

Ability Grouping and Mathematics

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Abstract

The purpose of the Action Research was to investigate whether small groupings of students in mathematics would improve their scores in measurement; one of the National Council for the Teaching of Mathematics (NCTM) new core standards for the fourth grade. A Walk to Math program was implemented during the research enabling students to move to a group that specifically met their mathematical needs. The research was conducted in the three fourth grade classrooms on site however the focus was on the researcher's fourth grade classroom, which housed the intensive students. Results of the case study demonstrated that focused and explicit instruction along with consistent progress monitoring did increase students' numerical sense and understanding in students needing intensive help. The research also indicated more research would need to be conducted to make a conclusive statement. Suggestions for future small group implementation and further research are discussed.



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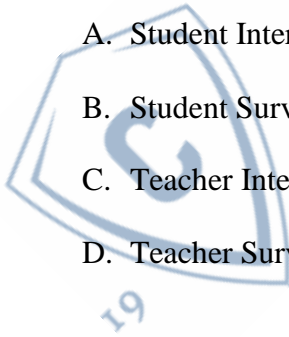
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Action Research Proposal

Chapter One – Introduction

Nestled in the Willamette Valley there sits a relatively small city that sits between the McKenzie River to the North and Willamette River to the South. The hillsides are densely covered by fir trees and often blanketed with snow. Low lying clouds frequently hide the gorgeous view. The fragrance of wood products is prevalent and drifts through the air. Filbert orchards can be found throughout the community and numerous fruit and vegetable farms surround the city.

Housing accommodations range from lavish to neat and tidy smaller homes and also to apartments and trailer parks. Once a thriving forest and lumber community, this quiet city struggles to find a new industry vision, one that will support the lagging economy and provide a sustainable job market for its residents. A large number of residents are former wood products laborers who learned a skill or a trade on the job or from a family member who worked in the wood products industry. They now find themselves unemployable due to a lack of a formal education. Even if new industry were to enter to city, most residents would need to be retrained in order to apply for jobs that would become available.

The city of approximately 58,000 residents is served by the researcher's local school district. Twenty-five schools serve the 11,000 students. 15 elementary schools (K-5), five middle schools (Grades 6-8), two high schools (Grades 9-12) and two alternative education schools comprise the school district. Of those schools, 14 are rated as exceptional or strong and nine are satisfactory. The district has struggled with large class sizes and budget woes over the past several years. Many valuable programs have been cut

to retain classroom teachers including librarians, full-time counselors, and PE teachers, as well as eliminating advanced placement courses at the high school level.

The district employs 1,407 teachers to provide an exemplary education for these students, including the 52% of students who receive free and reduced lunches. Those receiving free and reduced lunches are a mixture of Hispanic students, the largest minority in the district, and the growing number of students whose families are unemployed. The 52% of students who receive the free and reduced-price meal program are the primary reason some elementary, middle, and high schools are newly identified as Title I schools, thereby entitling them to federal money to support programs at each of their campuses.

The research site falls in the median range of elementary schools in the district and sits across the street from a middle school. With a population of 358 K-5 students, the school has experienced a decline in enrollment, leaving extra room for small groups to meet. Large class sizes remain a concern with the implemented budget cuts and the loss of full-time certified employees.

The researcher's school site has three half-day kindergarten classes, three each of 1st, 2nd and 4th, and two each of 3rd and 5th. Class sizes range from 18 to 34 students. Eighty-one percent of the students are white and nineteen percent are a minority. There are 288 white, six American Indian, two African American, six Asian, 37 Hispanic and 18 unspecified students. The disproportionate numbers of white and minority students mirror the makeup of the school's boundary area. Large numbers of students come from older residential neighborhoods and newer housing additions, while a much smaller number come from lower income apartments and trailer courts.

The researcher's school became a Title I school at the beginning of the 2009-2010 year. Forty-one of the school's students are receiving free and reduced lunch this year, which qualified the school for Title I status. Corresponding additional federal money has enabled the school to run reading and intervention programs. Extra funds are always welcome, particularly with educational funding woes. However, a Title I status also means a student population with increased academic and emotional needs. Eight percent of the school's 358 students are identified SPED or students receiving services. Another 27% of students receive Title I services. Seven percent of students are ESL and 10% are identified as Talented and Gifted. The percent of students at the school site who meet or exceed in each subject has consistently been greater than the district average and the overall state average. Even with the high number of students meeting and exceeding, the researcher's school recognizes the need for and supports the district's desire to improve reading, math, and writing instruction.

The district's focus on reading and literacy included a Houghton-Mifflin adoption as well as a push to teach to fidelity. The researcher's school site has thoroughly embraced the new program and, as a result, scores have risen dramatically. The district continues its commitment to literacy, but has added a mathematics focus due to falling test scores. Currently the district is involved in the math adoption process, its goal to select a program that will support the new National Council for the Teaching of Mathematics (MCTM) Focal Points.

As a result of the need for math intervention, the researcher is interested in implementing a Walk to Math program at the site. Walk to Math is modeled after Walk to Read, which is currently in place at the site. Students are ability grouped for reading in

intensive, strategic, and benchmark groups. Students are able to move through the groups as their fluency, accuracy, and comprehension improve. The incredible success of the Walk to Read programmed has fueled the researcher's desire to ability group for math.

The researcher is presently teaching fourth grade at the school site and is completing her M.Ed. program in Curriculum Instruction with a Leadership Endorsement. The researcher's own classroom consists of 20 students. Of those 20 students, there are six Hispanics, two American Indian, and 12 white students. Two of those are SPED and five are TAG. The researcher is passionate about what she is learning through the curriculum and instruction courses and is eager to implement and try a new math program in the fourth grade. Throughout the researcher's 24 years teaching, she recognizes there is still much to learn about teaching mathematics. Therefore, the researcher has chosen to be actively involved in Investigation's training and Math in the Mind's Eye, has served on the district Math Cadre, has been involved in numerous math textbook adoptions and continues to be a member of the site's Math Team. Additionally, the researcher writes for the Oregon State Math Assessment. The researcher is taking a lead role in implementing the grade four Walk to Math.

The researcher is acutely aware that lack of number sense is impeding students' progress in math. Number sense is defined as "the meaning of a number, ways of representing numbers, relationships among numbers, the relative magnitude of numbers, and skill in working with them". Mathematical learning and understanding stall without a solid understanding of number sense. This is why the researcher is interested in using ability groups to increase number sense. Through this action research, the researcher will answer this question: "What effect will ability grouping have on student informal test

scores on the meaning of numbers, ways of representing numbers, relationships among numbers, and the relative magnitude of numbers?”



Action Research Proposal

Chapter Two – The Problem or Issue

The questions to be researched at the school site are:

- "What effect will ability grouping have on student informal test scores on the meaning of numbers, ways of representing numbers, relationships among numbers, and the relative magnitude of numbers?"
- "What will be the effect on student scores in Measurement, after 13 weeks of small group instruction?"

For the past two years the school site has been focused on raising reading scores through teaching the Houghton-Mifflin reading program with fidelity. The school site has seen an impressive effect on student reading scores using ability grouping. Because of this success, the researcher's school has turned its attention to math. With the implementation of the National Council for the Teacher of Mathematics, there is an urgency to have students master certain skills. The site's teachers have consistently noticed that students who lack numerical sense are students who consistently fail to make progress in math and master key skills. Australian author, Paul Turner states,

In school education, numeracy is a fundamental component of learning, discourse and critique across all areas of the curriculum. It involves the disposition to use, in context, a combination of underpinning mathematical concepts and skills from across the discipline (Numerical, spatial, graphical, statistical and algebraic)

(Turner, 2008, p1).

Additionally, in response to No Child Left Behind, schools districts across the United States have scrambled to find scientifically-based research to support educational instructional practices, including ability grouping. Ability grouping today is not the same as it was when the researcher was a child. Students are no longer placed into a group based solely on their intelligence nor are they permanently positioned in a group.

Today, ability grouping teachers gather data for a specific educational purpose, group according to the data, and then use data driven instruction to teach each group the same content. This creates what is commonly referred to as equitable instruction. A student may be strong in reading and be in the challenge group, struggle in number operations in mathematics and be in the strategic group, and be right at grade level in writing and be in the benchmark group.

Ability grouping is now widely used as a best practice. This is primarily due to ability groupings' capacity to meet the needs of each and every student in each and every subject area. Today's ability grouping is data-driven and students can move from group to group, as their test scores improve. The goal of ability grouping is to enable every student to succeed.

The site's teachers are highly qualified by the state and go to great lengths to help each and every student become a skilled mathematician. Strategy after strategy has been used to instruct students who appear to be missing numerical sense. Yet year after year these same students struggle with understanding and applying math concepts.

Investigations, a hands-on mathematics program, Scott Foresman, Key Mathematics, computer programs, and teacher-created materials have all failed to unlock numerical

sense in these students. Therefore, the fourth grade teaching staff has agreed to try ability grouping to increase numerical sense in all students.

Literature Review

Definition

The definition of ability grouping has many varied definitions, due to researchers' and educators' interpretation of the two terms "ability" and "grouping." According to Helen Abadzi in her article *Ability Grouping Effects on Academic Achievement*, Findley and Bryan describe the method of ability grouping as generally consisting of "teaching together students who function similarly in learning achievement" (2001, p.36). Kulik defined ability grouping as "a practice that places students into classrooms or small groups based on an initial assessment of their levels of readiness or ability" (1992, p.74). Another definition by Mike Muir is, "widespread practice of grouping students by their academic ability" (2007, p.1). Ability grouping has spanned the breadth of definitions throughout the majority of the twentieth century. Perhaps this is the very reason ability grouping has been hailed as the strategy to improve student achievement and booed as a strategy that labels students as "high" or "low" and contributes to segregation of genders and certain ethnicities.

History

The question of ability grouping to increase scores in reading and mathematics has long been debated. Researchers have examined the effects of common variants: forming classrooms by ability and forming ability groups within classrooms. On the

outskirts of these variants are several more issues, including flexible vs. stable groups, ethical concerns, and teacher roles and their influence. For every article that claims ability grouping is ineffective in raising student achievement, there seems to be another article that can be found saying ability grouping is effective.

At the top of the list of those who do not support ability grouping are those who claim school performance is often related to social inequity outside of the school setting. “Such divisions contribute to the separation of students from different racial, ethnic, and social backgrounds” (Oakes, 2005, p.14). Following this same vein of thinking is the claim that studies show inequity increases over time (Hollinan & Sorenson, 1983). Lower achieving students were thought to continue to achieve less than their peers, due to slower instruction, less demands, and lower expectations. In effect, lower achieving students were equated with less skilled teachers.

Researchers Sorenson and Hollinan (1983) have stated there is no advantage to ability grouping over whole-class instruction. They did, however, concede that high ability students made greater gains in ability groups than did lower students. In other words, ability groups have tended to favor higher achieving students. The essence of these statements appears to be there is a positive, high-motivation climate in the high achieving groups as opposed to a negative, low motivation climate in the lower achieving groups, thereby creating inequity.

Anne Wheelock, author of *Keeping Track: How Schools Structure Inequality*, writes, “The practice of grouping by ability is too widespread and too widely accepted” (2005, p.14). Wheelock infers that tracking leads to labeling of students, which leads teachers to harbor different expectations for “high” and “low” students. “High” and

“low” labels have often been associated with racial segregation, since students of color have historically been given a “low” label (Oakes, 1996).

The often unpredictable debate over ability grouping is highlighted in an article found in the magazine *Principal*. Authors Perry A. Zirkel and Ivan P. Gluckman write:

In 1991 a parent sued the Augusta, Arkansas School District claiming ability grouping and placement practices violated the Fourteenth Amendment’s equal protection clause. The court decided the Augusta district’s pervasive ability grouping policy for grades K-3 violated the Fourteenth Amendment, but that the modified Joplin plan for grades 4-6 did not violate the Constitution [*Simmons v. Hooks*, 843 F. Supp. 1296(E.D. Ark. 1994)]. The difference appears to be evidence that grouping for reading had beneficial effects that outweighed the stigma of homogeneity. (1991, p.4)

Ethnicity, Intelligence and Gender

Ethnicity, intelligence and gender are three variables often referred to in the ability group debate. How exactly does ability grouping benefit or create a disadvantage to one or more of these groups? Throughout the years, researchers have often concluded that students with higher intelligence benefit from ability grouping far more than those who have a lower intelligence (Hess, 1978; NEA, 1968; Wilson & Ribovich, 1973).

These researchers conclude there are specific areas of concern surrounding ability grouping. One area of concern is around instruction and curriculum, the belief being that lower students receive an undemanding curriculum and instructional expectations are typically low. This is in sharp contrast to those higher achieving students who receive

rigorous instruction and a demanding curriculum. However, concern is expressed as a negative for higher students too, as the fear exists that their scores will falter without appropriate competition. Similar concerns are attributed to gender, as it has often been thought that girls cannot be as successful at mathematics as boys. Thus, girls have frequently been placed in the lower performing groups. Another area of noted concern is the social stigma that often accompanies being placed in a lower group. "Ability," in the strictest sense of the word is thought to be a poor criterion for grouping. "Because school performance is related to social inequality outside the school, such divisions contribute to the separation of students from different racial, ethnic, and social backgrounds" (Oakes, 2005, p.13).

Clearly parents, educators, administrators and even the courts have a keen interest in the delicate variables surrounding ability grouping. Even with the negativity surrounding ability grouping, there are positive attributes of ability grouping that have thrust their way to the forefront. Both Slavin (1987) and Kulik (1987) have consistently found benefits in ability grouping. However it must be noted that both researchers have found ability grouping best suited to individual subjects, like reading and mathematics, rather than whole class ability grouping for all subjects. Both reading and mathematics are subjects which lend themselves to mastery learning. This suggests these subjects have certain skills that must be learned to mastery and those skills can be specifically tested.

Benefits of Ability Grouping

The nature of math requires that grounding concepts are learned before the mathematical process can be continued (Harlen, 1999). Thus the case for ability grouping

has more bearing in mathematics than other learning groups, because of the enormous range of abilities within each and every classroom. There are students who grasp mathematical concepts easily and are ready to move forward. There are also students who struggle to get a concept, but do grasp the concept after working for several days. Then there are those who seem to be trapped and cannot move forward no matter how many strategies are used.

It is the researcher's opinion that the stumbling block for this last group is numerical sense. These students do not have the concepts that form the foundation for learning math, and cannot build on what is not there. They need an environment where the pace moves according to the capabilities and level of understanding of the students within their group. They need an environment that uses the constructivist approach to building a solid mathematical foundation. As educators, each teacher has the responsibility for meeting the needs of each and every student in his/her room. This can be easier said than done in a fourth grade classroom with students whose math skills range from kindergarten to sixth grade.

It is crucial to the success of ability grouping to choose the right teachers who possess the capability to increase the value of instruction for each group (Freeman, 2003). Teachers who have a sound knowledge in a specific subject do a much better job of instructing students than those who do not. This would certainly be applicable to the teaching of mathematics in ability groups.

Teaching skills alone will not insure ability groups will be successful in building numerical sense in students. Ability grouping must also build students' self-esteem within a classroom that is relaxed and non-threatening. High expectations must let students

know they are anticipated to be successful in learning mathematical concepts. All students can and should be challenged in their work, but not so challenged that they give up.

One ability grouping method is the Joplin Plan, a cross-grade ability grouping. Grouping is only done when being with similar ability-level peers is particularly important for learning. John Hollifield states in his article *Ability Grouping in Elementary Schools* that R.E. Slavin suggests the Joplin Plan has been proven most effective due to:

Grouping plans allow for frequent reassessment of student placement and for easy reassignment based on student progress. The level and pace of instruction is varied according to students' needs, levels of readiness, and learning rates in ability groups. Student numbers are typically small in ability groups so teachers can provide adequate direct instruction for each group. Finally, students are only grouped for specific skills, allowing students to work with students of diverse ability level for most of the day (Hollifield, p.3).

The Joplin Plan is ability grouping that allows for flexibility, thus preventing students from being permanently pigeon-holed into a low or high group.

Summary

Through this literature research, it is clear history has not supported ability grouping, in part because of issues around equity among gender, intelligences, and ethnic groups. In more recent literature the researcher has also noticed a shift toward ability grouping that has guidelines in place to protect students from those inequities. Today's ability groupings are formed according to measured performance in specific subjects in

school. Frequent assessments are given and reassignments are commonplace. The level and pace of instruction is based on student' needs for a certain concept, vs. a group of students who are classified as "low" or "high" (Huitt, 1997). This flexibility in groupings helps safeguard students from being permanently placed in a "low" or "high" group.

The researcher understands the dilemma of ability grouping. As schools continue to use ability grouping, teachers must use assessments for all students to ensure students are in the right grouping for a select few subjects. Assessing students weekly on the concepts taught will allow students who learn the concepts quickly to move into a group that now meets their needs. Teachers must use curriculum and instruction that moves at a pace that meets the needs of students, yet also continually challenges students, whether they are in a struggling group or a high achieving group.

Equity means students are not placed in a group because of being on an IEP or because of their gender or ethnic background. Equity means students are placed in groups according to assessment results on a given tested concept. Equity means a student can move easily from one group to the next if assessments show they have mastered a concept. Equity means all students will receive the same curriculum, but may be taught that curriculum at a different pace than another group. What equity does not mean is keeping all students in the same curriculum, learning at the exact same pace, oblivious to individual students' needs.

Through continued research, frequent assessment and the collection of concrete data, the researcher will explore the effects of ability grouping on fourth grades students in achieving numerical sense.

Action Research Proposal

Chapter Three – The Goal of the Action Research Project

The questions to be researched at the school site are:

- "What effect will ability grouping have on student informal test scores on the meaning of numbers, ways of representing numbers, relationships among numbers, and the relative magnitude of numbers?"
- "What will be the effect on student scores in Measurement, after 13 weeks of small group instruction?"

The researcher is well aware of the diverse opinions about ability grouping in mathematics. Whether it is called tracking or flexible grouping, hackles rise among teachers, in part because of personal experiences that were painful for them. There is indeed a fine line between tracking and ability grouping, and the researcher understands the importance of not crossing the line or even stepping on it.

There is adequate support for intervention, especially early intervention. Helping students struggling with numerical sense during the grade school years may prevent their failure in later years. "Students struggling with mathematics may benefit from early interventions aimed at improving their mathematics ability and ultimately preventing subsequent failure (Gertsen, et.al., 2009, p. 1).

To begin, the researcher will meet with the school site's principal and request written permission to conduct the action research project. Since the school site uses ability grouping in its Walk to Read program, the fourth grade teachers are already

familiar with individual student's skills in both reading and mathematics. The fourth grade teachers will use EasyCBM progress monitoring, informal skills assessments and personal observations to identify students and place them into three categories; intensive, strategic, and benchmark/above.

Instruments for Gathering Data

Several instruments will be utilized to gather data on all students. All students have been progress monitored on the NCTM focal points since the beginning of the 2009-2010 school year. The sites' fourth grade teachers will take fall and winter scores to compare students' progress and study areas of concern. In addition, teachers have used specific informal tests to determine students' ability to add, subtract, multiply and do simple division. Since these are integral skills fourth graders must master, these are key indicators as to which students are struggling with numerical sense. Together these teachers will make the decision as to which students will be in each of the groups. Specific teachers have been assigned to each group and will be in charge of the instruction that will take place during the 50- minute block each day.

The Plan

Over the next trimester the researcher will use the three fourth grades at the school site as the testing group. Students will be grouped in three ability groups for 30 minutes each day during this time. During these 50-minute sessions, students will receive explicit and systematic instruction. Group one will work specifically on number sense activities, which include place value, simple computation, and specific mathematical

vocabulary. Group two will work on number sense to a lesser degree, as well as re-taught the previous trimester's focal point, which is Number, Operations, and Algebra. Group three will engage in enhancement and challenging activities since these are the students who have mastered the previous two focal points and are ready to extend their learning.

At the end of each week, teachers will administer informal tests to assess students' progress. The goal is for students to improve one to two percentage points each week. This would mean an overall gain of 13 to 26 points by the end of the 13 weeks. It is the researcher's opinion that this would demonstrate a striking increase in numerical sense, particularly for the intensive and strategic groups.

At the end of the 50 minutes, all students will return to their homeroom where the primary teacher will instruct students in the key concept for the day. The focal point for this trimester, which spans 13 weeks, is measurement. All students will be in their homeroom during the additional 30 minutes of mathematics instruction, which will focus on measurement. The first ten minutes of each of class will involve instruction on building quick retrieval of arithmetic facts. Teachers will be using the same lessons for all three classrooms, using differentiated instruction and tiered assessments to meet the needs of all students. Specific training has been given to two of the site's teachers on Guided Language Acquisition Design (G.L.A.D.) and Differentiated Instruction for Gifted and Talented Students.

Teachers will meet at the end of each week during the trimester to discuss student progress and to see if students need to be moved to a higher or lower group to meet their needs. The researcher feels this will prevent students from being inappropriately placed or permanently placed, which would constitute crossing the "tracking" line. This meeting

time will also include discussion on delivering lessons and help teachers solve any problems they are having with teaching the lessons.

Since intervention is taking place throughout the last trimester of the school year, students will have the benefit of being placed appropriately. It is the researcher's opinion that a summer lapse in instruction is often the cause for a student being placed in an inappropriate group, simply because the student is rusty after not being in school for three months. Additionally, students have the benefit of receiving intervention prior to entering fifth grade, which may aid in ensuring a student does not enter middle school with a severe deficit in numerical sense. In the researcher's opinion, this deficit in numerical sense is the primary reason students continue to fall behind in math as they move through middle and high school.

Interviews, surveys, observations, and discussions are an informal way to gather student and teacher perception of students' numerical sense. The student interview (Appendix A) and survey (Appendix B) will be administered before the student receives any instruction in the small group setting. These surveys will be used to measure the student's own existing knowledge of numerical sense, and their perception toward mathematics. Student surveys will remain anonymous, as students will be identified by numbers rather than by name.

Student discussions will occur in whole group settings and will be recorded and transcribed to reflect the groups' concept of numerical sense and mathematical facts. Again these will be anonymous, as discussions will be recorded by student number. Parental informed consent will be sought if the researcher's district deems this to be

necessary. The discussions will focus on what the students' perceive a good mathematician to be, and how a good mathematician strategizes to solve problems.

The teacher interview (Appendix C) will be used to determine how the site's teachers teach numerical sense, and if they think small, ability grouping will be effective in teaching numerical sense to students. Teachers will also have an opportunity to express their support or misgivings concerning ability grouping, as this will provide important insights into how they will approach intervention. A similar survey (Appendix D) will be given to the teachers at the end of the 13 weeks to determine if attitudes toward ability grouping have changed and if teaching styles have changed to complement student learning.



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Action Research Proposal

Chapter Four – Action Plan

The questions asked by the researcher are:

- "What effect will ability grouping have on student informal test scores on the meaning of numbers, ways of representing numbers, relationships among numbers, and the relative magnitude of numbers?"
- "What will be the effect on student scores in Measurement, after 13 weeks of small group instruction?"

As the researcher seeks possible solutions for implementing ability grouping to increasing numeracy in students, the researcher will keep in mind the fine line of equity that exists between tracking and ability grouping. In the quest to meet the needs of every student, it is imperative to not breach the inequity line.

Possible Solutions

Researching ability grouping and its effects on student learning continues to be a daunting challenge. Tracking, in its purest sense, has left a sour taste in the mouth of parents, teachers, and students. Ability grouping has faced, and will continue to face, a string of barriers, because of tracking that has singled out gender, ethnicity and low socio-economic students.

Financial constraints are a common barrier when attempting to implement any intervention program. School districts are faced with continual slashes to school budgets, yet are required to make Average Yearly Progress (AYP). Lack of funding has made it imperative to find viable programs, requiring little or no funding for materials and/or

teacher training. Thus, the researcher has chosen to focus on programs requiring skilled and committed teachers, but very little funding.

The Joplin Plan

R.E. Slavin (1987) initially had misgivings about ability grouping, but began to see benefits in The Joplin Plan. The Joplin Plan operates on these basic premises:

- Students are in heterogeneous classes for the majority of the school day.
- Students are grouped for one or two skill specific subjects: reading or mathematics.
- Students are grouped across grade levels.

Slavin noted in his synthesis that there is strong evidence showing the Joplin Plan increased reading achievement.

Though The Joplin Plan has a strong pull in the curriculum area of reading and it would appear the same strategies would work for mathematics, the researcher sees a major problem that would prevent its implementation at the school site. Schedules for grade levels are almost impossible to coordinate, making grouping across grade levels impossible. Right now the school site has common times for reading instruction and no other common times can be carved out of the schedule for mathematics instruction due to lunch, recess, and specials like music, art, library and physical education. Thus the researcher has chosen to reject The Joplin Plan.

The Non-Graded Plan

The Non-Graded Plan incorporates aspects from a variety of grouping plans, each of which places students into flexible groups according to performance rather than by age. Some find an appeal to these specific aspects:

- There are no grade-levels assigned to students.
- The curriculum is divided into levels.
- Students progress at their own rate.

The researcher holds the opinion that the Non-Grades Plan is similar to the Montessori approach to education. While she admits this approach has merits, she also realizes The Non-Grade Plan would not work in mathematics for several reasons. The main reason is the implementation of the National Council for the Teaching of Mathematics' (NCTM) new Focal Points. Each grade level will now have three specific focal points they will teach to for the school year. The push is to teach these skills in depth and to mastery, with the full knowledge that these skills will not be specifically taught again. This means if a student does not learn these skills to mastery, he/she will be at a deficit for their remaining years of school, unless intervention takes place. Therefore the researcher rejects the Non-Grades Plan.

With-in Class Ability Grouping

The third plan is the Within-class Ability Grouping which is another method of ability grouping. With-in class grouping has not been studied to the same depth as The Joplin Plan or the Non-Graded Plan. Research does show however, that “within class

ability grouping in mathematics clearly supports the practice, especially when only two or three groups are formed” (Hollifield, p. 3). Within-class Ability Grouping supports;

- Grouping students according to ability in one specific subject.
- Groups of students work on the same material at a rate that meets their needs, yet also challenges their abilities.
- Frequent informal assessments are given to students to document progress.
- Flexible grouping allow students to move to another group when sufficient progress has been made.

The opinion of the researcher is Within-class Ability Grouping is best suited to the site’s classrooms. All of the key aspects of Within-class Ability Grouping are in line with the site’s schedules and with the teachers’ best practices beliefs, which make the buy-in 100%! The site’s teachers are dedicated to ensuring students are not permanently placed in any of the three grouping levels. Frequent informal testing allows the site’s teachers to consistently review student progress and move students to another group when their skills have improved to an acceptable level. The site’s teachers also are willing to prepare lessons together in order to be certain all students are covering the state mandated material. In addition, they are enthusiastic about sharing ideas on how to instruct, strategies that work, and how to challenge every group level.

The site’s teachers have expressed how gratifying it is to see how students are more willing to share information and are more willing to take risks when they are with students of similar ability in mathematics. For many of the site’s students this is the first time they have been willing to raise their hand and be called on without fear of making a mistake, or without a more capable student blurting out the answer before the other

student had a chance to process the information. The researcher accepts this possible solution and will implement it as part of her action research project.

The Plan

District and Building Notification

Prior to beginning the action research the researcher met with the building principal to obtain permission. She also met with the Superintendent of Schools to gain permission and clarify district guidelines for her research. Parents must be informed prior to use of data in the research, with a clearly outlined statement that states names, student numbers and any other identifying information will be removed from any data collected. (Appendix E)

Identification of Students

The site's fourth grade teachers meet. Placement of students into groups is based on informal EasyCBM testing and the first round of Oklahoma Assessment of Skills and Knowledge (OAKS). Students are placed into three groups; intensive, strategic and benchmark. The intensive group has 13 students and is the smallest of the three groups. The strategic group has 21 students and the benchmark group has 25 students.

Teachers also used this first meeting time to plan lessons, to discuss teaching strategies, to share students' information regarding both skills and behavior, and plan for the first round of progress assessments at the end of one week of teaching.

Common Math Times and Curriculum Alignment

Before beginning the program, teachers agreed on a common 30-minute block of time for each day of the week. Teachers also agreed on a common curriculum that covers their third focal point for the National Council for the Teaching of Mathematics (NCTM). A curriculum map was created for the third trimester, which helped all three teachers to be intimately familiar with the state standards and the third focal point. This was critical to making optimal use of the 50-minute block of time. Teaching in all three groups will provide systematic and explicit instruction, tiered assessments and challenging work that falls within each group's ability level.

Small Ability Group Implementation

Small ability groups were implemented. Each of the site's three fourth grade teachers administered additional informal skills testing to ensure no student was placed incorrectly. Teachers used comprehensible instruction by delivering instruction in such a way that the information was easily understood by the diverse learners within the group. Each lesson includes these best practices as outlined by L.T. Goldsmith & J. Mark (2002, 7, 8):

- Fact retrieval practice, as it is crucial for long-term mathematical success.
- Systematic teaching of each key concept in the focal point.
- Curriculum-embedded assessment.
- Active engagement of all students.
- Acknowledgment of student accomplishments.

Student engagement is a key component in student success in numeracy success. Students must have the opportunity to construct their understanding and verbally share their mathematical thinking, all within the safety of a classroom that sees mistakes as opportunities to learn. The emotional safety of every student is critical to a student taking the risk of being wrong. Teacher expectations must be clear and well outlined, so every student knows what is required of them academically and behaviorally. When the classroom climate is one that is welcoming, students are willing to try, to share, to make mistakes, and to succeed.

Timeline for Action Plan

The following timeline combines curriculum mapping and best practices.

March:

- Pre-assessments are administered and scored.
- Fourth grade site teachers are assigned to specific groups.
- Curriculum mapping is completed.
- Specific teaching strategies are decided upon.
- Students are placed into one of three groups; intensive, strategic, or benchmark.

April - June:

- Ability groups begin.
- Weekly informal assessments are administered.
- Site teachers meet weekly to go over data and make student moves if data supports this decision.

- Weekly meetings allow teachers to discuss any problems, ask for help with instruction strategies, and share teaching strategies.
- The site's teachers journal daily lessons, setbacks, concerns, questions and successes.
- Data is collected and charted weekly so the data is manageable, problems are found in a timely manner, and progress is accurately documented.

Mid-June:

- Post assessment is given and scored.
- Post-surveys are given to both students and teachers.
- Data is accurately compiled to allow researcher to study in depth and come up with sound, well documented conclusions.

Conclusion

If within-class ability grouping is a good fit and is truly a sound best practice, students' scores should reflect this by an increase in students' scores for the current focal point, which is measurement, and for computational skills.

"Within class ability grouping can benefit students of all ability levels" (The Balanced View, 2002, p.32). If early and intense intervention of students who are struggling with simple numeracy enables these students to make significant gains, then the researcher will feel justified in implementing and researching the often controversial issue in education; ability grouping.

Action Research Proposal

Chapter Five – The Results

Mathematics scores have consistently dropped statewide over the last ten years. The researcher's school was no exception to this trend. Last year the researcher's school implemented a Response to Intervention (RtI) program to meet the growing need for intensive intervention for reading students. The results of this program were worthy of continuing the program this coming year. The researcher noted the small grouping of students, along with targeted instruction, was an instructional strategy benefiting all students, spanning intensive to talented and gifted.

The researcher spent significant time reading journal articles, educational publications and books dealing with small groupings for instructional purposes. According to Helen Abadzi in her article *Ability Grouping Effects in Academic Achievement*, Findley and Bryan describe the method of ability grouping as generally consisting of “teaching together students who function similarly in learning achievement” (201, p.36). Kulik's definition went further in saying ability grouping is “a practice that places students into classrooms or small groups based on an initial assessment of their level or readiness of ability” (1992, p.74).

The scholarly opinions spanned the breadth of an ocean and varied from vehemently opposing small groups and enthusiastically embracing them. At the top of the list of those who do not support ability grouping are those who claim school performance is often related to social inequity outside the school setting. “Such divisions contribute to the separation of students from different racial, ethnic, and social backgrounds’ (Oakes, 2005, p.14). Following this same vein of thinking is the claim that studies show inequity

increases over time (Hollinan & Sorenson, 1983). Anne Wheelock, author of *Keeping Track: How Schools Structure Inequality*, writes, “The practice of grouping by ability is too widespread and too widely accepted” (2005, p.14). Wheelock infers that tracking leads to labeling of students, which leads teacher to harbor different expectations of “high” and “low” students. These are just a few of the many scholars who have a firm stance against any type of ability grouping.

The very nature of math requires that grounding concepts are learned before the mathematical process can be continued (Harlan, 1999). Thus the case for ability grouping has more bearing in mathematics than other learning groups, because of the enormous range of abilities within each and every classroom. There are students who grasp mathematical concepts easily and are ready to move forward. There are also those students who struggle to get the concept, but do grasp the concept after working for several days. They also are able to retain this knowledge. Then there are those who seem to be trapped and cannot move forward no matter how many strategies are used.

It is the researcher’s opinion that the stumbling block for this last group of students is numerical sense. These students do not have the basic mathematical concepts that form the foundation for further mathematical learning, and cannot build on what is not there. They need an environment that uses the constructivist approach to building a solid mathematical foundation. As educators, each teacher has the responsibility for meeting the needs of each and every student in his/her room. This can be easier said than done in a fourth grade classroom with students whose math skills range from kindergarten to sixth grade.

Today's ability groupings are not those of the 1950's – the 1980's. Today's ability groupings are formed according to measured performance in specific subjects in school. Frequent assessments are given and reassignments are commonplace. The level and pace of instruction is based on students' needs for a certain concert vs. a group of students who are classified as "low" or "high" (Huitt, 1997). This flexibility helps safeguard students from being permanently placed in a "low" or "high" group.

After taking into account the opinions and research of those more scholarly than herself, the researcher decided to propose a Walk to Math program to meet the mathematical needs of the researcher's school's student population. Teachers from all grade levels were eager to try this educational approach, due in large part to the success experienced with the Walk to Read program.

The researcher chose to focus on the fourth grade students, since she is one of the fourth grade teachers at the school. All three teachers administered baseline testing and tested the students in Numbers and Operations, Measurement, and Numbers, Operations, and Algebraic Expression through the University of Oregon's EasyCBM testing site. Using these scores and each teacher's knowledge of the students, three groups were formed; intensive, strategic and benchmark. Teachers agreed to progress monitor weekly, meet weekly to analyze scores, and to move students as they made gains or showed a weakness in a specific mathematical area. Teacher G taught benchmark students, Teacher C taught strategic students, and Teacher N taught intensive.

The researcher's classroom is an octagonal shape room. Her room is brightly decorated in blues, greens, yellows and a bit of white. Research shows these colors have been shown to help students focus on learning. Large shelves are lined with hundreds of

appealing books. Bulletins boards include Focus on Reading and Focus on Math. Each of those boards celebrates the learning process. Several corners are available for students to read, practice math facts, solve mathematical puzzles, and to write to explain thinking. Every child is acutely aware that learning is valued within this classroom. We are a community of learners; growing and expanding our knowledge together.

The first week of Walk to Math was a real eye opener. Students in the benchmark group expressed their enthusiasm for being challenged and doing more difficult work. Students in the strategic group expressed similar enthusiasm based on challenging work and opportunities to be re-taught without concern that higher students would think they were dumb. Surprisingly the intensive group appeared to be the most enthusiastic of all. Time and again the researcher heard that it was fun to get to answer problems and students said they felt positive about understanding math for the first time. Even with all that enthusiasm, the researcher was most interested in seeing the progress monitoring scores as students were progress monitored. While all fourth grade students were monitored, the intensive group was the one on which the researcher focused.

The questions researched at the school site were:

- "What effect will ability grouping have on students' informal test scores on the meaning of numbers, ways of representing numbers, relationships among numbers, and the relative magnitude of numbers?"
- "What will be the effect on students' scores in Numbers, Operations and Algebra, after 13 weeks of small group instruction?"

Specifically, “What effect will ability grouping have on students’ informal test scores on the meaning of numbers, ways of representing numbers, relationships among numbers, and the relative magnitude of numbers?”

The first week small groups were tested on basic math facts in addition, subtraction, multiplication, and division. They were also given a formative assessment on simple algebra. The teachers then met to discuss where students were in math facts fluency and in basic algebra. Immediately teachers knew there were a few students who needed to be moved up a group and one who needed to be moved down to the intensive group. From there, teachers decided on what would be taught during each of the next 13 weeks, agreed on the formative assessments and summative assessments, and set dates for each of the weeks to meet. During these meetings teachers agreed to analyze the assessments, share strategies, share instruction materials, and discuss students we were concerned about or knew needed to move to another group. All teachers agreed that students should be able to move quickly if they were successful in making progress, and teachers desired to intervene just as quickly if a student was not making progress.

The researcher’s intensive group needed to have daily work on place value and basic facts as part of their instruction. 15-20 minutes per day was allowed for building these skills. The researcher knew these students could not succeed in moving to another group, without learning in depth these basic skills. The other forty minutes of instruction was on the same focused skill as the other two groups. Instruction was concrete and kinesthetic to engage students and to allow the students to build a sound foundation upon which to build mathematical knowledge.

The teacher for the strategic group used 10 minutes each day for review and to strengthen basic math facts. The next 30 minutes were used to teach the focused skill and the last 10 minutes were used for solving problems. Teacher C used 40 minutes to teach the focused skill and the last 20 minutes to do challenging work. Much of the instruction was concrete, but these students were ready to begin moving to abstract thinking.

The benchmark group was already thinking abstractly and the teacher knew they needed to extend their thinking and to be challenged with more difficult problems. This teacher decided to do more extensive testing to see where gaps existed. Using this information teacher G decided to teach to the gaps for 40 minutes and then use 20 minutes for Hands on Algebra in order to challenge these students.

Each week brought new insights to these teachers. The researcher noticed a light coming on in what had been a fog of misunderstanding for the intensive students. Her students were actually visibly excited about being in math class and hands were shooting up, anxious to answer questions. Teacher C noticed strategic students were eager to learn and were making noticeable progress in a relative short amount of time. Teacher G commented that her benchmark students were excited to come to class and share their thoughts and thoroughly explain their answers.

The researcher was pleasantly surprised when two students were recommended to move from strategic to benchmark and one from intensive to strategic within just two weeks of small group instruction. These students were set to be closely monitored over the next week to be certain these moves were beneficial to each of the students. During this same meeting the teachers listed the top reasons for the success we are witnessing in our groups.

- Students’ needs are being met.
- Students are being challenged.
- Students are feeling successful.

The researcher and her fellow teachers wanted to continue to see if these statements would continue to be true as the weeks turned into months.

During the fourth week of instructions, students took the second round of the Oregon Assessment of Skills and Knowledge (OAKS). At the end of that testing, it was noted that a significant number of students were still not meeting in mathematics. Teachers agreed it would be interesting to note the impact of small groups on state testing when students take the third round toward the end of the year.

After the first week of small group instruction all groups progressed monitored using EasyCBM. All groups showed improvement, however the intensive group showed the most dramatic gains.

Table 1.

Easy CBM Progress Monitoring for Intensive Students

Student	Progress Monitoring 4.1	Progress Monitoring 4.2	Gain/Loss
1	63	69	+6
2	50	56	+6
3	69	81	+12
4	69	69	0
5	63	81	+18
6	50	75	+25
7	69	88	+19
8	No Score		
9	56	94	+38
10	69	81	+12
11	69	81	+12
12	63	81	+18

Teacher G, teacher C and teacher N discussed the specific teaching strategies being used that were enabling students to make such significant progress in most instances. Two of the teachers used intensive, hands-on instruction that is clearly focused.

Informal formative testing is ongoing, with immediate feedback followed by re-teaching. Students are praised and encouraged. The third teacher is in her first year of teaching an intermediate grade, having previously taught kindergarten. This teacher lacked a clear understanding of focal points and did not grasp the importance for clear and focused instruction. The first two teachers worked with Teacher C to plan and implement purposeful lessons. These two teachers took turns team teaching a lesson with that teacher to strengthen her skills and confidence.

The researcher noted students in the intensive group could now perform a skill, but were unable to transfer that skill and knowledge to a real world situation. As a fourth grade team, teachers made a decision to call in our speech and special education people. Staff members spent several hours discussing the intensive students' inability to apply their skills. Since many of the intensive students have processing difficulties, these specialists offered some simple strategies to help students make real world connections.

- Using pictures
- Drawing models
- Building models

The researcher was already using two of the strategies, but with the help of the specialist was able to obtain pictures to extend students' understanding.

Example: A picture of a fence that is a rectangle.

Problem: This fence is a rectangle.

The length is 10 yards and the width is 6 yards.

What are the measurements of the other two sides?

A. 10 yards and 10 yards

- B. 6 yards and 6 yards
- C. 10 yards and 4 yards
- D. 10 yards and 6 yards.

By seeing the fence as a rectangle and labeling the length and the width, students were able to see the lengths were equal and the widths were equal, meaning the answer was D.

As a team teachers noted students in intensive and strategic groups often lack exposure to the real world, making it difficult for them to visualize a problem. Teachers reached a decision to provide these things:

- A. Real world experiences through videos.
- B. Multiple opportunities to apply mathematical skills within those experiences.
- C. Explicit modeling of application of a skill.
- D. A pictorial library of real life objects and situations.

Using this newfound knowledge, the fourth grade team taught a lesson on measurement using these strategies. Since students were studying linear measurement, teachers used paper clips, feet, and hands to measure items in the classroom. Desks, books, doors, chair height, etc... were all measured. Teachers used this exercise to help students determine why there was a need for a standard unit of measure. Then students measured all those objects again using a ruler and a yardstick. Students compared these measurements to the ones they took using nonstandard measures.

When teachers met at the end of the week each teacher commented on the depth of understanding most students could vocalize after using these strategies. EasyCBM bar graphs were created to visually show growth of students'

knowledge in measurement over the course of the 2009-2010 school year. These charts were analyzed by all three teachers and discussions emerged around steady progress, gradual progress, and in some instances, no progress.

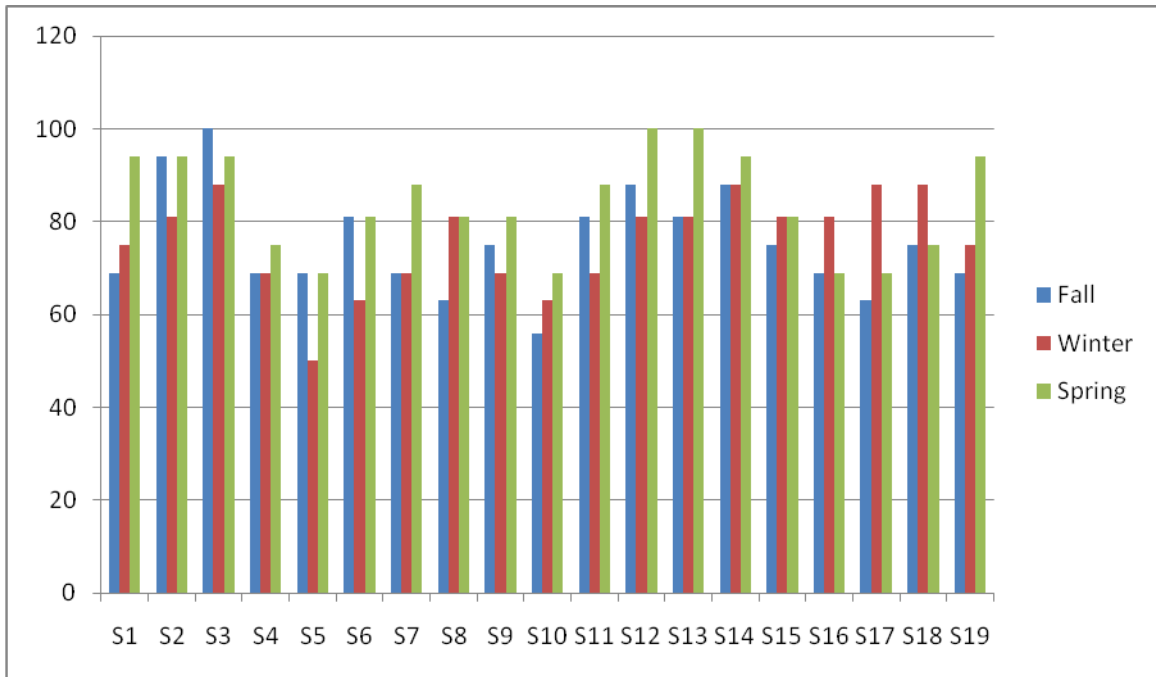


Figure 1. Teacher 1C – EasyCBM – Measurement



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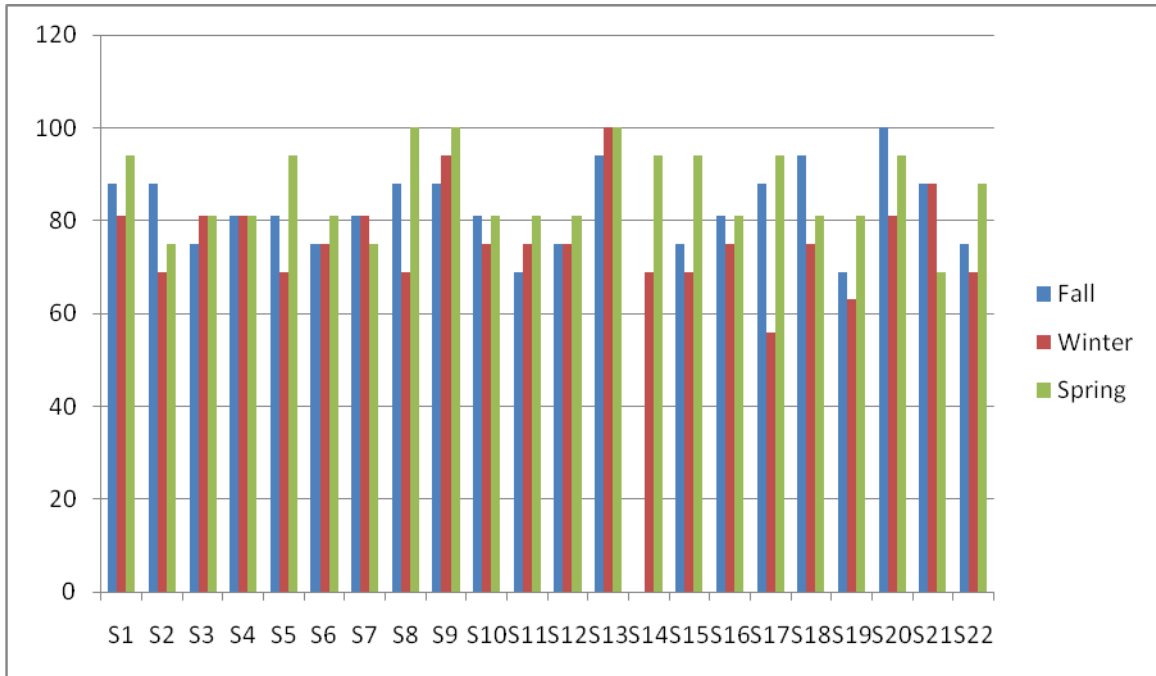


Figure 2. Teacher 2G – EasyCBM – Measurement

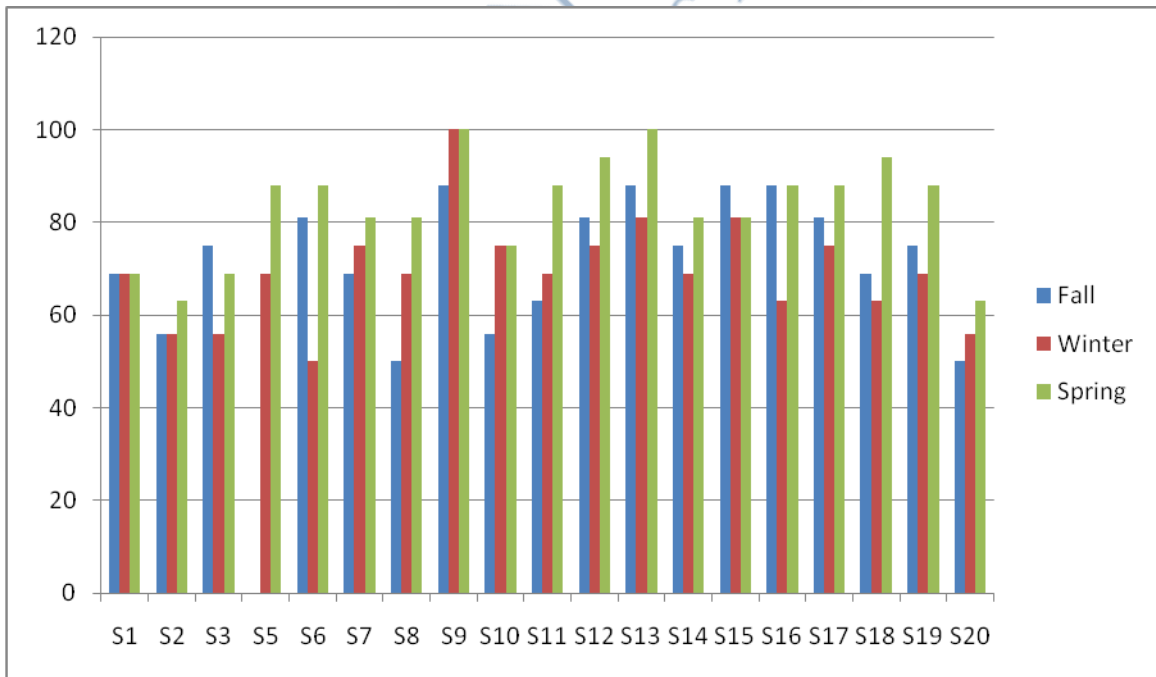


Figure 3. Teacher 3N – EasyCBM – Measurement

At this same meeting, the team discussed the positive and negative aspects of grouping students for mathematical instruction.

Table 2. *Positive and Negative Thoughts on Small Groupings*

Positives	Negatives
Students' needs appear to be met on a consistent basis.	We do not get to see all of our own classroom students in a mathematical setting.
Hands-on instruction for intensive and strategic students is a plus.	It is difficult to assign work that needs to be completed in a student's free time in the classroom, since teachers do not know which students have incomplete work.
Extensions and challenges are in all groups, however the benchmark group gets to those sooner.	
Tests scores have shown significant improvement in all groups.	The greatest improvement in scores has been within the intensive group. This can be considered a positive or a negative, depending on how a person views it.

The researcher, along with the other teachers, made a decision for the 2010-20211 year. The fourth grade teachers will test students within the first two weeks of school. The teachers will meet and decide the groups; intensive, strategic, and benchmark. All teachers will teach a whole group on the core standard for 30-35 minutes. Then students will go to one of the three other groups. Intensive students will work on math facts. Strategic students will review the core standard and then will have the opportunity to be challenged within the core standard. Benchmark students will be challenged within the core standard. This decision will allow teachers to work with all their students in a mathematical setting. Students will have the opportunity to work with their peers, but will also have their unique needs met within the small group settings.

Teachers will still meet each week to look at students who need to move to another group. Data from EasyCBM will allow teachers to progress monitor each student on a regular basis. All teachers will be using the same test, so data will be taken from the

same test for all students. The researcher and the other teachers will continue to meet with the special teachers to ensure students with special needs will have all their needs met and will have an equal chance to excel in math.

At the end of the school year, all three teachers retested Math Measurement in EasyCBM. A graph showing class growth for each of the three classes is provided to show the progress of each of the three fourth grade classes.

Table 3.

EasyCBM Benchmark Testing – 3rd Trimester – All Students

Math Measurement 4.1 – 16 possible correct	5-8 correct	9-12 correct	13-16 correct
Teacher C	0	12	7
Teacher G	1	9	11
Teacher N	1	8	10
Math Measurement 4.3 – 16 possible correct	5-8 correct	9-12 correct	12-16 correct
Teacher C	0	8	11
Teacher G	0	8	13
Teacher N	1	6	12
Math Measurement 4.5 – 16 possible correct	5-8 correct	9-12 correct	13-16 correct
Teacher C	0	4	15
Teacher G	0	3	18
Teacher N	0	4	15

The graph demonstrates the growth students experienced over the year, the most significant growth taking place during the last trimester. By the end of the year, there were no students who scored below 67% percent on measurement. 11 of the 59 scored between 69% and 75% and 48 of the 59 students scored 80% to 100%. This is a noteworthy gain for all students.

Data is a wonderful tool when properly used. As a tool, data is not a decision maker, but rather data is to be used to inform and guide wise educational decisions about appropriate instruction. Based on the research done over these last 13 weeks, the researcher does not feel qualified to make a rock solid statement that claims small groupings are the cure-all for mathematical gaps in student learning. The researcher does, however, feel strongly about the use of small groupings to enhance learning of mathematics for all students. Thirteen weeks of teaching small groups and working side by side with talented peer teachers has shown the benefits of and the depth of learning that can take place in small learning groups. It has also shown that small groupings must be continually monitored, progressing monitoring must be consistent and focused, and a team of teachers must work closely to ensure groupings serve students equally.

The researcher plans to continue working with the small mathematical groupings during the next school year. The researcher also plans to continue documenting progress, obstacles, and strategies to further explore the benefits of small groupings, as well as to also document any disadvantages. As this point in the research, the researcher feels confident making this statement, "Small groupings that have a clear purpose, that are taught by skilled teachers, that are progress monitored consistently, and that are designed

to be flexible in nature, have the potential to increase mathematical scores of elementary school students.”

Suggestions for Further Research

Researching small groupings to increase mathematical understanding has been rewarding, however it has also brought to mind several possible areas of research related to mathematical learning. The researcher has chosen to continue to focus on mathematics and numeracy, as this is a logical extension of the research already completed. The researcher plans to continue to research the effects of numeracy sense, as it relates to students’ learning.

- What is numeracy? How does numeracy or lack of numeracy affect a student’s ability to learn mathematical concepts?
- What is the connection between being an English Language Learner and being able to master numeracy?
- How does the reading level of students affect students’ ability to master numeracy?
- To what degree can small groupings improve numeracy in elementary school students?
- To what will the National Council for the Teaching of Mathematics Core Standards help to improve students’ numeracy?

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1. What do you like best about math?

2. What do you like least about math?

3. Name two areas of math you are good at.

4. Name two area of math you think you could use some help with.

5. Do you feel you are a good mathematician?

6. What makes someone a good mathematician?



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Appendix B

Student Survey

1. What do you like best about math?

2. What do you like least about math?

3. Name two areas of math you improved in.

4. Name two area of math you think you feel you still need help with.

5. Do you feel you are a good mathematician?

6. What makes someone a good mathematician?



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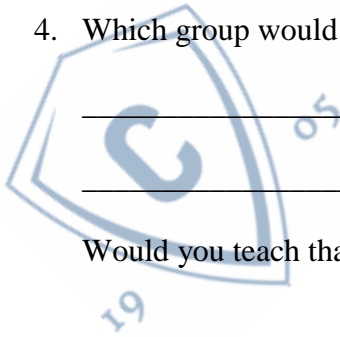
1. What are your thoughts on small groupings for mathematics instruction?

2. Are you in favor of Walk to Math? (please explain any advantages or misgivings)

3. As part of a team for Walk to Math, which groups would you feel qualified to teach?

4. Which group would you feel the least comfortable teaching?

Would you teach that group if you knew you had help and support? _____



1. What are your thoughts on small groupings for mathematics instruction?

2. Are you in favor of continuing Walk to Math? (please explain any advantages or misgivings)

3. Were you comfortable with and successful in teaching your small group? (Please explain.)

4. Which group would you feel the least comfortable teaching next year?

Would you teach that group if you knew you had help and support? _____

