

Introduction

Research has shown that students struggle with fractions. This project was designed to help students understand fractions through hands-on activities and visual models.

The purpose of this project was to help students understand fractions through hands-on activities and visual models.

Theoretical Framework

The Five Strands of Mathematical Proficiency:

- Conceptual Understanding
- Procedural Fluency
- Strategic Competence
- Adaptive Reasoning
- Productive Disposition

Key points from this learning progression:

- Unit fractions
- Equivalent fractions
- Comparing fractions with the same denominator
- Comparing fractions with the same numerator

Methodology

Participants and Procedure

Each student came to class at least once a week for seven one-hour sessions plus the introductory and concluding interviews.

Participants: 10 students

Procedure: 7 sessions

Methodology

Data Gathering and Analysis

The students were given tasks and a number line. They were asked to explain their work and to compare their work with others. The data was analyzed using the Five Strands of Mathematical Proficiency.

Data gathering and analysis procedures:

- Observation
- Interviews
- Document analysis
- Task analysis
- Analysis of student work
- Analysis of student interviews
- Analysis of student work
- Analysis of student interviews

Reflection and Discussion

CCSS.MATH.CONTENT.4.NF.A.2 states: [Students should] Understand a fraction as a number on the number line; represent fractions on a number line diagram. In our experience over the course of this project, students had the most trouble with this particular standard.

Key Points to Remember:

- The idea of having the same whole
- Maintaining student interest
- Visual models
 - relativity
 - equal parts

Synopsis

Initial Assessment Results

The results from the completed initial assessment were generally very low. This suggests that the students had very little understanding of fractions.

Instructional Sessions (Weeks 2-3)

'Fraction Art'

The students created a visual model of fractions using colored paper.

'Fraction Wall'

When asked to make a fraction equivalent to 1/2, the students were able to make a fraction equivalent to 1/2 using their fraction wall.

Students completed and adapted learning tasks during the week. They had the most trouble with the task of representing fractions on a number line diagram. They also helped students develop a productive disposition toward mathematics.

Instructional Sessions (Weeks 4-6)

We focused on the task of representing fractions on a number line diagram. The students were given a task that required them to represent fractions on a number line diagram. They were given a task that required them to represent fractions on a number line diagram.

The children expressed difficulty in representing fractions on a number line diagram. They were given a task that required them to represent fractions on a number line diagram.

Empirical Teaching and Learning Trajectory

Post Assessment Results

The results from the post assessment were generally higher than the initial assessment. This suggests that the students had a better understanding of fractions after the instructional sessions.

Instructional Sessions (Weeks 7-9)

The students were given a task that required them to represent fractions on a number line diagram. They were given a task that required them to represent fractions on a number line diagram.

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Developing Fraction Proficiency in



Fourth Grade Mathematics



Alexis Perno, Salisbury University & Andrea Widdowson, Wor-Wic Community College
Mentor: Jathan Austin, Salisbury University



Synopsis

Reflection and Discussion

CCSS.MATH.CONTENT.3.NF.A.2 states: [Students should] Understand a fraction as a number on the number line; represent fractions on a number line diagram. In our experience over the course of this project, students had the most trouble with this particular standard.

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Empirical Teaching and Learning Trajectory

Theoretical Framework

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- Conceptual Understanding
- Procedural Fluency
- Strategic Competence
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- Productive Disposition

Key points from this learning progression:

- Unit fractions
- Equivalent fractions
- Computing fractions with the same denominator
- Computing fractions with the same numerator

Introduction

Research indicates that third grade students in the United States struggle with fractions. This is an important time for an intervention to take place to address the needs of these students.

The purpose of this study was to explore the effectiveness of a research-based intervention for third grade students who struggle with fractions. The goal of this study was to explore the effectiveness of a research-based intervention for third grade students who struggle with fractions.

Initial Assessment Results

The results from the completed initial assessment were generally very encouraging. This example shows the responses to strategic example three that this study initially had.

After three weeks, it was also reported that the students had some conceptual knowledge. The correct answer is a question that all students answered.

Instructional Sessions (Weeks 2-3)

"Fraction Art" and "Fraction Wall"

The students designed a job sheet that they could use to help them understand the concept of fractions.

When making the students, we did to make a fraction poster to use in their fraction work.

Strategic competence and adaptive reasoning was shown in each activity by having the students solve these problems and explain their answers. They also helped students to learn regarding their disposition toward mathematics.

Instructional Sessions (Weeks 4-6)

We have provided this activities to add the concept of reading fractions. The intent of this activity was to get the children thinking about operations some quickly and they explaining the relative distance of the number line.

The children exercised skills in strategic competence by using the "Fraction-Relatives" it was. By having more than fraction bars, the students had to connect their thinking to the way these proportions in a more complex way.

Post Assessment Results

The students did not understand the concept of the relative distance of the number line.

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Instructional Sessions (Weeks 7-8)

The students were able to explain the concept of fractions and all of their operations. They can use the fraction bars to help them understand the concept of fractions.

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Methodology, Participants and Procedure

Each student came to learn about one week for seven one-hour sessions plus the introductory and concluding interviews.

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Methodology, Data Gathering and Analysis

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Developing Fraction Proficiency in Fourth Grade Mathematics



Alexis Perno, Salisbury University & Andrea Widdowson, Wor-Wic Community College
Mentor: Jathan Austin, Salisbury University



Introduction

Research indicates that third grade students in the United States have difficulty with multiple mathematical topics they are expected to learn upon entering the fourth grade.

The 3rd National Core State Standards report that by the end of third grade students should have a strong foundation in:

- fraction representations
- multiplicative relationships
- fraction proximity of a whole and half a unit

The purpose of this study was to explore and describe four related fourth grade student thinking about fractions. The specific research questions were:

1. What difficulties do the students have with fractions concepts presented by the Common Core?

2. What types of representations and coaching strategies are effective in helping the students develop mathematical proficiency with fractions?

Theoretical Framework

The Five Strands of Mathematical Proficiency:

- Conceptual Understanding
- Procedural Fluency
- Strategic Competence
- Adaptive Reasoning
- Productive Disposition

Key points from this learning progression:

- Unit fractions
- Equivalent fractions
- Comparing fractions with the same denominator
- Comparing fractions with the same numerator

Synopsis

Methodology Participants and Procedure

Each student came in to our classroom once a week for seven one-hour sessions plus the introductory and concluding interviews.

Daisy (female)
Jordan (female)
Jay (male)
Nick (male)



Methodology Data Gathering and Analysis

The students were given both a written and a verbal interview style pre-assessment so that we could gauge their level of comprehension. After seven weeks of instructional sessions, students were given a post-assessment that consisted of the same set of interview and written questions.

Data gathering and analysis procedures followed:

- filmed sessions
- collection of student work samples
- watched video and transcribed verbatim
- reviewed transcript and coded segments using the 5 Strands of Mathematical Proficiency
- summarized students' attainment and made students' thinking
- Created a design of the next lesson.

Reflection and Discussion

CCSS.MATH.CONTENT.3.NF.A.2 states: [Students should be able to] Understand a fraction as a number on the number line; represent fractions on a number line diagram. In our experience over the course of this project, students had the most trouble with this particular standard.

Key Points to Remember:

- The idea of having the same whole
- Maintaining student interest
- Visual models
 - relativity
 - equal parts

Developing Fraction Proficiency

Fourth Grade Mathematics

Introduction

Research confirms that third grade students in the United States have difficulty with multiple mathematical topics they are expected to know upon entering the fourth grade.

The Common Core State Standards report that by the end of third grade students should have a strong foundation of:

- fraction representation
- inequalities and equivalency
- fraction proximity of a whole and half a unit

The purpose of this study was to explore and develop four rising fourth grade students' thinking about fractions. The specific research questions were:

1. What difficulties do the students have with fractions concepts prescribed by the Common Core?
2. What types of representations and teaching strategies are effective in helping the students develop mathematical proficiency with fractions?

Theoretical Framework

The Five Strands of Mathematical Proficiency :

- Conceptual Understanding
- Procedural Fluency
- Strategic Competence
- Adaptive Reasoning
- Productive Disposition

Key points from this learning progression :

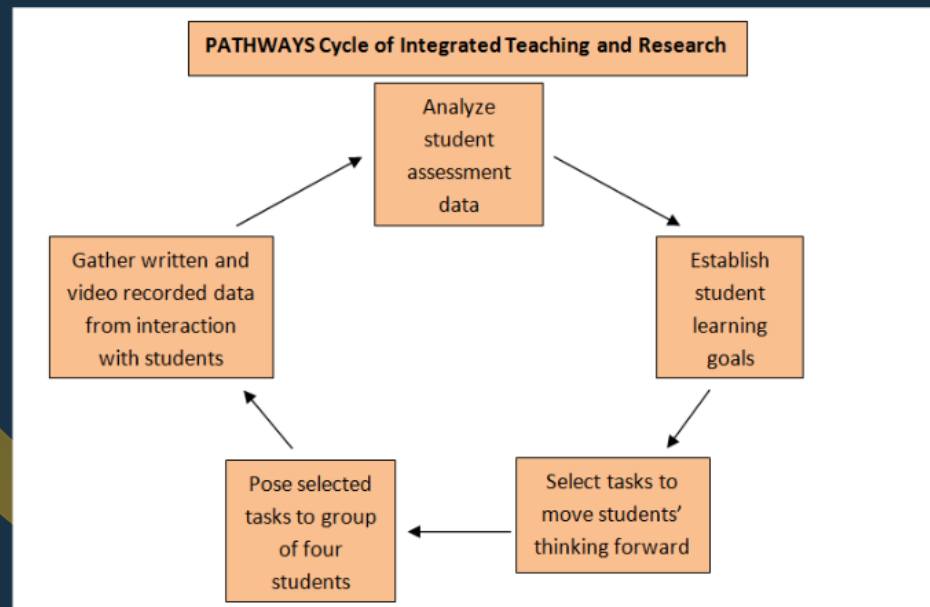
- Unit fractions
- Equivalent fractions
- Comparing fractions with the same denominator
- Comparing fractions with the same numerator

Methodology

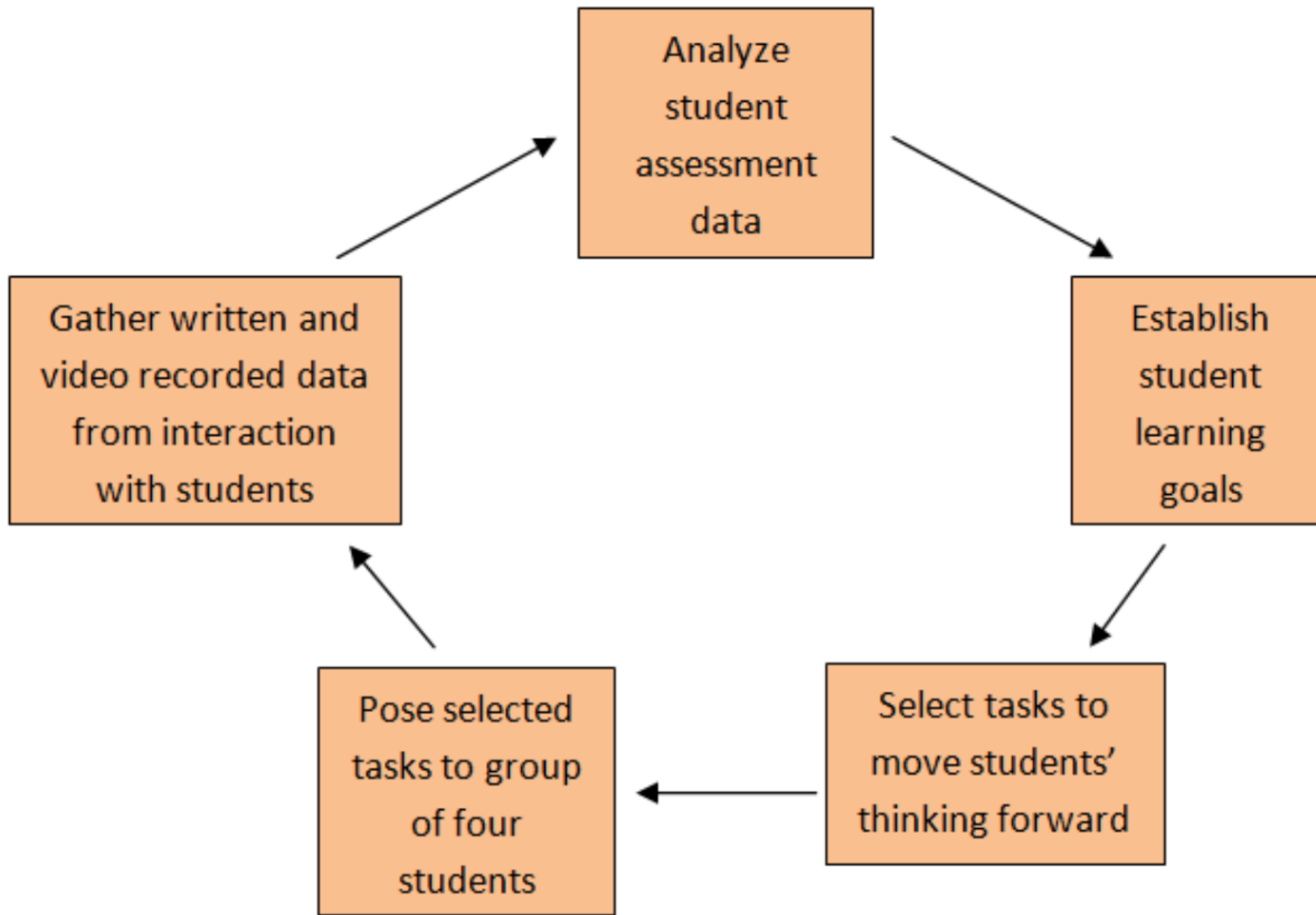
Participants and Procedure

Each student came in to our classroom once a week for seven one-hour sessions plus the introductory and concluding interviews.

Daisy (female)
Jordan (female)
Jay (male)
Nick (male)



PATHWAYS Cycle of Integrated Teaching and Research



Methodology

Data Gathering and Analysis

The students were given both a written and a verbal interview style pre-assessment so that we could gauge their level of comprehension. After seven weeks of instructional sessions, students were given a post-assessment that consisted of the same set of interview and written questions.

Data gathering and analysis procedures followed:

- filmed sessions
- Collection of student work samples
- Watched video and transcribed verbatim.
- Reviewed transcript and coded segments using the 5 Strands of Mathematical Proficiency
- Summarized students' attainment and made data-based conjectures about how to enhance students' thinking
- Created a design of the next lesson

Reflection and Discussion

Math.CONTENT.3.NF.A.2 states: [Students should] understand a fraction as a number on the number line; represent fractions on a number line diagram. In our lessons over the course of this project, students had the opportunity to work with this particular standard.

Key Points to Remember:



- The idea of having the same whole
- Maintaining student interest
- Visual models
 - relativity
 - equal parts

Initial Assessment Results

The results from the completed initial assessment were overall very inconsistent. This example shows the weakness in strategic competence that this student initially had:

Aside from weaknesses, it was also apparent that the students had some combined strengths. Pictured below is a question that all students mastered:

Instructional Sessions (Weeks 2-3)

"Fraction Art"

The students designed a shape that fit into specific guidelines we provided.

"Fraction Wall"

When asked to, the students were able to make a fraction equivalent to $\frac{1}{2}$ using their fraction walls.

Strategic competence and adaptive reasoning was shown in each activity by having the students solve these problems and explain their reasoning. They also helped students develop a productive disposition toward mathematics.

Empirical Teaching and Learning Trajectory

Instructional Sessions (Weeks 4-6)

We incorporated dice activities to add the element of random selection. The intent of this activity was to get the children thinking more about equivalency more quickly and thus exhibiting procedural fluency while completing this task.

The children exercised skills in strategic competence during our "pizza-fractions" lesson. By moving away from fraction bars, the students had to convert their thinking to represent these proportions in a more complex way.

Post-Assessment Results

One weakness that was consistent for all four students was the ability to interpret number line representations of fractions.

Students generally performed better, however, on post-assessment problems involving the comparison of fractions by showing the percentage of correct responses given for each of the four fraction pairs.

Instructional Sessions (Weeks 7-8)

The final two weeks of instruction focused on a more in-depth exploration of fractions and all of their components. This was a great fit for the students as it built on their previous learning. The children's fraction activity we conducted is shown below.

In another lesson entitled "Fraction Avenue," we addressed the students' disposition toward their work, displaying a productive disposition toward their work.

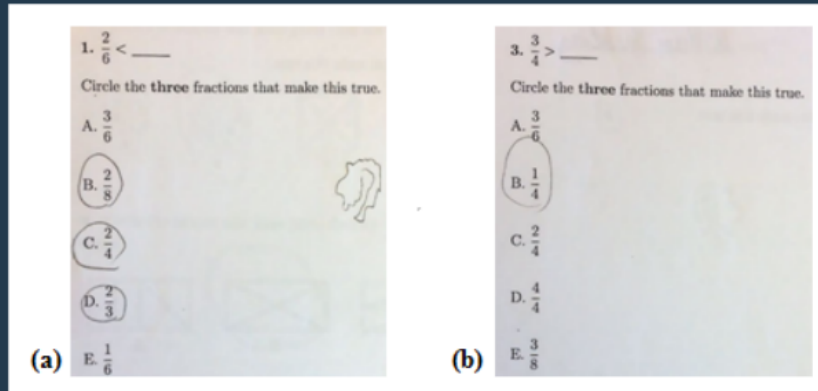
The children demonstrated strategic competence by solving these problems and creating the correct fraction to represent the amount of candy on a tray.

Fraction Proficiency in

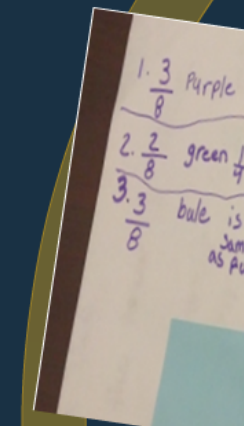
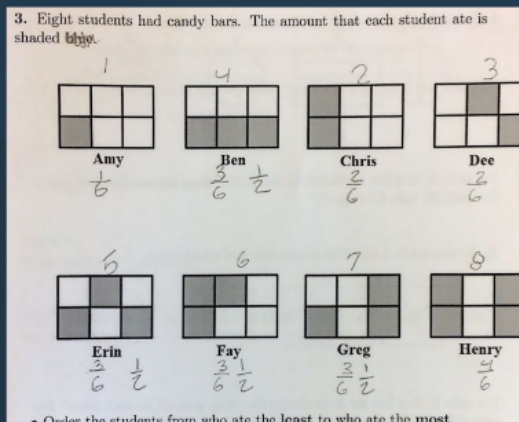


Initial Assessment Results

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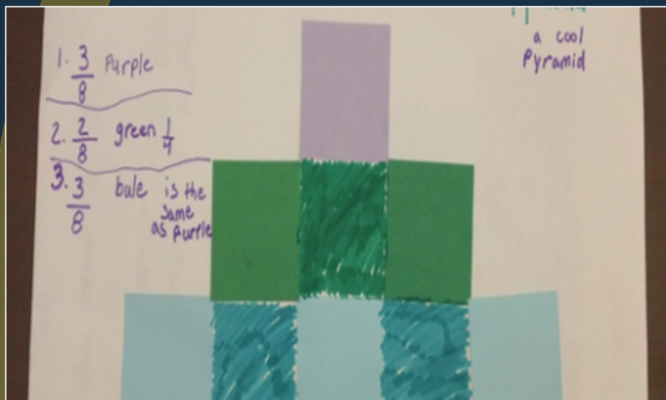
Aside from weaknesses, it was also apparent that the students had some combined strengths. Pictured below is a question that all students mastered:



The student fit into specific

Instructional Sessions (Weeks 2-3)

"Fraction Art"



The students designed a shape that fit into specific guidelines we provided.

"Fraction Wall"



When asked to, the students were able to make a fraction equivalent to $\frac{1}{4}$ using their fraction walls.

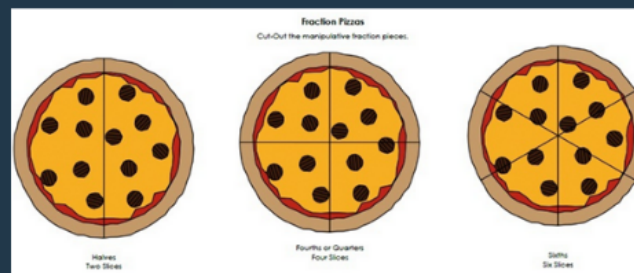
Strategic competence and adaptive reasoning was shown in each activity by having the students solve these problems and explain their reasoning. They also helped students develop a productive disposition toward mathematics.

Instructional Sessions (Weeks 4-6)

We incorporated dice activities to add the element of random selection. The intent of this activity was to get the children thinking more about equivalency more quickly and thus exhibiting procedural fluency while completing this task.

Fraction Dice!
Equivalencies

Fraction Rolled	Equivalent Fraction



The children exercised skills in strategic competence during our “pizza-fractions” lesson. By moving away from fraction bars, the student’s had to convert their thinking to represent these proportions in a more complex way.

Instructional Sessions (Weeks 7-8)

The final two weeks of instruction focused on a more in-depth exploration of fractions and all of their components. This was a way for the students to employ adaptive reasoning. The clothespin-fractions activity we conducted is shown below.



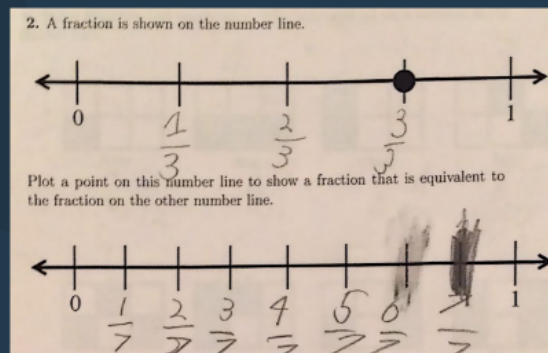
In another lesson entitled “Fraction Avenue,” we witnessed the students displaying a productive disposition toward their work.



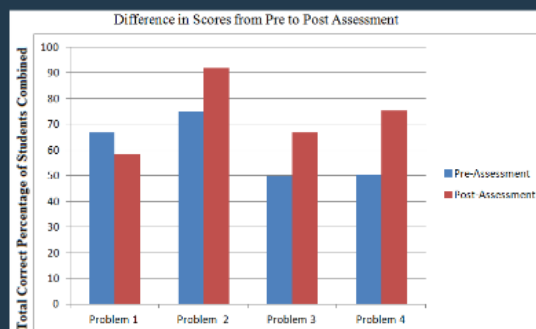
The children demonstrated strategic competence by solving these problems and creating the correct fractions to represent the amount of driveway paved.

Post Assessment Results

One weakness that was consistent for all four students was the ability to interpret number line representations of fractions.



Students generally performed better, however, on post-assessment problems requiring the comparison of fractions in inequality statements. Below is a bar graph showing the percentage of correct responses given for each of the four inequality items.



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Reflection and Discussion

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THANK YOU!

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