

Field Test Evaluation Report: Family Visitors

**The Handheld Signing Math & Science Dictionaries for Deaf and Hard of Hearing
Museum Visitors Research Project**
(NSF, Grant #DRL-1008546)

TERC

Judy Vesel, Principal Investigator
Bill Nave, Project Evaluator
Tara Robillard, Lead Researcher

March 2014

PROJECT DESCRIPTION

With this 3-year project, TERC and the Museum of Science (MoS) Boston are studying how family and school visitors integrate iPod Touch versions of the Signing Science Pictionary (SSP), Signing Science Dictionary (SSD), and Signing Math Dictionary (SMD) into their museum experience and the impact of dictionary use. This report focuses on family visitors.

Each dictionary includes more than 700 standards-based science or mathematics terms. The SSP (funded in part by grants from the Shapiro Family Foundation and the U. S. Department of Education, Grant #H327A080040) is intended for children ages 5-8 and grades K-4. The SSD (funded in part by grants from NEC Foundation of America, the National Science Foundation Grant [NSF] #HRD-0533057, and the U.S. Department of Education Grant #H327A060026), and the SMD (funded in part by NSF, #HRD-0833969) are for ages 9-12 and grades 5-8.

The dictionaries follow the concept of *Universal Design for Learning*¹ (UDL) developed by David Rose et al., which means that content is presented in multiple ways in order to allow the learner to select the method of presentation that best matches the ways in which (s)he learns. UDL also means that learners can choose from multiple ways to show what they have learned. Figures 1-3 provide examples of pages from the SSP that incorporate these “universally designed” features.

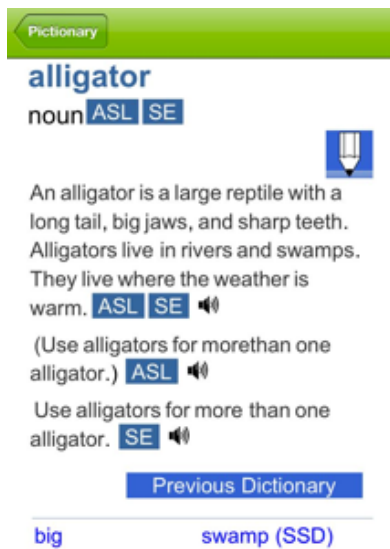


Figure 1. Term Page



Figure 2. Illustration Page

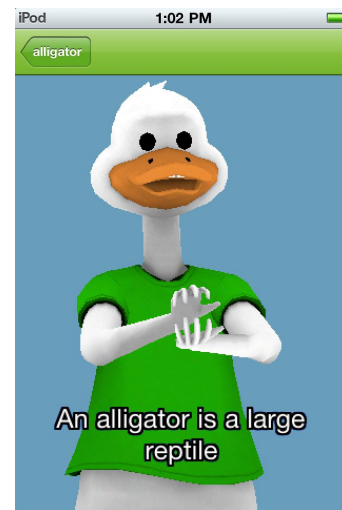


Figure 3. Signing Page

Science in the Park and *Take a Closer Look* were selected as the two exhibits at the outset of the project as the setting for our study. They were selected because: 1) They offer opportunities to accommodate the age-range of participants. 2) Many of the terms used to introduce activities and to help visitors understand their meaning are included in one or more of the dictionaries. 3) They offer opportunities to find out about use of the dictionaries with visitors of varying levels of hearing loss, reading ability, and STEM knowledge. 4) They focus on visual learning, incorporate text that is clear and concise, and include activities of varying difficulty.

¹ Rose, D.H., & Meyer, A. (2002). *Teaching every student in the digital age. Universal design for learning*. Alexandria, VA: Association for Supervision and Curriculum Development.

OBJECTIVES and GOALS

The objectives of the project as they relate to family visitors are twofold: 1) to study how family visitors integrate iPod Touch versions of the Signing Science Pictionary (SSP), Signing Science Dictionary (SSD), and Signing Math Dictionary (SMD) into their museum experience; and 2) to study what kinds of learning are made possible with use of the dictionaries and their impact on the museum experience. The goals of the evaluation as they relate to family visitors are to collect data to answer two primary research questions:

- 1) How do visitors, ages 5-12+ who are deaf or hard of hearing, integrate handheld dictionaries into their museum learning experience during family visits?
- 2) What kinds of learning are made possible with use of the dictionaries and how do they affect the engagement, involvement and interest of visitors, ages 5-12+ who are deaf or hard of hearing, during family visits?

METHODOLOGY

Analysis of our Pilot Test data informed our design of the methodology used for the Field Test². The Field Test used a mixed methods design that integrated quantitative and qualitative methods. The research team collected data from groups of family visitors before they visited the Museum, during their visit to the Museum exhibits, and after their visit. These data included surveys with fixed-response and open response items, observations, and exit interviews. The data sources provided a robust data set to support an analysis that was intended to answer our research questions.

DATA COLLECTION PROTOCOLS

Pre-visit Protocols. Parents completed a *Family Information Form* that provides demographic information about factors such as age, hearing level, and signing ability of each participant. We used this demographic information to determine which exhibit to assign each family to visit. *Science in the Park* is an area with a range of activities appropriate for families that include both younger and older children. *Take a Closer Look* is an area that includes topics and methods of presentation that are more appropriate for families that include older children. Therefore, we assigned families with younger children to visit *Science in the Park*; we assigned families with older children to visit *Take a Closer Look*. The Family Information Form is included in the Appendix.

Visit Protocols. The research team affixed Word Lists to some of the activities in each exhibit prior to each visit. We had learned from the Pilot Study that having this information available in this way enabled visitors to immediately identify key terms that were important for doing the activity and for understanding its underlying content. Placing Word Lists on some activities but not others during the Field Test allowed our data collection to either confirm or disprove this preliminary finding.

² Vesel, J. & Robillard, T. (2012). *Evaluation report: The Handheld Signing Math & Science Dictionaries for Deaf and Hard of Hearing Museum Visitors Research Project Pilot Test*. Unpublished report. Posted at http://signsci.test.terc.edu/MoS_SMSD/reports/index.htm

The Word Lists had the name of the activity at the top followed by: 1) A list of terms that are in at least one of the dictionaries and are related to the activity. 2) A three-letter abbreviation (SSP, SSD, or SMD) to signify the dictionary in which the term could be found. 3) An illustration to help clarify the term's meaning. For *Science in the Park*, Word Lists were placed on the activity panels for *Swing*, *Race*, *Spin*, *Big See Saw*, *Jump*, *Slide* and *Turn*. For *Take a Closer Look*, Word Lists were placed on the panels for *How Long Is A Minute?*, *Light in the Darkness*, *Vibration Patterns*, *Vibration Sensation*, *Seeing Heat, Hot or Cold?*, and *Seeing a Sound Wave*. Figure 4 provides an example of a Word List.

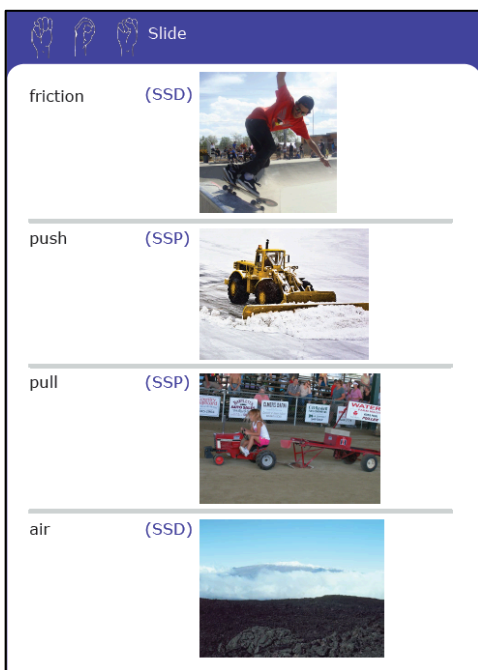


Figure 4. Word List Posted on the Activity Panel for *Slide*

When a family arrived at the museum for their visit, they met TERC's lead researcher, Tara Robillard, at a designated spot near the entrance of the exhibit to which they had been assigned. Tara gave each family member an iPod Touch with the dictionaries installed. Family members could choose to wear the iPod around their neck using a lanyard, or they could clip it to a belt or pocket.

After each family member had their iPod in their hands, Tara introduced them to the UDL features of the dictionaries. Specifically, they practiced accessing illustrations, text, human narration; selecting American Sign Language (ASL) or Signed English (SE) translations; choosing from a group of Avatar characters of different ages, ethnicities, and genders (including the Duck seen in Figure 3); and changing the signing speed and size of the text. When the researcher was satisfied that the family members were comfortable using the dictionaries, she explained that some of the activities in the exhibit had Word Lists posted on the information panels. She explained further that each list had words that were relevant to the particular activity and that they could look up using the dictionary specified by the three-letter abbreviation that followed the word. Finally, the researcher instructed the family to *either* first visit at least two activities that *did not* have a Word List posted, *or* to first visit at least two activities that *did* have Word Lists posted.

The research team had designed a modest randomization procedure for the family visitors in order to collect data that could potentially confirm the value of the Word Lists. Given that we expected only about ten families to visit during the field study and that we wanted the number of families that began their visit with Word Lists to be approximately equal to the number that began without Word Lists, we decided to toss a coin for the first family who visited. If the coin landed on heads, we assigned this first family to begin with the Word List activities. If the coin landed on tails, they were to begin with the non-Word List activities. After this first assignment, the family assignments alternated between beginning at the activities with Word Lists and beginning at those without Word Lists. Thus, in effect, the single coin toss determined the random assignment not only for the first family to visit, but also for each subsequent set of family visitors.

Once the families began to explore the activities, the researcher closely observed the family members, recording her observations on the project *Observation Log*. An example of the Observation Log is included in the Appendix. A member of the research team also videotaped the family’s visit. After the family group had completed their exploration of the exhibit, they met with the researcher at the same spot where they had begun their visit so that she could conduct a post-visit exit interview.

Post-visit Protocols. Following the exit interview, the researcher explained to parents (or those assuming that role) that she would email them a link to the *Follow-Up Online Survey* to complete and return within the next two weeks. Family members then returned the iPods. Groups were free to remain at the museum and explore other areas on their own. The Appendix includes copies of the Interview Form and the Follow-Up Online Survey.

VISITOR DEMOGRAPHICS

Eleven families participated in the Field Test. As described in Table 1, this included 52 family members, 24 adults (mothers, fathers, grandmothers, grandfathers, one friend, and one Big Sister) and 28 children (11 boys, four of whom are deaf or hard of hearing, and 17 girls, eight of whom are deaf or hard of hearing). In addition to the twelve deaf children, one of the fathers is deaf and visited the Museum with his hearing wife and three hearing children.

Table 1. Family Visitor Demographics

Group	N	Members	Gender	Age*	Hearing Status	Hearing Loss	Signing Skills
A	4	Father	M		Hearing	None	Intermediate
		Mother	F		Hearing	None	Advanced
		Child 1	M	9	HH w/ hearing aid(s)	Moderate-Severe	Novice
		Child 2	M	12	Hearing	None	Survival
B	4	Father	M		Hearing	None	No Skills
		Mother	F		Hearing	None	No Skills
		Child 1	M	6	Deaf with CI**	Severe	Novice
		Child 2	M	<5	Hearing	None	No Skills
C	2	Mother	F		Hearing	None	Survival
		Child	F	6	Deaf with CI	Profound	Superior
D	6	Father	M		Hearing	None	Novice
		Mother	F		Hearing	None	Survival

		<i>Child 1</i>	<i>F</i>	<i>6</i>	<i>HH w/ hearing aid(s)</i>	<i>Moderate-Severe</i>	<i>Novice</i>
		<i>Child 2</i>	<i>F</i>	<i><5</i>	<i>HH w/ hearing aid(s)</i>	<i>Moderate-Severe</i>	<i>No Skills</i>
		Child 3	M	6	Hearing	None	No Skills
		Child 4	F	>14	Hearing	None	No Skills
		Father	M		Hearing	None	Survival
		Mother	F		Hearing	None	Survival
E	6	<i>Child 1</i>	<i>F</i>	<i>9</i>	<i>HH w/ hearing aid(s)</i>	<i>Moderate-Severe</i>	<i>Superior</i>
		Child 2	F	6	Hearing	None	No Skills
		Child 3	F	>14	Hearing	None	Novice
		Child 4	M	>14	Hearing	None	No Skills
		Father	M		Hearing	None	Survival
		Mother	F		Hearing	None	Intermediate
		Grandfather	M		Hearing	None	Novice
		Grandmother	F		Hearing	None	Novice
F	9	<i>Child 1</i>	<i>F</i>	<i>12</i>	<i>Deaf</i>	<i>Profound</i>	<i>Intermediate</i>
		Child 2	F	12	Hearing	None	Intermediate
		Child 3	F	>14	Hearing	None	Intermediate
		Child 4	M	12	Hearing	None	Novice
		Child 5	M	9	Hearing	None	Novice
		Father	M		Hearing	None	Survival
		Mother	F		Hearing	None	Survival
G	4	<i>Child 1</i>	<i>F</i>	<i>6</i>	<i>HH with hearing aid(s)</i>	<i>Moderate-Severe</i>	<i>Intermediate</i>
		Child 2	F	12	Hearing	None	Novice
H	2	Big Sister***	F		Hearing	None	Superior
		<i>Child 1</i>	<i>F</i>	<i>14</i>	<i>Deaf with CI</i>	<i>Profound</i>	<i>Intermediate</i>
		Mother	F		Hearing	None	Superior
		Grandfather	M		Hearing	None	Novice
I	5	Grandmother	F		Hearing	None	Novice
		<i>Child 1</i>	<i>F</i>	<i>9</i>	<i>Deaf with CI</i>	<i>Profound</i>	<i>Advanced</i>
		Child 2	M	9	Hearing	None	Survival
		Mother	F		Hearing	None	Superior
		Grandmother	F		Hearing	None	No Skills
J	5	Mother's Friend	F		Hearing	None	No Skills
		<i>Child 1</i>	<i>M</i>	<i>12</i>	<i>Deaf</i>	<i>Profound</i>	<i>Survival</i>
		<i>Child 2</i>	<i>M</i>	<i>>14</i>	<i>Deaf w/ hearing aid(s)</i>	<i>Profound</i>	<i>Novice</i>
		<i>Father</i>	<i>M</i>		<i>Deaf</i>	<i>Profound</i>	<i>Superior</i>
		Mother	F		Hearing	None	Superior
K	5	Child 1	M	<5	Hearing	None	Novice
		Child 2	F	6	Hearing	None	Novice
		Child 3	F	9	Hearing	None	Intermediate

*Age ranges are represented by a single digit as follows: 6=5-7, 9=8-10, 12=11-13

**Cochlear Implant

***Volunteer from the Big Sisters/Big Brothers organization

RESULTS

Research Question 1: *How do visitors, ages 5-12+ who are deaf or hard of hearing, integrate handheld dictionaries into their museum learning experience during family visits?*

To help us answer this research question, we organized our results around the four sub-questions listed below. Results that emerged from analysis of the data for sub-questions 1-3 are provided in Tables 2-7. Results for sub-question 4 are provided in narrative form. These results are then summarized as key findings for our first research question.

- 1) What do family groups do during their visit?
- 2) Why do visitors use the dictionaries to look up science and math terms?
- 3) Which dictionary features do visitors use to acquire information?
- 4) What are visitors' perspectives and opinions about using the dictionaries during their visit?

Sub-question 1: *What do family groups do during their visit?* —Observation and exit interview data provided the evidence for these results.

Table 2. What Do Family Groups Do at Science in the Park Activities With Word Lists?

Activity	# of Groups	Read Instructions	Read Labels	Used Word List	Terms Looked Up	Used the ASL Sign	Engaged in Discussion
Big See Saw	3	2/3, 67%	1/3, 33%	1/3, 33%	fulcrum, heavy	1/3, 33%	3/3, 100%
Jump	3	1/3, 33%	2/3, 67%	2/3, 67%	jump, gravity, graph	1/3, 33%	3/3, 100%
Race	3	1/3, 33%	2/3, 67%	2/3, 67%	fast, potential energy	1/3, 33%	3/3, 100%
Slide	2	1/2, 50%	0	1/2, 50%	none	0	1/2, 50%
Spin	5	2/5, 40%	2/5, 40%	3/5, 60%	spin (4)	3/5, 60%	4/5, 80%
Swing	3	1/3, 33%	1/3, 33%	3/3, 100%	pendulum, angle, gravity, long	1/3, 33%	2/3, 67%
Turn	3	3/3, 100%	1/3, 33%	1/3, 33%	turn	1/3, 33%	1/3, 33%
TOTAL	22	11/22, 50%	9/22, 41%	13/22, 59%		8/22, 36%	17/22, 77%

Table 3. What Do Family Groups Do at Science in the Park Activities Without Word Lists?

Activity	# of Groups	Read instructions	Read Labels	Used Word List	Terms Looked Up	Used the ASL Sign	Engaged in Discussion
Small Balances	3	1/3, 33%	1/3, 33%	n/a	balance, lever	2/3, 67%	2/3, 67%
Lift	2	0	0	n/a	none	0	2/2, 100%
Run	2	1/2, 50%	0	n/a	none	0	0
Speed Up	2	1/2, 50%	1/2, 50%	n/a	speed	0	1/2, 50%
TOTAL	9	3/9, 33%	2/9, 22%	n/a		2/9, 22%	5/9, 56%

Table 4. What Do Family Groups Do at *Take a Closer Look* Activities *With Word Lists*?

Activity	# of Groups	Read Instructions	Read Labels	Used Word List	Terms Looked Up	Used the ASL Sign	Engaged in Discussion
Hot or Cold	5	5/5, 100%	4/5, 80%	3/5, 60%	hot, cold, nerve (3), metal, temperature	3/5, 60%	5/5, 100%
How Long is a Minute?	4	4/4, 100%	4/4, 100%	2/4, 50%	sixty (2), second (2), minute, hour	2/4, 50%	4/4, 100%
Light In the Darkness	4	4/4, 100%	2/4, 50%	3/4, 75%	light (2), reflect (2), dark, star, space	3/4, 75%	3/4, 75%
Seeing Heat	6	4/6, 67%	4/6, 67%	5/6, 83%	temperature (2), visible light, infrared light (3), warm, cool	2/6, 33%	4/6, 67%
Seeing Sound Waves	2	1/2, 50%	1/2, 50%	2/2, 100%	frequency, vibrate (2)	2/2, 100%	1/2, 50%
Vibration Patterns	5	3/5, 60%	3/5, 60%	4/5, 80%	vibrate (3), pattern, frequency, vertical	3/5, 60%	5/5, 100%
Vibration Sensation	1	1/1, 100%	1/1, 100%	1/1, 100%	hertz, frequency	1/1, 100%	1/1, 100%
TOTAL	27	22/27, 82%	19/27, 70%	20/27, 74%	7 of 7, 100%	16/27, 59%	23/27, 85%

Table 5. What Do Family Groups Do at *Take a Closer Look* Activities *Without Word Lists*?

Activity	# of Groups	Read Instructions	Read Labels	Used Word List	Terms Looked Up	Used the ASL Sign	Engaged in Discussion
Fingerprints of Light	1	1/1, 100%	1/1, 100%	n/a	knob (not in dictionary)	0	1/1, 100%
How Smooth is Smooth?	3	3/3, 100%	3/3, 100%	n/a	none	0	3/3, 100%
Now You See It	1	1/1, 100%	1/1, 100%	n/a	none	0	1/1, 100%
Quick as a Wink	1	1/1, 100%	1/1, 100%	n/a	none	0	1/1, 100%
Seeing With Sonar	1	1/1, 100%	1/1, 100%	n/a	sonar	1/1, 100%	1/1, 100%
Sense for Scents	2	2/2, 100%	1/2, 50%	n/a	grass, coconut, lemon, strawberry, rose (flower)	1/2, 50%	2/2, 100%
Splash in a Flash	1	1/1, 100%	1/1, 100%	n/a	motion	1/1, 100%	1/1, 100%

Time Lapse Video	1	0	0	n/a	none	0	0
View From Space	6	2/6, 33%	2/6, 33%	n/a	mountain, Earth, space, lake, salt	6/6, 100%	6/6, 100%
Whirling Watcher	1	0	0	n/a	none	0	0
Whose Woods Are These?	3	0	1/3, 33%	n/a	turtle (3), snake, lettuce, sink (to sink)	3/3, 100%	3/3, 100%
TOTAL	21	12/21, 57%	12/21, 57%		6 of 11, 55%	12/21, 57%	19/21, 90%

Sub-question 2: *Why do visitors use the dictionaries to look up science and math terms?* —Exit interview and follow-up survey data provided the evidence for these results.

Table 6. Why do visitors use the dictionaries to look up terms?

Reasons for Using the Dictionaries	# of Parents
To learn new signs or see terms signed.	9/10, 90%
To help child(ren) learn something new, extend their learning, or answer their questions.	6/10, 60%
To learn more about science and math concepts.	5/10, 50%
To help us/me understand the instructions or information presented in writing (on activity signs).	5/10, 50%
To be able to ask child(ren) questions about what they were observing or doing.	5/10, 50%
To look up terms on our own for different reasons.	4/10, 40%
To learn more about or be able to talk about and explain what was happening in the activities.	4/10, 40%
To hear their definition and learn what they mean, understand instructions, and /or communicate in English.	0

The researcher also included children in the post-visit exit interviews. For example, she asked them to name a term they had looked up and to explain why they did so. More than half of them (56%) said they looked up terms because their parents asked them to, or because their parents prompted them indirectly to look up a term. Nearly half of the children (44%) said they looked up terms because they were on the Word List.

Sub-question 3: *Which dictionary features do visitors use to acquire information* —Exit interview and follow-up survey data provided the evidence for these results.

Table 7. Which dictionary features do visitors use?

Dictionary Feature	Parents (N=10)	Deaf or HH Children (N=10)	Hearing Children (N=4)
Terms in ASL	10/10, 100%	8/10, 80%	4/4, 100%
Definitions in ASL	7/10, 70%	7/10, 70%	2/4, 50%
Terms in English	4/10, 40%	1/10, 10%	2/4, 50%
Definitions in English	5/10, 50%	2/10, 20%	2/4, 50%
Terms in SE	1/10, 10%	0	0
Definitions in SE	1/10, 10%	0	0
Voiced Definitions	0	0	0

Comments from children during the post-visit exit interview parallel the comments made by parents: I only looked at the signed terms. I mostly watched the signed definitions. Watched the signed term first if I did not know the sign for the word. I knew most of the signs for the words on the word lists, but I learned more from watching the signed definitions.

Sub-question 4: *What are visitors' perspectives and opinions about using the dictionaries during their visit?* —Exit interview and follow-up survey data provided the evidence for these results.

Ten (100%) of the parents who responded to the survey said the dictionaries were easy to use. Parent's comments during the post-visit interview provide some of the reasons they thought the dictionaries were easy to use: The dictionaries are simple to use - interactive and include a lot of features, but it (the dictionary) isn't bogged-down by them! I found the selection of words extensive and the avatars easy to understand. I particularly liked that you were able to control the speed of the avatar that comes in real handy in making sure that you have signed the word correctly.

Some parents identified minor challenges in using the dictionaries: Had a little difficulty selecting the right definition. I kept selecting the one that told me the part of speech as well by mistake. Harder for my five year old to use since she is a beginning reader. The only difficulty I encountered was the fact that the 2 dictionaries [SSD and SMD] were linked. If you were to look up a word and it was in both [dictionaries] you could very well end up selecting the wrong definition and have to back track into the correct application to find what you were looking for.

A couple of the parents offered suggestions for improvement: If possible, including some video would help or some of the definitions. Need a little tutorial to get started.

Ten (100%) of the parents who responded to the survey found the information presented in the dictionaries to be informative. Nine (90%) said the dictionaries were useful, and eight (80%) said that having the dictionaries made the visit easier for them. Seven (70%) of the parents responding to the survey said the dictionaries gave them better access to the exhibits.

Parent's comments during the interview focused primarily on the usefulness and value of the dictionaries to support communication with their children about the activities. The Big Sister (from the Big Sisters/Big Brothers organization) found the dictionary to be particularly helpful in giving her Little Sister some independence during the museum visit. Other comments included: We learned new signs. The dictionaries helped me discuss activities with my daughter. The signed definitions were especially helpful. It takes some of the pressure off of me to explain everything during the visit. It also helps my (*little sister*) to take initiative to look things up on her own and not have to rely on me. In the past she would get frustrated with having me explain everything. They opened up conversation and learning between parent and child. The dictionaries helped my hearing children learn new signs to communicate with their deaf father.

Parents unanimously endorsed the Word Lists. All eleven parents interviewed (100%) said they used the Word Lists to identify which terms to look up in the dictionaries. All 10 who responded to the survey (100%) said the Word Lists were useful in helping them use the dictionaries. Parents commented that the combination of the Word Lists and the dictionaries seamlessly integrated their experience with the activities: The Word Lists helped to integrate the dictionaries with the exhibit. They helped us feel confident that we would find the terms we were looking for. They gave me a better sense of what terms to "push" my little sister to understand/explore within the exhibit. They were very helpful to know right there if a word was in the dictionary before looking it up. Also helped from being frustrated if the word was not there.

Parent's comments also indicated that the Word Lists do indeed motivate visitors to use the dictionaries. It targeted our focus in the exhibits and helped to move us along. Almost like a scavenger hunt. They were

helpful to provide suggested terms to look up. My daughter really liked looking up the words on the list, at other activities without the lists she didn't look up any words. It also helped her grandparents know which words were in the dictionaries.

Key Findings for Research Question 1—*How do visitors, ages 5-12+ who are deaf or hard of hearing, integrate handheld dictionaries into their museum learning experience during family visits?*

Families did use the dictionaries during their visits to the exhibit activities. Specifically, they used the dictionaries to help them: read instructions, read labels, look up terms, use the ASL sign, and engage in discussion.

Parents used the dictionaries to learn the signs for terms so that they could better communicate with their children and answer their questions. Prompting from parents and seeing terms in Word Lists often prompted children to look up particular terms. Parents, deaf or hard of hearing children, and hearing children most frequently used the dictionaries to look up terms in ASL. The next most frequent reason for family members to use the dictionaries was to look up definitions in ASL. Parents and hearing children looked up terms and definitions in English more frequently than children who were deaf or hard of hearing. Only 10% of parents looked up terms and definitions in SE. Parents and children did not listen to the human voice narrations.

Evidence appears to point to the value of posting Word Lists. At *Science in the Park*, family members looked up terms at six of the seven activities with Word Lists, but at only two of four of the activities without Word Lists. Additionally, 77% engaged in discussions about the activities using their new signing vocabulary at activities with Word Lists, compared to 56% at activities without Word Lists. In fact, activities without Word Lists received only nine family visits compared to twenty-two family visits to activities with Word Lists, in spite of half the families being assigned to begin their visit with activities that did not have Word Lists. At *Take a Closer Look*, groups looked up terms at 100% of the activities with Word Lists, but did so at only 55% of the activities without Word Lists; 82% read the instructions at the activities with Word Lists, compared to 57% at activities without Word Lists; and 70% read the labels at activities with Word Lists, compared to 57% at activities without Word Lists.

In sum, both parents and children used the dictionaries. They found them easy to use, informative, and useful. The primary reasons for using the dictionaries were to look up terms to learn the sign or to see the definition signed. Said differently, most of the parents and many of the children used the dictionaries for building their signing vocabulary, which in turn supported their ability to communicate about the concepts that were demonstrated in the various museum activities.

Research Question 2: *What kinds of learning are made possible with use of the dictionaries and how do they affect the engagement, involvement and interest of visitors, ages 5-12+ who are deaf or hard of hearing, during family visits?*

To help us answer this research question, we organized our results around the three sub-questions listed below. Results that emerged from analysis of the data for sub-questions 1 and 2 are provided in Tables 8-15. Results for sub-question 3 are provided in narrative form. These results are then summarized as key findings for our second research question.

- 1) How much time do family groups spend at activities?
- 2) What do family members learn with use of the dictionaries?
- 3) What do family members say about use of the dictionaries and their level of engagement, involvement, and interest?

Sub-question 1: *How much time do family groups spend at activities?* —Observation data provided the evidence for these results.

Table 8. How Much Time Do Family Groups Spend at *Science in the Park* Activities With Word Lists?

Name of Activity	Number of Groups	Less Than One Minute	One to Two Minutes	More than Two Minutes
Big See Saw	3	0	1/3, 33%	2/3, 67%
Jump	3	0	2/3, 67%	1/3, 33%
Race	3	0	1/3, 33%	2/3, 67%
Slide	2	1/2, 50%	1/2, 50%	0
Spin	5	0	1/5, 20%	4/5, 80%
Swing	3	0	1/3, 33%	2/3, 67%
Turn	3	0	2/3, 67%	1/3, 33%
TOTAL	22	1/22, 5%	9/22, 41%	12/22, 54%

Table 9. How Much Time Do Family Groups Spend at *Science in the Park* Activities Without Word Lists?

Name of Activity	Number of Groups	Less Than One Minute	One to Two Minutes	More than Two Minutes
Small Balances	3	0	1/3, 33%	2/3, 67%
Lift	2	1/2, 50%	0	1/2, 50%
Run	2	0	1/2, 50%	1/2, 50%
Speed Up	2	0	2/2, 100%	0
TOTAL	9	1/9, 11%	4/9, 44%	4/9, 44%

Table 10. How Much Time Do Family Groups Spend at *Take a Closer Look* Activities With Word Lists?

Name of Activity	Number of Groups	Less Than One Minute	One to Two Minutes	More than Two Minutes
Hot or Cold	5	0	0	5/5, 100%
How Long is a Minute?	4	0	3/4, 75%	1/4, 25%
Light In the Darkness	4	0	2/4, 50%	2/4, 50%
Seeing Heat	6	0	2/6, 33%	4/6, 67%
Seeing Sound Waves	2	0	1/2, 50%	1/2, 50%
Vibration Patterns	5	0	1/5, 20%	4/5, 80%
Vibration Sensation	1	0	0	1/1, 100%
TOTAL	27	0	9/27, 33%	18/27, 67%

Table 11. How Much Time Do Family Groups Spend at *Take a Closer Look* Activities Without Word Lists?

Name of Activity	Number of Groups	Less Than One Minute	One to Two Minutes	More than Two Minutes
Fingerprints of Light	1	0	1/1, 100%	0
How Smooth is Smooth?	3	0	3/3, 100%	0
Now You See It	1	0	0	1/1, 100%
Quick as a Wink	1	0	1/1, 100%	0
Seeing With Sonar	1	0	0	1/1, 100%
Sense for Scents	2	0	0	2/2, 100%
Splash in a Flash	1	0	1/1, 100%	0
Time Lapse Video	1	0	1/1, 100%	0
View From Space	6	0	0	6/6, 100%
Whirling Watcher	1	0	1/1, 100%	0
Whose Woods Are These?	3	0	0	3/3, 100%
TOTAL	21	0	8/21, 38%	13/21, 62%

Sub-question 2: *What do family members learn with use of the dictionaries?* —Observation and exit interview data provided the evidence for these results.

Tables 12 and 13 are direct evidence of using the dictionaries to learn new ASL signs.

Table 12. What Do Family Members Learn at *Science in the Park*?

Family	Activity	Observation notes
A	Balance	Father demonstrates how to put a weight onto the balance. He says to Child 1, “Here you try.” Child 1 tries to balance the lever. The father helps Child 1 to look up the term <i>balance</i> . They both learn the sign and practice it.
G	Race	Child 1 did the activity while the parents used the dictionaries to look up terms. Mother looked up the term <i>fast</i> and learned the sign for the term and then practiced the sign.
K	Jump	Mother explained the directions to Child 3. Child 3 jumped on the platform a few times. The mom pointed to the graph. Child 3 looked up the term <i>graph</i> and watched the term signed. She practiced the sign and then called her father over and demonstrated the sign to him.

Table 13. What Do Family Members Learn at *Take a Closer Look*?

Family	Activity	Observation notes
H	Hot or Cold?	Both adult and Child 1 read the activity instructions. The adult helped Child 1 understand what to do. Child 1 did the activity. The adult pointed to the term <i>nerve</i> on the content label and prompted the child to look it up. Child 1 watched the term being signed and then watched the signing of the definition. After the child had learned the sign, they discussed the term and its meaning.
D	How Long is a Minute?	Mother prompted Child 1 and Child 2 to look up the first two terms on the Word List (<i>sixty</i> and <i>second</i>). The mother first watched the terms being signed. She then turned the iPod to show the children the signs. Afterwards, they all practiced the sign for each term together.

F	Vibration Patterns	Mother used the dictionaries to look up a term. The researcher asked the mother which word she looked up and she said, “ <i>vibrate</i> .” She said this was a new sign for her.
---	--------------------	--

As the tables show, use of the dictionaries enables the learning of new ASL signs. The following comments from parents during the exit interviews provide further evidence: I learned new words in ASL. The dictionaries helped my hearing children learn more ASL. I learned the signs for “force” and “lever”. My niece learned a few new signs. My children learned the signs for “earth”, “stars”, “lemon”, and “temperature”. I learned the sign for “vibration”.

Comments from children made during the interviews with their parents provide additional evidence of using the dictionaries to learn new signs: At the see saw we looked up “lever” and “fulcrum”. I didn’t know the sign for “lever” before. I learned the sign for “star”. I learned signs for some words like “nerve” and “reflect”.

Tables 14 and 15 are direct evidence of using the dictionaries to learn the definitions of terms they have looked up.

Table 14. What Do Family Members Learn at *Science in the Park*?

Family	Activity	Observation notes
K	Race	Child 1 and Child 3 started putting the balls in the slots and running the race. The mother was pointing out the timers and talking to Child 3 about how long it took on each track. Then she pointed to the term <i>energy</i> on the activity panel. Child 3 used the dictionary to look it up. Child 3 found the term and watched the definition being signed [It is possible that she was also reading the English text definition]. She looked up at her mother and exclaimed, “Oh!”

Table 15. What Do Family Members Learn at *Take a Closer Look*?

Family	Activity	Observation notes
H	Light in the Darkness	Both group members read the activity instructions. The child did the activity. As they began to discuss what was happening, the Big Sister pointed out the term, <i>reflect</i> . The child looked up the term and watched the term and definition being signed. She then used the term in her explanation of what was going on in the activity. The researcher subsequently asked which word she looked up and they said <i>reflect</i> . They added that the child did not know the sign for the term before she looked it up. The Big Sister said, “She really gets it!”
H	Splash in a Flash	The child read the instructions and started to do activity. The child looked up <i>motion</i> (because it was a word on the content panel that she did not know the meaning of). She watched the definition being signed. The adult and child then discussed [the meaning of the term in the context of] the activity.

As the tables show, use of the dictionaries enables learning of the meaning of terms. The following comments from parents during the exit interviews provide further evidence: In math terminology, “frequency” means one thing. In scientific terminology, it means something else. This led to a rich conversation with my kids about multiple meanings. We learned about ultraviolet light and the light spectrum.

Comments from the children made during the interviews provide additional evidence of learning the meaning of terms: I looked up “sonar” and learned what sonar is. Knowing the meaning and sign for “reflect” helped me understand and explain what was happening with the light.

Sub-question 3: *What do family members say about use of the dictionaries and their level of engagement, involvement, and interest?* —Survey and exit interview data provided the evidence for these results.

Anything on an iPod makes my son happy! It was great. Kids enjoyed using the technology. Children enjoyed the “technology” aspect of using the iPod. Enjoyed being able to look up the word and see the signs for themselves. I really like it! I especially like the definitions (which are not included in the ASL dictionary I already have on my phone).

It was a nice opportunity for us to enjoy the museum as a family and for our son to gain more understanding. Thank you. All in all it was an enjoyable morning and it was good to be able to interact with our granddaughter more. It was a great experience. The whole family really enjoyed it.

We liked the application so much that we downloaded the Science dictionary to our phone and continued to use it in the museum. I am going to purchase these dictionaries! I will be purchasing the apps.

This is great! I really like being able to use the dictionaries to look up words. I like science so it’s interesting to me. Using the dictionaries opened up more vocabulary for both parent and child. I really like this. This can really help me to explain things to my son. It’s fabulous. The signs are good but its nice that the dictionaries also tell you what the words mean. It’s really great for families.

Key Findings for Research Question 2: *What kinds of learning are made possible with use of the dictionaries and how do they affect the engagement, involvement and interest of visitors, ages 5-12+ who are deaf or hard of hearing, during family visits?*

Evidence from the field test indicates that the dictionaries supported family members’ learning of new signs and definitions for terms. In particular, discussion of the activities as a family using their newly acquired signed vocabulary is a concrete indicator that these kinds of learning occurred. It is also indicative of dictionary use leading to engagement, involvement, and interest in the activities.

The duration of time spent at each of the activities further indicates that dictionary use contributed to engagement, involvement, and interest. Nearly all of the groups spent at least a minute at an activity, and half spent at least two minutes. More groups spent more time at *Take a Closer Look* activities than at *Science in the Park* activities. It is likely that the longer attention spans of the older children, who were assigned to this exhibit and the kinesthetic nature of *Science in the Park* explain a good deal of this difference.

DISCUSSION

Eleven families participated in the field test. These families included twelve deaf or hard of hearing children, ranging in age from younger than five to older than 14, and also included one deaf father. Nearly three quarters (71%) of the family groups observed during the visits engaged in discussions about the activities they visited. The new signs they had learned from using the dictionaries were used to support these discussions. Family members reported that they used the dictionaries to learn signs and definitions for terms that were new to them more frequently at activities where a Word List was posted.

One parent's comment on the post-visit survey captures an idea common among most of the families: "It [the dictionary] opened up more conversation and learning between parents and child." Additionally, all of the 10 parents who completed the surveys indicated that using the dictionaries helped them access the activities, made the visit more "fun", and enhanced their museum experience. They "got more out of it" and would like to use the dictionaries elsewhere at the museum and when visiting other museums. Many children supported these sentiments during the exit interviews when they commented that using the dictionaries helped them "do" the activities.

In sum, families used the dictionaries to look up and learn the signs for and definitions of terms that were new to them. They then used this new learning to discuss and learn the science content that was the focus of the activity they were visiting.

Limitations. The results of this study reflect the experiences of a limited number of families. Therefore they cannot be generalized to *all* families with deaf or hard of hearing children. It is also important to note that the study was conducted in a limited number of exhibit areas, in a single informal educational setting, and using a limited number of activities within each of only two exhibit areas. Therefore, a larger-scale, study is required. This larger study needs to include more participants, take place in an expanded number of exhibits in the Museum setting, and include additional museum settings.

Implications. The data strongly suggest that when a Word List is affixed to an activity, the visitors are more likely to use the dictionaries to look up terms and definitions and to discuss the content of the activity with their companions. This suggests that if an informal science education venue were to decide to make the signing dictionaries available to deaf or hard of hearing visitors during their visit, their learning value would be enhanced substantially if the venue also affixed Word Lists to display panels. These lists should include key terms that are also in at least one of the dictionaries and are necessary to understand the content focus of the presentation.

Suggestions from parents indicate that the SigningAvatars® could be integrated into other aspects of the displays to enhance the overall visit experience as follows:

For children who cannot read well, it would be nice if the blurbs [English Text] on the exhibits themselves could be signed out so deaf/HH kids that sign could get the directions or explanation.

[Add] a signed introduction to match the exhibit and the words we will be looking up.

Maybe some indicator [next to the text on the panels] so people who are deaf would know that those are the words they can look up.

Suggestions from parents also indicate ways in which the dictionaries could be improved for use in a museum setting. These included: adding more terms that are museum specific, identifying additional terms at each activity that could be accessed using the dictionaries, adding video clips for some of the "harder" concepts.

Conclusions. Family visitors that included a range of ages and levels of hearing loss used the dictionaries to learn the signs and definitions for terms that were new to them as they visited activities. They then engaged in discussions related to the activities. In the context of the two exhibits used for this field test, the data strongly support the assertion that the dictionaries are

valuable learning tools for science museum visitors who are deaf or hard of hearing. It would be important to conduct additional studies in more exhibits at the MoS and in additional informal science education venues such as zoos, aquariums, and natural history museums, to confirm the dictionaries would also be valuable learning tools for these other kinds of settings. It would also be useful to conduct additional studies to begin to ascertain the degree to which increased vocabulary knowledge might result in quantifiable increased content knowledge—a topic about which little is known.

Appendix

Family Information Form

Part I. Parent/Guardian Information (Please complete for all parents/guardians who will visit the MoS)

1. Name: _____

2. Are you:

- Hearing Deaf Hard of Hearing

Please specify your level of hearing loss.

- Mild (27–40dB)
 Moderate (41–55dB)
 Moderate - Severe (56–70dB)
 Severe (71–90dB)
 Profound (91dB+)

Please specify your age of onset of hearing loss.

- Age of onset < 3 years
 Age of onset > 3 years

3. What is your ethnic background?

- American Indian/Alaskan Native
 Asian American
 African American/Black
 Latino/Hispanic
 American Indian/Alaskan Native
 White
 Other: _____

4. Please check each of the language, communication, or sign system(s) that you use.

- Spoken English
 Spoken Spanish
 American Sign Language
 Signing Exact English
 Fingerspelling
 Simultaneous Communication (sign-supported speech)
 Manually Coded English Systems
 Cued Speech

Guide to Sign Communication Proficiency Levels

Superior: Able to have a fully shared conversation, with in-depth elaboration for both social and work topics.

Advanced: Able to have a generally shared conversation with good, spontaneous elaboration for both social and work topics.

Intermediate: Able to discuss with some confidence routine social and work topics within a conversational format with some elaboration; generally 3-to-5 sentences.

Survival: Able to discuss basic social and work topics with responses generally 1-to-3 sentences in length.

Novice: Able to provide single sign and some short phrase/sentence responses to basic questions signed at a slow-to-moderate rate with frequent repetition and rephrasing.

No Functional Skills: (May be) Able to provide short single sign and “primarily” finger-spelled responses to some basic questions signed at a slow rate with extensive repetition and rephrasing.

5. Please specify your “Sign Communication Proficiency Level”.

- Superior
- Advanced
- Intermediate
- Survival
- Novice
- No Functional Skills

Part II. Child Information (Please complete for all children who will visit the MoS. If you have more than 2 children, complete an additional form.)

1. Name: _____ Age: _____

2. Is this child:

- Hearing Deaf Hard of Hearing?

If deaf/hh, does the child have:

- Cochlear Implant(s)? Hearing Aid(s)?

If deaf/hh, please specify level of hearing loss (with a CI and/or hearing aid, if applicable).

- Mild (27–40dB)
- Moderate (41–55dB)
- Moderate - Severe (56–70dB)
- Severe (71–90dB)
- Profound (91dB+)

Please specify the age of onset of hearing loss.

- Age of onset < age 3 years
- Age of onset > age 3 years

3. Does child have a disability in addition to, or other than being deaf/hh?

- Yes No

If yes, please describe:

4. Ethnic background:

- American Indian/Alaskan Native
- Asian American
- African American/Black
- Latino/Hispanic
- American Indian/Alaskan Native
- White
- Other:

5. Ability to read and write English:

- Below grade level
- At grade level
- Above grade level

6. Please check each of the language, communication or sign system(s) that this child uses.

- Spoken English
- Spoken Spanish
- American Sign Language
- Signing Exact English
- Fingerspelling
- Simultaneous Communication (sign-supported speech)
- Manually Coded English Systems
- Cued Speech

7. Please specify this child's "Sign Communication Proficiency Level".

- Superior
- Advanced
- Intermediate
- Survival
- Novice
- No Functional Skills

8. Please specify the school/program that this child attends.

- Public/Private School
- School for the Deaf/HH
- Preschool/Pre-K

Name of School/Program: _____ Grade: _____

Part 3. Getting Started

1. Has your family visited the MoS before?

- Yes No

If yes, please tell us about any particular challenges or obstacles that you may have experienced during prior visits.

2. Has anyone in your family used either the Web or App versions of the Signing Math and Science dictionaries at home or at school?

- Yes No

If yes, please tell us about your prior use of the dictionaries.

Family Interview Form

Questions for Children

1. In general, what do you think about using the dictionaries during the visit?
2. Did you use the dictionaries to look up any words? (Yes or No)
3. Which words did you look up? Give some examples.
4. Choose a word that you looked up and tell me why you looked it up.
 - It was on a word list.
 - It was a word displayed on the activity panel.
 - It was a word I did not know.
 - It was a word my parent asked or helped me look up.Comments the child made related to the above:
5. How did you typically use the dictionary when you looked up words?
 - I read the English term and/or definition.
 - I watched it signed in ASL or SE.
 - I listened to the voiced term and/or definitionComments the child made related to the above:
6. What did you learn about that word?
 - Did you learn how to sign it?
 - Did you learn more about its meaning?Comments the child made related to the above:
7. Did using the dictionaries help you do the activities? (Yes or No)
 - Give an example. How did it help?
8. Did you like using the dictionaries during the visit? (Yes or No)
9. Did it make it easier for you? (Yes or No)
 - Give an example. How did it help?

Questions for Parents

1. What are your general reactions, thoughts, and impressions about using the dictionaries during the visit?
2. Please tell me how you typically used the dictionaries in the two exhibits.
3. Why did you look up words?
 - a) Did you look up words to help you understand the instructions?
 - b) Did you look up words to see the terms or definitions signed?
 - c) Did you look up words to be able to better communicate with your child and ask or answer his or her questions?Comments the parent made related to the above:
4. Which features did you use most frequently?
 - a) I read the term and/or definition.

- b) I watched the term signed in ASL or SE.
 - c) I listened to the term and/or definition voiced.
- Comments the parent made related to the above:

5. Did you look at or use the Word Lists? (Yes or No)
6. How were the Word Lists helpful?
7. Did you look up any words at the activities that did not have Word Lists? (Yes or No)
8. How did you choose words to look up if there were no Word Lists?
9. Please give me an example of an activity for which you looked up a term. What term did you look up?
 - a) Why did you look it up?
 - b) What did you learn?
 - c) What did you do with what you learned?
10. Did you like using the dictionaries during the visit? (Yes or No)
11. Did it make it easier for you? (Yes or No)
 - Give an example. How did it help?
12. Do you think it would be helpful to have access to the dictionaries during subsequent visits to the museum or to other types of museums, an aquarium, etc? (Yes or No)

Additional comments related to the above:

Family Observation Log - Science in the Park

<p style="text-align: center;">RACE</p> <p>Start: _____ End: _____</p>	<p><u>Who Observed?</u></p>	<p><u>Terms/Looked Up?</u></p> <p><input type="checkbox"/> Acceleration (SSD) <input type="checkbox"/> Potential Energy (SSD) <input type="checkbox"/> Kinetic Energy (SSD) <input type="checkbox"/> Fast (SMD) <input type="checkbox"/> Slow (SMD)</p>	<p><u>Discussion/Action:</u></p>	<p><input type="checkbox"/> Read the instruction labels? <input type="checkbox"/> Read the content labels? <input type="checkbox"/> Talked with others in the group? <input type="checkbox"/> Used Sign? <input type="checkbox"/> Looked at/used the Word List?</p>
<p style="text-align: center;">SWING</p> <p>Start: _____ End: _____</p>	<p><u>Who Observed?</u></p>	<p><u>Terms/Looked Up?</u></p> <p><input type="checkbox"/> Pendulum (SSD) <input type="checkbox"/> Gravity (SSD) <input type="checkbox"/> Angle (SSD) <input type="checkbox"/> Long (SMD) <input type="checkbox"/> Short (SMD)</p>	<p><u>Discussion/Action:</u></p>	<p><input type="checkbox"/> Read the instruction labels? <input type="checkbox"/> Read the content labels? <input type="checkbox"/> Talked with others in the group? <input type="checkbox"/> Used Sign? <input type="checkbox"/> Looked at/use the Word List?</p>
<p style="text-align: center;">SPIN</p> <p>Start: _____ End: _____</p>	<p><u>Who Observed?</u></p>	<p><u>Terms/Looked Up?</u></p> <p><input type="checkbox"/> Spin (SSD) <input type="checkbox"/> Inertia (SSD) <input type="checkbox"/> Mass (SSD) <input type="checkbox"/> Speed (SSD)</p>	<p><u>Discussion/Action:</u></p>	<p><input type="checkbox"/> Read the instruction labels? <input type="checkbox"/> Read the content labels? <input type="checkbox"/> Talked with others in the group? <input type="checkbox"/> Used Sign? <input type="checkbox"/> Looked at/used the Word List?</p>
<p style="text-align: center;">BALANCE E (Big See Saw)</p> <p>Start: _____ End: _____</p>	<p><u>Who Observed?</u></p>	<p><u>Terms/Looked Up?</u></p> <p><input type="checkbox"/> Lever (SSD) <input type="checkbox"/> Fulcrum (SSD) <input type="checkbox"/> Weight (SSD) <input type="checkbox"/> Distance (SSD) <input type="checkbox"/> Heavy (SMD) <input type="checkbox"/> Light (SMD)</p>	<p><u>Discussion/Action:</u></p>	<p><input type="checkbox"/> Read the instruction labels? <input type="checkbox"/> Read the content labels? <input type="checkbox"/> Talked with others in the group? <input type="checkbox"/> Used Sign? <input type="checkbox"/> Looked at/used the Word List?</p>
<p style="text-align: center;">SLIDE</p> <p>Start: _____ End: _____</p>	<p><u>Who Observed?</u></p>	<p><u>Terms/Looked Up?</u></p> <p><input type="checkbox"/> Friction (SSD) <input type="checkbox"/> Push (SSP) <input type="checkbox"/> Pull (SSP) <input type="checkbox"/> Air (SSD)</p>	<p><u>Discussion/Action:</u></p>	<p><input type="checkbox"/> Read the instruction labels? <input type="checkbox"/> Read the content labels? <input type="checkbox"/> Talked with others in the group? <input type="checkbox"/> Used Sign? <input type="checkbox"/> Looked at/used the Word List?</p>
<p style="text-align: center;">JUMP</p> <p>Start: _____ End: _____</p>	<p><u>Who Observed?</u></p>	<p><u>Terms/Looked Up?</u></p> <p><input type="checkbox"/> Jump (SSP) <input type="checkbox"/> Gravity (SSD) <input type="checkbox"/> Graph (SSD) <input type="checkbox"/> Up (SSP) <input type="checkbox"/> Down (SSP)</p>	<p><u>Discussion/Action:</u></p>	<p><input type="checkbox"/> Read the instruction labels? <input type="checkbox"/> Read the content labels? <input type="checkbox"/> Talked with others in the group? <input type="checkbox"/> Used Sign? <input type="checkbox"/> Looked at/used the Word List?</p>
<p style="text-align: center;">TURN</p> <p>Start: _____ End: _____</p>	<p><u>Who Observed?</u></p>	<p><u>Terms/Looked Up?</u></p> <p><input type="checkbox"/> Turn (SMD) <input type="checkbox"/> Rotate (SSD) <input type="checkbox"/> Momentum (SSD) <input type="checkbox"/> Opposite (SMD) <input type="checkbox"/> Force (SSD)</p>	<p><u>Discussion/Action:</u></p>	<p><input type="checkbox"/> Read the instruction labels? <input type="checkbox"/> Read the content labels? <input type="checkbox"/> Talked with others in the group? <input type="checkbox"/> Used Sign? <input type="checkbox"/> Looked at/used the Word List?</p>

Follow-up Survey for Families

1. Please provide your name so that we can match responses to your information on the family information form.
2. How easy was it for you to use the dictionaries?
 - Easy
 - Difficult
 - Comments:
3. How informative was the information in the dictionaries?
 - Informative
 - Not Informative
 - Comments:
4. How useful were the dictionaries during your visit to the museum?
 - Useful
 - Not Useful
 - Comments:
5. Rate how useful each of the following dictionary features was for you (Useful, Not Useful, Not Sure, Never Used).
 - a) SEARCH feature
 - b) Alphabet Bar
 - c) Alphabetical listing of terms
 - d) Parts of Speech
 - e) Definitions
 - f) Illustrations/Examples
 - g) Choice of ASL or SE
 - h) Signing Blocks of Text
 - i) Signing Individual Words
 - j) Human Voice Narration
 - k) Going to Terms Within Definitions
 - l) Changing Signing Speed
 - m) Changing Text Size
 - n) Changing Signing Character
 - o) Rotating Character
 - p) Zooming Character In and Out
6. Which of the following best describes the way your family experienced the exhibits at the museum?
 - a) We did most of the activities within exhibit area together.
 - b) We split up and explored individually, checking in at times.
 - c) Both a and b
 - d) Other (please describe):
7. Which of the following best describes the way your family used the dictionaries at the museum?
 - a) We looked up words to learn new signs or see terms signed.
 - b) We looked up words to learn more about science and math concepts.
 - c) We/I (parents) looked up words to help my child(ren) learn something new, extend their learning, or answer their questions.

- d) We/I (parents) looked up words to be able to ask my/our child questions about what they were observing/doing.
- e) Each of us used the iPods individually to look up terms on our own for different reasons.
- f) We/I looked up terms to learn more about or be able to talk about and explain what was happening in the activities.
- g) We/I looked up terms to help us/me understand the instructions or information presented in writing (on activity signs).
- h) We looked up words to hear their definition and learn what they mean, understand instructions, and /or communicate in English.

8. Which of the following were most helpful/useful for you?

- a) terms in SE
- b) terms in ASL
- c) terms in English
- d) definitions in SE
- e) definitions in ASL
- f) definitions in English
- g) voiced definitions

Please explain your choice(s):

9. Which of the following were most helpful/useful for your deaf/hh child(ren)?

- a) Terms in SE
- b) Terms in ASL
- c) Terms in English
- d) Definitions in SE
- e) Definitions in ASL
- f) Definitions in English
- g) Voiced definitions

Please explain your choice(s):

Questions for Families with Hearing Children

10. Which of the following were most helpful/useful for your hearing child(ren)? (check all that apply)?

- a) Terms in SE
- b) Terms in ASL
- c) Terms in English
- d) Definitions in SE
- e) Definitions in ASL
- f) Definitions in English
- g) Voiced definitions

Please explain your choice(s):

11. How useful were the posted Word Lists in helping you use the dictionaries?

- Useful
- Not Useful
- Comments:

12. Did you or your children use the dictionaries to learn new signs? If so, please list the terms for which you learned signs.

13. Did you or your children use the dictionaries to learn the meaning of a term that you did not know or

that you were not sure about? If so, please give an example.

14. Did you or your children use the dictionaries to learn something that you didn't know before about science or math? If so, please give an example.

15. Rate how much you agree/disagree with the following statements (Strongly Agree, Agree, Disagree, Strongly Disagree).

- a) Using the dictionaries during the visit made it more fun.
- b) Using the dictionaries during the visit made it easier.
- c) Using the dictionaries during the visit gave us better access to the exhibits.
- d) Using the dictionaries during the visit helped us learn more about science or about math.
- e) Using the dictionaries enhanced our museum experience (We "got more out of it").
- f) Using the dictionaries during the visit helped our child(ren) explore and learn on their own (reduced the amount of help/instruction needed from parents).

16. Would you like to use the dictionaries during visits to other exhibits at the museum?

- Yes
- No