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The Effect of Flexible Small Groups on Math Achievement in First Grade

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Abstract

This action research study explores the Guided Math Approach to improving math scores for first grade students. Previous MAP (Measure of Academic Progress) scores were used to measure proficiency and students were placed in separate categories for appropriate instruction. This study reviewed math achievement scores on MAP test from a First grade classroom in a rural area of southern Kentucky. The results from this study reflect an improvement in student mathematical knowledge and achievement of eleven below level students in the Math concept “Telling Time to the Hour and Half-hour” as required by Common Core Standard. All students received instruction within flexible grouping rotation of one hour and fifteen minute blocks. Below level students were extracted during instruction time and grouped to provide small group instruction in cooperation and individual work. The smaller group instruction is guided by the teachers to address deficiency areas identified within the pre-test assessment. The analysis revealed one hundred percent proficiency in the instructional lesson used for this study. The finding support the potential benefits and continuous need to explore the benefits of Guided math approach for student achievement in math.

Introduction

Education is an inspiring field that can help students achieve great things. David Benders, a professor of education at Union College provided the research guidance and worked with Tracy Craft, a first grade classroom teacher, during this research study. This Action Research project is a demonstration of Tracy Craft’s self-reported approach to become a better teacher. Its results influenced instructional modification within Tracy Craft’s approach to learning and assessment of student learning and instruction practices. Tracy Craft served as the primary researcher and writer for this project.

Background

Children may require different degrees and types of intervention at different times in their school career, or for different aspects of the mathematics curriculum. Interventions should be guided by data to identify a student's strengths and weaknesses. Flexible small grouping in mathematics, also known as Guided Math, is a data-driven intervention that matches a student's readiness level for learning with the appropriate instructional strategy, delivering the right content at the right pace. Flexible grouping is an ongoing intervention process where a student's assignment to a particular ability group can change based on performance of improved competency and skill development.

One difficulty facing educators today is meeting the needs of individual learners. The traditional classroom now encompasses a range of mixed abilities among students - some struggling to meet grade level standards to those performing above grade level. According to research, differentiated instruction is the most effective teaching strategy to improve student achievement (Slavin, Lake, & Groff, 2010). As Slavin et al. reported, for the United States Department of Education research entitled, *Educator's Guide: What Works in Teaching Math?*, programs designed to change daily teaching practices – particularly through the use of cooperative learning, classroom management, and motivation programs – have larger impacts on student achievement than programs that emphasize textbooks or technology alone." (2010, p. 3).

Literature Review

Greater importance has been placed on students to make measureable academic gains in key academic areas, "The No Child Left Behind (NCLB) Act of 2001 requires states to ensure that all students make adequate yearly progress in achieving proficiency in English, language arts, and math," (Louie, Bratt, Yang, & Tan 2008; Sammons, 2010)." Research conducted by Clements and Sarama suggested that "too many children not only start behind their more advantaged peers, but also begin a negative trajectory in mathematic (2011, p. 968)." Early intervention programs designed to target early mathematical skills in the primary grades can have positive effect on children's achievement throughout their educational career. Barnett states that "early education intervention has been proposed to partially offset the impacts of poverty and inadequate learning environments on child development and school success" (2011, p. 975).

Significant efforts are being made to improve reading through research-based instructional strategies, resources, and professional development; however, there is limited number of designated resources dedicated toward mathematical instructional initiatives (Crowe, Connor, & Mazzocco 2011). Many math educators are still delivering math instruction in a one-size fit all models. Classrooms are filled with mixed abilities ranging from learning styles to academic readiness. Differentiated mathematic instruction is a powerful way to potentially increase student learning is a strategy supported by several researchers (Huebner 2010; Murray 2007; Newton 2013; Sammons, 2010; Taylor-Cox 2013). Unfortunately, most teachers today have limited resources and support to help them in the development and delivery of differentiated math instruction.

Guided Math framework claim that it "offers teachers an alternative to the whole-class instructional model so frequently used for mathematics instruction," (Newton 2013, p. 41). It is very hard to meet the needs of all students at their level during whole-class instruction, but flexible groups allow time for students to get needed instruction. Guided Math offers a flexible grouping framework based on students' academic needs as determined by formative, summative,

and/or diagnostic testing. Flexible groups are more effective than ability grouping because “students are assessed frequently for growth and reassigned to different groups based on assessment” (Tieso, 2002, p. 5). Flexible grouping provides students an opportunity to learn at their level and proceed to higher levels of achievement. Student achievement growth should improve by getting the support they need.

Methods

The research began with meaningful reflection on my instruction and on the needs of my students, as I articulated the purpose of my research. Through classroom observations, summative assessments, and MAP test data, I discovered a deficiency in mathematical understanding in a large number of my students. I knew there was a need for math intervention, but was uncertain how to implement an effective program within my classroom. This inquiry led me to this action research on flexible small grouping as a math intervention.

Setting and Participants

The school was a P-6 school located in a rural area of southern Kentucky. Total school population was 271, 100% white (Non-Hispanic). Free/reduced lunch rates averaged 65% of total school population. The focus of this study was to explore the academic performance of flexible small grouping on Math achievement of below level students in First grade. The class was a mixed-ability class of 25 students. According to the winter 2013 MAP test, 11 of the 25 students were below level in Mathematics. This below level group consists of seven boys and four girls.

Intervention Strategy

Flexible grouping provided an opportunity to efficiently manage instructional time and focus on smaller group needs. A flexible grouping rotation of one hour and fifteen-minute math block was organized with student separated in three groups based on the winter’s MAP test. The table below details the rotation schedule and instruction focus for the three groups.

Table 1: Sample of daily flexible small group rotation schedule

	Below Level (7 students)	On Level (10 students)	Above Level (8 students)
Introduction to skill 10 - 15 minutes (use online resource, white board, student book, etc.)	Whole Group	Whole Group	Whole Group

15 minutes	Meet with Teacher review past skills through daily skill review, reteach daily skill focus, begin working on independent work to correct misconceptions	Cooperative Work Games/Computer review skills	Independent Work practice workbook pages math journal challenge
15 minutes	Independent Work practice workbook pages apply skills from small group instruction	Meet with Teacher review past skills through daily skill review, fluency practice addition & subtraction, begin working on independent work to correct misconceptions	Cooperative Work Games/Computer review skills new skills
15 minutes	Cooperative Work Games/Computer review skills	Independent Work practice workbook pages apply skill for the day	Meet with Teacher review daily completed independent work, review past skills through daily skill review, enrichment activity increased to 2 nd grade level common core standards
Review Session 10 - 15 minutes (math journal)	Whole Group	Whole Group	Whole Group

Data Collection

MAP Test

MAP (Measures of Academic Progress) is a computerized adaptive assessment that students in grades one through six are tested three times per year in math, reading, and language arts. Students are required to show progress among the three MAP tests: Fall test in August/September; Winter test in December/January; and Spring test in April/May. The MAP test generates test questions based on student responses and measures growth over a period of time.

First grade students are tested in four critical mathematical areas: algebraic reasoning; number and operations; geometry; and measurement and data. A student’s test performance is measured and reported in RIT scores. A RIT score is an estimation of a student’s instructional

level and measures student progress in school. This score can be used by teachers to pinpoint what students have learned and what students are ready to learn.

Students' test data is then transferred to a Decile Report. The Decile Report places students into percentile rankings in relation to their RIT scores.

Student Work Samples

On the first and last day of the unit of study, students completed a pre-test and post-test. This provided evidence of achievement as the MAP test were not offered until later in the term. Throughout the two-week unit, students completed daily individual practice sheets and exit slips. By collecting and analyzing student work samples, I was able to assess both the quality of their work and their acquired knowledge of the focused math concept. This served as an indicator to move students within the three flexible small groups according to their performance.

The pre-test was a set of questions given to students before the instructional unit began to determine their knowledge level of the math content. After the completion of the unit, students were given the post-test to answer the same set of questions. Comparing students' post-test scores to their pre-test scores determined whether the flexible small group was successful in increasing the student's knowledge of the math content.

Daily practice sheets were completed by the students, either independently or with a partner, depending upon the skill task. The practice sheets consisted of a set of two to four worksheets that target the daily skill. Skill demonstration varied from simple identification of time to the hour or half-hour, drawing hands on an analog clock to show correct time, and/or calculating elapsed time. Reviewing student's daily practice worksheets provided an opportunity to assess students' weaknesses and strengths.

The Exit Slip was another type of formative assessment that was used to informally measure how well students have understood a topic or lesson. Exit slips were used the first 2-3 days after a new math concept was introduced. Students were given an Exit Slip during the last five minutes of the math block. It consisted of questions relating to the daily focus skill. By assessing the responses on the Exit Slips, I could adjust the instruction to accommodate students' needs for the next class.

Results

Before administering the flexible small group intervention, I tested the students' current knowledge of how to tell time to the hour and half-hour using an analog and digital clock. A pre-test and post-test was given which focused on three skills: identifying digital and analog time; writing digital time from an analog clock; and drawing minute and hour hands on analog clock to show corresponding digital time. Although the pre-test was given to all 25 students, this action research focused on the academic improvement of 11 below level students. The pre-test results showed that five students scored below 20%, and one student scored the highest of 50%. The average pre-test score for the participating students was just below 25%.

During the first "Work with the Teacher" intervention session, I asked the students to complete a practice page which required them to identify the hour and minute hand on an analog clock by coloring the hour hand red and minute hand blue. I noticed that 3 students incorrectly identified the clock hands. I conducted a quick reteach session from the earlier whole group lesson using a large demonstration clock, pointing out the size and name of each hand. I asked the students to set their student demonstration clock to various times as I called them out (1 o'clock, 4

o'clock, 7 o'clock), while saying the name of each clock hand as they touched it. This effectively allowed them to correctly identify the minute and hour hands.

In each "Work with the Teacher" intervention session, I began with a 3-5 minute past skill review and followed with a reteach worksheet of the day's whole group instruction. Afterwards, students began working on their practice worksheets. This group consistently relied upon their student demonstration clocks to complete the assigned worksheets, especially in completing practice pages requiring them to draw the hour and minute hands to show time on an analog clock.

On days two and five of the instructional unit, students completed an Exit Slip. Each Exit Slip consisted of six questions. The first required students to identify time to the hour on an analog clock and write the time in a digital format. The second required students to identify time to the half-hour on an analog clock and write the time in digital format.

Data Interpretation

The pre-test and post-test results suggest tremendous growth in student achievement. The data from the pre-test shows that all 11 students scored below mastery level with a mean average of 24.5% and median score of 30%. The post-test results indicated an increase in student growth to an average score of 90.9% and mode score of 100%. According to the post-test, 6 students reached "Mastered" level while 5 are considered to be in the "In Progress" level.

Teacher observation and review of student work indicated students' progress of mathematical understanding of telling time to the hour and half-hour concept. Daily completed practice sheets by students proved to show 85%-90% accuracy within the below-level group. Informal teacher directed re-teaching instruction and worksheet practice provided students additional support in completing daily assignments. Daily assignments were reviewed by teacher and presented to the students with verbal or written feedback of student performance. Students were asked to identify any mistakes and explain their reasoning for their answer choice and ways to correct the mistake.

The students' performance on the exit slips showed an increase in conceptual understanding of the math concept. All 11 students completed the first Exit Slip with a mean average of 100%. Only 9 of the 11 students accurately completed the second Exit Slip. Two students missed two questions each with a mean average of 66.7%. It appeared that these two students misread the hour hand as it was set at half-past the hour and they wrote the hour ahead. The following day, I asked these two students to take another look at their incorrect answers, each student was able to tell me their mistake and correctly identify the time.

Conclusions

Results from the pre-test and post-test suggest that student achievement and growth may depend on the types and amount of instruction. These relations draw attention to the fact that not all students respond in the same way to instruction and that the growth experience may depend on the amounts and types of mathematics instruction their teacher provides. No two children with difficulties in math are the same. It is important to find out their strengths, weaknesses, misconceptions, and incorrect strategies. The flexible small group intervention allowed me to identify and target individual student's particular difficulties. The below-level group benefited far more from small group instruction than from whole-class teaching.

When the quality core instruction is not sufficient to meet the needs of all students, smaller groups and more individualized instruction are needed to remediate (National Center on Response to Intervention, 2010). Overall, it appears that average students perform similarly whether they are provided with predominately whole-class instruction or small student/peer group instruction. However, for students who begin first grade with below grade level scores, the small student/peer group instruction seems to facilitate an increase in mathematical understanding and achievement.

Further research is necessary to explicate whether these small group interactions will increase student's overall mathematic achievement to specific math skills by the end of first grade. Overall mathematic achievement data will be available upon the completion of the Spring MAP test in late May 2014.

Students do not begin first grade on a leveled academic playing field. Under my former whole-class instruction, I noticed very little growth of mathematic achievement in below level students, thus widening the gap in student math achievement levels. I tried to differentiate instruction within the whole-class instructional environment, but I was unable to effectively meet the needs of every student. Research suggested that flexible small group instruction and workstations for children with similar needs was an effective and workable solution to my problem (Huebner 2010; Murray 2007; Newton 2013; Sammons, 2010; Taylor-Cox 2013). This approach had already been embraced within my school with great success in our literacy instruction.

Flexible small group instruction reaches all students at their level of development and takes them to the next level (Sammons, 2010). The use of flexible small groups has allowed me to differentiate instruction from the struggling students to the students having difficulty with just one skill or concept, to those who are advancing quickly through the material and need new challenges.

Schools, more importantly teachers, are held accountable for student achievement. Though reading instruction has been the primary push for the last several years at my school, I foresee mathematics achievement gaining momentum as a problem area. I recognized that changes needed to be made to my mathematics instruction to address the differences in students' strengths and weaknesses in regards to their learning needs.

Collecting mathematic data on my students has helped me to make solid, data-based decisions. The use of data from the MAP test helped guide my flexible small grouping and mathematics instruction. Additional data collection through formative and summative assessments allowed me to measure student growth and adjust small group instruction to meet students' needs.

Changing my practice was a challenge. I needed a lot of guidance before I could embark on this project, but the result was worth the effort. Implementing flexible small grouping during math instruction has helped to alleviate the problem I had in effectively managing time with students to meet their individual needs and increasing student achievement as prompted by the former whole-class instruction I was so accustomed to executing.

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