

The Impact and Effects of Incorporating Student Interests into Thematic Instruction and Thematic Assessment on Subtraction and Geometry Understanding

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Background/Purpose

My interest in leveraging students' prior knowledge and experiences in the classroom inspired me to conduct this study. When a student new to our class shared her experience growing up visiting the island of Tortugranja, a turtle sanctuary off the coast of Mexico, I saw how her story sparked an interest in sea turtles and ocean conservation in our class. This gave me an idea. What if we incorporated both students' funds of knowledge and interests into mathematics instruction and assessment? Could delivering and assessing mathematics in a more relevant, real-world context help students develop a deeper, more transferable understanding?

Context

This study took place in a Kindergarten classroom over the course of a 4-week period during the students' 20 minute small group math time. I met with 2 groups of 5 students each, for a total of 10 focus students.

Research Question

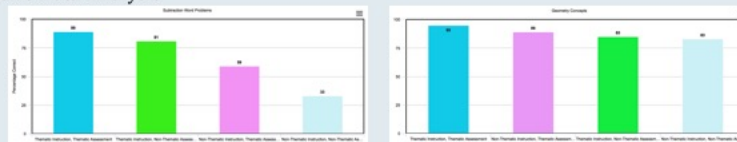
How does incorporating student interests into thematic instruction and thematic assessment impact students' mathematical understanding of subtraction and geometry?

Relevant Research

In order to give students agency in the learning in your classroom, you must incorporate their funds of knowledge (González, Moll and Amanti, 2005). These funds can include their family and home life funds, community funds, popular culture funds, personal activity funds and general knowledge funds (Burns & Botzakis, 2016). According to Burns and Botzakis (2016), "using students' funds of knowledge is not intended to replace instructional design procedures or traditional assessments, but to enhance them both" (p. 46), which is the intention in my study.

According to Kerch (2018), students in integrated, thematic curriculums perform better than those who are not. These students developed increased critical thinking skills, self-confidence and a love of learning (Kerch, 2018). The goal of my study is to take this research to another level by incorporating student interests and funds of knowledge into those themes.

Quantitative Data Analysis

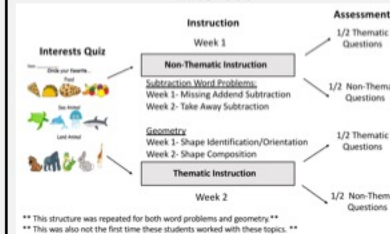


The graphs above show the average score across the 10 students on each type of assessment question. As you can see, there was a much larger discrepancy across the different types of problem sets during the subtraction word problem weeks compared to the geometry weeks. For both topics, it was clear that thematic instruction coupled with thematic assessment produced the greatest understanding (89% and 95% respectively), and non-thematic instruction paired with non-thematic assessment resulted in the weakest understanding (33% and 83% respectively). However, the major differences occurred between the remaining two variables. For subtraction word problems, the thematic instruction week with non-thematic assessment produced the second greatest understanding (81%), and the non-thematic instruction week with thematic assessment produced only 59% accuracy across the students. For geometry, the non-thematic instruction week with thematic assessment produced the second greatest understanding (89%), but the thematic instruction week with non-thematic assessment was close behind with 85% accuracy. These results show that incorporating thematic instruction and thematic assessment may not work the same, or even be beneficial, for all areas of mathematics. For example, with subtraction word problems, it was clear that thematic instruction had an overall larger impact than thematic assessment on student understanding. For geometry, however, this same conclusion cannot be made. This data shows us that the incorporation of students' interests into thematic instruction must be thoughtful, purposeful and significantly add to and enhance the instruction (Burns and Botzakis, 2016).

Qualitative Data Analysis

Throughout my discussions and interviews with the students, it was clear that incorporating their interests into thematic instruction helped them reach deeper mathematical understanding. Almost all students expressed to me that after the end of the thematic week they felt like they better understood both subtraction and geometry. One discrepancy in this, however, was that two of the students, who scored lower than their peers on all assessment types, said they preferred the non-thematic instruction weeks. When I asked one student why, he responded with, "This was different from how we normally do math." This is insightful because it again shows how intentional you must be in planning your thematic, interest-based instruction, making it a norm in your classroom. This way students can consistently see the real-world relevance to math and are not confused when their routine is changed. It was clear, though, that almost all students reached a deeper understanding, especially with regard to subtraction. In our interview following the non-thematic instruction week, one student said, "You make me want to go to sleep." After the thematic week, however, she shared that she liked subtraction better now because we were using it to help animals and "take away" trash from the ocean, a key phrase needed to understand how to solve subtraction word problems.

Methods



Sources of Data

Weekly assessments- At the end of each week of instruction, the students were given an assessment. Half of the assessment was thematic and half was not. The assessment was scored looking at the average percentage of both types of questions the students got correct. This data is shown in the bar graph (left).
Observational notes- Throughout the month, I took observational notes of patterns I was noticing in how the students were interacting with the mathematics.
Informal student interviews- At the end of each week, I asked students their general thoughts, how they felt about the week's instruction and how confident they felt in their current mathematical understanding.

Classroom Implications

During my informal observations of the students, I witnessed multiple instances of students incorporating math outside of our instructional time. At the end of the thematic word problem week, I allowed the students 10 minutes of playtime. Without any prompting or guidance, the students began reenacting our subtraction stories along with their own versions of the literature. Another student came into class the next day, with her own version of our ocean story board, and told me how she had been "playing ocean subtraction" at home.



These instances, along with my informal observational notes, show the positive impacts of student-driven thematic instruction on the transference of mathematics skills. The greater understanding students shared with me after the thematic week also shows how students understood what subtraction really means instead of simply looking for key words to mindlessly and formulaically solve word problems. However, as you can see from the graph, the thematic instruction did not seem to have as large of an impact on geometric understanding, nor did it produce the same transference. This demonstrates that thematic mathematics instruction and assessment must be intentionally incorporated and purposefully lend itself to the mathematics instruction for it to be beneficial.

Limitations and Next Steps

Due to the design of this study and the lack of a control group, there is a possibility that the results could have been skewed by students' natural abilities and preferences for one subset over another. In order to make a claim for or against the impact of thematic instruction and assessment on overall mathematical understanding, this study would need to be repeated with a control group for all of the mathematics topics covered in Kindergarten. Lastly, the next question would be to address how to incorporate thematic instruction that is personally relevant or of interest to all of the students in your class for each unit.

