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ABSTRACT

The differences in effects of heterogenous and homogenous regrouping for math on academic ability and self-concept in math were investigated. Five sixth-grade students from both grouping placements were interviewed to determine their self-concept of their math abilities. All students labeled as average or below from both placements were given an assessment of basic grade-level math skills. The classes containing these students were observed, and each placement had the same teacher providing all math instruction. The results indicated that the homogenous students liked their math classes better and were more likely to compare themselves above their classmates in ability than the heterogenous students. However, there were almost no differences between overall self-concept in math between the placements, and the scores on the assessment substantially favored the heterogenous placement. It was concluded that heterogenous regrouping in math did not have any substantial negative consequences. Nine appendixes provide: (1) interview format and questions; (2) interview transcripts; (3) the assessment measure; (4) categorization of interviewed students; (5) students' perceptions of their math ability; (6) math class placement levels; (7) overall test results; (8) test scores eliminating fraction questions; and (9) percentage of differences between the two groupings. (Author/MDM)

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Ability Grouping Effects on Lower Level Math Students' Self-Concept and Achievement

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Running Head: ABILITY GROUPING EFFECTS

Abstract

The differences in effects of heterogenous and homogenous regrouping for math on academic ability and self-concept in math were investigated. Five sixth-grade students from both grouping placements in an upper-elementary school were interviewed to determine their self-concept of their math abilities. All students labeled as average or below from both placements were given an assessment of basic grade-level math skills. The classes containing these students were observed, and each placement had the same teacher teaching all the math classes. The results indicated that the homogenous students liked their math class better and were more likely to compare themselves above their classmates in ability. However, there were almost no differences between overall self-concept in math between the placements, and the scores on the assessment substantially favored the heterogenous placement. It was concluded that heterogenous regrouping in math did not have any substantial negative consequences.

Ability Grouping Effects on Lower Level Math Students' Self-Concept and Achievement

Ability grouping, as defined by the Encyclopedia of Educational Research (1982), is the grouping of students into homogenous groups on the basis of either the teacher's judgement of achievement and ability or results from intelligence and achievement tests, and many times both test results and teacher judgment. As Slavin (1986) points out:

> Ability grouping is supposed to increase student achievement primarily by reducing the heterogeneity of the class or instruction group, making it more possible for the teacher to provide instruction that is neither too easy nor too hard for most students. Ability grouping is assumed to allow the teacher to increase the pace and level of instruction for high achievers and provide more individualized attention, repetition, and review for the low achievers (p. 9).

Slavin (1986) also states that "the principal arguments against ability groups have to do with the fact that this practice must create classes or groups of low

achievers" (p. 9). These students are considered deprived of the motivation and the example that is provided by high achievers and that low expectations may be communicated to these students by their placement which could be self-fulfilling.

In past years many educators have focused on these arguments against ability grouping and have decided that grouping students into a homogenous class on the basis of the students overall ability, usually called tracking, is harmful for lower ability-level students. Instead, they have shifted towards more heterogenous grouping, and only group students by ability in the certain subject areas that are thought to need homogenous grouping to be taught effectively, such as math and language arts. This is done so that the classes being taught these subjects will be truly homogenous, and also so that the lower ability-level students will have exposure to upper level students for other subjects that are more conducive to heterogenous groups. Some feel that this system of regrouping for certain subject areas is the best way to educate all students including those of lower abilities, however, others insist that this is only a stepping stone to total heterogenous grouping in all subjects.

In my experiences in elementary and middle schools, I have found classrooms moving towards and experimenting with heterogenous grouping. In fact, I found an upper elementary school that had a sixth grade team of five teachers and about 110 students that heterogeneously grouped all students for all subjects. The only exception was that one math class was designated as a high ability class by the teacher and was assigned the top math students identified by teacher recommendations and standardized test scores. The other math classes were heterogeneous and consisted of randomly assigned students. This was the only team of three at the sixth grade level in this school that grouped their students relatively heterogeneously, for the rest of the teams regrouped their students for math and reading. After having experience working with these heterogenous math classes, I decided to contrast the differences in the effects of this grouping to the effects of the regrouped classes on lower ability-level students.

The purpose of this study is to determine if there are any academic achievement or affective outcome differences between the two different grouping practices. My hypothesis, after having worked

extensively with the heterogeneously grouped classes, is that the achievement levels will be higher for them because they have been exposed to more material and have higher ability classmates. My hypothesis on affective outcomes is that the students grouped heterogeneously will feel better about their math ability because they will not feel that they are in the lowest level math class and among the less capable math students. To narrow my focus and to determine exactly what I wanted to examine, I began to look through the abundance of research that has been done on this topic.

Literature Review

Ability grouping has been in practice in the United States since about the turn of the century, and has been researched since 1916. Even now in 1993 there has been no consensus on its merits. The central message of all studies, as Kulik and Kulik (1982) point out, is that "nothing has been established with certainty" (p. 416) and that there is a "lack of clear evidence on the effectiveness of ability grouping" (p. 416). Noland and Taylor (1986) point out that "researchers who appear to favor grouping found that ability grouping increased achievement and other cognitive measures while researchers who appeared to

oppose ability grouping found heterogeneous grouping more beneficial to students" (p. 29).

Therefore, when looking at studies that focus on the effect of ability grouping on student achievement, the results found are quite varied. In the meta-analysis of secondary school students, Kulik and Kulik (1982) found that students seemed to benefit slightly in the area of achievement when placed in ability groups. Kulik and Kulik (1984) also found, in their meta-analysis of elementary school students, that performance was better in grouped classes in 20 of the 28 studies. Student achievement did not improve with ability grouping, however, when Noland and Taylor (1986) researched various studies. Leiter (1983) found that:

> the ability level of the class has a strong effect on mathematics learning. Students with high ability classmates tend to make substantially greater mathematic gains than do those with low ability classmates. The effect is so strong it mediates a major portion of the student's own previous achievement level on mathematic gains (p. 129).

Esposito (1973) found that homogenous ability grouping did not consistently have a positive effect on student achievement. It was found that "the slight gains favoring high ability students is more than offset by evidence of unfavorable effects on the learning of students of average and below average ability" (p. 171). The author also pointed out that the studies that did show an improved scholastic performance in either homogenous or heterogenous ability-grouping did not take into account the effects of other variables such as differing teaching methods and materials.

In looking at ability grouping, Slavin (1986) separates grouping into several categories. Two of the categories, which are pertinent to this study, are ability-grouped class assignment where students are grouped into one self-contained class on the basis of overall ability and regrouping for reading or mathematics where students are in heterogenous classrooms for most of the day and are regrouped "according to achievement level for one or more subjects" (Slavin, 1986, p. 5). In this comprehensive synthesis on studies looking at elementary school students, Slavin found that ability-grouped class assignments produce no effect on student achievement.

When looking at regrouping for math and reading, Slavin (1986) found that these studies, overall, were inconclusive. Two of the studies that he looked at are Provus (1960) and Koontz (1961). Provus (1960) found that, in regrouping for math, high achievers gained the most from the regrouping, middle achievers benefitted slightly, and low achievers profited no more than they would have in heterogenous groups. Koontz (1961), however, could not reject her hypothesis that:

> Children grouped homogeneously by subject matter achievement, and who were given instructional materials on their level would show no greater achievement as a result than pupils who were grouped heterogeneously and followed a regular course of study (p. 249).

Slavin states that these studies may suggest that regrouping for reading and/or mathematics "can be instructionally effective if the level and pace of instruction is adapted to the achievement level of the regrouped class" (Slavin, 1986, p. 74). He also implies that the regrouping must not exceed two subjects and must greatly reduce the heterogeneity of the students in the subject (Slavin, 1986). In their analysis of the same studies, Kulik and Kulik (1987)

contradicted Slavin and found that regrouping had a positive effect on achievement even when it was not limited to one or two subjects and when it did not significantly reduce student heterogeneity. Also, Becker (1987) states that, in middle schools, sixth graders who were homogeneously regrouped for math and reading classes have greater math achievement than sixth graders not regrouped for math, but only for reading, for all levels of students except those that are in the "low-middle" group.

From the research it seems that overall ability grouping or tracking is not a practice that provides positive results for low ability-level students in the area of academic achievement. Regrouping for math and language arts has been suggested as being beneficial for students, yet there is not enough research to back these claims. As it stands, it is unclear that regrouping is any better than heterogenous grouping especially for the lower ability-level students.

When looking at studies on the affective outcome of ability grouping on students, the same varied results are seen. Esposito (1973) found that homogenous ability grouping is "essentially unfavorable" (p. 171). The author states that:

> Whatever the practice does to build or inflate the self-esteem of children in the high-ability groups is counterbalanced by evidence of unfavorable effects of stigmatizing those placed in average and below average ability groups as inferior and incapable of learning (p. 171).

Noland and Taylor (1986) also found that the "overall affective outcome scores of the ability-grouped students were lower" (p. 27). Kulik and Kulik (1982) found that in half of the studies they looked at there was a small positive effect on self-concept, and the other half a small negative effect, creating an overall trivial effect. Lesyk, et al (1971) found, in surveying middle and junior high grades, that the students had positive attitudes overall towards homogenous grouping and that the highest and lowest groups tended to favor grouping the most. The authors also found that the students could accurately denote their group placement (Lesyk, et al, 1971).

In looking at affective outcomes of the various types of ability grouping, Kulik and Kulik (1982) found that students ability-grouped for a specific subject had a better attitude towards it, but that

overall attitude towards school did not change as a result of grouping. Noland and Taylor (1986) also found that students' attitudes towards subject matter were higher among ability-grouped students. They also found that "for students who spent a small percentage of the school day in ability groups, the scores, both cognitive and affective, of ability grouped students were lower" (Noland and Taylor, 1986, p. 28). Kulik (1985) states that placing a student into a group may have some impact on self-esteem, but that it's impact may be overshadowed by the effect of the student's comparison to others in the class. Indicating that low achievers will feel more successful and competent in a homogeneous class (Kulik, 1985). Kibby (1977) found that the lowest achievers from the highest class had "poorer self-concepts...and more negative attitudes" (p. 19) towards the subject and that the highest achievers from the lowest class had a "more positive self-image and positive attitude" (p. 19). The author concluded that the negative attitudes and poor self-concepts of the students in the highest class resulted from having a low status in their classroom and that the positive self-image and attitude of the students from the lowest class resulted from having a high

status in their classroom (Kibby, 1977). Reuman (1989), in his study of sixth graders grouped into either within-class groups or between-class groups for mathematics instruction, also found that, "students in low-ability groups received lower grades in mathematics than did students in low-ability classrooms" (p. 187), and that the reverse was true for high achievers. The author concluded that within-classroom ability groups, "increases the tendency of students in low-ability groups to nominate a comparison other who is better at math" (p. 187) and that this comparison lowers the achievement expectancies of low-ability students (Reuman, 1989).

This study is an attempt to determine if regrouping students into low-ability math classes has any effect on their social comparison and, more importantly, their self-concept of their math ability, and if this self-concept has any effect on their achievement in math. For as Shavelson and Bolus (1982) suggest, specific subject-matter self-concept is substantially correlated to academic achievement in the same subject matter. This finding is supported further by the research of Marsh (1986) and Byrne (1984). Therefore, the purpose of this study is two-fold. On

one hand it will examine the difference between regrouping low-ability students into a low-level math class and heterogeneously mixing the low-ability students with average ability students in their self-concept of math ability. It also will look at the relationship of this self-concept to the students' actual academic performance in math.

Method

Subjects

The subjects for this study were the sixth grade students in the heterogenous math classes on the team that only separated out a top math class and the students from another sixth grade math team that were regrouped for math into a low and average ability-level math class. The distribution of students to the two teams, as specified by the instructional coordinator for the school, was for scheduling purposes on the basis of the instrument the student played in orchestra or band. The teams were also divided up so that each had about the same approximate number of students from the six elementary schools that fed into the middle school. There was no consideration given to the placement of the students by their math ability, and all of the students had been regrouped for math in the

fifth grade. The heterogenous team had 25 students identified as low ability in math and the homogenous team had 36. Each team also had only one class designated as a high ability-level class. For each team the same teacher taught all of the math classes. I had these teachers pick five lower ability-level students for me to interview based on the following criteria: a student that tried hard and succeeded, a student who tried hard and failed, a student who tried some and did not try some, a student who did not care about math, and a student who was a behavior problem. This criteria was devised to ensure that the students interviewed represented the class and that the samples from the two teams were as closely matched as possible. Of the ten students selected, five were females and five were males, two were white and eight were black, and they ranged from twelve to thirteen years old. The heterogenous team contained three black males and two females, one black and one white. The other team contained two black males and three females, of which two were black and one was white. All of the students from the two teams labeled as average or low in math ability were given an assessment of basic skills if they were present on the day of the testing. Each of

the students interviewed were among those tested.

Design and Procedure

I began my research by observing the four math classes from each team involved in the study. I sat in the back of the room and informally observed the interactions and functioning of the classes. I used these observations to get familiar with the students I was to be interviewing and to see if there was any substantial differences between the teaching styles of the two teachers.

After the teachers selected the students to be interviewed, I met with them as a group and told them that they had been chosen by their teacher to be interviewed regarding their feelings about math. They were also told that they would be given an assessment along with the rest of their math class. If the students agreed to be interviewed, the student was handed a permission slip to be signed by his/her parent. They were told that they could not be interviewed until the slip was returned. Eight of the ten students brought back the signed form or a note from the parent. The two students who did not bring back the form were both from the category of "does not care". These students were interviewed, but the

interviews were used just for data and not recorded. The rest of the interviews were transcribed (See Appendix A & B) and analyzed. Answers to seven of the ten questions were placed in a table to show possible similarities or differences between the two teams. The interviews were member checked as they progressed in order to make sure that the information being recorded was accurate and exactly what the student meant to say.

The assessment of the students was done at the beginning of the class period for each of the classes on both teams. It was given by the teacher and replaced the daily review, a routine established by both teachers. The teachers were given the assessment (see Appendix C) the day they were supposed to administer it so that they could not review the information with the students. The problems were selected and revised from a practice minimum competency test, a test that had already been administered to the students that year, and from an assessment used by the office to determine the level of competency of incoming students. The assessment only covered material that sixth graders were to have mastered by this point in the sixth grade. The tests were graded on a ten point scale, and later on an eight point scale, throwing out

two questions. One point was awarded for each right answer, and half credit was given if the correct procedure was performed but a small computational error was made. Low and average ability students' assessments were separated and both totals were given for the heterogenous and homogenous groups. Since there were different totals for each group; heterogenous average having 49, heterogenous low having 22, homogenous average having 37, and homogenous low having 27; percentages were also given.

Results

Interview Results

From the interviews there are definitely differences between the two teams as far as attitude and perception of math ability. In looking at overall attitudes towards math (see Appendix D), more students on the homogenous team liked math and none of them disliked it. As one student said in response to how she felt about math, "It's fun, it's one of my funnest classes." Four of the students on this team explicitly expressed this same feeling. However, on the heterogenous team two of the five students said that they dislike math and the same two students said that it is their worst subject. As one of the students put

it, "I hate math...because it's boring." On the homogenous team, four of the students said that math was their best subject and none of them said that it was their worst. It seems that from this data more of the homogenous students have a positive outlook towards math and their math class.

In looking at the students perceptions of their abilities in math (see Appendix E), there is little difference between the two teams. Both teams had two students who felt like they were doing well, and the homogenous team had one more student than the heterogenous team, three to two, feel that they were doing okay in math. However, one of these students admitted that she did not do very well on the tests, which would classify the two teams identical in their students' perception of ability. The homogenous team's responses, overall, were more positive and self-assured in comparison to the responses of the heterogenous team. The differences are apparent in the responses such as, "I get all A's and B's," to responses like, "Well, I get B's." However, the real differences between the two teams is seen in how they view their ability in comparison to the other students in their class. All of the homogenous students saw themselves

as right with their classmates or right above them when ranking and comparing their ability level to that of their classmates. They also thought that the pace of instruction in the class was just right or too slow for them. One even suggested that the instruction be sped up because he wanted to:

> learn all my stuff so I can go on to seventh grade work while I'm in sixth grade and then go on to eight grade work when I'm in seventh grade and keep going until...like I'll be ready for my diploma when I am in the eleventh grade.

However, two of the heterogenous students that said they did okay in math saw themselves as below most in their class, when comparing their abilities to their classmates. Yet when ranking their ability, they put themselves back in the middle. The two students who saw themselves as doing well in math continued, for the most part, to see themselves as doing well when comparing and rating their ability to those of their classmates. All but one of the five students on this team felt that the class was moving at the right pace for them, and the one that did not, felt like it was moving too fast. When asked he said, "Yeah, but I got

to catch up," and he agreed that it should be slowed down a bit.

From this data it is apparent that the students from the heterogenous team that thought they were doing well, continued to think this way even when comparing their ability to those of their classmates. On the other hand, the students who thought they were doing okay did not necessarily think that they were doing as well as their classmates. One of the students stated it this way, "Sometimes they say answers, and I don't know it. And sometimes they'll call me up, and I don't know how to do it. And sometimes I know how to do it." The homogenous students, however, tended to see themselves as doing better than their classmates even when they thought they were only doing okay in their math class. This may suggest that the students self-perception of their math ability may be independent of their perception of their abilities in comparison to others. They may still be able to see themselves as proficient in a subject even when they see most of the others around them as more proficient than them in that subject. It is interesting to note that none of the students interviewed thought of themselves as the lowest in their classroom in regards to ability, as one

student put it, "I'm not the worsest person in my math class."

Another interesting finding of the interviews came when the students were asked to note any differences between their math class and the other math classes on the team. Only one of the homogeneously grouped students thought that there were in fact three levels of math classes, the rest thought that there were two levels or did not know about the levels of the other classes. Also all of the students from this team except one thought that they were in a middle ability-level math class. The one student that thought her class was low observed that the class was still doing fifth grade work at the beginning of the year and concluded that obviously it was not a high level class especially when other classes were doing seventh grade work. On the other hand, three of the heterogeneously grouped students thought that there were three levels of math classes, when in fact there are only two. The other two students correctly identified that there were two levels, and all but one of the students saw themselves in a middle ability-level class. The one that did feel that she was in the lowest class, thought this because she was in the lowest class in fifth grade

and figured that her placement would be the same this year also. The students generally judged the levels of placement by recognizing that certain classes were using a different book and that this book was harder than the one that they were using. They also went by remarks made by the teacher and other students and went on how they thought math was organized by observations made in the previous grades. As one student said, "I just thought there might be one [low level math class] because there's a higher math class."

The student's perception of their rank on the team followed pretty closely to their perception of how their classes ranked with the other classes on the team and how they ranked in comparison to the other students in their class. The only two students who thought that they would be ranked at the top of the team were among those who ranked themselves at the top of their class in ability. It was interesting also to note that the distribution of the student's rankings of ability in regards to the team was the same for both teams.

Assessment Results

When looking at the results of the assessment (See Appendix G), I noticed in a comparison of the two average ability groups that there was a definite bias

toward the heterogenous team. When I questioned the teacher on the homogenous team about the assessment, I found out that her classes had not covered fractions yet, even though they had been on the minimum competency exam given prior to this assessment. Since I had two fraction questions on the assessment, I went back and scored the test eliminating those two questions. When I did this the scores came out more even for both the average and low ability students on each team. To make sure that both teams had covered the same material, I questioned the teachers about what they had covered up to this point in the year. The teacher for the heterogenous group had gone by the book and had covered, in the following order, adding and subtracting whole numbers, multiplying and dividing whole numbers, adding and subtracting decimals, multiplying and dividing decimals, geometry, and adding and subtracting fractions. The teacher for the homogenous group said that she did not like to go by the book, yet she covered almost the same material. She proceeded from adding and subtracting whole numbers, adding and subtracting decimals, multiplying and dividing whole numbers, multiplying and dividing decimals, to geometry. Her average ability class was

just about to start fractions, and her lower ability class was still on geometry at the time I gave the assessment. Overall, the heterogeneously grouped students seem to have covered more material than the homogeneously grouped students.

Looking at the test scores of the average students from both teams (See Appendix H & I), a greater percentage of the students heterogeneously grouped scored higher than did the homogeneously grouped students. For example, the percentage of students grouped heterogeneously that had a score of six or above was 71, where on the homogeneously grouped team it was only 53, a difference of 18 percentage points. However moving down the scores, the percentage difference decreases, yet it always favors the heterogenous team. The same trend is found for the lower students. The difference in the percentage of students that scored at or above a certain score was greater for the heterogenous team for all scores except at the mark of four, which was the score for 26 percent of the homogenous team. The average percentage difference of those scoring at or above a certain mark was 7.5 percent in favor of the average heterogeneously grouped students, and it was 8.7 in favor of the lower

heterogeneously grouped students. From this, it can definitely be determined that the heterogenous team outscored their homogeneous counterparts at both levels and that the grouping arrangement did not seem to have any direct negative effects on the lower ability heterogeneously grouped students because they showed the same tendencies, even slightly more profound, as the heterogeneously grouped average ability students.

Discussion

From the responses in the interviews, it seems that the students did not base their self-concept of their ability in math on their placement in the math classes or on the ability levels of their classmates. It seemed evident that the students had, for the most part, already formed their self-concept of their math abilities prior to the sixth grade. However, their perceptions also seemed to be a reflection of how well they did in the class, which is indirectly related to the ability-levels in the class. From the interview results, it seemed that the students were not necessarily comparing their grades to the grades of others in the classroom to form their self-perceptions. They seem to have learned by this point that their grade is a reflection of how much they work and what

their teacher is like, not on who they are competing with in their class. From my observations of how report card grading is done, this seems accurate. For the grades reflected on the report cards generally reflect much more than a student's test and quiz scores, at least in the elementary and middle school grades.

Based on this conclusion, the scores for the lower ability-level students should not vary between the two teams. However as noted by the results, there was a general trend that both the average and lower ability-level students on the heterogenous team outscored their homogenous counterparts. This difference is interesting and definitely suggests that heterogenous grouping does not hurt either the average or low ability students. However, it is not so easy to say that homogenous grouping hurts both average and low ability students, and I am quite sure that this is not the case. From my observations of the two teams, I found that the homogeneously grouped lower ability classes had many social interactions among the students during the lesson and also had many students off-task. As seen in the interview results, four of the students from this team said explicitly that their class was

fun, where none of the students from the heterogenous class said that their math class was fun. Also, through the course of the interviews, two of the students said that their class had a hard time settling down and starting their work. As one student stated, "in our math class, it's sort of hard for everybody to get ready to do math because everybody will joke around and stuff like that, talk to each other." This student did not seem to mind the disturbance, but the other student did say that, "it just really gets on my nerves...I'm just not concentrating when they're all doing that, and they are calling everybody's name in the classroom, and the teacher has to say..." In observing the average ability-level classes on this team, I noted more time on task and more limited interactions among the students, yet there were still more than I observed on the heterogenous team. For in all of the four classes that I observed on this team, there were almost no interactions among the students and most students seemed to be on-task. The room was very quiet and teacher directed, whereas the homogenous team's classrooms seemed to have more open student involvement. This more time on-task by the heterogenous team may be the reason for the increased

assessment scores and also may be the reason that this team has covered more material throughout the year.

In regards to the teaching methods of the teacher on the homogenous team, she explicitly told me that she tries very hard to ensure that her students do not think that they are in a low math class. She has a system set up in her classroom where students who get the right answer on a practice question will go around and check other student's work and help them if they do not understand it. This seems to help boost the students self-confidence and self-perception of their abilities in her low classes. For every student that I interviewed talked about this system of help that goes on in their classroom. This teacher, as mentioned before makes math fun for her students through the system of classroom management that she has set up. This makes math enjoyable for her students and could potentially increase their likelihood for taking more math later on in their schooling.

Therefore, there seems to be a trade off between having a fun and interactive class, having less material covered and lower test scores, or having a class more structured and more on task, yet not as fun, having better test scores. I feel that there is a

happy medium between the two that could allow for the full coverage and comprehension of material yet in a more student-centered and relaxed atmosphere. However, as far as heterogenous grouping verses homogenous grouping, more research needs to be done. Yet, I do believe that, by integrating the lower ability-level students among the average ability-level students, one can increase the learning potential of the lower students without lowering the potentials for the average students. The proof of this lies in the results from this study. I also believe that any potential negative outcomes of heterogenous grouping on the lower students can be nullified by consideration on the part of the teacher to provide extra support and reinforcement to those lower ability-level students. Future research needs to be done where teacher effects are nullified and many more students are studied. Research should also be done on the types and availability of extra support for these lower students that are heterogeneously grouped with students higher in ability.

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Appendix A

Interview Format and Questions

All interviews were conducted in a conference room in the library of the school. I had previously explained when handing out the permission slips that the interview was going to be audiotaped and was concerning how they felt about math and their math class. Each student was reminded at the beginning of the interview that they should be free to speak their minds because the interview would be confidential and the tape was only going to be heard by me.

All of the students that I interviewed seemed to be at ease and were open in there responses to the questions. The following questions were asked in the same order of each student. Question number ten was only asked to students who, in responding to question number seven, stated a different number of math levels than existed on the team.

1. How do you feel about math? How well do you do in math? What are your abilities in math?

2. How do you think you do in comparison to the other students in your math class?

3. Can you help others in your math class and is there someone who can help you, or do you rely on the teacher to help you?

4. If you were to rank all the students in your math class, where would you put yourself?

5. What are your best and worst subjects in school?

6. Do you think that the instruction in your math class is going at the right pace for you?

7. Are there any differences between your math class and the other math classes on the team?

8. Do you ever try to get the highest grade in the class or does that matter to you?

9. If you were to rank all the students on the team in math ability, where would you put yourself?

10. Later added to #7 -- If there are differences, how and when did you find out about them.

Appendix B

Transcripts of Interviews

C = interviewer
# = interviewee

HOMOGENOUS - TRIES HARD AND SUCCEEDS

C: The first question is how do you feel about math?
2: I like math. Its ok.
C: Why do you like it?
2: Because it's fun and you learn more stuff that you didn't know, and it helps you when you grow up.
C: How does it help you when you grow up?
2: You can be an engineer and a scientist and stuff like that.
C: What do you want to be when you grow up?
2: A scientist.
C: You do?
2: [Agrees]
C: Great. How well do you do in math?
2: I get A's and B's. This is the first time I have ever gotten a B in math?
C: Really? So you have gotten straight A's all the rest of the time?
2: [Agrees]
C: That's great. What are your abilities in math?
2: I'm ok.
C: What are your strong points?
2: Decimals and multiplying and dividing.
C: Great. How do you think you do in comparison to the other students in your math class?
2: I'd say I do ok.
C: You do ok? If you were to put yourself in a list where would you put yourself?
2: A nine. If it were one to ten, I would put a nine.
C: A nine meaning what? One being the lowest or ten being the lowest?
2: Ten being the highest.
C: So you'd be a nine? Where would everybody else in your class be?
2: I'd say about an eight or a seven.
C: Ok, so you think you are pretty high up in your class.
2: [Agrees]

C: Great. Can you help others in your class, or is there someone who can help you, or do you just rely on your teacher to help.
2: I help others and my teacher helps me.
C: None of the students ever help you?
2: No
C: Do you never need help, or do you never ask for it?
2: I never ask for it usually.
C: Really, so you just get your teacher to help you.
2: Uh huh. She explains it and then I'll try to do it and if I get it right, I'll know how to do it.
C: Great, how often do you help other people?
2: Every time I get my work done, and the person whoever it is says they need help. And then she will ask me, do I want to help that person since I am done.
C: Do you usually do that?
2: Uh huh.
C: What are your best and worst subjects in school?
2: My best subject? Math.
C: Math. Ok, what is your worst subject?
2: Social studies.
C: Why social studies?
2: I think I did ok this time.
C: But what do you usually do in it?
2: I usually get about an F, a D, or a C.
C: Oh, so you don't like it because of that?
2: [Agrees]
C: Ok. Do you think that the instruction in your math class is going at the right pace for you?
2: No, I think it should be speed up a little bit.
C: Why do you think that?
2: Because I want to learn all my stuff so I can go on to seventh grade work while I'm in sixth grade and then go on to eight grade work when I'm in seventh grade and keep on going until...like I'll be ready for my diploma when I am in eleventh grade.
C: Wow. So you think you should be speeding through this stuff so you can finish all your math early.
2: Uh huh.
C: Great. Are you there any differences between your math class and the other math classes on the team?
2: I don't know. I know I'm on grade level but I don't know, there could be kids higher than me or lower than me.
C: Ok. Did you ever try to get the highest grade in your class or does that matter to you?
2: Yeah, I always try to get the highest grade.
C: If you were to rank all the students in your team

where would you put yourself?
2: On a scale of one to ten, I would say a seven.
C: You would say a seven? Where would everybody else be?
2: About seven.
C: So you would be about where everybody else is? Would there be some people higher than you?
2: Probably.
C: Would there be anybody lower than you?
2: Probably.
C: So you'd say you were right in the middle.
2: Uh huh.

HOMOGENOUS - TRIES HARD AND DOES NOT SUCCEED

C: Ok, my first question is how do you feel about math?
1: Its fun, its one of my funnest classes.
C: Oh really, ok. How well do you think you're doing?
1: I think I am doing ok except for my tests, I mean, for a couple of tests, I think two tests, I got an F on.
C: Really.
1: Yes, I got to bring them up.
C: Why did you get an F, did you just not understand it or...
1: Yeah, sometimes I am slow, in some things, and I am like my brother. He is slow in a lot of things and that is why he does not go to public schools. And, it just takes me a long time to learn it.
C: Yeah, but you like it a lot.
1: Uh huh.
C: That's good. What are you abilities in math, I mean, what are your strong points.
1: I don't know.
C: No strong, no weak points, No...
1: I like adding and subtracting and division, but times, I am not good at that.
C: Ok, how do you think you do in comparison to the other students in your class?
1: I don't know. There is one student, he's good, he's got straight A's in the class. I think he is the best one in there. I might come maybe third or fourth in there.
C: Third or fourth from the top?
1: Uh huh.
C: That's good, that's great. Can you help others in your math class, or do other people help you, or...
1: We all help each other.
C: Oh really.
1: When she lets us.
C: That's good, so your don't just rely on your teacher to help you.
1: No.
C: That's neat. That's a good attitude. Do you like that?
1: Yeah, cause sometimes when I need help, sometimes I go to the teacher. Sometimes she will say, well, like, you know, if you are finished or something, "____ can you go help somebody, go help ____", or if that person is done, like if he needs help and they will raise their hand, and she will say "put ya'll's paper

together and see who's wrong", it helps out. Its really good for me.
C: That's good, if you were to rank all of the students in your math class where would you put yourself?
1: I am not sure, I know I wouldn't come first. I know about that. I'd say more like fourth.
C: Ok. What are your best and worst subjects in school?
1: My worst subject is social studies. I hate it with a passion. I know that's not allowed.
C: Why do you hate social studies so much?
1: She gives us tests half of the time, and you got to turn in your notebook all of the time. And it is just really hard, and I have never liked it neither did my mom or my dad.
C: So if you had to pick your best one, what would it be.
1: I would pick math.
C: Why do you like math so much?
1: Cause it is fun. I like [teacher], she is nice, I like her a lot. And just cause, I think math would be my main subject. Science, that's's ok. I like science too, but it wouldn't come first. It might be math, then science, then language arts. Social studies would come last on my list.
C: Ok, do you think that the instruction that's going on in your math class is at the right pace for you.
1: Yeah, sometimes we go a little fast because we need to catch up because we are behind, but yeah.
C: It's just fine?
1: Yes.
C: Ok. Are there any differences between your math class and the other math classes on the team?
1: Yes. My math class is for, not for slow people, but for people, you know, I can't explain it. But we're not more... Some of the classes are doing seventh grade work while we're still doing sixth or fifth grade work. So that's why there are certain classes, eight and seventh period I think it is. I am not sure which, it might just be eight, but they're doing seventh grade work.
C: And, so all of the rest of the classes are the same, or just eight is out.
1: Yeah, it might be seventh and eight, I am not sure about that, but I know it's the last classes that are advanced.
C: So then all of the other classes are doing the same.
1: Yeah.

C: Ok. Do you ever try to get the highest grade in your class, or does it matter to you?
1: No, sometimes when I get an A, sometimes I brag, not very much. But I just say, "I got an A, what did you get?" But I don't try to out-beat anybody else, cause I know I can't, but if I put my mind to it I probably could.
C: So you probably could, but... Why do you think you can't then?
1: Cause just sometimes I am distracted by some of the people in our class are really...They get on my nerves. They always talk, they always try to [whisper]. You know, it just really gets on my nerves. So... I'm just not concentrating. When they're all doing that, and they are calling everybody's name in the classroom, and the teacher has to say, "Can you please stop that." You know, and they're like, "What, we didn't do nothing", I mean the boys. We've got one girl that swacks them, she's alright.
C: So you like the people in your class?
1: Yeah, except for some of the boys. If we did not have some of them it would be fine.
C: How do you feel about the class itself, the makeup of it?
1: Yeah, I like it.
C: That's good. If you had to rank all of the students in your team, where would you put yourself? Like all the students in math ability.
1: Last.
C: Last? Why?
1: Because the eight and seventh period, all of them would come first, because they are doing seventh grade work. We're still on fifth and sixth grade work, so...and that's probably about fifty kids right there, so...
C: So fifty out of one hundred, and you would say your...
1: Not last, last, but close to last. It'd be a hard task because, I mean, you know, sometimes I get mad because I'm still doing fifth and sixth grade work. But sometimes I feel like, you know, that's ok, because you're in sixth grade. But doing fifth grade work, uh, you know, then it's just like well I got to hurry up and get this thing in. And then some people that are in seventh or eight period, they brag, like, "Well we are on seventh grade work and you're not."
C: How do you feel about that?
1: Mad.

C: Oh.
1: Yep. There was one girl who used to brag all the time, every time she got an A. And then I reckon she come to me at the wrong time and said, "Well I got an A, and you didn't." I got so mad I just went off.
C: So do aiel do fifth and sixth grade work, or do you just do sixth grade?
1: First we started out with fifth, and then now we are on sixth grade work.
C: How did you feel about doing fifth grade?
1: I hated it. I felt like I was back in fifth grade again.
C: Did you know, I mean, had you had that in fifth grade?
1: Uh huh. We did not have all the work, some of the work was different and harder.
C: So were you in the sixth grade book or were you...
1: Yeah, we are in the sixth grade book now.
C: But you weren't before in the other...
1: No, actually we were doing worksheets.
C: Ok.
1: You know, adding and subtracting. It is sort of sixth grade work too, but you don't do much of that in sixth grade.
C: Uh huh, I see.
1: But times and division, you do that in seventh.
C: Alright, anything else you want to tell me about math?
1: [Math teacher] always compliments the students when we do our jobs good. She told me that I was one of her more concentrated students, I was a hard worker. Which, not trying to brag, but I sort of think I do. My mom always tells me that because at the beginning of the year, I didn't want to settle down and do my homework so I sort of got, I didn't get bad grades which was hard to believe. But later on in the school year I realized that if I didn't calm myself down and do the homework, I was going to be in some trouble. Because every summer we go either to Florida or we go to California to visit my aunt. This year we are going to Florida. Usually I get to take two friends to Kings Dominion when we go, and that's what sort of changed my mind. Because I really like Kings Dominion, and the people that I want to take with me really like it, and I didn't want to disappoint them. So ever since my Dad told me that we were going to be doing that, I settled down and brung my homework in. Sometimes I may forget it, but I bring it in the next day so I won't get in

trouble.
C: So your parents are really pushing you, or I guess you are pushing yourself to do well.
1: And when I get a bad grade or something, my mom doesn't like, "Why did you get that." She just says, "So, what happened?", and she tries to talk it out with me. She won't go like, "You're grounded!" A lot of parents do that to kids and it makes them really mad and it doesn't help them a lot. Which I think my mom learned with my brother...[goes on to tell about brother's failure in school]

[Additional]

C: When we were talking before, you said that you noticed that there were differences between your math class and the other math classes on the team.
1: Uh huh.
C: I was wondering, when did you find out that there were differences? I mean, how did you know that?
1: Well first of all, first in the beginning of the year I didn't know, and then towards sort of the middle, the teacher started saying...Well you know, there is this other math book in there, so a student took it out and he said what is this and they go, oh that's for my eight period classes, and then he goes, but how come they are not in the book we are, and they go, 'cause they are at a higher level or whatever.
C: So the students said that, or did you teacher say that?
1: Teachers.
C: Teachers said that. So you knew that...
1: Yeah. Some of the students say they are.
C: So some of the students always say that they're in a higher class. Did you believe when they said that?
1: No not at first, but when the teacher said it then I did.
C: Uh huh.
1: Yeah, it ain't that big of a deal, not everybody is supposed to be smart.
C: So you just know that that class is higher, but all of the rest of the classes are pretty much the same.
1: Uh huh.
C: So there is no difference except for just one class has a different book.
1: Right.
C: Ok, sounds good.

HOMOGENOUS - TRIES SOME AND DOESN'T TRY SOME

C: How do you feel about math?
4: It's ok, but it can be hard sometimes. I like math.
C: That's good. How well to you do in math?
4: Ok. Sometimes I do terrible, sometimes I do good.
C: Do you know when you do terrible?
4: When we have tests and I don't really understand it, I get bad grades on it.
C: When do you do well?
4: Sometimes I don't pay attention and then I don't understand it. That's when I do bad.
C: Ok, when you understand it you do well and when you don't...
4: Uh huh.
C: Ok, what are your abilities in math or your strong points?
4: I don't know.
C: You don't know? There is nothing that you do really well always.
4: Well, multiplication and division, yeah.
C: Ok. How do you think you do in comparison to the other students in your class.
4: Probably about the same, good.
C: So you do well and everybody does the same as you do.
4: Yeah.
C: Ok. Can you help others in your math class or is there somebody who can help you, or do you just...
4: Yeah, I help some people who don't understand it after I finish my work. I ask the teacher if I can help them.
C: Ok. Does anybody ever help you?
4: Uh huh.
C: Do you ever rely on your teacher to help you?
4: Yeah.
C: So there is a lot of help going on?
4: Yeah.
C: If you were to rank all the students in your math class, where would you put yourself?
4: What do you mean, rate myself?
C: Put it in, like this is the best and this is the worst, where would you put yourself if you lined up everybody in your class.
4: I would put myself in between both.
C: In between, so in the middle somewhere.
4: Yeah.

C: Ok. What are your best and worst subjects in school.
4: Science and..., that's all. I don't have two, I just have one.
C: Science is what?
4: My worst class.
C: And you don't have a best class?
4: Yeah, I have a best class, social studies.
C: Why is social studies your best class?
4: Cause it's exciting to learn about the histories and stuff like that.
C: Huh, that's neat. Why is science your worst?
4: It's sorta boring. It's not all that exciting. Cause you just have to sit in science class and listen, but I like when we do our experiments and stuff.
C: Ok, so you like history because it is exciting and fun...
4: Yeah.
C: And science, you don't like because it's just sitting there.
4: Yeah, it's just sitting around.
C: Ok, where would math fit in that range?
4: Probably in between both of them.
C: So it would be something you...
4: Sort of like.
C: Ok. Do you think that the instruction in your math class is going at the right pace for you?
4: Uh huh.
C: It's never too fast or too slow, it's just right.
4: Yeah.
C: Ok. Are there any differences between your math class and the other math classes on the team?
4: Yeah. Eight period is higher than the rest of the math classes because they are learning seventh grade math. Second period is, I think, higher than ours, so yeah.
C: Ok, so there is eight period that's doing seventh grade and then there is second period that is higher too, and then all of the rest are the same?
4: Uh huh.
C: So there are two higher and then everybody else is kind of in the middle?
4: Uh huh.
C: Ok. There is probably not a bottom one or anything?
4: No.
C: Ok. Did you ever try to get the highest grade in your math class or does that matter to you?
4: No, but I do try to make my grades stay up.

[Interruption]
C: So you try to get good grades, right?
4: Yeah, but this time I got a D because I was absent a lot of days because I had broken my toe.
C: Oh my. Did the D bother you?
4: Yeah, but I'm gonna try to get a higher grade to bring it up.
C: That's good. So you never try to get the highest, but it does matter to get a good grade.
4: Uh huh.
C: If you were to rank all the students in your team in math ability, where would you put yourself.
4: I don't know. Probably stay in the middle.
C: In the middle?
4: Yeah.
C: So there's people above and people below, and your just right in the middle.
4: Yeah.
C: Ok. Is there anything else you want to tell me about math?
4: Yeah, in our math class it's sort of hard for everybody to get ready to do math because everybody will joke around and stuff like that, talk about each other. I think my math class is fun though.
C: So its fun, but it takes them a while to kind of settle down for math?
4: Yeah.
C: Do you like that kind of thing, or does it bother you that it takes a while for them to settle down?
4: Nope.
C: So you just like hanging out for a while and getting eventually around to math?
4: Yeah.
C: Do you think that other classes are like that?
4: Yeah some of them are. Like probably eight period because when they finish their work it's loud in that class with everybody talking because you can hear them through the walls.
C: You can, so you think that after they finish their work then they start...
4: Yeah.
C: And aiel do it before you start?
4: Uh huh.
C: Interesting. So math class is kind of fun?
4: Yeah.
C: Ok.

[Additional]

C: When I was interviewing you, you said that there were differences between your math class and other math classes on the team. I was wondering how you found out that there were differences, what made you think that?
4: Because the kids had a different book from our book. Their math is higher than ours.
C: Ok, so you knew because you saw that they had a different book.
3: Uh huh.
C: Ok, is that the only thing that told you?
3: Yeah.
C: So when did you notice that they had a different book?
3: When they switch my classes you can see, and when I seen their work.
C: When did you see their work, like on the board, or...?
3: Yeah, on the board and inside the book.
C: Oh, inside the book. You noticed that they weren't doing the same thing you were.
3: Uh huh.
C: Ok, so you noticed that they were at a different level.
3: Uh huh.
C: So that's the first time you noticed it, this year.
3: [Agrees]
C: Did you ever notice it before this year?
3: Uh-uh.
C: So this year there is a difference.
3: [Agrees]

HOMOGENOUS - BEHAVIOR PROBLEM

C: How do you feel about math?
3: I like it.
C: You do. Why do you like it?
3: Cause it's easy.
C: Ok, how well do you do in it?
3: I get all A's and B's.
C: That's great. So you like it because you do really well...
3: Uh huh.
C: What are your abilities or strong points in math.
3: All of it.
C: All of it. So you don't have any like...so you're not real strong in something and not strong in other things.
3: Uh-uh.
C: So you're just really strong in all of it. Ok. How do you think you do in comparison to other students in your math class?
3: It's me and a couple of other girls, we all get A's and B's.
C: Ok, so you do as well as a lot of other people.
3: Uh huh.
C: And where is the rest of the class?
3: Some of them don't care about it.
C: Really. So you'd say you do as well or better than most people in your class.
3: See, [math teacher] said that she would move me up if my attitude would change.
C: What does she mean by that?
3: Cause I got a bad attitude.
C: Why do you have one?
3: I don't know.
C: You don't know, you just know you have one. Do you think you have one?
3: Uh huh.
C: You do.
3: My mom even says I do.
C: Oh, you don't know why though.
3: Uh-uh.
C: Can you help others in your math class or do other people help you, or do you only rely on [math teacher].
3: [Math teacher], she lets me help others when I get finished with my work.
C: Ok, does anybody ever help you?
3: Uh-uh.

C: Ok. Does your teacher ever help you?
3: When I don't understand it she'll tell me and then I catch on to it.
C: Ok, and then you help other people.
3: Uh huh.
C: Ok. If you were to rank all of the students in your math class, where would you put yourself?
3: I'd say top because I was the only person to get an A in my math class.
C: Ok, so you would put yourself way up on the top.
3: [Agrees]
C: Ok. What are your best and worst subjects in school?
3: My best is math and social studies. My worst is science.
C: Why are math and social studies your best?
3: 'Cause they easy.
C: Why is science the worst?
3: 'Cause you go to do all sorts of labs and stuff. Sometimes it's fun up in there. Sometimes you got to be writing all this stuff down, taking notes.
C: Too many notes?
3: Uh huh.
C: Too much to do?
3: Too much.
C: And you don't have many notes and stuff in history?
3: We just only got to copy down the definitions and that's all.
C: Ok. Do you think that the instruction in your math class is going at the right pace for you?
3: Uh huh.
C: So it's never going too fast or too slow.
3: I would like it to go a little bit faster.
C: So you wish it would go a little bit faster some times?
3: Uh huh.
C: Ok. Are there any differences between your math class and the other math classes on the team?
3: Yeah, it's one higher than us, and that's the one I am supposed to be in besides my attitude.
C: Ok, but the rest of them are all just the same.
3: Uh huh. Some of them are lower than us.
C: Some of them are lower? Ok, so there's one higher and then there's some lower?
3: Uh huh, there's two lower than us.
C: Two lower.
3: Yeah.
C: Ok, so you're right in the middle.

3: Uh huh.
C: So there's five math classes on here, so you and another class are in the middle and there's one higher and there's two lower.
3: Yeah.
C: Ok. Do you ever try to get the highest grade in your class, or does that matter to you?
3: It doesn't matter to me as long as I get a good grade.
C: So you just try to get a good grade and as long as you get that you don't care.
3: Yeah.
C: Ok. If you were to rank all of the students on your team in math ability, where would you put yourself?
3: In the middle.
C: In the middle, so half would be higher and half would be lower.
3: Yeah, see my best friend, she's in the high math class, the one I am supposed to be in.
C: Ok. Is there anything else you want to tell me about your math class?
3: Last year, I got F's and D's in math, but this year, I get all A's and B's.
C: Wow, what do you think the difference is?
3: It seems like sixth grade math is so easy, but fifth was so hard.
C: Huh, did it seem like a lot of people were smarter than you in fifth grade?
3: Uh huh.
C: But now it seems like you have caught up to them.
3: Yep. Last year, that math was hard, but this year it's easy.
C: Do you think you are studying more this year? What do you think the difference could be?
3: I do not know. It might just be the teachers. Last year my teacher was mean.
C: She was mean? And [math teacher] is not mean?
3: Uh-uh, she's nice.
C: So you just think it's the teachers causing the problem.
3: Uh huh.
C: Ok.

[Additional]

C: When we were talking about the differences between the math classes on the team, you said that you noticed differences between the classes. What made you think

there were differences, and when did you find this out?
3: 'Cause they be separating it, and then sometimes they change it and stuff like that.
C: Who would separate it?
3: All the math teachers, they get together and they'll talk.
C: And they'll talk and separate the kids up.
3: Uh huh.
C: How did you know they did that?
3: Because last year, I heard my teacher talk about it. And then, like on the board, we'll have harder work and the next class that comes in, they'll have easier work.
C: Ok, so there are different assignments on the board, and then you also knew that your teacher last year was going to divide aiel up.
3: Uh huh.
C: So you knew it by the teacher and also by the board.
3: Uh huh.
C: Ok, so that's how you figured out you were in the middle class and there were higher and lower.
3: Uh huh.
C: Ok.

HETEROGENOUS - TRIES HARD AND SUCCEEDS

C: My first question is, how do you feel about math?
4: How do I feel about math. I think its a cool subject. I think its kinda neat, but hard.
C: Why is it cool?
4: Why is it cool? I don't know, it's just made like that.
C: And why is it hard?
4: It's hard because you have to use your brain too much.
C: You have to use your brain too much?
4: Yeah, you have to use your brain to figure out every little thing.
C: So it's too picky? Too hard?
4: Not too hard for me. I hate helping people.
C: Why?
4: Because I am pulled like five different ways.
C: Oh so you like working by yourself.
4: Uh huh.
C: Ok, that's reasonable. How well do you think you do in it?
4: Well, I get B's.
C: Oh so you think you do well?
4: Yeah.
C: What are your abilities in math?
4: Everything.
C: Everything. So everything is good?
4: Uh huh.
C: That's good. How do you think you do in comparison to the other students in your class?
4: I'm better than half of the students in the class. Well I think that, I'm not sure.
C: So you're better than half, what about the rest of the half? You're on that level? Or...
4: Yeah. Well I got the highest grade on the team with one of the tests that I didn't study for.
C: Wow, pretty good, especially if you didn't study.
4: I know math too well.
C: Ok, so you think you are in the upper half.
4: Yeah.
C: Can you help others in your math class or do others help you or do you just rely on your teacher?
4: Well, today I needed help because I didn't learn it yesterday because I left early. I usually help people with most of it. There is a girl in my class, and I tell her the answers for every single thing, even

though I am not supposed to.
C: So she always relies on you for help?
4: Uh huh.
C: Ok. And do you get help from your teacher or other students?
4: Other students.
C: So your teacher doesn't play any part in this.
4: No.
C: Ok, interesting. If your were to rank all the students in your math class, where would you put yourself?
4: Below [a student].
C: Below her. Does that mean she's first and you are second? Or...
4: No, like [three students] are upper, I'm middle, and everybody else in the class is low. Because they are always asking people for help. Except [a student], she's like as smart as me.
C: Ok, so it's those three girls, and then it is you and [student] and then everybody else.
4: Yeah.
C: Ok. What are your best and worst subjects in school?
4: Science is my best, and math is my best. And I don't do good in social studies or language arts.
C: Why do you think math and science are your best?
4: Because I get good grades.
C: Why do you think that...
4: They're my favorite.
C: They're your favorite, and you get good grades in them?
4: Uh huh. They're my favorite teachers. But I like [language arts teacher] too.
C: Well why is history and language arts your worst.
4: Because I am no good.
C: You're no good at it?
4: No, not at all.
C: Do you like it?
4: NO!
C: So you are no good at it because you don't really like it.
4: I hate social studies. It's so boring listening to the olden days music and stuff.
C: Well, do you think that the instruction in your math class is going at the right pace for you?
4: Uh huh.
C: So it's not too fast, not too slow...
4: Uh huh.

C: Are there any differences between your class and all the other classes on the team, all the other math classes on the team?
4: Uh huh, there is only one higher than ours, I think.
C: So there is one higher, and all the rest are in the same boat?
4: I don't know, but I know there is one advanced class, and the rest, I don't know.
C: The rest are just there.
4: Uh huh.
C: Did you ever try to get the highest grade in your math class, or does that matter to you?
4: It doesn't matter. Do you mean on a report card or on a test?
C: On anything.
4: On the test I did better than the team.
C: So does it matter or not?
4: Doesn't matter, as long as I don't get the lowest grade.
C: Ok, so as long as you don't get the lowest, it's fine.
4: Yeah.
C: If you were to rank all the students on your team in math ability, where would you put yourself?
4: Third. The advanced class, all the people in there in one group, is the high. And then the people like [ones previously ranked high in class] in another group and then me.
C: And then all the rest below that?
4: Uh huh.
C: How many groups would be below that? Would there be two, three...
4: One.
C: One group below that.
4: Like two middle, one high and one low.
C: And you would be...
4: One of the middles.
C: One of the middles?
4: Yeah.
C: Ok. Anything else you want to tell me about your math class?
4: I don't like my class.
C: You don't like your math class? Why?
4: I like the math class, I don't like the people in it. I just think people don't like me, some people want to beat me up, or whatever.
C: They want to beat you up?
4: Well some, I don't know.

C: So you'd rather be in another class?
4: Uh huh, [names another period]
C: Why, better people? or better class?
4: Better people. Third period is the best class.
C: Anything else?
4: No.

HETEROGENOUS - TRIES HARD AND DOES NOT SUCCEED

C: The first question is how do you feel about math?
5: It's alright sometimes, but it's pretty hard.
C: Why is it hard?
5: Well, some things I can't do, some things I can do.
C: Well, do you do well in math?
5: Uh huh, pretty good. I don't get F's.
C: So you do pretty well. What is well?
5: Pretty good.
C: Ok. What are your abilities or strong points in math?
5: Well, working with partners.
C: Working with partners. So you can help people.
5: Yeah.
C: Ok. Do you have any other strong points?
5: Learning.
C: Learning it, so you can pick it up pretty fast?
5: Yeah.
C: Ok. How do you think you do in comparison to the other students in your math class?
5: Pretty good, I don't fuss with them.
C: Ok. Do you think you are right up with them?
5: A little bit.
C: A little bit?
5: Yeah.
C: Maybe sometimes not?
5: Yeah, sometimes not, sometimes...
C: Like what, sometimes your...
5: Sometimes they'll like say answers, and I don't know it, and they'll call me up, and I don't know how to do it. And sometimes I know how to do it.
C: How do you feel about when you don't know the answers and they know it?
5: Embarrassed.
C: Embarrassed. So you don't want to go up to the front of the board.
5: No.
C: Ok. Can you help others in your math class or is there someone who can help you or do you just rely...
5: Sometimes they help me, sometimes I help them.
C: Ok, do you ever rely on your teacher?
5: Uh huh.
C: So there is a whole lot of help going on, and you're helping people and they are helping you.
5: Uh huh.
C: Ok. If you were to rank all of the students in your

math class, where would you put yourself?
5: In the middle.
C: In the middle.
5: Yeah.
C: So some would be higher, and some would be lower?
5: Yeah.
C: Ok. What are your best and worst subjects in school?
5: My best subject is reading.
C: Reading. Why is reading your best?
5: It seems like the easiest subject.
C: Why is it the easiest, do you just like it? Or?
5: Yeah, I like it and I do well in it.
C: You do well in it, or you get it real fast.
5: Yeah.
C: What is your worst?
5: I'd have to say language arts.
C: Why is language arts your worst?
5: I don't know my conjunctions and stuff like that.
C: Oh, so that's hard for you, all those parts of speech.
5: Yeah.
C: Ok, where would math fit into that?
5: I like math. Sometimes I don't like it, sometimes I do.
C: Sometimes it's good and sometimes it's bad.
5: Yeah.
C: Do you think the instruction in the class is going at the right pace for you?
5: Yeah, but I got to catch up.
C: So you've got to catch up with it.
5: Yeah.
C: Do you think that it should ever be slowed down?
5: A little.
C: A little bit.
5: Yeah.
C: To give you more time to catch on.
5: Uh huh.
C: Ok. Are there any differences between your math class and the other math classes on the team?
5: Some are higher than me.
C: Which ones?
5: I don't know, I think I am pretty low.
C: You think you are?
5: Yeah.
C: So you think that there are others higher than you...
5: Yeah.

C: Do you think you are the lowest class? Or do you think you are in the middle?
5: Uh-uh. I think I am in the middle.
C: So there is a higher one and is there a lower one?
5: Yeah.
C: So you are right in the middle. What makes you think that?
5: I don't know, I'm pretty good at math.
C: So you know you're pretty good so you are in the middle somewhere.
5: Yeah.
C: Well what makes you think there is a lower class, or a higher class?
5: Well I think there is a lower class, I'm smarter than some people.
C: When did you first notice that there were differences in the classes?
5: Because some people would say, "I'm in the higher math class," and then some people would say, like teachers would say, this is the lowest math class.
C: Really, so some people think that there's a lower math class.
5: Yeah.
C: Interesting. So your just doing it by what other people are saying to you.
5: Uh huh.
C: Did you ever try to get the highest grade in your math class or does that matter to you?
5: Try. Sometimes I get the lowest, but I try.
C: So you try to get the highest, so it does matter.
5: Yeah.
C: If you were to rank all the students on the team in math ability, where would you put yourself?
5: I would say the middle.
C: The middle. So of all the people in the team you're right in the middle.
5: Yeah.

HETEROGENOUS - TRIES SOME AND DOESN'T TRY SOME

C: How do you feel about math?
1: Well, it's a good subject. It's probably my favorite subject. All of the teachers are nice that teach it. It helps you the most in all the subjects that you take. Like social studies and all that, you do not have to know that as much as you have to know math. Because you have to know how to estimate and add and subtract to you will know...like if you have to go to the grocery store and buy something and you have to estimate it, and like if you have coupons...they'll just subtract it from what your normal price is like for everything that you bought and it will subtract it from...
C: The total.
1: The total of it.
C: Ok, so you think it's very useful for you in the future, and you like it because of that? Or you like it because...
1: I just like it because it helps me.
C: Ok. How well do you do in math.
1: I do great. Last year I had straight A's. This year I got like two C's and two B's and maybe one more B if it comes today.
C: Ok. What are your abilities in math?
1: Almost everything.
C: Ok, so everything you have had so far you have been good at?
1: [Agrees]
C: Ok. How do you think you do in comparison to the other students in your class?
1: I hang around them, like the good students who know how to do their work. I hang around them people in the class.
C: So you do about as well as everybody else does?
1: Yeah. I do maybe, you could say better.
C: Better than everyone else does. Ok, can you help other people in your math class of is there someone who can help you or do you just rely on the teacher?
1: Well, you see I can help other people but, if I need help, I can sometimes ask a student or I can ask [math teacher].
C: Does anybody ever help you?
1: They don't really need to help me.
C: Ok. If you were to rank all the students in your math class, where would you put yourself?

1: I'd be at the top.
C: At the top. Ok, what are your best and worst subjects in school?
1: I do good in pretty much all of my subjects, but some of the are kind of hard.
C: So if you had to pick your best and your worst which ones would you pick?
1: My favorite one is math and my worst one is social studies.
C: Why social studies?
1: Cause...well either social studies or language, cause I don't like it, I don't just hate it, but I like it a little bit, but I just don't like copying the notes because we have to copy them every day and today we had to copy three pages of notes in English and it was tiring.
C: So you don't like the subjects that you have to copy notes in.
1: [Agrees]
C: Do you think that the instruction in the class is going at the right pace for you?
1: Yeah.
C: Are there any differences between your math class and the other math classes on the team?
1: Some of the math classes have different books cause higher math classes and a lower math class and a medium one.
C: Ok, which ones are you in? Or...
1: They say second or third period that has the high books, second or third, and we are in the middle. The other books for second or third are harder for them than what we have.
C: Is there a lower class than yours?
1: I think it's sixth period that is the lowest. It's like, first, second, and third I think are the high ones, no, it's first and second, I think and third, and then we're like medium and the other ones are low.
C: Ok. Did you ever try to get the highest grade in your class or does that matter to you?
1: It doesn't really matter to me as long as I don't get an F or a D. A C, B, or A is fine.
C: Ok, so as long as you get those three grades you're fine.
1: Yeah.
C: If you were to rank all the students on your team, where would you put yourself, in math ability?
1: I'd have to put myself up top.
C: Up top, like how far up on top?

1: Well, I'd say in the middle then, because some of them are better than me but I don't really pay that much attention to them I just do my work and make sure that I get it done.
C: So you would put yourself in the middle?
1: Yeah.
C: Ok, so half of the people would be...
1: At the top and I would be down in the middle and then people would be on the bottom.

[Additional]

C: When I asked you if there were any differences between your class and the other math classes on the team, you said that you thought there were. And I was wondering how you found that out, or what made you think that?
1: Well the books that the other people, they have different books than what we have.
C: They do?
1: Yeah. Like some of them, they have like orange books, and we have different colored books. And I looked inside them and the work's a lot harder.
C: Oh, so that made you think that they're in a higher class.
1: Yeah.
C: Ok, are there any other differences? You said that there was a lower class, why do you think there is a lower class?
1: So the work's easier 'cause they might not understand as much, like they might not understand...
C: Ok, but what made you think that there is one, just because there always is one or...?
1: No, I just though there might be one because there's a higher math class too.
C: Oh, so since there's a higher math class, there's got to be a lower one.
1: Yeah.
C: So it's just because you saw that other book.
1: Yeah.
C: Ok, I get it.

HETEROGENOUS - BEHAVIOR PROBLEM

C: The first question that I have is how do you feel about math?
3: I hate math.
C: Why?
3: Because it's boring.
C: Why is it boring?
3: Because I never liked math.
C: So you don't like it. Ok, how well do you do in math?
3: So-so good.
C: What does so-so good mean?
3: I do my work sometimes and I don't.
C: So, sometimes you do well, sometimes not?
3: Yep.
C: And it all depends on how much of your work that you do?
3: Yep.
C: Ok. What are your abilities in math?
3: I don't know.
C: You don't know? You don't have any strong points, nothing?
3: No.
C: Ok. How do you think you do in math in comparison to everybody else in your class?
3: Sometime I do good.
C: What about other times?
3: So-so.
C: So, sometimes you do as well as other people or better, or what?
3: No, I do the same.
C: The same as everybody else?
3: Uh huh.
C: Ok, what about the other times?
3: Nope.
C: Nope meaning you don't do as well, or what?
3: I don't do as well.
C: Ok, that's fine. Can you help others in your math class or can other people help you or do...
3: Other people help me.
C: Other people help you. Do you ever help anybody else?
3: Yeah.
C: Ok. Does [math teacher] help you?
3: No.
C: No?

3: Nope.
C: Ok, so you just rely on other people in your class to help you.
3: Sometimes.
C: And sometimes you help them.
3: Yep.
C: Ok. If you were to rank all the students in your math class, where would you put yourself?
3: I'm not the worsest person in my math class, so in the middle. I'm sort of bad and sort of good.
C: In the middle. So half the people would be better than you and half the people would be worst.
3: Yep. But sometimes I was real bad.
C: So then you would be at the lower end of class. But now it's better, are you doing better in your school work?
3: Yep.
C: Ok, so sometimes you are in the middle and sometimes you are not.
3: [Agrees]
C: Ok. What are your best and worst subjects in school?
3: My best subject is language arts, and my worst subject is math and history.
C: Why is language arts your best?
3: Cause I like that class.
C: You like it because you like the work?
3: [Agrees], it's fun.
C: Ok. Why do you not like math and history.
3: 'Cause I don't like it. I do the work, but I don't like it.
C: So you don't like the work or the class?
3: The class, but I do the work.
C: Ok. Do you think that the instruction in the class is going at the right pace for you?
3: No.
C: No. Do you think it's going too fast, too slow.
3: Too fast.
C: Too fast. Why do you think that?
3: 'Cause I was absent lot of time and I didn't get no work to make up.
C: You didn't.
3: Nope.
C: Well if you had, then it would be going at the right pace?
3: [Agrees]
C: So if you are there, then it is going at the right pace, but if you are absent then you miss out on too

much.
3: Yeah.
C: So as long as you are there it's going just at the right pace for you and you are keeping up just fine, or not?
3: Uh huh.
C: You are?
3: [Agrees]
C: Ok. Are there any differences between your math class and the other math classes on the team?
3: Yeah. We the lowest math class.
C: Why do you think that?
3: Cause, I think it's the first, no, it's one of those classes, they got a different book than we do.
C: Ok, so what does that tell you?
3: They in the high math class.
C: They are in the high math class. What about all the rest of them, you said that's only one.
3: I don't know about the other ones, but we the lowest math class.
C: So you think you are the lowest and you don't know where the rest of them are?
3: Yep.
C: Why do you say that you think you are the lowest?
3: 'Cause of the other people around me.
C: So you're saying that the people in your class don't seem to know as much.
3: Yep, that's why we in the low math class.
C: Ok, huh. Do you ever try to get the highest grade in math?
3: [No]
C: Does it matter to you?
3: [Yes]
C: So you don't try to get it, but it does matter.
3: [Agrees]
C: Why does it matter?
3: 'Cause
C: Well if it matters...
3: I want to good, but sometimes I don't.
C: So you want to do good, but sometimes you don't.
3: Uh huh.
C: Do you ever try?
3: Yeah.
C: What happens when you try?
3: I do good.
C: You do good. So you do try to get the highest grade.
3: Yes.

C: And sometimes it works and sometimes it doesn't.
3: Yep.
C: If you were to rank all the students on the team in math ability, where would you put yourself?
3: I'm not the worst person. Somewhere on the bottom.
C: On the bottom somewhere.
3: Yep.
C: So there is a top, and middle, and you're in the bottom somewhere.
3: Yep.

[Additional]

C: When I was going over what you said, I noticed that you said you noticed differences between the math classes, like one was higher, one was lower, and one was in the middle. I was wondering when you first noticed these differences. What made you think there were differences?
3: 'Cause [student].
C: [student]? What did she do?
3: She's in the higher math class.
C: She's in the higher math class. How did you know that?
3: I saw her math book.
C: Oh, so she had a different math book.
3: That's cause she is in the [highest] math class.
C: Ok, so what made you think there were differences other than that? Is there just a higher math class and all of the lower ones, or is there more separation than that?
3: I don't know.
C: You don't know, so you just noticed that she had a different math book.
3: Yep, and she said she was in a higher math class.
C: Ok, what made you think you were in the lowest one though?
3: 'Cause I was in the lowest math class in fifth grade.
C: What made you think you were in that, I mean did somebody tell you that you were in the lowest?
3: Yep.
C: Really. Oh so you just assumed that this year you were in the lowest class too.
3: Yep.
C: Ok.

Appendix C

Assessment

1. $46.39
+$38.92

2. 8,357
x 6

3. $\frac{2}{6}$
+ $\frac{1}{3}$

4. .76
x 5.9

5. $5\overline{)4685}$

6. $53\overline{)3551}$

7. $3\frac{3}{4} + 5\frac{2}{3} =$

8. 11.456 + 0.679 + 200.24 + 0.04 =

9. The Amazon River is 3,900 miles long, and the St. Lawrence River is 1,945 miles long. How many miles longer is the Amazon than the St. Lawrence?

10. Gary buys a book for $3.15, a box of crayons for $1.29, and construction paper for $2.07. How much change will he get from $10.00?

Appendix D

Code for Appendix D - F

T = tries and succeeds
F = tries and does not succeed
S = tries some, doesn't try some
D = does not care
B = behavior problem

Attitude Towards Math

	Heterogenous	Homogenous
like	S	F,B
indifferent	T,F	T,S,D
dislike	D,B	0

Math as Best or Worst Subject

	Heterogenous	Homogenous
best	S,T	F,T,B,D
neither	F	S
worst	B,D	0

Appendix E

Perception of Math Ability

	Heterogenous	Homogenous
doing well	S,T	T,B
ok	B,F	F,S,D
badly	D	0

Comparison to Others in Class

	Heterogenous	Homogenous
above	S,T	F,T,B
with them	0	S,D
below	B,F,D	0

Rank in Class

	Heterogenous	Homogenous
high	S	F,T,B,D
middle	F,T,B	S
low	D	0

Pace of Class

	Heterogenous	Homogenous
too slow	0	B,T
right	S,D,B,T	S,F,D
too fast	F	0

Appendix F

Levels of Math Classes on Team and Their Placement

	Heterogenous	Homogenous
3 levels	F,S,B	B
2 levels	T,D	S,F,D
don't know	0	T
top class	0	0
middle	F,T,D,S	S,B,T,D
bottom	B	F

Rank on Team

	Heterogenous	Homogenous
high	S	D
medium	T,F,D	T,B,S
low	B	F

Appendix G

Overall Test Results

	Heterogenous				Homogenous			
	Average		Low		Average		Low	
	#	%	#	%	#	%	#	%
10/10	3	6	0	0	0	0	0	0
9.5	5	10	0	0	0	0	0	0
9	3	6	0	0	1	3	0	0
8.5	2	4	0	0	0	0	0	0
8	4	8	1	5	2	5	0	0
7.5	9	18	0	0	3	8	0	0
7	6	12	0	0	5	14	0	0
6.5	3	6	1	5	7	19	0	0
6	7	14	1	5	4	11	1	4
5.5	2	4	0	0	5	14	1	4
5	2	4	3	14	3	8	3	11
4.5	1	2	5	23	3	8	3	11
4	0	0	1	5	1	3	7	26
3.5	2	4	4	18	2	5	1	4
3	1	2	2	9	0	0	0	0
2.5	0	0	0	0	0	0	3	11
2	0	0	2	9	0	0	3	11
1.5	0	0	2	9	0	0	3	11
1	0	0	0	0	1	3	2	7
0.5	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

= number of students who received this score
% = percent of students who received this score

Appendix H

Test Scores Eliminating Fraction Questions

	Heterogenous						Homogenous					
	Average			Low			Average			Low		
	#	%	T%	#	%	T%	#	%	T%	#	%	T%
8/8	5	10	10	0	0	0	2	5	5	0	0	0
7.5	7	14	24	0	0	0	2	5	10	0	0	0
7	8	16	40	0	0	0	6	16	26	0	0	0
6.5	5	10	50	0	0	0	6	16	42	0	0	0
6	10	21	71	2	9	9	4	11	53	1	4	4
5.5	5	10	81	1	5	14	5	14	67	1	4	8
5	4	8	89	3	14	28	4	11	78	3	11	19
4.5	2	4	93	4	18	46	4	11	89	3	11	30
4	0	0	93	1	5	51	0	0	89	7	26	56
3.5	2	4	97	4	18	69	3	8	97	1	4	60
3	1	2	100	2	9	78	0	0	97	0	0	60
2.5	0	0	100	1	5	83	0	0	97	3	11	71
2	0	0	100	2	9	92	0	0	97	3	11	82
1.5	0	0	100	2	9	100	0	0	97	3	11	93
1	0	0	100	0	0	100	1	3	100	2	7	100
0.5	0	0	100	0	0	100	0	0	100	0	0	100
0	0	0	100	0	0	100	0	0	100	0	0	100

= number of students who received this score
% = percent of students who received this score
T%= percent of students who received this score or higher

Appendix I

Percentage of Differences Between the Two Teams

	Heterogenous		Homogenous		Difference (Het-Hom)	
	Average T%	Low T%	Average T%	Low T%	Average D%	Low D%
8/8	10	0	5	0	5	0
7.5	24	0	10	0	14	0
7	40	0	26	0	14	0
6.5	50	0	42	0	8	0
6	71	9	53	4	18	5
5.5	81	14	67	8	14	6
5	89	28	78	19	11	9
4.5	93	46	89	30	4	16
4	93	51	89	56	4	-5
3.5	97	69	97	60	0	9
3	100	78	97	60	3	18
2.5	100	83	97	71	3	12
2	100	92	97	82	3	10
1.5	100	100	97	93	3	7
1	100	100	100	100	0	0
0.5	100	100	100	100	0	0
0	100	100	100	100	0	0

T% = percent of students who received this score or higher
D% = difference between the percentage of students who received this score or higher in the heterogenous group and in the homogenous group

Average Percentage Difference

Average Level = 7.5% in favor of heterogenous team

Low Level = 8.7% in favor of heterogenous team

Average percentage difference was found by totalling up the percentage differences starting at the first mark where there is a difference and ending at the last mark where there is a difference