

The Power of Math Dictionaries in the Classroom

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This article investigates the value of a math dictionary in the elementary classroom and if elementary students prefer using a traditional math dictionary or a dictionary on an iPad. In each child's journey to reading with understanding, the dictionary can be a comforting and valuable resource. Would students find a math dictionary to be a useful resource in the classroom? Would students prefer to use a traditional math dictionary or a dictionary app on an iPad? Fourth graders were surveyed to find the answers to these two questions. The results are shared in this article.

Introduction

In each child's journey to reading with understanding, the dictionary can be a comforting and valuable resource. Children are introduced to dictionaries early in their school life, beginning with picture dictionaries. First-graders begin to use word dictionaries. Along this path to understanding words, children are exposed to and learn to use dictionaries in the form of the traditional book, an Internet resource, or perhaps an iPad Touch app.

Dictionaries play an important role in the development of vocabulary and connecting words with their true or multiple meanings. In fact, many publishers now distribute student dictionaries geared to a particular age and grade level (Routman, 2000). Every discipline has its own unique vocabulary, a group of words and definitions that people use to study or communicate information within that field. Mathematics has a vocabulary that consists of words and symbols that allow people to have a common base of understanding of mathematics. Like in other disciplines, knowing the vocabulary

of mathematics provides the power to unlock problems (Fitzgerald, 2006).

The best of both worlds for children seeking the meaning of a mathematical term, word, or definition would be perhaps a math dictionary in the form of an app. We believe children would understand, appreciate, and benefit from the value of a math dictionary along with the easy access of an app.

Background

Our research began with a question from the second author. One day during an advising session, the second author, an undergraduate advisee of the first author, a university instructor and undergraduate student advisor, asked about a children's math dictionary sitting on the first author's desk. She wondered if children really would use a math dictionary and if doing so would help elementary-age children better understand math concepts. The first author shared an app version of a math dictionary she had recently downloaded onto her iPad, which then brought up the question of whether a student

would prefer to use a math dictionary in an app format or a traditional book format. The authors decided then to undertake a research project to find the answers to their questions.

Research Focus

The Value of Math Dictionaries

While a traditional word vocabulary dictionary requires students to use pronunciation keys, alphabetical order, and guide words and to read to identify the correct meaning of words, math dictionaries may require a different set of reading skills for finding math terms. Some math dictionaries are organized by a table of contents, and some are organized in alphabetical order like a traditional word dictionary. Most math dictionaries include pictures and illustrations.

As mentioned above, our first objective in this research endeavor was to find out if students would find a math dictionary to be a useful resource in the mathematics classroom setting. Along the lines, we sought to examine the following:

- Would students look up unknown terms?
- Would students seek out geometry formulas or measurement conversions?
- Would students use the dictionary to assist them in problem solving?
- Would students thumb through a math dictionary out of curiosity?

The Preferred Format of Math Dictionaries

In today's world of print, students can choose from an electronic version or a traditional book version of dictionaries. The demand for digital technologies in the classroom continues to increase daily, and in order to accommodate the students' changing needs, iPods, iPads, and Smartboards have made their way into some classrooms across the globe (Saine, 2012, p. 1). As teachers begin exploring the possibilities of

using mobile devices such as the iPad in their classrooms, it will be important to examine how this technology with its affordances and constraints can influence student learning. For literacy instruction, this means investigations of how such mobile devices can foster successful reading practices (Hutchison, Beschoner, & Schmidt-Crawford, 2012, p. 15). Once students understand the value of a dictionary in their reading/writing journey, they might have the opportunity to choose between an electronic version (e.g., on an iPad) or a traditional book format. The same is true for a math dictionary. Thus, our second objective in this research endeavor was to determine if students would prefer to use a math dictionary in an app format or a traditional book format. With this main question in mind, we sought to specifically determine if students would rather use their finger to touch an iPad app and find a math term's meaning or thumb through a traditional book dictionary to find the meaning of a math term.

What We Did

Once our project was approved by our university's Institutional Review Board, we went to a local school and met with a group of fourth-graders. We shared a traditional math dictionary with each student and asked the students to look up a term in the dictionary. Next, we asked each student to look up the same math term on an iPad using the dictionary app. Then we had each student complete a student interview. As we observed students in the student interview setting, we noticed that student engagement with both math dictionary formats was positive. Students appeared to enjoy using a math dictionary in both the traditional book format and the app format. All students willingly participated and answered our questions without reservation. We used a five point likert scale survey with happy faces to indicate ratings of poor, below average, average, above average, and excellent on student attitudes. The interview used can be found in Appendix 1. Figure 1 shows a fourth grader coming to the

Figure 1
Student using a math dictionary



testing corner or the classroom, while another student thumbs through a math dictionary. Figure 2 shows a student exploring the iPad Dictionary.

Results

Table 1 shows the results of a partial analysis of responses to our survey. The questions featured here are: How do you feel about math class; how much do you like math; and how much do you think a math dictionary will help you outside of school? These three questions were important to us in determining the students' feelings about math and whether or not a math dictionary would be considered by them a valuable tool outside of the classroom. Overall, the majority of the responses fell in the average to excellent range. In fact, 28 out of 29 students felt average, above average, or excellent about their math class, 27 students liked math as a content area, and 25

students fell in the above average and excellent range in terms of thinking that a math dictionary would help them outside of school.

Table 2 shows the results of an analysis of the question asked during the interview regarding whether any of the students had used an iPad, iPhone, or iPod before. It was surprising to see that 44% of the students had never used one of these devices. In addition, only 20.7% used one of the devices every day, while 24.1% used one a few times a week.

Table 3 displays the results of the analysis of the two questions related to how easy or hard it was to find a specific math concept on the iPad or in the book dictionary. As the table shows, 86.2% of the students interviewed felt that their concept was extremely easy to find on the iPad, and 0% thought it was hard or extremely hard to find their

Figure 2
A fourth-grade student explores the iPad dictionary.



concept on the iPad. In contrast, only 37.9% of the students thought that it was extremely easy to find their concept in the math dictionary, and 13.8% thought that it was extremely hard to find their concept in the math dictionary.

Implications for Teaching

Our research has important implications for classroom teachers, from preschool to elementary. Our findings suggest that students are highly motivated by technology and that a math dictionary is an effective way to support reading skills in the mathematics classroom. In this age of ever-advancing technology, it is important to note that today's students find it extremely easy to look up a math concept using an iPad app. Furthermore, today's students appreciate and understand the value of a math dictionary. Based on what we found, we concluded that young

children respond well to the immediate response of technology. If students are provided with iPads in the classroom, they are more likely to look up an unknown concept in the math classroom. Students may also use math dictionaries to provide valuable mathematical information in real-life applications.

By simply providing students with math dictionaries in either format, classroom teachers will enrich and enhance the mathematical success of their students now and in the future. Students and teachers will discover the “power” of math dictionaries in any format, but we now know the preferred format is the iPad app.

Figure 3
Taking the math survey.



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Tables

Table 1

Math Attitudes & the Value of a Math Dictionary

	Extremely Poor	Below Average	Average	Above Average	Excellent
How do you feel about math class?	3.45% (1)	0% (0)	27.6% (8)	37.9% (11)	31.03% (9)
How much do you like math?	0% (0)	6.9% (2)	24.1% (7)	41.4% (12)	27.6% (8)
How much do you think a math dictionary will help you outside of school?	0% (0)	0% (0)	13.8% (4)	37.9% (11)	48.3% (14)

Table 2

Use of iPad, iPhone, or iPod

	Never	Once a month or less	About once a week	A few times a week but not every day	Every day
How often do you use an iPad, iPhone, or iPod?	44.8% (13)	6.90% (2)	0% (0)	24.1% (7)	20.7% (6)

Table 3

Ease of Usage of the Dictionary vs. the iPad

	Extremely Hard	Hard	Average	Easy	Extremely Easy
Was it easy or hard to find your concept on the iPad?	0% (0)	0% (0)	3.45% (1)	10.3% (3)	86.2% (25)

Appendices

Appendix 1

App vs. Book

Which would you prefer to use as a math dictionary? Student Interview Questions

Age:

Grade:

Gender:

Circle which dictionary was explored first: iPad or book

Please mark the face that shows how you feel in response to the question.

How do you feel about math class?



How much do you like math?



How much do you think a math dictionary will help you outside of school?



Check your response to this question.

How often do you use an iPad, iPhone, or iPod?

Never	Once a month or less	About once a week	A few times a week but not everyday	Everyday

In a minute, you will look up a math concept you are interested in.

What math concept did you choose?

Go ahead and look that up on the Math Dictionary in the iPad and in the Math Dictionary book. Take your time. I may take your picture while you explore the iPad and the book.

Was it easy or hard to find your concept on the iPad?

Was it easy or hard to find your concept in the Math Dictionary?

Now, tell me what you think about your experience.