86	18	1.33	0.49	18	1.33	0.59	17	1.76	0.90	18	2.67	1.33	18	2.56	0.92
Calhoun North-Perry 2 (22)	20	1.60	0.68	20	1.65	0.67	20	2.60	0.99	20	1.30	0.66	20	1.25	0.44	20	1.95	0.83	20	2.20	1.32	20	2.70	0.80
Calhoun North-Perry 3 (22)	21	1.76	1.00	21	1.81	0.87	21	2.14	1.01	21	1.19	0.51	21	1.43	0.93	21	1.62	0.80	20	2.35	1.27	21	2.57	0.98
Calhoun North-Perry 4 (21)	21	1.43	0.60	21	1.52	0.68	20	2.40	0.88	20	1.20	0.41	21	1.14	0.36	21	1.76	0.83	21	2.33	1.28	21	2.81	1.12
Calhoun North-Perry 5 (27)	26	1.42	0.58	25	1.52	0.77	26	1.81	0.90	26	1.00	0.00	26	1.31	0.74	26	1.54	0.76	26	2.08	1.20	26	2.73	0.96
Calhoun North-Perry 6 (22)	21	1.48	0.68	22	1.32	0.65	22	2.23	1.07	22	1.23	0.43	22	1.18	0.39	22	1.45	0.67	22	2.36	1.33	22	2.68	1.21
Calhoun North-Schroeder 1 (1)	0	0.00	--	1	2.00	--	1	4.00	--	1	2.00	--	1	1.00	--	1	4.00	--	1	3.00	--	1	3.00	--

School-Class *(N)*	**37**			**38**			**39**			**44**			**45**			**49**			**53**			**55**		
	(N)	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**	***(N)***	**Mean**	**StD**
—MiC—																								
Calhoun North-Perry 1 (19)	18	3.11	0.96	18	1.72	0.75	18	2.28	0.96	18	3.06	0.64	18	2.83	0.99	18	2.06	1.16	18	1.33	0.69	18	2.72	1.07
Calhoun North-Perry 2 (22)	20	2.95	0.89	19	1.37	0.68	19	2.21	0.86	20	3.20	0.89	20	2.50	0.89	19	2.00	1.15	20	1.50	0.69	20	2.80	1.01
Calhoun North-Perry 3 (22)	21	2.95	1.02	21	1.67	0.86	21	2.05	0.86	20	3.45	0.60	20	2.05	0.94	20	1.75	0.91	20	1.45	0.89	20	2.60	0.88
Calhoun North-Perry 4 (21)	21	2.76	1.18	20	2.00	1.03	21	2.43	0.98	21	3.43	0.68	21	2.67	1.11	21	1.43	0.68	21	1.33	0.58	21	2.57	0.98
Calhoun North-Perry 5 (27)	26	3.23	0.86	25	1.44	0.77	25	2.12	1.13	25	2.80	0.91	24	2.38	1.10	25	1.44	0.77	25	1.44	0.87	24	2.58	1.14
Calhoun North-Perry 6 (22)	22	3.05	1.25	22	1.64	0.90	22	2.36	1.05	22	3.14	0.89	22	2.59	1.05	22	1.41	0.85	22	1.36	0.79	22	2.55	1.06
Calhoun North-Schroeder 1 (1)	1	3.00	--	1	3.00	--	1	3.00	--	1	2.00	--	1	2.00	--	1	2.00	--	1	3.00	--	1	4.00	--

Key

3. I feel sure that I am able to learn new ideas in math class. *(confidence in ability to learn mathematics)*
4. In mathematics, you can discover new ways of solving problems that the teacher or your classmates may not have thought of. *(problem solving)*
6.* If I use a calculator to solve a problem, I can be sure it will always give me the right answer. *(calculator use)*
11. Anyone who works hard enough can be good at math. *(effort)*
16. It's okay if I solve a math problem differently than my classmates do. *(problem solving)*
20.* Mathematics is not related to any of my other school subjects. *(connection to other school subjects)*
27.* Understanding why an answer is right is not as important as getting the right answer. *(understanding vs. answer)*
28.* Mathematics is more difficult to understand than other subjects. *(connection to other school subjects)*
37.* No matter how hard a person works, some people are just naturally good at math and some are just not. *(effort)*
38.* Answering questions correctly in math means only giving a number. *(process vs. answer)*
39.* Each new math topic I study is not related to ones I have learned before. *(connection among mathematics topics)*
44.* When my teacher asks a question I will get it right if I have memorized the correct rule or fact. *(mathematics as facts or rules)*
45.* If you have to use a calculator to solve a problem, you don't really understand how to do the problem. *(calculator use)*
49.* It really doesn't matter if you understand a math problem or how you get an answer as long as the answer you get is right. *(understanding vs. answer)*
53. Knowing how to solve a problem is as important as getting the answer. *(process vs. answer)*
55.* Mathematics is mostly learned by memorizing facts and rules. *(mathematics as facts or rules)*

* Reverse-scored due to wording of question.

Table E6

Class Means on Student Attribution of Success or Failure in Mathematics, Grade 7, District 3

School-Class (*N*)	Success											
	Teacher			Ability			Effort			Luck		
	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD
—MiC—												
Calhoun North-Perry 1 (19)	18	3.83	0.38	18	2.17	1.04	18	1.28	0.57	18	3.17	0.99
Calhoun North-Perry 2 (22)	20	3.60	0.75	20	2.25	1.02	20	1.55	0.83	20	3.20	0.83
Calhoun North-Perry 3 (22)	21	3.52	0.87	21	2.62	1.12	21	1.29	0.72	21	3.33	0.97
Calhoun North-Perry 4 (21)	20	3.65	0.59	21	2.90	0.89	21	1.19	0.40	21	3.24	0.83
Calhoun North-Perry 5 (27)	25	3.72	0.74	26	2.69	1.05	25	1.16	0.47	26	3.62	0.57
Calhoun North-Perry 6 (22)	22	3.86	0.35	22	2.55	0.96	21	1.29	0.72	22	3.55	0.74
Calhoun North-Schroeder 1 (1)	1	1.00	.	1	3.00	.	1	2.00	.	1	1.00	.

School-Class (*N*)	Failure											
	Teacher			Ability			Effort			Luck		
	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD	(*N*)	Mean	StD
—MiC—												
Calhoun North-Perry 1 (19)	18	3.56	0.86	18	3.06	0.94	17	1.94	1.03	18	3.28	1.02
Calhoun North-Perry 2 (22)	20	3.75	0.55	20	3.00	0.86	20	2.15	0.93	20	3.30	0.92
Calhoun North-Perry 3 (22)	20	3.70	0.73	21	3.14	0.85	18	1.89	0.90	20	3.50	0.95
Calhoun North-Perry 4 (21)	21	3.71	0.46	21	2.95	0.86	21	1.90	0.89	21	3.48	0.68
Calhoun North-Perry 5 (27)	26	3.77	0.51	26	3.08	0.98	25	1.84	0.94	25	3.68	0.56
Calhoun North-Perry 6 (22)	22	3.73	0.63	22	3.36	0.90	22	2.14	1.21	22	3.59	0.85
Calhoun North-Schroeder 1 (1)	1	1.00	.	1	2.00	.	1	2.00	.	1	2.00	.

APPENDIX F

GRADE 6, DISTRICT 4

Table F1

Fixed Characteristics, Grade 6, District 4

School-Class *(N)*	**Sex**		**Ethnicity**								
	F	**M**	**African American**	**Native American**	**Asian**	**Hispanic**	**White**	**Multiracial**	**Haitian**	**Other**	**Non-Response**
—MiC—											
Kelvyn Park-Downer 1 (24)	12	12	46%	0%	4%	17%	8%	8%	0%	21%	0%
Kelvyn Park-Downer 2 (24)	8	16	58%	0%	0%	4%	4%	4%	0%	25%	4%
Kelvyn Park-Vega 1 (14)	10	4	21%	0%	0%	21%	0%	29%	0%	29%	0%
Kelvyn Park-Vega 2 (19)	11	8	58%	0%	0%	16%	5%	5%	0%	16%	0%

Table F2

Standardized Test Scores, Spring 1997, Grade 6, District 4

School-Class *(N)*	**CAT**										
	(*N*)	**Scale Score**					**National Percentile**				
		Mean	**StDev**	**Minimum**	**Median**	**Maximum**	**Mean**	**StDev**	**Minimum**	**Median**	**Maximum**
—MiC—											
Kelvyn Park-Downer 1 (24)	23	728.87	24.85	676	731.0	777	56.35	20.18	15	60.0	93
Kelvyn Park-Downer 2 (24)	22	722.45	22.32	676	726.5	759	51.77	19.43	15	55.0	83
Kelvyn Park-Vega 1 (14)	14	758.50	32.01	690	761.0	830	78.00	20.35	23	84.5	99
Kelvyn Park-Vega 2 (19)	19	762.74	22.08	722	763.0	809	82.47	13.62	51	86.0	99

Table F3

Class Results on the Collis-Romberg Mathematical Problem-Solving Profiles, Grade 6, District 4

School-Class (*N*)	Level of Student Performance									No Response
	Prestructural	Unistructural		Multistructural		Relational		Extended Abstract		
	(%)	(%)	Ave.	(%)	Ave.	(%)	Ave.	(%)	Ave.	
—MiC—										
Kelvyn Park-Downer 1 (24)			2.63		0.79		0		0.00	
Number	20.8%	62.5%		16.7%		0.0%		0.0%		0.0%
Algebra	45.8%	50.0%		0.0%		0.0%		0.0%		4.2%
Space	29.2%	33.3%		37.5%		0.0%		0.0%		0.0%
Measurement	50.0%	25.0%		25.0%		0.0%		0.0%		0.0%
Chance & Data	50.0%	25.0%		25.0%		0.0%		0.0%		0.0%
Kelvyn Park-Downer 2 (23)			2.26		0.7		0.04		0.00	
Number	17.4%	73.9%		4.3%		4.3%		0.0%		0.0%
Algebra	52.2%	43.5%		0.0%		0.0%		0.0%		4.3%
Space	43.5%	21.7%		34.8%		0.0%		0.0%		0.0%
Measurement	60.9%	13.0%		26.1%		0.0%		0.0%		0.0%
Chance & Data	87.0%	4.3%		0.0%		0.0%		0.0%		8.7%
Kelvyn Park-Vega 1 (14)			3.07		1.43		0.21		0.07	
Number	7.1%	64.3%		7.1%		14.3%		7.1%		0.0%
Algebra	64.3%	35.7%		0.0%		0.0%		0.0%		0.0%
Space	14.3%	21.4%		64.3%		0.0%		0.0%		0.0%
Measurement	35.7%	28.6%		35.7%		0.0%		0.0%		0.0%
Chance & Data	71.4%	21.4%		7.1%		0.0%		0.0%		0.0%
Kelvyn Park-Vega 2 (19)			3.26		1.37		0.32		0.11	
Number	15.8%	52.6%		21.1%		0.0%		10.5%		0.0%
Algebra	26.3%	68.4%		0.0%		0.0%		0.0%		5.3%
Space	15.8%	21.1%		42.1%		15.8%		0.0%		5.3%
Measurement	36.8%	10.5%		42.1%		5.3%		0.0%		5.3%
Chance & Data	52.6%	36.8%		0.0%		0.0%		0.0%		10.5%

Table F4

Student Data From Subscales of the Student Attitude Inventory, Grade 6, District 4

School-Class *(N)*		**Subscale *(1 = very true; 4 = not true at all)***			
	Effort	**Confidence**	**Interest**	**Usefulness**	**Communication**
—MiC—					
Kelvyn Park-Downer 1 (24)					
Count	17	17	17	16	15
Mean	1.87	2.26	2.43	1.98	2.06
Median	1.83	2.20	2.38	1.75	1.86
Minimum	1.17	1.40	1.25	1.50	1.43
Maximum	2.67	3.40	3.63	3.13	3.00
Standard Deviation	0.43	0.50	0.72	0.51	0.48
Kelvyn Park-Downer 2 (24)					
Count	11	10	10	8	9
Mean	1.85	1.90	1.91	1.70	1.71
Median	1.83	1.90	1.81	1.75	1.57
Minimum	1.00	1.20	1.00	1.00	1.00
Maximum	2.67	2.80	2.75	2.38	2.57
Standard Deviation	0.54	0.49	0.60	0.44	0.56
Kelvyn Park-Vega 1 (14)					
Count	14	14	13	13	12
Mean	1.61	2.03	1.96	1.82	1.92
Median	1.50	2.10	2.13	1.75	2.00
Minimum	1.00	1.00	1.00	1.13	1.00
Maximum	2.67	2.80	3.25	2.88	2.57
Standard Deviation	0.58	0.56	0.66	0.53	0.54
Kelvyn Park-Vega 2 (19)					
Count	19	17	19	19	18
Mean	1.87	1.98	2.38	1.70	1.90
Median	1.83	2.00	2.25	1.63	1.93
Minimum	1.00	1.00	1.13	1.00	1.14
Maximum	3.50	3.60	4.00	3.25	3.57
Standard Deviation	0.66	0.72	0.78	0.56	0.55

Table F5
Class Means on General Perception Items of the Student Attitude Inventory, Grade 6, District 4

School-Class *(N)*	3 *(N)*	3 Mean	3 StD	4 *(N)*	4 Mean	4 StD	6 *(N)*	6 Mean	6 StD	11 *(N)*	11 Mean	11 StD	16 *(N)*	16 Mean	16 StD	20 *(N)*	20 Mean	20 StD	27 *(N)*	27 Mean	27 StD	28 *(N)*	28 Mean	28 StD
—MiC—																								
Kelvyn Park-Downer 1 (24)	17	1.35	0.49	17	1.71	0.77	15	2.67	1.18	16	1.13	0.34	16	1.13	0.34	17	2.06	1.09	16	2.44	1.09	17	2.53	1.33
Kelvyn Park-Downer 2 (24)	11	1.09	0.30	11	1.73	0.90	11	2.91	1.04	11	1.36	0.92	11	1.27	0.47	11	2.55	1.37	10	1.60	0.97	11	1.55	0.69
Kelvyn Park-Vega 1 (14)	14	1.21	0.43	14	1.64	0.74	14	2.79	0.89	14	1.07	0.27	14	1.14	0.36	14	1.43	0.65	14	2.00	1.11	14	2.36	0.93
Kelvyn Park-Vega 2 (19)	19	1.47	0.77	19	1.63	0.90	19	2.53	1.02	19	1.05	0.23	19	1.47	0.84	19	1.42	1.02	19	2.32	1.29	19	2.42	1.07

School-Class *(N)*	37 *(N)*	37 Mean	37 StD	38 *(N)*	38 Mean	38 StD	39 *(N)*	39 Mean	39 StD	44 *(N)*	44 Mean	44 StD	45 *(N)*	45 Mean	45 StD	49 *(N)*	49 Mean	49 StD	53 *(N)*	53 Mean	53 StD	55 *(N)*	55 Mean	55 StD
—MiC—																								
Kelvyn Park-Downer 1 (24)	17	3.00	1.12	17	1.88	0.93	17	2.24	0.90	17	3.00	1.06	17	3.06	0.90	17	2.41	1.06	17	1.47	0.62	17	2.88	0.93
Kelvyn Park-Downer 2 (24)	11	3.09	0.94	11	1.55	0.69	11	3.00	1.10	11	3.45	0.52	11	3.09	0.94	10	2.20	1.40	11	1.45	0.69	11	3.45	0.69
Kelvyn Park-Vega 1 (14)	14	2.86	1.23	14	1.21	0.43	14	1.86	0.77	14	2.71	0.73	13	2.62	1.19	14	1.71	0.91	14	1.57	0.76	14	2.36	0.93
Kelvyn Park-Vega 2 (19)	19	2.89	0.88	19	1.53	0.90	19	2.05	0.97	19	3.42	0.77	19	3.11	0.99	19	2.16	1.34	19	1.89	1.20	19	2.58	1.12

Item Number *(see Key)*

Key

3. I feel sure that I am able to learn new ideas in math class. *(confidence in ability to learn mathematics)*
4. In mathematics, you can discover new ways of solving problems that the teacher or your classmates may not have thought of. *(problem solving)*
6.* If I use a calculator to solve a problem, I can be sure it will always give me the right answer. *(calculator use)*
11. Anyone who works hard enough can be good at math. *(effort)*
16. It's okay if I solve a math problem differently than my classmates do. *(problem solving)*
20.* Mathematics is not related to any of my other school subjects. *(connection to other school subjects)*
27.* Understanding why an answer is right is not as important as getting the right answer. *(understanding vs. answer)*
28.* Mathematics is more difficult to understand than other subjects. *(connection to other school subjects)*
37.* No matter how hard a person works, some people are just naturally good at math and some are just not. *(effort)*
38.* Answering questions correctly in math means only giving a number. *(process vs. answer)*
39.* Each new math topic I study is not related to ones I have learned before. *(connection among mathematics topics)*
44.* When my teacher asks a question I will get it right if I have memorized the correct rule or fact. *(mathematics as facts or rules)*
45.* If you have to use a calculator to solve a problem, you don't really understand how to do the problem. *(calculator use)*
49.* It really doesn't matter if you understand a math problem or how you get an answer as long as the answer you get is right. *(understanding vs. answer)*
53. Knowing how to solve a problem is as important as getting the answer. *(process vs. answer)*
55.* Mathematics is mostly learned by memorizing facts and rules. *(mathematics as facts or rules)*

* Reverse-scored due to wording of question.

Table F6

Class Means on Student Attribution of Success or Failure in Mathematics, Grade 6, District 4

School-Class (*N*)	**Success**											
	Teacher			**Ability**			**Effort**			**Luck**		
	(*N*)	**Mean**	**StD**	**(*N*)**	**Mean**	**StD**	**(*N*)**	**Mean**	**StD**	**(*N*)**	**Mean**	**StD**
—MiC—												
Kelvyn Park-Downer 1 (24)	17	3.65	0.61	16	2.38	0.89	17	1.35	0.61	17	3.24	0.75
Kelvyn Park-Downer 2 (24)	9	3.11	1.36	11	1.64	0.81	10	1.20	0.42	11	2.91	1.30
Kelvyn Park-Vega 1 (14)	14	3.79	0.43	14	2.43	1.22	14	1.43	0.76	14	3.43	0.85
Kelvyn Park-Vega 2 (19)	19	3.89	0.46	19	2.00	1.25	19	1.16	0.50	19	3.26	0.99

School-Class (*N*)	**Failure**											
	Teacher			**Ability**			**Effort**			**Luck**		
	(*N*)	**Mean**	**StD**	**(*N*)**	**Mean**	**StD**	**(*N*)**	**Mean**	**StD**	**(*N*)**	**Mean**	**StD**
—MiC—												
Kelvyn Park-Downer 1 (24)	17	3.71	0.59	17	2.65	1.11	17	2.12	0.99	17	3.35	0.79
Kelvyn Park-Downer 2 (24)	11	3.36	1.03	11	3.36	0.92	11	2.45	1.29	11	3.36	1.12
Kelvyn Park-Vega 1 (14)	14	3.71	0.61	12	3.00	1.48	14	2.21	1.05	14	3.79	0.43
Kelvyn Park-Vega 2 (19)	19	3.47	1.12	19	2.74	1.24	19	2.00	1.05	18	3.67	0.77

APPENDIX F

GRADE 7, DISTRICT 4

Table F1

Fixed Characteristics, Grade 7, District 4

School-Class (*N*)	Sex		Ethnicity (*self-identified*)								
	F	M	African American	Native American	Asian	Hispanic	White	Multiracial	Haitian	Other	Non-Response
						—MiC—					
Kelvyn Park-Finn 1 (30)	16	14	27%	0%	0%	17%	7%	33%	0%	10%	7%
Kelvyn Park-Finn 2 (24)	13	11	13%	0%	0%	17%	0%	46%	0%	21%	4%
Kelvyn Park-Woodward 1 (27)	14	13	19%	0%	0%	22%	4%	7%	0%	22%	26%
Kelvyn Park-Woodward 2 (28)	13	15	21%	0%	0%	25%	0%	7%	0%	29%	18%
Kelvyn Park-Yackle 1 (23)	11	12	39%	4%	0%	17%	0%	9%	0%	13%	17%
Kelvyn Park-Yackle 2 (20)	11	9	10%	0%	5%	50%	5%	5%	0%	10%	15%

Table F2

Standardized Test Scores, Spring 1997, Grade 7, District 4

School-Class (*N*)	CAT										
	(*N*)	Scale Score					National Percentile				
		Mean	StDev	Minimum	Median	Maximum	Mean	StDev	Minimum	Median	Maximum
					—MiC—						
Kelvyn Park-Finn 1 (30)	26	764.50	23.16	709	763	808	70.65	18.42	21	72	96
Kelvyn Park-Finn 2 (24)	22	749.50	27.50	704	751	801	55.59	24.21	19	58	95
Kelvyn Park-Woodward 1 (27)	22	757.18	22.74	713	757	808	64.32	16.66	25	66	96
Kelvyn Park-Woodward 2 (28)	23	709.17	27.29	640	717	745	26.74	15.37	2	28	55
Kelvyn Park-Yackle 1 (23)	17	773.59	34.98	728	769	849	73.29	20.17	38	77	99
Kelvyn Park-Yackle 2 (20)	13	714.54	27.08	713	735	801	50.08	23.12	25	45	95

Table F3

Class Results on the Collis-Romberg Mathematical Problem-Solving Profiles, Grade 7, District 4

School-Class *(N)*	**Level of Student Performance**									**No Response**
	Prestructural	**Unistructural**		**Multistructural**		**Relational**		**Extended Abstract**		
	(%)	**(%)**	**Ave.**	**(%)**	**Ave.**	**(%)**	**Ave.**	**(%)**	**Ave.**	
—MiC—										
Kelvyn Park-Finn 1 (28)			3.86		2.29		1.11		0.14	
Number	0.0%	50.0%		7.1%		32.1%		10.7%		0.0%
Algebra	28.6%	64.3%		0.0%		0.0%		0.0%		7.1%
Space	3.6%	14.3%		53.6%		25.0%		3.6%		5.9%
Measurement	10.7%	14.3%		57.1%		17.9%		0.0%		0.0%
Chance & Data	57.1%	14.3%		0.0%		21.4%		0.0%		7.1%
Kelvyn Park-Finn 2 (24)			3.42		1.29		0.29		0.00	
Number	4.2%	70.8%		4.2%		20.8%		0.0%		0.0%
Algebra	25.0%	70.8%		0.0%		0.0%		0.0%		4.2%
Space	16.7%	29.2%		41.7%		8.3%		0.0%		4.2%
Measurement	20.8%	20.8%		54.2%		0.0%		0.0%		4.2%
Chance & Data	45.8%	25.0%		0.0%		0.0%		0.0%		29.2%
Kelvyn Park-Woodward 1 (18)			3.56		1.17		0.11		0.00	
Number	0.0%	83.3%		11.1%		5.6%		0.0%		0.0%
Algebra	16.7%	83.3%		0.0%		0.0%		0.0%		0.0%
Space	22.2%	16.7%		55.6%		5.6%		0.0%		0.0%
Measurement	33.3%	22.2%		38.9%		0.0%		0.0%		5.6%
Chance & Data	61.1%	33.3%		0.0%		0.0%		0.0%		5.6%
Kelvyn Park-Woodward 2 (24)			2.33		0.67		0.08		0.00	
Number	8.3%	79.2%		4.2%		4.2%		0.0%		4.2%
Algebra	45.8%	41.7%		0.0%		0.0%		0.0%		12.5%
Space	37.5%	20.8%		33.3%		0.0%		0.0%		8.3%
Measurement	66.7%	0.0%		29.2%		0.0%		0.0%		4.2%
Chance & Data	62.5%	16.7%		0.0%		0.0%		0.0%		20.8%
Kelvyn Park-Yackle 1 (19)			3.26		1.53		0.68		0.05	
Number	10.5%	63.2%		5.3%		21.1%		0.0%		0.0%
Algebra	36.8%	52.6%		0.0%		5.3%		0.0%		5.3%
Space	15.8%	26.3%		36.8%		15.8%		0.0%		5.3%
Measurement	26.3%	5.3%		57.9%		5.3%		0.0%		5.3%
Chance & Data	68.4%	10.5%		0.0%		10.5%		5.3%		5.3%
Kelvyn Park-Yackle 2 (17)			3.00		1.06		0.24		0.06	
Number	11.8%	58.8%		0.0%		23.5%		5.9%		0.0%
Algebra	43.8%	56.3%		0.0%		0.0%		0.0%		0.0%
Space	35.3%	11.8%		47.1%		0.0%		0.0%		5.9%
Measurement	11.8%	52.9%		29.4%		0.0%		0.0%		5.9%
Chance & Data	82.4%	11.8%		0.0%		0.0%		0.0%		5.9%

Table F4

Student Data From Subscales of the Student Attitude Inventory, Grade 7, District 4

School-Class *(N)*		**Subscale *(1 = very true; 4 = not true at all)***				
		Effort	**Confidence**	**Interest**	**Usefulness**	**Communication**
			—MiC—			
Kelvyn Park-Finn 1 (30)						
	Count	26	27	27	26	26
	Mean	1.69	1.66	1.73	1.54	1.69
	Median	1.58	1.60	1.63	1.50	1.57
	Minimum	1.00	1.00	1.00	1.00	1.00
	Maximum	2.67	3.00	3.13	2.25	2.86
	Standard Deviation	0.44	0.45	0.57	0.38	0.42
Kelvyn Park-Finn 2 (24)						
	Count	20	22	20	17	18
	Mean	1.85	1.97	2.21	1.74	1.79
	Median	1.75	1.80	1.94	1.63	1.71
	Minimum	1.00	1.00	1.00	1.00	1.00
	Maximum	2.83	3.40	3.63	3.00	3.43
	Standard Deviation	0.53	0.67	0.79	0.52	0.56
Kelvyn Park-Woodward 1 (27)						
	Count	19	19	18	19	17
	Mean	1.68	1.81	1.78	1.62	1.60
	Median	1.67	1.60	1.50	1.63	1.57
	Minimum	1.00	1.00	1.13	1.13	1.14
	Maximum	2.17	3.20	3.63	2.25	2.29
	Standard Deviation	0.36	0.59	0.73	0.35	0.32
Kelvyn Park-Woodward 2 (28)						
	Count	20	24	23	23	22
	Mean	1.70	2.13	2.09	1.91	1.88
	Median	1.67	2.20	2.13	1.88	1.86
	Minimum	1.17	1.00	1.00	1.13	1.00
	Maximum	2.50	3.00	3.25	2.75	2.71
	Standard Deviation	0.37	0.52	0.67	0.42	0.44
Kelvyn Park-Yackle 1 (23)						
	Count	17	18	17	18	17
	Mean	1.61	1.66	1.84	1.58	1.76
	Median	1.50	1.60	1.75	1.56	1.71
	Minimum	1.00	1.00	1.13	1.13	1.00
	Maximum	2.67	2.80	2.88	2.38	2.71
	Standard Deviation	0.41	0.52	0.56	0.33	0.45
Kelvyn Park-Yackle 2 (20)						
	Count	11	12	10	10	12
	Mean	1.91	1.82	2.10	1.74	2.02
	Median	2.00	1.80	2.13	1.56	2.00
	Minimum	1.00	1.00	1.00	1.00	1.43
	Maximum	2.50	2.40	3.50	2.50	2.57
	Standard Deviation	0.51	0.48	0.73	0.47	0.37

Table F5

Class Means on General Perceptions Items of the Student Attitude Inventory, Grade 7, District 4

School-Class *(N)*	3			4			6			11			16			20			27			28		
	(N)	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD
—MiC—																								
Kelvyn Park-Finn 1 (30)	27	1.22	0.51	27	1.63	0.79	27	2.04	1.06	27	1.07	0.27	26	1.15	0.37	27	1.33	0.78	27	1.78	1.01	27	2.30	0.91
Kelvyn Park-Finn 2 (24)	24	1.33	0.70	24	1.88	1.08	24	2.04	1.04	24	1.25	0.74	24	1.13	0.34	24	1.67	1.01	23	2.43	1.27	23	2.65	1.15
Kelvyn Park-Woodward 1 (27)	18	1.39	0.50	18	1.50	0.86	19	1.95	0.85	18	1.11	0.32	19	1.32	0.75	19	1.32	0.48	19	1.84	1.17	19	2.63	1.01
Kelvyn Park-Woodward 2 (28)	24	1.33	0.48	24	1.83	0.92	24	2.79	1.06	24	1.54	0.93	24	1.54	0.72	24	1.92	0.93	24	2.13	1.19	23	2.39	1.12
Kelvyn Park-Yackle 1 (23)	17	1.24	0.44	18	1.44	0.98	18	2.83	1.10	18	1.06	0.24	18	1.28	0.46	18	1.28	0.67	18	1.94	1.35	18	2.17	1.10
Kelvyn Park-Yackle 2 (20)	12	1.33	0.65	11	1.55	0.52	12	2.75	0.87	12	1.25	0.45	12	1.50	0.80	12	2.08	1.24	11	2.73	0.79	12	2.00	0.85

School-Class *(N)*	37			38			39			44			45			49			53			55		
	(N)	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD	*(N)*	Mean	StD
—MiC—																								
Kelvyn Park-Finn 1 (30)	26	2.27	0.96	27	1.15	0.36	26	2.00	0.85	27	3.48	0.70	26	2.85	1.08	27	1.26	0.53	27	1.26	0.66	27	3.11	0.97
Kelvyn Park-Finn 2 (24)	23	2.13	1.18	23	1.61	0.84	23	2.09	1.00	21	3.38	0.80	20	2.45	1.32	21	1.48	0.81	20	1.55	0.94	21	2.48	1.17
Kelvyn Park-Woodward 1 (27)	19	3.05	0.97	19	1.47	0.61	19	2.26	0.99	19	3.58	0.77	19	2.84	0.96	19	1.63	0.96	19	1.42	0.84	19	3.00	0.94
Kelvyn Park-Woodward 2 (28)	24	3.08	1.18	24	1.58	0.93	24	2.46	1.18	24	3.33	0.87	24	2.46	1.02	24	2.29	1.08	24	2.04	0.91	23	3.00	1.13
Kelvyn Park-Yackle 1 (23)	18	2.67	1.24	18	1.22	0.55	18	2.17	1.04	18	3.17	0.99	18	3.39	0.92	18	1.44	0.86	18	1.61	1.14	18	3.11	1.18
Kelvyn Park-Yackle 2 (20)	12	2.83	0.94	12	2.33	0.98	12	2.17	0.83	12	3.42	0.67	12	2.75	0.97	12	2.42	1.08	12	1.75	0.75	12	2.83	1.03

Item Number *(see Key)*

Key

3. I feel sure that I am able to learn new ideas in math class. *(confidence in ability to learn mathematics)*
4. In mathematics, you can discover new ways of solving problems that the teacher or your classmates may not have thought of. *(problem solving)*
6.* If I use a calculator to solve a problem, I can be sure it will always give me the right answer. *(calculator use)*
11. Anyone who works hard enough can be good at math. *(effort)*
16. It's okay if I solve a math problem differently than my classmates do. *(problem solving)*
20.* Mathematics is not related to any of my other school subjects. *(connection to other school subjects)*
27.* Understanding why an answer is right is not as important as getting the right answer. *(understanding vs. answer)*
28.* Mathematics is more difficult to understand than other subjects. *(connection to other school subjects)*
37.* No matter how hard a person works, some people are just naturally good at math and some are just not. *(effort)*
38.* Answering questions correctly in math means only giving a number. *(process vs. answer)*
39.* Each new math topic I study is not related to ones I have learned before. *(connection among mathematics topics)*
44.* When my teacher asks a question I will get it right if I have memorized the correct rule or fact. *(mathematics as facts or rules)*
45.* If you have to use a calculator to solve a problem, you don't really understand how to do the problem. *(calculator use)*
49.* It really doesn't matter if you understand a math problem or how you get an answer as long as the answer you get is right. *(understanding vs. answer)*
53. Knowing how to solve a problem is as important as getting the answer. *(process vs. answer)*
55.* Mathematics is mostly learned by memorizing facts and rules. *(mathematics as facts or rules)*

* Reverse-scored due to wording of question.

Table F6

Class Means on Student Attribution of Success or Failure in Mathematics, Grade 7, District 4

School-Class (*N*)	**Success**											
	Teacher			**Ability**			**Effort**			**Luck**		
	(*N*)	**Mean**	**StD**	**(*N*)**	**Mean**	**StD**	**(*N*)**	**Mean**	**StD**	**(*N*)**	**Mean**	**StD**
—MiC—												
Kelvyn Park-Finn 1 (30)	27	3.85	0.46	27	2.22	1.01	27	1.07	0.27	27	3.56	0.64
Kelvyn Park-Finn 2 (24)	23	3.78	0.52	23	2.74	1.05	23	1.26	0.75	23	3.39	0.78
Kelvyn Park-Woodward 1 (27)	19	3.63	0.60	19	2.47	1.07	19	1.16	0.50	19	3.47	0.90
Kelvyn Park-Woodward 2 (28)	24	3.63	0.58	24	2.46	1.10	24	1.54	0.88	24	3.00	0.98
Kelvyn Park-Yackle 1 (23)	18	3.94	0.24	18	2.22	1.22	18	1.11	0.32	18	3.61	0.85
Kelvyn Park-Yackle 2 (20)	12	3.83	0.39	12	2.00	0.74	12	1.25	0.45	12	3.25	0.87

School-Class (*N*)	**Failure**											
	Teacher			**Ability**			**Effort**			**Luck**		
	(*N*)	**Mean**	**StD**	**(*N*)**	**Mean**	**StD**	**(*N*)**	**Mean**	**StD**	**(*N*)**	**Mean**	**StD**
—MiC—												
Kelvyn Park-Finn 1 (30)	27	3.78	0.58	27	3.00	1.00	27	1.52	0.70	27	3.67	0.78
Kelvyn Park-Finn 2 (24)	22	3.64	0.95	24	2.92	1.18	20	2.45	1.32	21	3.67	0.91
Kelvyn Park-Woodward 1 (27)	19	3.58	0.84	19	3.00	1.11	19	1.53	0.84	19	3.42	0.90
Kelvyn Park-Woodward 2 (28)	23	3.57	0.73	24	2.92	1.14	23	2.00	0.80	24	3.29	1.00
Kelvyn Park-Yackle 1 (23)	18	3.83	0.71	18	3.28	1.02	18	1.50	0.79	18	3.89	0.32
Kelvyn Park-Yackle 2 (20)	12	3.67	0.65	11	2.91	1.14	12	2.25	1.14	11	3.45	0.82