

Evaluation Report 1: National Field Test

The Signing Math Dictionary
(NSF, Grant #HRD-0833969)

June 30, 2011

Project Description

The evaluation findings reported here focus on the Web-based version of the Signing Math Dictionary (SMD), developed by TERC and Vcom3D and funded, in part, by the National Science Foundation, Grant #0833969. The SMD is being developed to serve the approximately 50,000 students in grades 4-8 who are deaf and hard of hearing and require services under the Individuals with Disabilities Education Act (IDEA). For use with a Windows Operating System, the SMD is a complete assistive tool that can be used with an Internet connection or as a stand-alone. An animated interactive viewer—the SignSmith® player—allows users to select from a range of Avatar characters with different personalities and facial expressions; to adjust the speed of signing; and to sign a selected word, its definition, or part of speech in American Sign Language (ASL) or as a word-for-word translation (Signed English [SE]).

Evaluation Goals

The primary intent of this field-test evaluation was to assess the degree to which students who used the SMD to perform activities related to a standards-based math unit in place in their school develop knowledge of the unit's key vocabulary and of the content. A secondary intent of the evaluation was to inform any necessary revision of the SMD before publication.

Research Design

The research design for the evaluation builds on the methodology TERC has established for similar studies. The evaluation was coordinated by TERC and conducted by teachers solicited from a pool of upper elementary and middle grade teachers of students who are deaf and hard of hearing with a range of hearing loss. The pool included teachers who taught in specialized schools for the deaf and in classrooms in which students were included with hearing students.

A mixed measurement pre- post design that combines quantitative and qualitative methods in which the outcome of interest was measured for participants only was used with 4th through 8th grade students to ascertain the types of learning gains that are possible with use of the SMD. Findings in this report address learning outcomes demonstrated by changes in students' mastery of key vocabulary for the unit of study as indicated by pre- and post-unit questions related to students' ability to sign/fingerspell, understand, and use the terms identified as important for mastering the unit content. Content outcomes were assessed by responses on pre- and post-unit tests normally administered at the beginning and end of the unit. Qualitative feedback were supplied via written post-unit teacher and student surveys and analyzed to discern: (a) what teachers and students gained over the course of using the SMD; (b) their thoughts about usability and feasibility; and (c) what they liked and disliked about the SMD.

The research procedure for the field test involved placing the SMD in the designated classroom context with students who are deaf and hard of hearing at the intended grade levels. Research studies extended over the course of approximately 18 months from January 2010 through May 2011. The intent of the field test was to examine effectiveness of the SMD under normal use conditions. To this end, each teacher identified at least one math unit to use for data collection. Pre- and post unit vocabulary lists, questionnaires, and scoring criteria were then developed by the teachers in collaboration with TERC. Tests normally administered at the end of the unit served as pre- and post-unit content questionnaires. These were submitted to TERC prior to beginning the unit and modified as needed. Teachers and students were given opportunities to provide qualitative and quantitative feedback and suggestions regarding ease of use, teacher/student gain, and likes and dislikes through post-use surveys. Teachers also tracked and

rated each student's ability to work independently for a two-week period while using the SMD as High (3), Medium (2), or Low (1). Survey data provided additional information about use of the SMD and independence. The pre- and post unit vocabulary and content questionnaires and teacher and student post-use surveys are described in more detail in the following section.

Research Instruments

Student Pre- and Post Unit Vocabulary Questionnaire: A Pre-unit Vocabulary Questionnaire, which is identical to the Post-unit Vocabulary Questionnaire, was administered to obtain a baseline assessment of students' initial knowledge of their ability to sign/fingerspell, understand the meaning of, and use those terms that are important for developing ideas related to the unit content. Comparison of the scores on each questionnaire was used to ascertain changes in students' knowledge of the vocabulary.

To develop the questionnaires, teachers completed a Pre-Teaching Survey in which they listed the key mathematics terms students should know before and after doing the unit activities. They then communicated with TERC to share and refine the methods to be used to identify students' knowledge of these terms. Before doing the unit, teachers met one-on-one with each student to identify those terms the student could sign or fingerspell, recognize, and accurately describe the meaning of and/or use when solving a problem. At the end of the unit, teachers repeated the process. Scores for each student were reported to TERC. A copy of the survey is included in the Appendix.

Student Pre- and Post Unit Content Questionnaire: A Pre-unit Content Questionnaire, which is identical to its post-unit counterpart, was administered to obtain a baseline assessment of students' initial knowledge about the unit topic selected for the field test. Comparison of the scores on each questionnaire was used to ascertain changes in students' mastery of the content.

To develop the questionnaires, teachers listed the learning goals of the unit on the Pre-Teaching Survey. They then shared the test they usually administer at the end of the unit and the scoring criteria that would be used. The tests and scoring criteria were refined as required to ensure that they aligned with the learning goals and key unit vocabulary. Before doing the unit, teachers administered the test and sent the scored tests to TERC. At the end of the unit, teachers repeated the process.

Post-unit Teacher Survey: Completed after the unit, the Post-unit Teacher Survey asks teachers for feedback about their experiences using the SMD. The text of the survey follows.

1. How would you rate students' ability to find information in the SMD?
 very easy
 fairly easy
 possible with a little trial and error
 somewhat difficult
 impossible

2. How would you rate the SMD as a resource that complements and enriches instruction?
 Very Valuable
 Valuable
 Neutral
 Hardly Valuable
 Not at All Valuable

3. When did your students use the SMD?

- With a math activity
- For subjects other than math
- For homework or research
- Other (please specify)

4. How did your students use the SMD?

- Learn the definition of a word
- Learn how to sign a word
- Learn a part of speech
- Communicate the content being studied
- Do homework
- Other (please specify)

5. Do you think using the SMD improved students' self esteem and/or self-confidence?

- Yes
- No

If yes, give an example.

6. Do you think using the SMD changed students' attitude toward math?

- Yes
- No

If yes, give an example.

7. How did you embed student use of the SMD into activities (pre-, during, at the end) and homework?

8. Did using the SMD help you accommodate different usages and learning styles? If yes, give an example.

9. Did using the SMD help you meet mandated curriculum frameworks? If yes, give an example.

10. Describe the value the SMD adds to teaching and learning.

11. What do you like about the SMD? What do you dislike?

Post-unit Student Survey: Completed after the unit, the Post-unit Student Survey asks students for feedback about their experiences in using the SMD. The text of the survey follows.

1. How easy was it to find information in the SMD?

- Very easy
- Fairly easy
- Possible with a little trial and error
- Somewhat difficult
- Impossible

2. How did you use the SMD?

- Learn the definition of a word
- Learn how to sign a word
- Learn a part of speech
- See how things look
- Tell what I know
- Help me ask questions
- Do homework

3. Why were you unable to find what you were looking for?

- It was not there.
- It was hard to find so I gave up.

4. Tell us how you found information in the SMD?

5. Tell us what you like about the SMD? What do you dislike?

Demographics

The evaluation study included a sample of 104 students distributed among 22 treatment groups representing grades 4-8. As several of the teachers taught multiple classes, 16 teachers participated in the test. A summary of demographic information about the treatment groups and about students' levels of hearing loss and academic ability gathered from a Site Data Form submitted by each teacher before beginning the study is presented in Table 1. A copy of the form is included in the Appendix. In support of TERC's policies for working with human subjects, identifiers have been removed to ensure confidentiality of the participants.

Table 1. Treatment Groups

Treatment Group*	N	Region	Setting	Classroom Type	Hearing Loss	Academic Ability
Group 4-I	3	South	Urban	Specialized	Mild/Moderate	Below/At Grade Level
Group 4-II	5	East	Urban	Specialized	Mild-Severe Profound	Below/At Grade Level
Group 4-III	9	Midwest	Suburban	Inclusion	Profound/Severe	Below/At Grade Level
Group 4-IV	4	Midwest	Suburban	Inclusion	Moderate-Severe	Below Grade Level
Group 4-V	4	West	Urban	Inclusion	Severe	Below Grade Level
Group 5-I	5	South	Urban	Specialized	Mild/Moderate	Below/At Grade Level
Group 5-II	7	East	Urban	Specialized	Mild-Severe Profound	Below/At Grade Level
Group 5-III	1	Midwest	Suburban	Inclusion	Severe	Below Grade Level
Group 5-IV	5	South	Urban	Specialized	Mild-Severe Profound	Below Grade Level
Group 5-V	5	Midwest	Suburban	Inclusion	Moderate-Severe/Profound	Below/Above Grade Level
Group 5-VI	6	Northeast	Suburban	Specialized	Severe/Profound/Cochlear Implant	Below/At Grade Level
Group 6-I	7	South	Urban	Specialized	Mild-Severe Profound	Below Grade Level
Group 6-II	3	East	Urban	Specialized	Mild-Severe Profound	Below/At Grade Level
Group 6-III	5	Midwest	Urban	Inclusion	Mild-Severe Profound	Below Grade Level
Group 7-I	2	South	Rural	Inclusion	Severe/Profound	Below Grade Level
Group 7-II	5	East	Urban	Specialized	Mild-Severe Profound	Below/At Grade Level
Group 7-III	1	South	Rural	Inclusion	Moderate-Severe	Below Grade Level
Group 8-I	1	South	Rural	Inclusion	Cochlear Implant	At Grade Level
Group 8-II	6	East	Urban	Specialized	Mild-Severe Profound	Below/At Grade Level
Group 4-8	6	West	Urban	Specialized	Severe/Profound	Below Grade Level
Group 3-5	8	Northeast	Suburban	Summer School	Not Provided	Below Grade Level
Group 7-8	6	Northeast	Suburban	Summer School	Not Provided	Below Grade Level

*- The Group Number identifies the grade. The Roman numeral identifies the class in cases where there is more than one class per grade.

Unit Topics

As mentioned, the intent was to examine the potential value the SMD adds to mathematics teaching and learning when implemented in “real use” conditions. As such, teachers selected one of the units that they ordinarily teach to do using the SMD. The unit topics for each treatment group follow.

- Group 4-I/II—shapes
- Group 4-III—whole numbers
- Group 4-IV—comparing and ordering
- Group 4-V — multiplication and division

- Group 5-I/II/III—shapes
- Group 5-IV—days and time; graphing
- Group 5-V—angles and triangles
- Group 5-VI

- Group 6-I—fractions
- Group 6-II—shapes
- Group 6-III—units

- Group 7-I—units
- Group 7-II—units
- Group 7-III—fractions

- Group 8-I—units
- Group 8-II—units

- Group 4-8—numbers and operations
- Group 3-5—graphing
- Group 7-8—graphing

Findings

As previously specified, student and teacher data were collected over the course of the study. Findings about use of the SMD and degree of mastery of the vocabulary and content being studied and students’ ability to use the SMD independently are reported in the following pages.

Vocabulary Knowledge: Each group with an N greater than 1 had significantly improved post-unit vocabulary scores compared to their pre-unit results as tested by a paired *t*-test. For the paired *t*-test, a *p* level of $\leq .05$ indicates a treatment affect occurred (post-use scores are significantly higher than pre-use scores). Thus, each group’s ability to sign and communicate the key vocabulary for the unit increased significantly with use of the SMD, on average. Due to classroom time constraints, only about one-third of the groups provided data about students’ ability to understand terms. Nonetheless, each of these groups had significantly improved post-unit scores compared to their pre-unit results as tested by a paired *t*-test.

The tables on the next page indicate these trends. Table 3 shows the percent positive change by group from pre- to post-unit assessment for those groups that provided data about the ability to sign or fingerspell and to define or use key terms for the unit of study. Table 4 shows the percent positive change for those groups that also provided data about the ability to understand the term when it was signed or fingerspelled. As Table 4 also reveals, Treatment

Group 4-V had improved post-unit scores compared to their pre-unit results. However, their pre-use means were higher than those of other groups, leaving less room for improvement.

Table 3. Pre-/Post-unit Change in Ability to Sign and Define or Use Terms

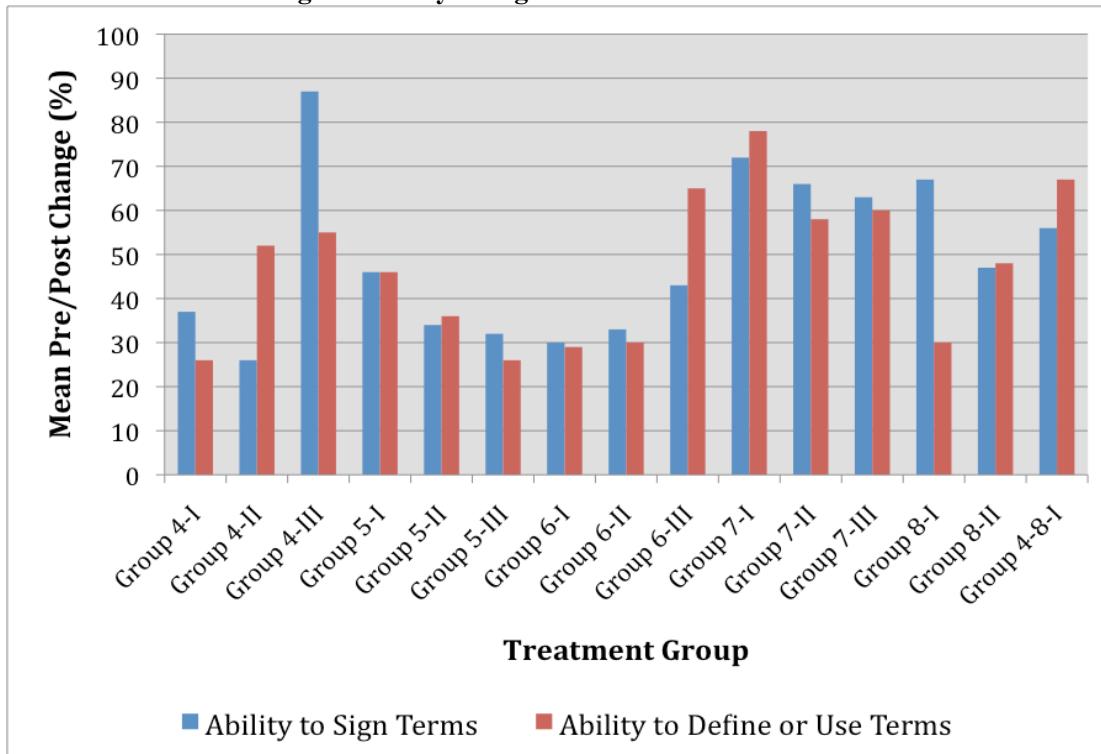
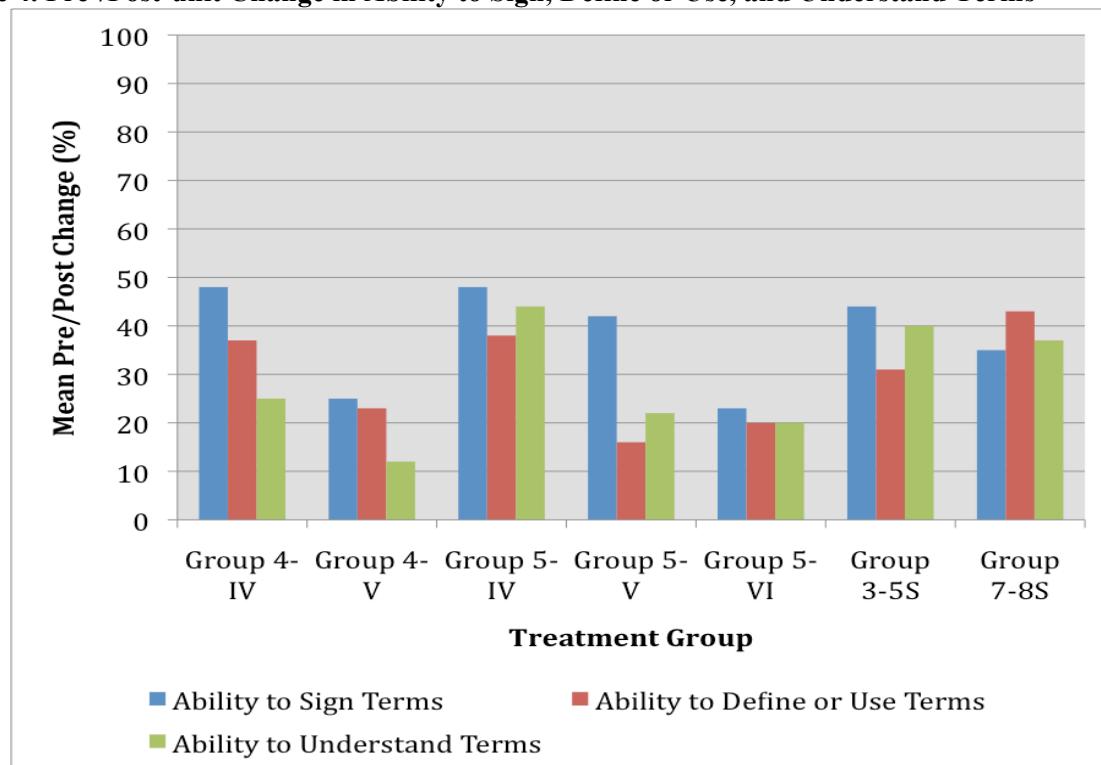
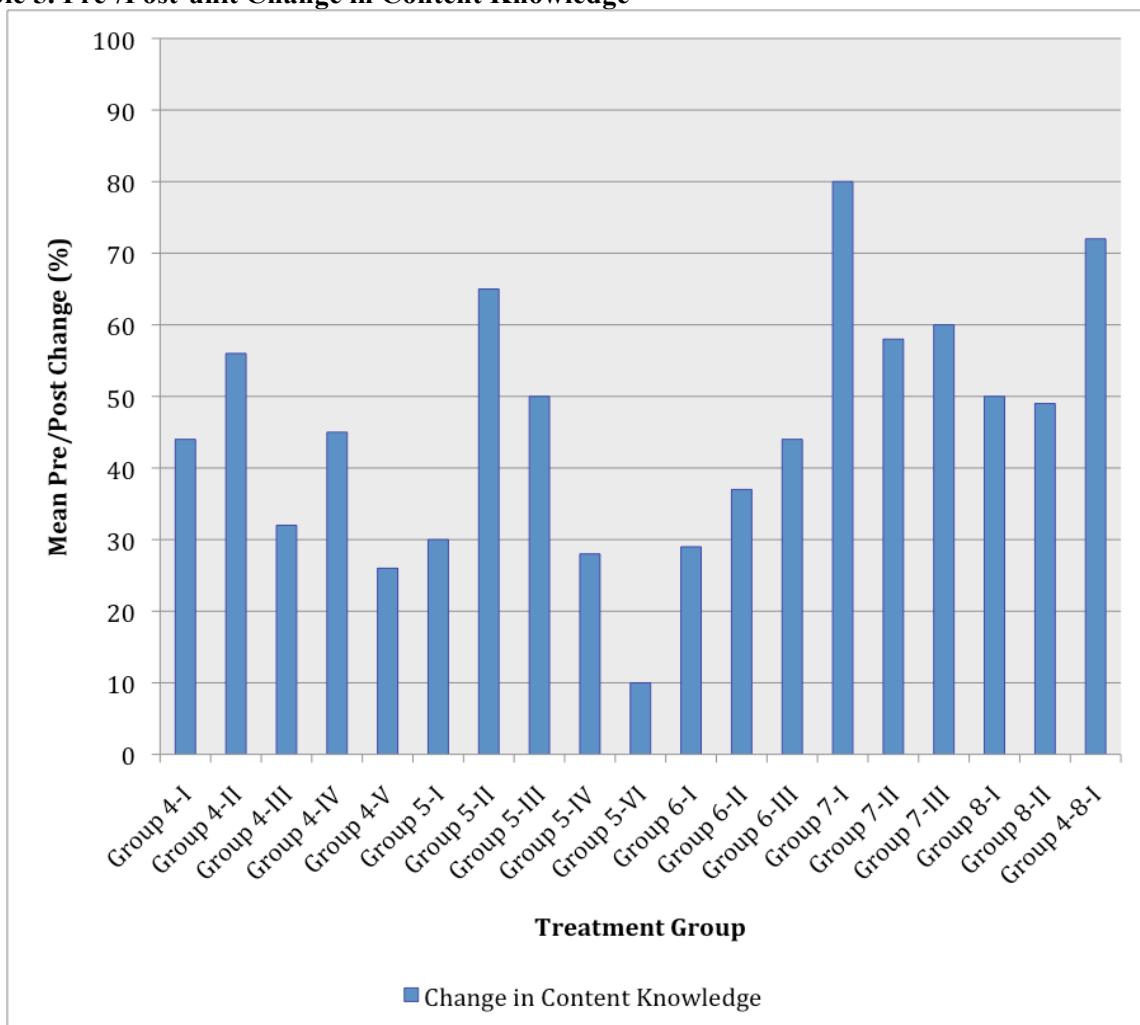


Table 4. Pre-/Post-unit Change in Ability to Sign, Define or Use, and Understand Terms



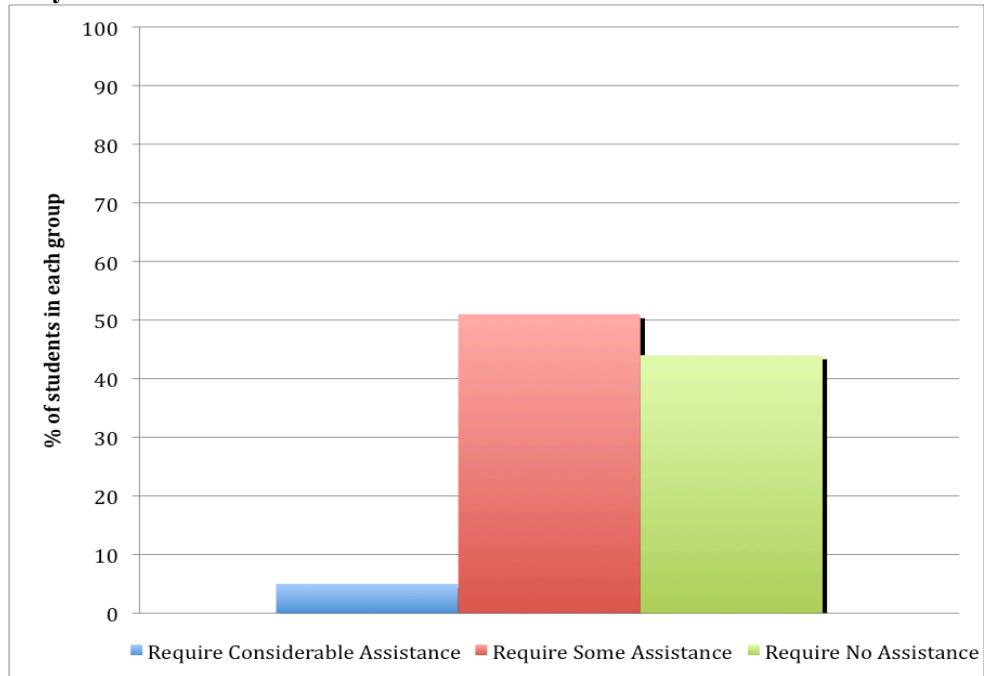
Content Knowledge: As Table 5 reveals, each of the 19 treatment groups that reported data demonstrated increased knowledge of the unit content from pre- to post-unit assessment. Of the 3 groups that did not report data, two were summer school classes and one used the SMD while preparing for the vocabulary component of the state assessment. Neither of these situations included content tests as a component of the curriculum. As described for vocabulary knowledge, each group with an N greater than 1 had significantly improved post-unit content-related test scores compared to their pre-unit results as tested by a paired *t*-test. Thus, each group's key content knowledge for the unit increased significantly with use of the SMD, on average. As is evident from the table, 19 of the 22 groups provided data related to students' content knowledge. As Table 5 also reveals, Treatment Group 5-VI had significantly improved post-unit scores compared to their pre-unit results. However, their pre-use means were higher than those of the other groups, leaving less room for improvement.

Table 5. Pre-/Post-unit Change in Content Knowledge



Ability to Use the SMD: As previously specified, teachers provided information about students' ability to work independently while using the SMD. They rated each student's ability during the period of use as 1: Low—Able to complete activities and homework with much assistance; 2: Medium—Able to complete activities and homework with some assistance; 3: High—Able to complete activities and homework with little to no assistance. As shown in Table 6, the majority of students were able to complete activities and homework independently (~45%) and with some assistance (~50%). Only a very small percentage (5%) required considerable assistance.

Table 6. Ability to Use the SMD



Overall Findings: Results of the field-test evaluation, summarized in Table 7 below and on the next page, indicate that the SMD serves as a bridge to help fill the language gap many upper elementary and middle grade students who are deaf and hard of hearing experience in doing mathematics.

Table 7. Summary of Findings

Treatment Group	Change in Ability to Sign Terms	Change in Ability to Understand Terms	Change in Ability to Define/Use Terms	Change in Content Knowledge
Group 4-I	+37%		+26%	+44%
Group 4-II	+26%		+52%	+56%
Group 4-III	+87%		+55%	+32%
Group 4-IV	+48%	+25%	+37%	+45%
Group 4-V	+25%	+12%	+23%	+26%
Group 5-I	+46%		+46%	+30%
Group 5-II	+34%		+36%	+65%
Group 5-III	+32%		+26%	+50%

Table 7
Continued

Treatment Group	Change in Ability to Sign Terms	Change in Ability to Understand Terms	Change in Ability to Define/Use Terms	Change in Content Knowledge
Group 5-IV	+48%	+44%	+38%	+28%
Group 5-V	+42%	+22%	+16%	
Group 5-VI	+23%	+20%	+20%	+10%
Group 6-I	+30%		+29%	+29%
Group 6-II	+33%		+30%	+37%
Group 6-III	+43%		+65%	+44%
Group 7-I	+72%		+78%	+80%
Group 7-II	+66%		+58%	+58%
Group 7-III	+63%		+60%	+60%
Group 8-I	+67%		+30%	+50%
Group 8-II	+47%		+48%	+49%
Group 4-8	+56%		+67%	+72%
Group 3-5S	+44%	+40%	+31%	
Group 7-8S	+35%	+37%	+43%	

Post-use Teacher Feedback

As previously specified, teachers provided feedback via post-use surveys about their experiences with the SMD. The following summarizes their written responses to this inquiry (N=11).

1. How would you rate students' ability to find information in the SMD?
Very easy—9; Fairly easy—2
2. How would you rate the SMD as a resource that complements and enriches instruction?
Very Valuable—2; Valuable—9
3. When did your students use the SMD?
With a math activity—7; For homework or research—4; For subjects other than math—1; Before, during an after a math unit—5
4. How did your students use the SMD?
Learn the definition of a word—7; Learn to sign a word—8; Learn a part of speech—1; Do homework—1; Communicate the content being studied—3

They used it as a resource when they could not find the term in their textbook. They used it to read math questions on their own. This is a huge plus and is what makes the SMD a great resource. I would love to see the signs embedded in our textbook math materials.

Kids would just click on the letter and try to find the word. They used that more than the search box. The one kid that's on grade level, she would do the search. But it was very simple, very easy to figure out.

We actually have one Internet connection, and I've got it connected to a Starboard, same kind of thing as a Smart Board. [Students] would take turns. We would set up stations, then, when it was their turn to work on the Starboard, then that's when we would use it.

They enjoyed getting the signing to go as fast as it could go. They liked that more than anything. But they didn't trend towards a certain character or anything.

We used the SMD to review/learn the signs and meaning of terms before starting the chapter. We used it at the end of the chapter to check our signing and understanding of the meaning of terms.

We used the SMD for everything we do that is math related.

Sometimes we used the SMD just for Fun!

Review for standardized testing. We used it for individual study to improve knowledge of weak areas.

5. Do you think using the SMD improved students' self esteem and/or self-confidence?

Yes—7; No—2

When the teacher introduced a topic that the students had previously worked with using the SMD, the student would light up and sign/say-*I know this*.

I liked that it helped my students focus on learning a group of signs that will help them in the classroom. In this way, it helped them become more confident learners.

They are so much better able to grasp the meaning of terms with the sign support. In this way, they feel better about themselves and learning.

They love it. The first week, we just played with it. They changed the avatars, the size, the speed, and all that fun stuff. Then one of the students just took off and actually helped out the other kids. But anything on the computer, they're just all about it. So they loved it.

It's a wonderful resource for teachers and students, especially in mainstream classes. It makes math accessible to *all* students.

We use all of the signing dictionaries that are available in all of our math and science classes. It is useful for standardizing the signs used throughout the school and gives teachers and kids a tool that they like and can count on.

6. Do you think using the SMD changed students' attitude toward math?

Yes—3; No—3

More connections were made. They also saw more patterns.

Because they knew the vocabulary so well they were confident in their knowledge.

Not for math in general. But they liked using it for the work we were doing.

7. How did you embed student use of the SMD into activities (pre-, during, at the end) and homework?

As we introduced each new vocabulary word or concept, I put the SMD up on the Activboard and we read through the definitions and discussed the signs. I also emailed parents and had them load the SMD on their home computers.

We used the SMD every time we met during the field test period to look up words and support what was going on in the class.

First we set it up. We started with just the vocabulary list. Each had ten words that were taken from the unit that they were required to know the sign for, and also to recognize the sign and the word in print. So we did that in isolation. But also, when it would come up in the lessons, we would go back to the dictionary as a reminder of what the signs were. They also started using it for more than those words that were on the list. If other words came up in the lessons that they weren't sure of, they would beg to go to the dictionary and find the sign for it. But, as far as the testing that I did on it, and what I've sent in, was just that the ten-word vocabulary list. And so, that's what we really focused on. But we did use it a lot more for finding signs and meanings for words that they weren't familiar with.

8. Did using the SMD help you accommodate different usages and learning styles?

I could bring in more ASL in a visual format. They loved watching different characters sign the same thing OVER and OVER.

Students who use ASL could get the information first hand. Students who are still learning ASL could read the English text.

I find that when students use the dictionary they are so much better able to grasp the meaning of terms they do not know because of the multiple forms of visual support as sign, as words, and as pictures. We also used it to look at differences between ASL and English grammar and to discuss why the math terms are signed the way they are. This particularly benefits kids whose primary language is ASL because it helps them understand and learn about their language.

Some students were able to benefit more from using the SE explanations and some could use the ASL version.

The SMD offers accessibility to math terms by deaf students who have stronger signing skills than literacy skills. I find students whose primary language is ASL especially benefit from the dictionary. They are so much better able to grasp the meaning of terms with the sign support.

9. Did using the SMD help you meet mandated curriculum frameworks? If yes, give an example.

We used the SMD to study and learn the vocabulary in the curriculum.

The vocabulary selected was from the general curriculum.

10. Describe the value the SMD adds to teaching and learning – specifically in the areas of comprehending the content, communicating about a topic, and working independently.

They like having a tool that is easy to use. They like doing math with the SMD because it is the only time they are able to sign the words and/or the definition and any word within the definition. They also like having the ability to alter the speed and angle to really look at the signing, and look at the pictures. These things make them like the math they are doing because it makes it more fun for them and they really feel that they are *getting it*.

More than anything it's the vocabulary. There is tons of vocabulary in math. And we sign so much of it. But it reminds me to finger spell a lot of it, to get them to remember that it's not just a rectangle. You've got to know that word in print. And also, just their interest in wanting to know the words they don't know. So, if something comes up, they don't just gloss right over it and keep on going. They stop and they want to go and find the definition and the sign for it. So that's what I think has held my class more than anything—it's slowing them down. And so, they're learning more. And they're learning how to find the answers, too, to things. Sometimes there would be words that weren't in the signed dictionary. They would have to go to Wikipedia or just a regular dictionary and find the definition. And we would use ASL Pro. We use that quite a bit on some things, too. So they're finding ways to find the answer. Whereas before, they would just give you the headshake, "Yeah, I'm good." So I think that's what they've gained more than anything, is they're starting to take it on themselves to find the answers.

The SMD helped students to connect signs, print words, and math concepts.

11. What do you like about the SMD? What do you dislike?

Students can use the SMD independently given a set of words.

I love that the SMD will sign each word in the definition if you click on the individual word, as well as the entire definition. I also like the pictures. I would also like to use the mobile version along with the Web version so they could look things up they came upon when working independently at their desks.

This is a great product...would love to have all of my students have the computer loaded with the math and science dictionaries.

I like the idea of having a "universal" for signs being used in the classroom that my students, teachers, and interpreters all use for signing words that are part of the curriculum. I think, in the long run, this will help our students have a better attitude toward math because they aren't all starting over. It will also help teachers focus more on teaching concepts and less on teaching signs. It will also give them more confidence as many of our teachers do not like to teach math or are *afraid* of it. I like the idea of this program, and I would love to use it again.

I can see utilizing this program with my students and their interpreters to be sure all are using the same signs. This will make administration of standardized testing much simpler when it comes to the question of how to sign a specific word.

I really liked the ease of use. The interpreter was able to use the dictionary with the math teacher in addition to the students. We also really liked being able to change the viewpoint for the sign.

I honestly can't think of anything I don't like. The kids love it, getting on the computer. They really do. We use it every day, and I don't have any complaints.

It was very easy to use to present vocabulary. It would be good to include examples using numbers in addition to the illustrations. Perhaps another icon button could be added for this.

The program is extremely easy to use. It is great! I liked the related words links and the pictures were tremendously helpful.

I liked the dictionary and the examples that went with the vocabulary items.

I like many things: Easy to use; signs the words and/or the definition and any word within the definition; ability to alter the speed and angle; the pictures.

I liked the format. I see lots of possibilities for this device.

I really liked the ease of use of this program.

We're all set to install the SMD and the other dictionaries on the computers teachers will be using next year. These dictionaries are just part of our teaching. We can't wait to try to the iPod and iPad versions.

The program is extremely easy to use. It is great! I liked the related words links and the pictures were tremendously helpful. I can see a lot of uses for it. I would like to have more general math terms. Basically, include anything having to do with math. (The Signing Math Pictionary for Grades K-3 is being developed.)

I would like to have an audio component." (Human voice narration has been added to the Web-based and mobile versions of the SMD.)

We used the iPod version last year and, if I had a choice, I'd use it this way because you do not need to be on the Internet, which for our school can be a problem. (A CD-ROM version for use without an Internet connection will be available.)

Post-use Student Feedback

As previously specified, students provided feedback via post-use surveys about their experiences with the SMD. The following summarizes their responses to this inquiry (N=60).

1. How easy was it to find information in the SMD?

Very easy—41; Fairly easy—12; Possible with a little trial and error—3; Somewhat difficult—4

2. How did you use the SMD?

Learn the definition of a word—36; Learn how to sign a word—35; Learn a part of speech—7; See how things look—2; Tell what I know— 6

3. Why were you unable to find what you were looking for?

It was not there—18; It was hard to find so I gave up—6

5 students reported they were able to find everything.

1 student reported that it is easy to use (and) I could find all of the words I wanted.

4 students reported that they found everything.

7 students reported that they used the other signing dictionaries to find what they were looking for.

4. Tell us how you found information in the SMD?

I looked for the first few letters and then found the word.

Pressed the letter buttons to find a word.

I looked at the pictures and the words together.

We typed the letters and used the alphabet order.

5. Tell us what you like about the SMD? What do you dislike?

I used the information to study for the test (state), but it was also fun. I really like the different characters and how they sign and express everything. I can see the face signing. I like finding words. It helps me learn sign language.

It looks like fun (and it is). I didn't know the words before and the avatar showed me everything. I liked the signs.

I really liked the guy turning around and signing to me.

It's fun. There was nothing I didn't like.

I could learn the parts of a whole (just) like the rest of the class. I like having a male to sign the words. I liked to pick the male that I want. It should have SEA (Signing Exact English).

There aren't enough sign language dictionaries. I like the SMD better than the book.

Different avatars; Many words; Signing: I love it all! It's cool! Dislike nothing.

It is part of math that we learn. It helps us make sense of math. I like that it has good information and signing. I can skip the pictures if I want. It's fun to use. I want to learn all of the definitions in it! Needs to have some simple words and some simple math words like we saw in the science pictionary.

It is easy to find things. I like to learn with fake people signing. It helps us learn some of the vocabulary. It helps us learn a sign language vocabulary. It is part of math that we learn and helps us make sense of math. Dislike nothing.

I like to learn about math things when it shows me a picture of its meaning.

I like most to learn the sign language that I don't know like *parallelogram*. Words like *cubic centimeter*, *cc*, are cool in 3D. It's good that I can skip the images (if I want to).

It is part of math that we learn and helps us make sense of math.

I like that it has good information and SIGNING.

It has simple definitions and I CAN understand the definitions.

I can learn new math words. Cool! I'd like to learn ALL of the math words in it.

I didn't know the signs before. Now I know them with the avatar

It's cool! Nothing is bad. Better than the book words. All I use. No more book.

Appendix

Site Data Form

1. School Information

Your Name: _____ Gender: Male Female

School Name: _____

School Classification: Urban Suburban Rural

2. Student Information

• What are the grade level(s) of the students who will use the SMD? _____

• Describe the ability of the student population that will use the SMD to read and write English.

Below grade level

At grade level

Above grade level

• Specify how many of the students who will use the SMD fall within the following levels of hearing loss:

_____ Mild (27–40dB)

_____ Moderate (41–55dB)

_____ Moderate - Severe (56–70dB)

_____ Severe (71–90dB)

_____ Profound (91dB+)

_____ Cochlear Implant

• Specify the number of your students who will use the SMD fall within the following ethnic backgrounds:

_____ African American/Black

_____ American Indian/Alaskan Native

_____ Asian

_____ Latino/Hispanic

_____ Native Hawaiian or Other Pacific Islander

_____ White

Pre-Use Teaching Survey

Unit/Activity Topic: _____ Goals: _____

I. List the 10 most important math terms students need to know to do the unit/activities.

Term	Able to Sign/Fingerspell the Term (yes/no)	Able to Understand the Sign for the Term (yes/no)	Able to Define/Use the Term (yes/no)
1)			
2)			
3)			
4)			
5)			
6)			
7)			
8)			
9)			
10)			