

Math Isn't Taboo: Using a Popular Board Game to Reinforce Math Vocabulary in a 4th Grade Classroom

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Abstract

This research project is investigating using a math vocabulary game to increase students' scores on a state-wide standardized math test. The 40 students are in two different fourth grade classrooms, but taught by one teacher. This research project is trying to identify if this math vocabulary game based on a popular board game will increase the students' understanding of math vocabulary and scores on the fourth grade Math TAKS exam.

Background/Context

There are many books written on the subject of math and how to teach it to young students. However, the field starts to narrow when asking about specific math vocabulary games. I have been a public educator for 19 years all in one school district. I have worked at five different campuses and each was unique in the type of students that attended there. Two schools had large bilingual programs and the bilingual students struggled with standardized testing. One school had a large population of African American students whose parents were middle class on a socioeconomic scale. However, working with all those students did not prepare me for working at a campus with a large English as a Second Language population. The classroom teacher has taught for three years all at our current campus and she only knows working with English Language Learners (ELLs). As a public educator for over 19 years and 10 as an administrator, I knew that games provided a safe context for students to learn new skills and vocabulary, so I was looking for information to support that ELLs learn best in this manner as well. I first approached the classroom teacher because I knew she wanted to help her students do well and as a “new” teacher she was open to more staff development or research in the area of

assisting ELLs with math acquisition of skills and concepts. I also knew that she had one classroom with more ELL students, so that we could compare them to non-ELL students.

The purpose of this research is to find out if playing a math vocabulary game will enhance our students' math skills. The following questions were chosen because at our school, our 4th grade Math scores on TAKS are below the 90% Exemplary level. The fourth grade classroom teacher and I are hopeful that we will see growth of at least 100 points on average on each individual student's Math TAKS exam score. The game was developed by me and is based on the popular Parker Brothers game *Taboo*. The original version of the game has very broad words, ideas, and pop culture terms with five "taboo" words listed under each word. My version of the game consists of 50 cards with math vocabulary words on them and three "taboo" words listed under the vocabulary term. (Appendix A) The mathematics game is played by all students at least once per month. The two research questions we want answered are:

- How does the use of a math vocabulary game increase 4th grade students' understanding of a math vocabulary?
- How does that game improve their performance on the 4th grade Math TAKS exam?

Literature Review

Students love to play games, whether they are board games or electronic ones. As a classroom teacher over the years, I incorporated and adapted many games to teach skills that I wanted and needed for students to learn. Therefore, I agree with Olson 2007 in *Developing Students' Mathematical Reasoning through Games* in which he states, "Games are fun and create a context for developing students' mathematical reasoning." This statement let me know that the teacher and I were on the right path in terms of having a game to help the students with their math skills.

Furthermore, in *Vocabulary Strategies for the Mathematics Classroom*, by David Chard, 2007 the author states that “vocabulary knowledge is as essential to learning mathematics as it is to learning how to read.” Dr. Chard also stated, “Vocabulary knowledge and ensuring that students’ learn, review, and use it makes problem solving on high stakes assessments accessible.” Since we wanted to improve the scores on our Math TAKS exam this statement was worth pursuing in our action research project.

Lastly, in his book *Building Background Knowledge for Academic Achievement*, Robert Marzano (2004) states the importance of games as a tool for vocabulary development and that students should periodically be involved in games that allow them to play with the terms. This is a further reason why the Math Taboo game was developed and students will be allowed to manipulate it in class. The game is based on a popular game that many of the students know and it is portable, thus it can be played anywhere in the classroom. Since all of the pieces are math terms, the goal is for students to become more familiar with the math vocabulary by playing, reading, and manipulating the game pieces on a regular basis.

Methodology

Participants

In a 4th grade classroom, a teacher will implement a card game based on the board game Taboo. This classroom is housed at a suburban elementary school with about 40% of the students on free or reduced lunch. The school has approximately 700 students and a very diverse ethnic population with approximately one-third of the students being an English Language Learners (ELLs). Two classes will use the game—one with English Language Learners and the other with native English speakers. Forty total students will participate in the research. One class has 21 students and the other has 19 students. Fourteen of the 40 students are English Language

Learners. The participants are allowed to play the game a minimum of once a month during their math workstations.

Materials

In developing my methodology for making the game, I designed the cards using math vocabulary that all 4th graders should know and be able to use. I collected the vocabulary words from the Texas Essential Knowledge and Skills objectives, a 4th grade math textbook, our district's on-line scope and sequence, and three released Math TAKS exams from the Texas Education Agency website. I typed the words in the form of Taboo cards, using only three "can't say" words as opposed to five, on yellow cardstock paper.

Data Sources

We want to see if the students playing the game will increase their knowledge of grade level math vocabulary. Therefore, the classroom teacher will collect anecdotal notes on the questioning and observing she does with the students as they are playing the math game to see if they understand the vocabulary words.

Next, we want the game to help students' scores on the 4th grade Math TAKS exam to increase by at least 100 points each over their 3rd grade Math TAKS exam score. Therefore, the classroom teacher will compile a list of all the students' Math TAKS scores from 3rd grade. This list will be compared to the scores those students make on the 4th grade Math TAKS.

Procedures

Chard (2007) outlined some key steps for vocabulary strategies in the classroom: make vocabulary knowledge a part of every lesson, preteach mathematics vocabulary, model vocabulary when teaching new concepts, use appropriate labels clearly and consistently, and

integrate vocabulary knowledge in assessments. During our research, we will use these strategies to teach vocabulary. The teacher will preteach mathematics vocabulary prior to starting a unit of study. She will model vocabulary when teaching and verbally reward students when they use correct math vocabulary. She will also give a vocabulary test at the beginning of the school year to see how many terms students know and she will give another vocabulary test in late May to see if the number of terms has increased, decreased, or stayed the same.

Data Analysis

To answer our first research questions, the teacher collected anecdotal records and from her observation of students and their conversations in the *Missouri Council of Teachers of Mathematics Bulletin Volume XXVII* No. 6, 2002, it is stated that, “Vocabulary games and puzzles provide an entertaining and educationally worthwhile experience that promotes learning and increases vocabulary usage.” The ELL student responses definitely support this research because some of those students have been in the United States less than two full academic years and are already beginning to use the math vocabulary that is used in the school system, on the Math TAKS exam, and in everyday life.

The classroom teacher also gave two vocabulary tests, one at the beginning of the school year and one at the end of the school year. Our second research question was to determine if TAKS scores on the math portion for 4th grade improved.

Findings

Here are some of the major findings of our research:

- It was evident that the students learned many of the 4th grade math vocabulary terms based on teacher observations (Appendix B) and the number of vocabulary terms learned on the vocabulary quizzes, (increased by an average of 8 terms per child).

- The average mean score on the TAKS math scores went up by at least 100 points on average for the class with the ELLs in it. In the class without the ELL students, the mean score did improve, but not by 100 points. (see chart below)

Teacher's Findings

From one of the researcher's anecdotal notes, a summarization of what she observed and learned.

- The ELL students struggled some with the game. They had a more difficult time coming up with words not on the list. They also had shorter verbal clues for their peers to guess from. I think it would have been easier for them if they didn't have a list so that they didn't focus only on those words and the fact that they couldn't use them.
- The classroom teacher did notice that some of the ELL students did a remarkably good job of guessing the word from my clues rather quickly. When the teacher was playing one-on-one with an ELL student, he had one word clues when he was quizzing her. When the teacher was going through the cards, he was guessing the correct vocabulary word immediately. It seemed to be much harder to use his background knowledge to come up with clues rather than to hear familiar words and recall their meaning. For the word "remainder" he could not come up with any words that were not on the list. Therefore, he had to pass and choose a different card. For "inches" he said, "like your little finger". He obviously was struggling with this one also, but was recalling some of the ways the teacher showed the class to measure inches using your hands. When the teacher was giving the clues she said, "not subtraction, but..." he immediately said "addition". Another time the teacher said, "When you cut a shape down the middle and it

looks the same...” and he immediately said symmetry. You could tell the vocabulary was there, but the creativeness in using clues to help other students guess the vocabulary word was definitely still premature.

- Another ELL student who is on a higher academic level was being very creative with his clues. He was using higher order thinking skills and math conversions to help give clues for the word gallon. He was trying to tell the researcher conversions in ounces and pounds since he couldn't think of words to use that were not on the list. It was very creative and he was putting a lot of thought into it. However, his peers especially fellow ELL students, would not have been successful had he been using the same clues with them.
- The students really enjoyed playing the Math Taboo game and learning vocabulary words in a more exciting way. As was evident by the smiles on their faces and the productive conversation they had during the game play. As a teacher, this conversation was enjoyable to hear and exciting as I watched the students interact with their peers.

The teacher did have an unexpected result from our research. She noticed that the lower the student's math aptitude was, the harder time they had playing the game. The higher math students were able to continue brainstorming clues for the students to use when guessing the word, but the lower students kept repeating the same few words over and over again. The higher math students also put a lot more effort when playing the game and seemed to enjoy it a little more since they were having an easier and more successful experience.

In conclusion, the classroom teacher believes that using this math game to teach ELL students was highly successful. The ELL students learned the math vocabulary necessary to understand 4th grade math and their scores improved on the Texas state math exam.

TAKS Scores' Findings

The following table (Table 1) shows the mean score of students' Math TAKS scores from two different years—the year before playing the vocabulary game (3rd grade) and the year they played it (4th grade).

Table 1

Comparison of Math TAKS Scores

	2008	2009
Class A	2213	2429
Class B	2256	2284

*Class A has the ELL students in it.

Conclusion

Literature Review Connection

The premise that students need to manipulate and play with vocabulary in order for it to become part of their vernacular and help them achieve higher scores on assessment exams is affirmed by the increase we saw in number of terms learned and the higher overall scores on the Math TAKS exam. As Chard (2007) states, "When effective vocabulary instruction is built into a mathematics curriculum, student achievement is likely to improve on mathematics assessments." We can conclude that students who play our version of Taboo will use the math vocabulary correctly and will score higher on the state standardized math test.

Limitations

This study was somewhat limited because of the number of students involved in the process. We have a mobility rate of 28% and some students who started the process with us left

during the year and others came into the process after we had begun the research. It was also limited by the fact that although the administrator developed the game, the classroom teacher was the one who had to do the monthly observation due to time constraints of a campus administrator.

Future Plans

In the future, we would suggest that the classroom teacher be more directly involved with making up the cards so he or she is familiar with the terms and can tie them back into the classroom for those “teachable” moments. Also, ask the ELL students what they would add or take away from the game to make it easier for them to play.

Appendix A Example of the Math Game Cards

Symmetry

Same
Congruent
Size

Congruent

Same
Symmetry
Triangle

Ordinal

1st
Place
Last

Rotation

Turn
Translation
Reflection

Probability

Spinner
Outcome
Combinations

Decimals

Percentage
Money
Fraction

Translation

Slip
Rotation
Reflection

Reflection

Flip
Rotation
Translation

Money

Dollars
Cents
Decimal

Percentage

Fraction
Decimals
Sale

Centimeter

Metric System
Ruler
Inches

Grams

Milli-
Smallest
Metric System

Bar Graph

Horizontal
Vertical
Lines

Liter

Metric System
Liquid
Volume

Yards

Inches
Feet
Centimeters

Scale

Weight
Capacity
Equal

Appendix B Notes on what students' said when playing Math Taboo

Word	Verbal Response(s)
Equivalent	"When something is equal to something"
Thousand	"Number place with 4 digits"
Subtraction	"Number when you get less"
Factor	"Beginning of a multiplication sentence"
Decimals	"The point in place value that divides the numbers"

Rotation	“Movements” “Like looking in a mirror” “Like when you look in water”
Inches	“Lines on a stick”
Money	“Point in between the numbers Model”
Hundred	“This is a place value”
Set	“Couple”
Angle	“This is a straight...”
Centimeter	Student A-“Unit you use to measure” Student B-“inches” Student A-“smaller than that”
Measurement	“Were working on it now”
Probability	“Talked about it at the beginning of the year” “Combine/put things together” “Group” “Draw a tree or diagram” “Something you do on tests”
Problem Solving	
Quotient	“divide”
Hundred	“hundred thousands”-students are not allowed to use the word hundred
Difference	“minus, decrease”
Liter	“milk, jar”
Inches	“Like your little finger.”
Remainder	The ELL student could not come up with any words not on the list

ELL students’ comments are in yellow.

Start studying Math Vocabulary 4th grade. Learn vocabulary, terms and more with flashcards, games and other study tools. $(>)$ is symbol used to compare two numbers, with the greater number given first. For example: $+9 > -6$ means $+9$ is greater than -6 . Equal To. Being the same in quantity, size, degree, or value. Related Facts of Addition and Subtraction. Teaching Math Vocabulary....Math vocabulary Frayer Model printable..The Frayer Model is a popular tool used to understand new math vocabulary terms. In this model, students record the word in the center of the graphic organizer. In the surrounding boxes, they list the definition, characteristics, and provide examples and non-examples Review Lines and Angles Using Art. Geometry Angles Basic Geometry Math Stations Math Centers Geometry Activities Math Words Fourth Grade Math Math Classroom Future Classroom. Review Lines and Angles Using Art. Incorporating Art in the Classroom. Fourth Grade Ma... You can use the cards from the actual board game to create a classroom activity that will thrill your students. This is a good, high action game that students really get into. Chalkboard Pictionary. To play in a classroom with many students, it's not very practical to use the game board. This means you'll be using the chalkboard or whiteboard at the front of the room. Divide the class into two teams and create a small column for each team on one side of the board. You'll record their points here. You'll need to do a little preparation for this game, but it's well worth it. Make bingo sheets with a 4×4 grid and add words to each square. Hand these out (each one should be unique) and have students mark the correct word when you call it out. The first person to finish marking their entire page wins.

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