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Small group math instruction : is it beneficial in a seventh grade classroom?

JoEllen A. Schwab

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Small groups were created based on student achievement. There were three main groups: low, middle, and high. A small group rotation schedule was created as well to assist teachers in planning activities for other groups that were not meeting with the teacher on a scheduled day. The assignments were differentiated to meet the needs of all students. Chapter test results indicated that small group math instruction does have its place in the regular math classroom.

Small Group Math Instruction:

Is it Beneficial in a Seventh Grade Classroom?

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INTRODUCTION

What can be done to aid seventh grade students in achieving proficiency (70% or higher) on chapter math tests? The author of this paper and a colleague were often asking that question. With that as a basis for concern, the purpose of this study was to see if implementing small group math instruction assisted students in raising their achievement level. No Child Left Behind is here to stay in some form or another, and school districts across the nation including the Waterloo Community Schools are implementing programs, strategies, and techniques that will support student success. Small group instruction is in place in all reading classrooms in Waterloo through eighth grade, and gains in student achievement are being made. On the other hand, in the area of math, the gains are not as great. Therefore, teaching strategies and programs need to be developed and utilized that can assist in student success.

The author and her colleague tried to learn if and why small group instruction would help raise student achievement in the regular math classroom. There were road blocks of several kinds that included the following: getting used to a small group rotation schedule, creating multiple activities to occur in the classroom at the same time, frequent data analysis so that small groups could be adjusted as needed, and finding additional planning and collaboration time. In the beginning the author of this paper and her colleague were overwhelmed with the change. As middle school teachers, we were just getting used to small group reading instruction, and now we were trying to implement it in the math classroom. However, having each other's support and guidance allowed the implementation to continue.

This study could be beneficial to both the school and school district, as well as other school districts. If small group math instruction proves to often be of assistance in increasing student achievement, then maybe more teachers would consider its implementation in their own content area from time to time. Stakeholders in education cannot stop looking for ways to improve student achievement. There is always room for improvement, and we as educators owe it to ourselves and to our students to do the very best job we can in helping them be successful life-long learners.

There are two main limitations to this study. First, the study only took place at the seventh grade level, and in only two classrooms. Second, only two teachers were involved in the planning and collaboration of the small group math instruction, and this was done in isolation. Administration was aware and supportive of its implementation, while many colleagues quite possibly did not realize that small group instruction of this magnitude was being utilized in a content area other than reading. Another limitation to this study was a lack of research done on small group instruction in the math classroom. Although research was readily available in the area of small group reading instruction it was much more challenging to find literature and research that supported the small group math instruction initiative.

LITERATURE REVIEW

The purpose of this study was to examine the effects of small group math instruction on chapter test scores. While there is not an abundance of research available supporting small group math instruction, there is literature and research that supports differentiated instruction and small group instruction in other content areas. The author

notes that small group math instruction does involve differentiating the instruction to meet the needs of all students. Attitudes and motivation also have a role in math classroom success for students.

Differentiated Instruction

A "one-size-fits-all model of instruction makes little sense," notes Tomlinson, (1995). She adds that middle school students come in all shapes, sizes, and abilities, and differentiating the instruction is a solution to meeting the needs of all students. Hall (2002) also supports this belief by adding that all children are not alike; therefore, differentiated instruction should be incorporated so that the needs of all students are being met. Characteristics of a differentiated class include varied instruction, on-going assessments, flexible groups, and students serving as active explorers.

Tomlinson (1995) believes that differentiated instruction provides students with a variety of ways to explore a concept. Differentiated instruction also allows a teacher to use a variety of teaching strategies so that the needs of all students can be met. Haury and Milbourne, (1999) also believe that all students can achieve by differentiating the curriculum. The Sacramento City Unified School District gives three reasons for differentiating the curriculum:

1. Students are not on the same level.
2. Classrooms in which students are active participants are more effective than those that are not.
3. All students have a better chance of learning the concepts being taught.

The Sacramento schools also believe that the curriculum should be differentiated in

content, process, and product. Students should have many options for learning information and making sense of concepts, and there should be multiple options for students to show what they know. Hall (2002) notes that flexible groupings of students should be consistently used. Instruction can come from both teachers and students within each group. Haury and Melbourne (1999) believe that lower students tend to improve more when placed in mixed-ability groupings. Tomlinson (2000) feels that scaffolding is a relevant instructional technique. As students feel comfortable with a concept, they can then begin their assigned task. Those that need more time with the teacher can hang on for a longer period of time. Teachers should work hard to ensure that the assignments are meaningful to all students.

Tomlinson (2000) says that when implementation of differentiated instruction begins, prepare both students and parents for the classroom change. The change should also take place slowly so that both the teacher and students have time to adjust, monitor effectiveness and assess how things are progressing, and get other teachers on board. Research also indicates that differentiation is successful because all students have the opportunity to learn through varied teaching strategies and assignments. The activities are relevant to individual students and learning is active, not passive. Tomlinson (2000) believes that students have a sense of satisfaction and happiness in learning. Research shows that through differentiated instruction all students can work together to solve problems.

A study conducted by Abell (2000) indicated that the differentiated program did benefit the students academically. Twenty-one teachers in three middle schools in

Kentucky participated in the differentiated program. Each of the middle schools started a program in which differentiated instruction was included in the regular classroom to meet the needs of disadvantaged gifted and talented students. Results indicated that all of the teachers implemented differentiated instruction into their regular classrooms. Parents felt that the program was successful, and the students did benefit academically due to differentiated instruction.

Small Group Instruction

The literature also supports the use of small group instruction in the classroom. A study by Mathes, Torgesen, Clancy-Menchetti, Santi, Nicholas, Robinson, and Grek (2003) identified the best instructional delivery methods to aid struggling readers in accelerating reading growth. Two methods were studied: peer instruction and small group teacher-directed instruction. Twenty-two teachers participated, seven of them taught using traditional methods, while seven of them implemented peer assisted instruction and eight of them implemented small group instruction.

In the peer assisted groups, pairs of students worked together learning reading skills. High students were partnered with struggling readers, with pairs changing every four weeks. The small group teacher-directed instruction groups met with four or five low-achieving students three times per week for 30 minutes each session.

Results indicated that both methods had increased student achievement more than the traditional method that was implemented. The small group teacher-directed method scored better than the other two methods, suggesting that small group instruction from a

teacher was more powerful than peer assisted instruction. It was noted that teachers were much better at scaffolding errors until all students had achieved mastery. The study concluded that small group instruction is beneficial for struggling readers, but care should be taken to not forget average and high performing readers. Peer assisted groups have their place in the classroom as well. Teachers should use multiple delivery methods, so that the needs of all students can be met.

A second study supported the use of cooperative learning groups within the classroom. Randsell (2003) suggests that whole group direct instruction seems most frequently used at the K-12 level, while lectures are the most popular method of instruction at the post-secondary level. She questions why teachers are not using more cooperative and collaborative learning techniques in the classroom, suggesting that teachers have limited coursework/training in those techniques. Also, it is easier to teach using a method that is comfortable, and cooperative learning may not be comfortable for many. Ransdell (2003) defines cooperative learning as a way to challenge students in small groups, together with peers, to use information in new ways and to create new understanding. She completed a study in the spring of 2000 to answer several questions. Ransdell interviewed and observed six Midwestern United States science classroom teachers in action on three occasions attempting to learn how teachers both defined and implemented cooperative learning. She was also observing to see whether or not the implementation was congruent with the teachers' stated beliefs of cooperative learning. All of the interviews were pre scheduled at the teacher's convenience, with most interviews occurring immediately following observations. Teachers completed

demographic sheets. Two of the teachers taught in private Christian schools, and four were in public schools. Four of the six were female. Teaching experience varied including a first year teacher, and another that had several years experience. Ransdell did not promote any one specific cooperative learning strategy.

Teachers in the study understood the concept of cooperative learning. They all believed that cooperative learning involved small groups of students working together to complete a specific task. The teachers all hoped that by allowing the students to work cooperatively with one another, that they would learn how to live peacefully with those of varied backgrounds. All of the teachers claimed that there was no one set way for determining when cooperative learning should take place. They said it varied day by day based on content and student needs. The type of cooperative learning varied as well. All of the teachers felt cooperative learning benefited the students, and that they would continue to use cooperative learning strategies.

Attitudes and Motivation

The purpose of this section is to establish that attitudes and motivation play an important part of both differentiated and small group instruction. When students are given a choice in an assignment, they may be more motivated in successful assignment completion. Werner (2001) completed a study on changing attitudes in math. The goal of the project was to engage students in math in ways that reached students' multiple intelligences and encouraged students to make complex connections and try problem solving techniques. Data collection consisted of an outside researcher's administration of an attitude toward math survey in both the fall and spring of the 2000-2001 school year.

The survey asked students to respond to statements about math and math practices. All students at the school in grades 2-5 completed the survey in both the fall and the spring. Results indicated that there was a significant difference between the attitude toward math of the dance/math students and the non-dance/math students. It was noted that in the fall of 2000 that all students pretty much answered the survey the same way; however, by the spring of 2001, the dance/math students scored much higher on the survey. The results also indicated that the project had an enormous effect on the dance/math students attitudes toward math. Werner concludes that the literature surrounding student attitudes toward learning suggests a strong link between positive attitudes and student achievement scores.

Oginsky (2003) created a study that looked for connections between positive, non-controlling feedback and students' views of the classroom as a safe learning environment followed by evidence of an increase in intrinsic motivation. He also looked for evidence that supported an increase in intrinsic motivation if sixth grade students were allowed to choose their assignments. This relates to differentiated instruction in that there is a flexibility in the type of assignment completed. Data was gathered through interest inventories, journals, teacher comment tally sheets, and student portfolios. Teacher records were also used to determine percentage of assignments being completed. Results indicated that teacher positive feedback increased from 60% in week one to 81 % by week four. In relation to that, it was noted that positive student journal responses had increased as well. Student classroom environment surveys indicated a slight increase as well. Intrinsic motivation did appear to increase when students were given a choice in

assignments. In a survey, students indicated that they liked having a choice in types of assignments. The data showed that being given a choice increased student interest in and motivation to complete assignments. With regards to benchmarks and content standards, many students liked knowing the standards being focused on during instruction. Only one student indicated that he did not like knowing the standards and benchmarks.

METHODS

Introduction

Does incorporating small group math instruction into seventh grade math classrooms assist students in achieving proficiency (70% or higher) on chapter math tests? With that question in mind, the author of this paper looked at several areas of concern. First, she analyzed chapter test results prior to intervention. Then the author looked at Iowa Tests of Basic Skills (ITBS) results of low socio-economic status (SES) students in the area of Math Concepts and Estimation. She also examined student perspectives on math classes in general, small group instruction, and math strategies that work. The author's purpose in this study was to investigate various avenues that would possibly provide insight into the benefits of small group math instruction.

Setting

This study took place at Hoover Middle School in Waterloo, Iowa. Approximately 750 students attend grades six through eight in the building. The author of this paper currently teaches seventh grade math and pre algebra in the regular classroom setting and one period of reading per day. During the 2004-2005 school year her average math classroom size was 24 students. The classroom environment consists of

rows of desks that can easily be moved into small groups, plus a table that is used for small group instruction.

Participants

There were three sets of participants in this study. Participants from this study included approximately 550 Hoover Middle School seventh graders from the fall of 2002-2003, 2003-2004, and the fall of 2004. Also included in this study are low (scoring below the 40th percentile) SES ITBS participants from the fall 2002 and 2003. The low SES students were chosen because that particular sub group has struggled to show sufficient growth on ITBS. Thirty seventh graders from the fall of 2004 participated in the student survey. The participants included English Language Learners, Special Needs students, and regular education students.

Measures/Instruments

Chapter test math scores

The purpose of using chapter test math scores was to show student achievement on chapter tests without small group instruction. Chapter tests consisted of approximately twenty-five to thirty questions each. The problems included both computation and problem solving types of questions. Both pre and post chapter tests were administered to show student achievement gains (see figure 1).

Low SES ITBS scores

The ITBS scores of low SES students were analyzed to determine if any growth from the fall of 2002 to the fall of 2003 in the area of Math concepts and Estimation. The ITBS data was not collected from the fall of 2001 because the students came to Hoover

Figure 1. Sample Chapter Test

Solve.

1. 5.08 + 2.009 =
2. 10.05 - 2.3 =
3. Find the quotient of .0045 and .09.
4. Sam's dog Spot can sit still for 7.5 minutes after given a command. Mark's dog Pepper can sit 2.3 times longer than Sam's dog when given the same command. How long can Pepper sit still after being given the command?

Middle School from several different elementary schools. Another limitation was that ITBS data was collected only on low SES students and not other sub groups. Using ITBS scores of low SES students assisted the author in showing if any yearly growth had been made in that particular sub group.

Student Surveys

A student survey was conducted to assess seventh grade students' feelings towards math and math classes in general. It included questions regarding their likes and dislikes about math, their interpretations of differentiated instruction, their ideas of which math strategies help, and their beliefs on small group math instruction. The surveys were administered to all regular math class seventh graders, but only thirty of the surveys were analyzed for the purpose of this study. Using the student surveys assisted the teachers with lesson planning in both whole and small group settings by providing the teachers with student perspectives on learning styles and beliefs.

PROCEDURES

Data Collection

Chapter test math scores

Students were given both pre and post chapter tests prior to and after small group instruction was implemented. The individual pre and post test scores were documented on a teacher-created spreadsheet (see figure 2).

Figure 2. Chapter ____ Pre and Post Test Score Record Sheet

Student Names: **Period: ___**	**Pre**	**Post**
Class Average		_____

The individual scores were averaged together to get a whole group average. No sub group average scores were compiled. The main purpose for documenting both pre and post test scores on a spreadsheet was so that any growth could be more easily noted.

Low SES ITBS scores

The author first gathered the necessary ITBS item analysis documents that focused on low SES students. After skimming all of the math data, it was determined that Concepts and Estimation would be beneficial in data analysis because it was a weak area for low SES students. The next step in the procedure was to highlight overall test scores,

noting both strengths and weaknesses. Graphs summarizing the results were then created to assist in data analysis (see figures 1-6 in the Appendix).

Student Surveys

The student surveys were administered to six seventh grade regular math classrooms in the fall of 2004. Each class consisted of approximately twenty-five students. The students were not allowed to include their names on their surveys. Every fifth survey in each class was set aside for survey analysis. The survey consisted of nine questions; therefore, the author created nine separate survey result pages for analysis purposes. Each individual survey response was documented on the survey results pages, with tally marks placed behind those responses that matched other responses.

Teaching Method

The teaching intervention being assessed was small group math instruction. Prior to the intervention implementation, chapter post test scores averaged 57%, while after small group math instruction was implemented post test scores climbed to an average of 80%. The students were divided into three smaller groups, sometimes consisting of high, middle, and low groups. The students were placed in the groups based on pre test scores of chapter tests. A weekly small group schedule was created by the teachers to aid in planning (see figure 3). Every other day the students received whole group instruction, while opposite days were reserved for small group instruction. Each class period was forty-six minutes in length, and included a five to seven minute warm up activity at the beginning of the class. On whole group instruction days a concept was introduced, modeled, and practiced. On small group days the students were placed in groups

Figure 3. Small Group Math Daily Schedule

Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
Rotation 1 and 2	Whole group Day	Rotation 1 and 2	Whole group Day	Rotation 1 and 2
SG SW		BUM SG		SW BUM
BUM SG		SW BUM		SG SW
SW BUM		SG SW		BUM SG

Small Group=(SG) Basic Understanding of Math=(BUM) Seat Work=(SW)

of approximately eight students that were rotated three times. Each rotation lasted approximately ten to twelve minutes. An overhead timer was used so that both the students and teacher would know when it was time to move to a new group. The three groups included Small Group (SG), Basic Understanding of Math (BUM, and Seat Work (SW). While in SG, students received additional practice with the teacher. During BUM, students practiced basic math facts including fractions, decimals, percents, and problem solving. The students usually worked with a partner during this time. While in SW, students had the opportunity to work on their homework assignments. All three groups of students participated in all three rotations: SG, BUM, and SW.

Collaboration was an essential key in planning small group instruction. The author of this paper and a colleague planned lessons on a weekly basis, and spent part of each planning session reflecting on the outcomes of the lessons and analyzing student achievement data.

RESULTS

Introduction

After small group instruction was implemented in the math classroom, the author found that average test scores increased and the students scored above proficiency. Prior to small group math instruction implementation, SES students were showing ITBS growth. A future goal was that through small group instruction, low SES students would continue to improve ITBS scores. Students preferred to work in small groups so that they received more individual attention. Students also noted that when a teacher thoroughly modeled and explained a new concept, they had a greater chance of achieving comprehension.

Chapter test math scores

Small group math instruction did not begin until January of 2004. Looking at the Student Achievement Analysis Table (see table 1), chapter test scores in the Fall of 2002 averaged 61% while those in the Fall 2003 averaged 60%. Each year that students did not receive small group math instruction, students, on average, scored below proficiency.

During the Fall 2004 school year, before small group instruction was implemented, students scored an average of 65% on the Chapter 1 post test. After small group instruction was implemented during Chapter 2, students scored an average of 76%.

Low SES ITBS scores

Based on ITBS scores from the fall of 2002 to the fall of 2003, low SES students are beginning to show growth in the overall area of Measurement. Low SES students

Table 1. Student Achievement Analysis Table

Year	**Chapter 1 Test** Average Percentage Correct	**Chapter 2 Test** Average Percentage Correct	**Chapter 3 Test** Average Percentage Correct
Fall 2002	63%	60%	59%
Fall 2003	61%	59%	61%
Fall 2004	65%	76%	78%

went from an average percentage correct of 53 to 68 in identifying and using appropriate units of measurement. Minimal growth was shown in the areas of Geometry and Probability/Statistics. However, in describing geometric patterns, low SES students improved from an average percentage correct of 36 to 83 as seventh graders.

Student Surveys

For all of the student responses, please see Student Survey Responses (see figure 7 in the Appendix). Refer to figure four to see a list of survey highlights.

The first four questions of the survey were affective questions involving likes and dislikes about math, differentiated instruction, and past math classroom experiences. The first question the students were asked to answer was what they disliked most about math. Eight of the students said that they disliked fractions and division, while eight other students said that there was not anything they disliked about math. Other dislikes included decimals, subtraction, and basic facts. Two students said that what they disliked most was that math takes too long to understand. The second question dealt with

Figure 4. Student Survey Highlights

Survey Questions:	**Highlighted Student Responses:**
1. Dislike most about math?	1. 8 students said fractions/division
2. Like most about math?	2. Majority liked decimals/multiplication
3. Define differentiated instruction	3. Common response, "I don't know".
4. Past math classroom experiences	4. 20% of students- too much homework 20% of students- learned a lot
5. What does a teacher do that helps?	5. One-third students- teacher explaining problem
6. Need more individual attention?	6. 60% of students- need more attention
7. If you already understand something, prefer to learn something else?	7. 80% of students- prefer to learn Something else
8. Prefer small groups?	8. 93% of students- prefer small groups
9. Why/why not?	9. Common responses- help each other; pay attention more

what students liked most about math. The response that involved the most students was in the area of decimals and multiplication. Four students noted that their teachers were nice, while four students enjoyed the various math games that were played that enhanced student learning. When asked to define differentiated instruction, the majority of the students did not know what it meant. Their written response was a consistent, "I don't know." Of the thirty students surveyed, six students did respond that differentiated instruction involves different people receiving different instruction. The next question asked students to respond to past math classroom learning experiences. Responses ranged from "it was boring" to "I learned a lot." Twenty percent of the students said that they had received too much homework, and that their teachers were mean. Another

twenty percent said that they had learned a lot, and that they liked learning about fractions and working hard division problems.

The remaining four questions of the study concerned strategies that both teachers and students used. Twenty percent of the students said that modeling is the most successful method a teacher can use that helps them to understand a new math concept. One-third of them noted that explaining the problems makes the biggest difference in their success. When asked if more individual help would aid in success, sixty percent of the students surveyed said that it would. Ninety-three percent of the students said that they preferred to work in small groups with reasons including being able to help each other and having to pay attention more. Students were also asked that if they already understood a math concept, would they prefer to learn it again with the whole class or would they prefer to learn something else. The majority of the students preferred to learn something else while one-fifth of the students preferred to learn it again.

DISCUSSION

The purpose of this study was to determine if small group math instruction would assist students in achieving proficiency on chapter math tests. The author of this paper examined several areas that included chapter test scores, low SES ITBS results, and student surveys. Chapter test results indicated that small group math instruction does serve a purpose in the regular math classroom. Test scores improved in all classes. Even before small group math instruction was implemented, data analysis showed that low SES students are beginning to show some growth in the area of Math Concepts and Estimation. The majority of students do prefer to work in smaller groups, as indicated by

the student survey results. In fact, they said they enjoyed the small group atmosphere because they received more individual attention.

Before small group math instruction had been incorporated into the classroom, chapter post test results were not much different from chapter pre test results. The students were averaging 60% even after the students had been taught the concepts. The author of this paper and a colleague grappled with the test results for months trying to determine the possible causes of low chapter test scores. Possibilities ranged from the students not studying outside of class to what we, as teachers, were doing wrong. Through teacher collaboration, the idea of small group math instruction became a topic of interest. The teachers quickly recognized the results of their efforts. Homework was being completed by students who normally did not do homework. This occurred, we believe, because through small group instruction the students received more individual instruction, thus better preparing them for independent practice. Another possible reason for chapter test score improvement was due to the data analysis that the teachers were doing. Teachers analyzed chapter pretest and quiz data, and then grouped students accordingly. The data analysis aided the teachers in recognizing strengths and weaknesses of all the students.

According to the data, low SES students are beginning to show growth in the area of Math Concepts and Estimation. Seventh grade teachers have placed additional emphasis on the areas of Number Properties/Operations and Algebra which are sub groups of Math Concepts and Estimation, areas in which the students are weaker. A large amount of time is placed on Math Computation. Concepts and Estimation are

emphasized next, with Problem Solving receiving the smallest amount of time. It appears that students are entering the middle school lacking the basic skills necessary to solve both single and multiple step problems, thus teachers are spending significant time reviewing skills that have not yet been mastered. Waterloo Community Schools are currently in the process of creating and introducing math curriculum guides at the middle school level. The lack of a curriculum guide could play a part in low ITBS scores. It appears that teachers are teaching what they feel to be most important, and they are not all on the same page. In contacting middle school math teachers from other buildings that fact was confirmed. That lack of homogeneity could have a definite effect on ITBS growth.

Having the students complete a survey provided the author with some valuable insights. The most important insight was that students confirmed, through their surveys, that they do prefer to work in small groups of students. The most common reason given was that they can help each other. The author feels when the students are in smaller groups, they feel more comfortable with each other. Students are not as afraid to ask questions when in smaller groups. In the survey, students also said that fractions and division were their least favorite concepts to learn. The author believes that some of the students are not at a level in their development necessary to fully comprehend fractions, thus making understanding difficult.

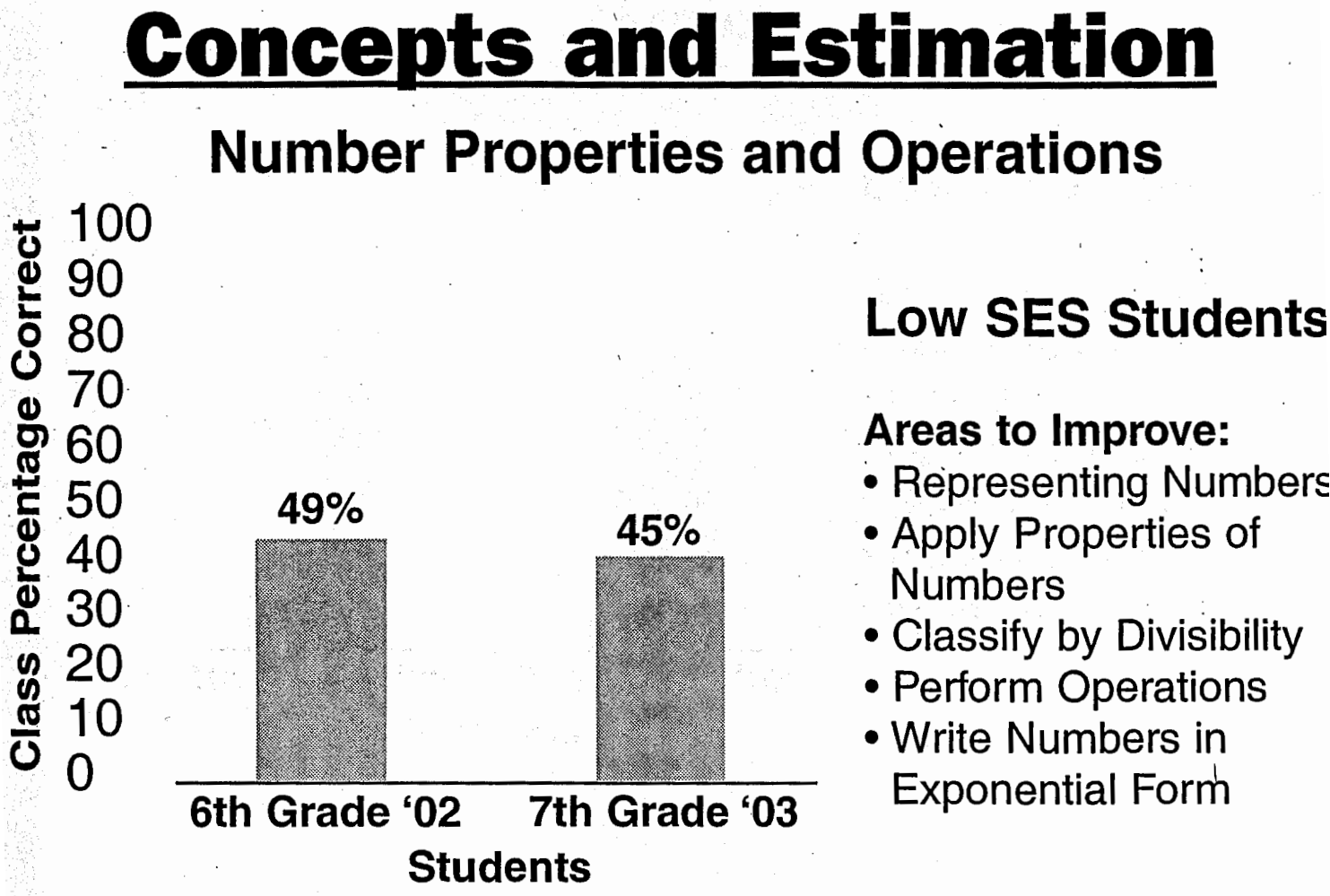
For the classroom, the chapter test scores indicate that small group math instruction should continue. Test scores have increased since implementing the small groups, and the students also prefer the individual attention. Small group math

instruction does require the classroom teacher to have a variety of activities planned for the students, so collaboration with another teacher in the building may be of some assistance. Many of the low SES students that are in the classrooms tend to struggle academically, so small group math instruction will work for those students as well. The technique allows the classroom teacher to give more individual attention to all students. Through the use of student surveys, the author learned that students actually prefer small group instruction. The Waterloo Community Schools encourage and support small group reading instruction in the middle school classrooms. Many students are coming to other academic classes already acclimated to the idea.

While completing this study, it was extremely difficult to find available research that addressed small group math instruction. More research and studies are definitely needed. The author believes that small group math instruction has its place in her classroom, and hopes that other colleagues will see its benefits as well. The author of this paper and her colleague that currently implement small group instruction in the math classrooms plan on continuing the effort. There is also a pair of seventh grade language arts teachers at Hoover Middle School that use small group instruction in their classrooms. As stated before, the Waterloo Community Schools are already using small group reading instruction through eighth grade. As teachers gain more experience in the area of small group reading instruction, they may begin to use it in their content areas as well.

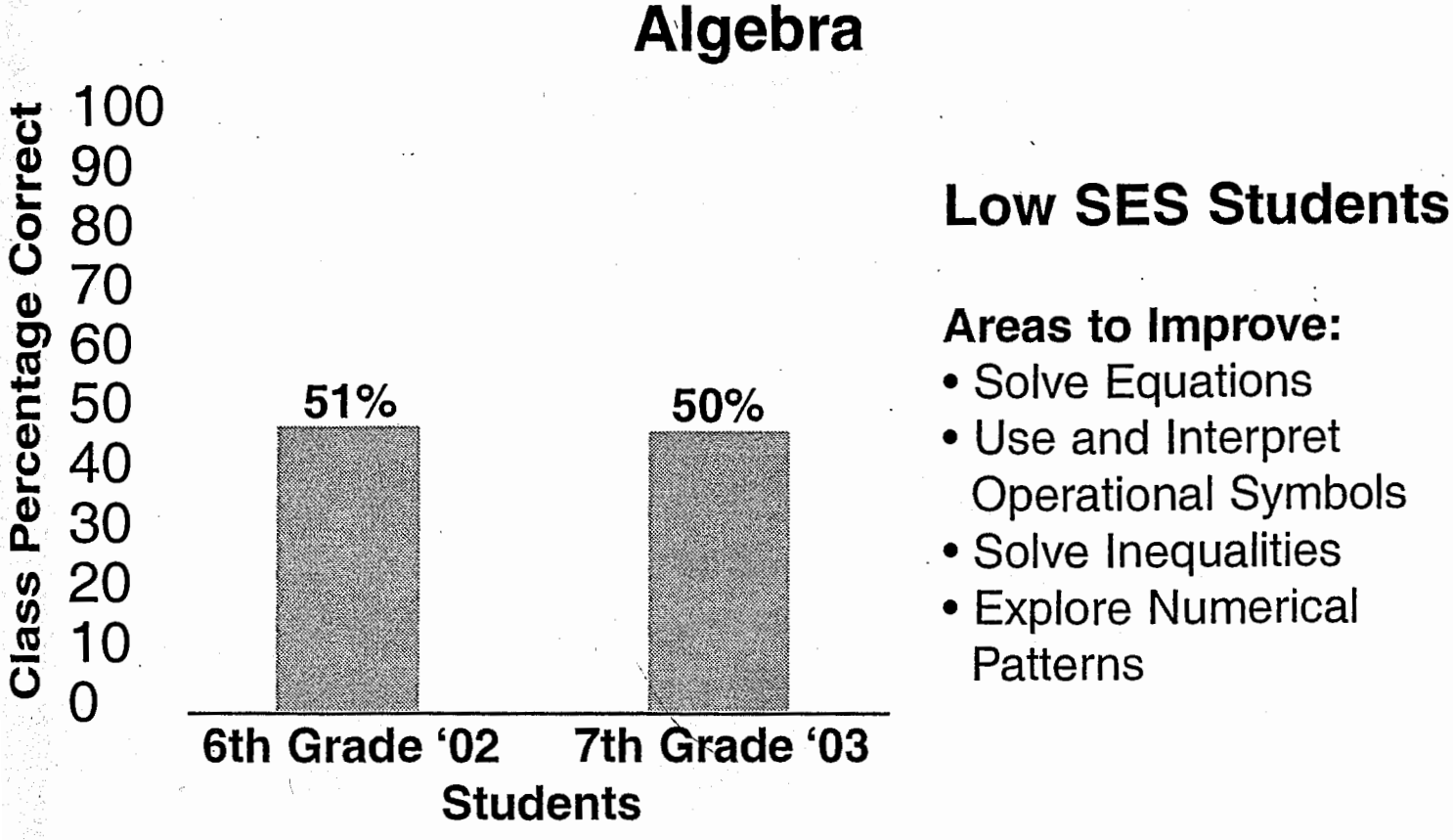
Appendix

Figure 1



Appendix

Figure 2



Low SES Students

Areas to Improve:

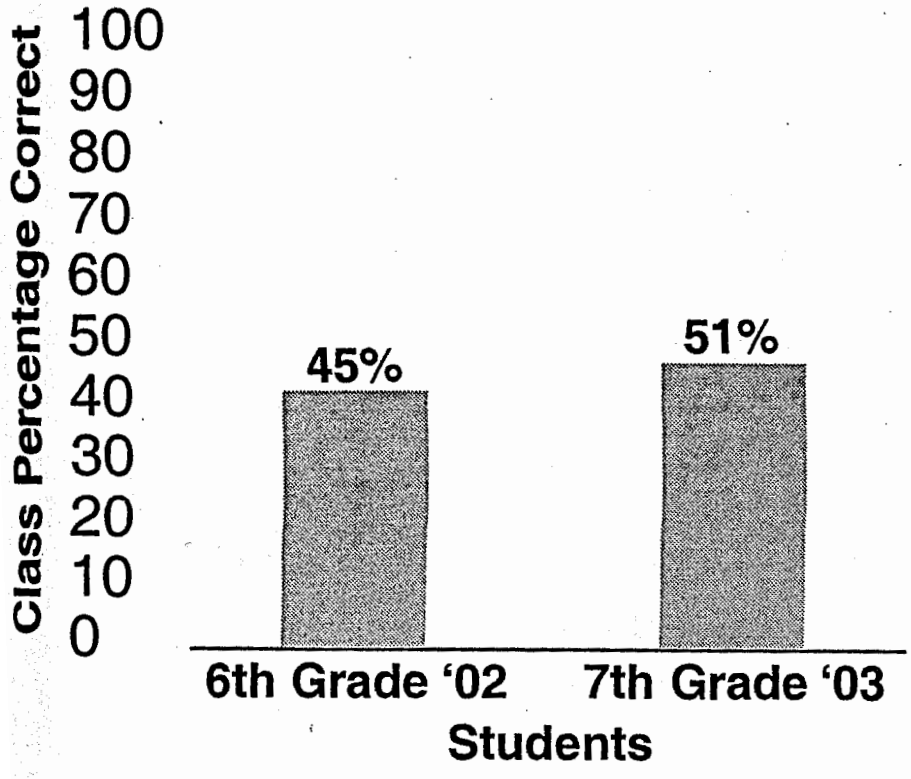
- Solve Equations
- Use and Interpret Operational Symbols
- Solve Inequalities
- Explore Numerical Patterns

Appendix

Figure 3

Concepts and Estimation

Geometry



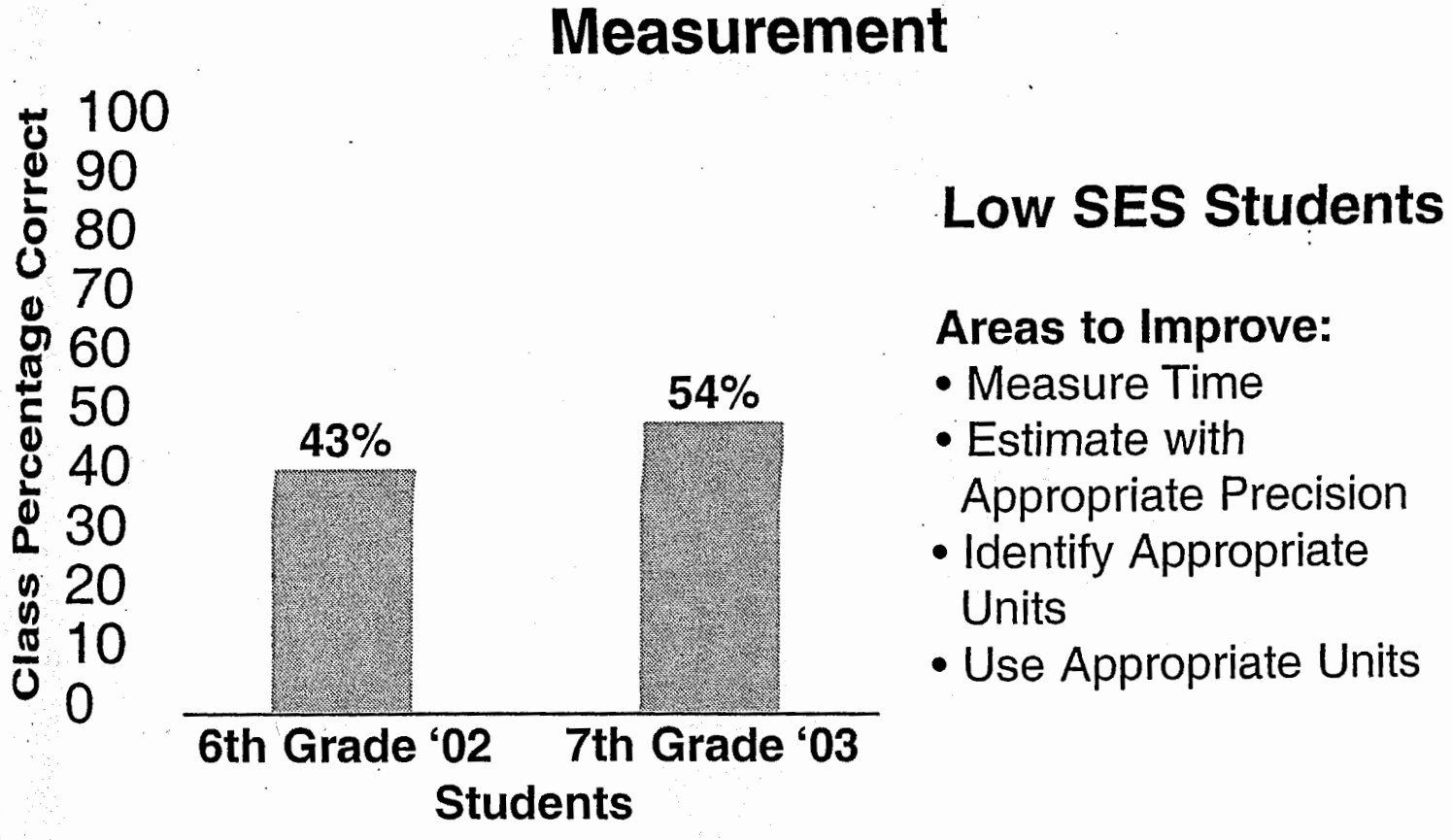
Low SES Students

Areas to Improve:

- Identify Geometric Figures
- Describe Geometric Relationships
- Apply Concept of Area

Appendix

Figure 4

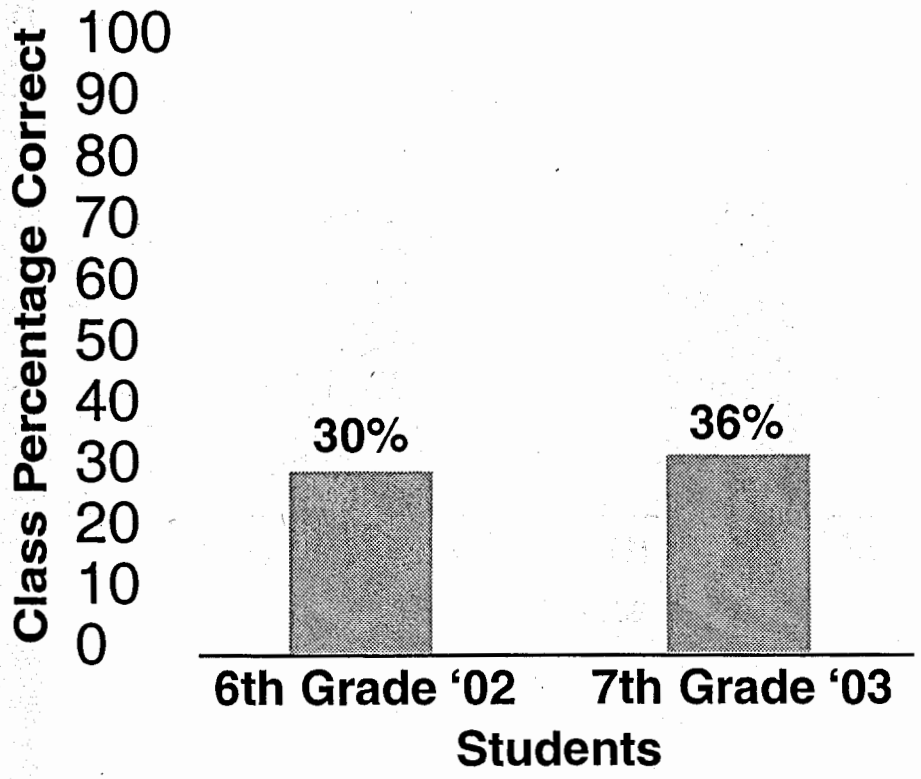


Appendix

Figure 5

Concepts and Estimation

Probability and Statistics



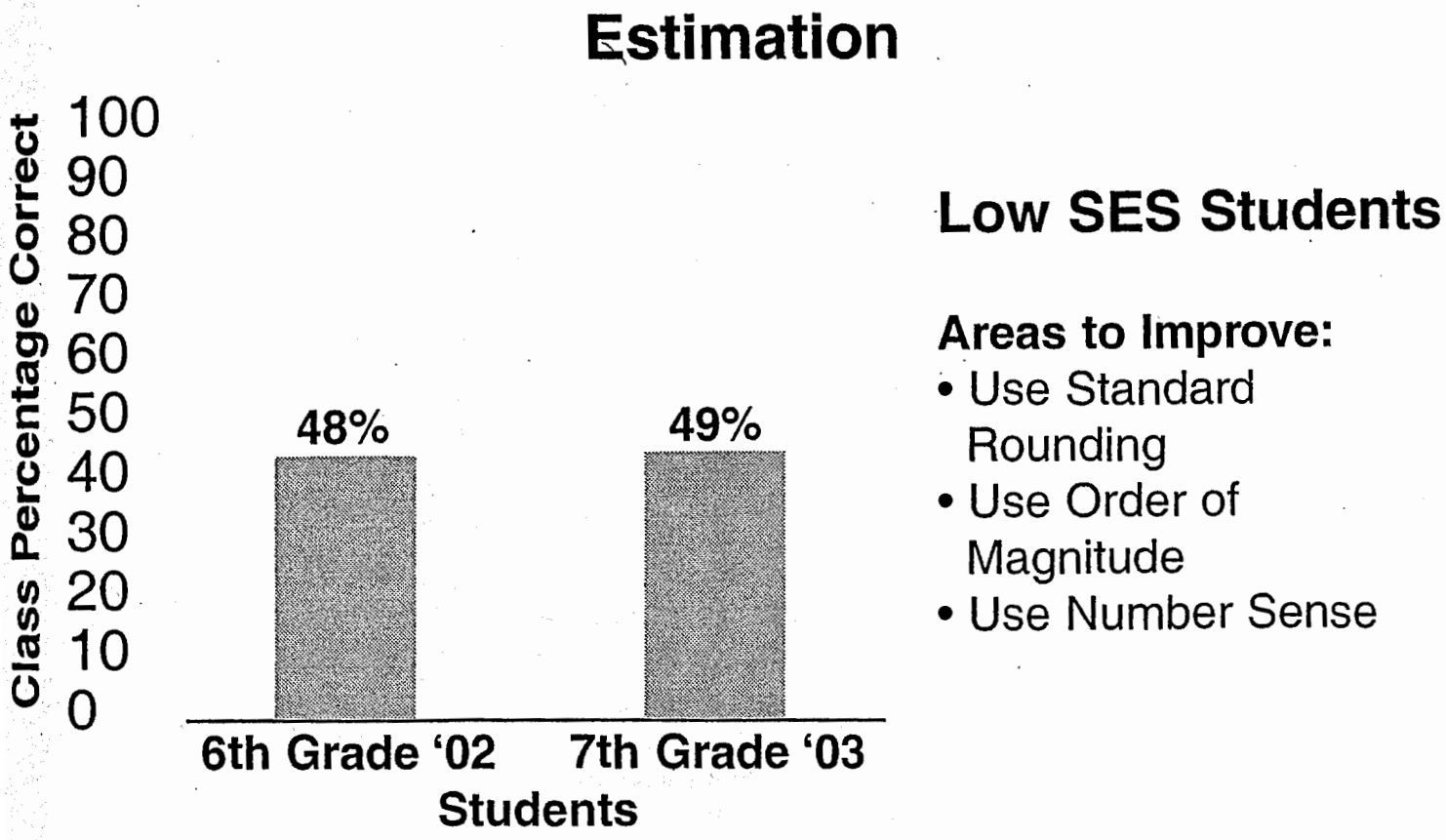
Low SES Students

Areas to Improve:

- Apply Counting Rules
- Understands Measures of Variability
- Apply Measures of Central Tendency

Appendix

Figure 6



Appendix

Figure 7

1. What do you dislike most about math?
    - Nothing (8students)
    - Fractions and division (8 students)
    - Decimals (4 students)
    - It takes too long to understand (2 students)
    - Subtraction (2 students)
    - Basic Facts (4 students)
    - Homework (2 students)
    - Warm-up activities (2 students)
2. What do you like most about math?
    - Mean, median, mode, and range (2 students)
    - Nice teachers (4 students)
    - Order of operations and games (4 students)
    - It is fun (2 student)
    - Addition (2 student)
    - Decimals and Multiplication (8 students)
    - Powers and exponents (2 students)
    - Learning and doing new stuff (2 students)
    - Problem solving (2 students)
    - Basic facts (4 students)
3. What do you think differentiated instruction means?
    - I don't know (20 students)
    - How instruction changes (2 students)
    - Different people getting different instruction (6 students)
    - Different (2 students)
4. Describe your past math classroom learning experiences?
    - Turning in homework everyday (3 students)
    - Too much homework; mean teacher (6 students)
    - I really improved my basic facts (2 students)
    - Boring teachers (2 students)
    - This is my first year of being in a math class (1 student)
    - No answer (2 students)
    - 30 desks in a circle (2 students)
    - I learned a lot. Like fractions and hard division problems. (6 students)
    - I don't have any (2 students)
    - I have always liked math (2 students)
    - I don't want to remember it (2 students)
5. What can a teacher do that helps **you** to understand a new math concept?
    - Offer extra help time during study hall (2 students)
    - Explain it (10 students)
    - Playing a math game (2 students)
    - Keep reinforcing it (4 students)
    - Help us (2 students)
    - Put it in a "nonboring" way (2 students)
    - Model the problem (6 students)29

Appendix

Figure 7

- I always understand the first time (2 students)

6. Would it help you in math class if you got more individual attention? Yes or no. (circle one)
   - 18 yes
   - 12 no
7. If you already understand a math concept, would you prefer to learn it again with the whole class or learn something else?
   - Learn it again (6 students)
   - I don't know (2 students)
   - Learn something else (22 students)
8. Would you prefer to work with small groups of students? Yes or no. (circle one)
   - No (2 students)
   - Yes (28 students)
9. Why or why not? (related to question number 8)

   <u>No</u>
   - Just because (1 student)
   - I don't like small groups because I get called on more (1 student)

   <u>Yes</u>
   - Partners can help each other (7 students)
   - Get assignments done in class (2 students)
   - Have good support (2 students)
   - Easier way to learn (4 students)
   - It's fun (2 students)
   - We get help at what we're bad at (2 students)
   - We can work with our friends (2 students)
   - We pay attention more (2 students)

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