

Evaluation Report

STEM Workforce Stories for Adolescents Who Are Deaf or Hard of Hearing Project

(NSF Award #2005511)

TERC

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PROJECT DESCRIPTION

With this *STEM Workforce Stories for Adolescents Who Are Deaf or Hard of Hearing* (SWS) Pilot and Feasibility project TERC studied use and potential effectiveness of 8 video stories from deaf or hard of hearing members of the STEM workforce.

Research and development involved: 1) Preparing 8 separate Web-delivered video stories; 2) Conducting a formative evaluation that incorporated a mixed-methods design to find out about use and effectiveness of the stories when used at home, while attending a boys and girls club, and playing a part in non-curriculum-based school learning; 3) Making the stories available at no cost and completing a report of findings. Outcomes rendered new knowledge that will be used to inform subsequent research and development of the stories.

The STEM Workforce Stories (SWS) are career stories told by the STEM professionals depicted below and on the next page.



Naturalist, A. Schrage



Pharmacologist, A. Ogunjirin



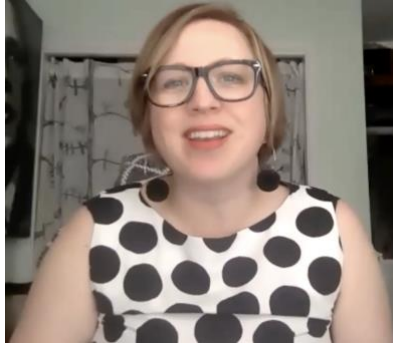
Nurse Practitioner, S. Hein



Water Quality Analyst, C. Solomon



Microbiologist, D. Braun

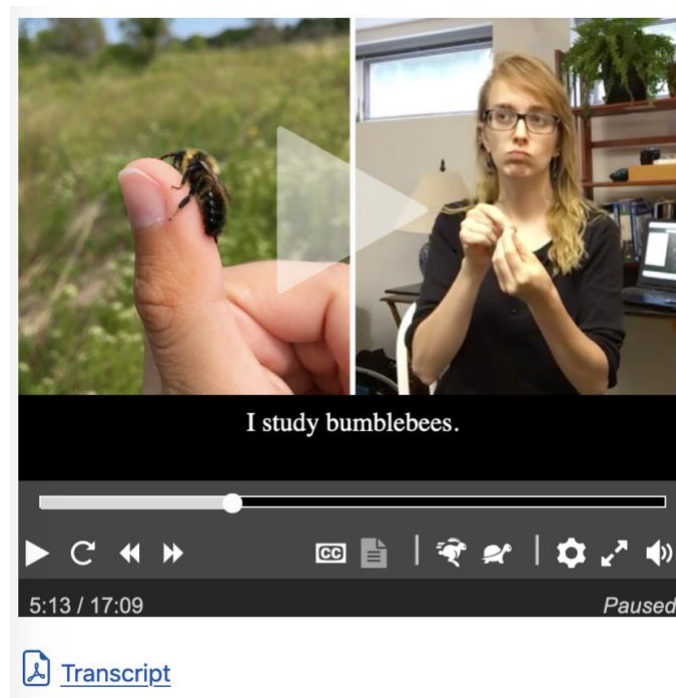


UX/UI Designer, M. Manak



Geologist, M. Cooke

To allow options for personalized use by deaf or hard of hearing viewers as well as those who are hearing Universal Design for Learning (UDL) features (CAST 2018)¹ are incorporated into the Web interface. Among these are an upper navigation bar that allows users to return to the Stories Home page, Story Selection Options, and Implementation Strategies. Once a story of interest has been selected, the story, as shown in the figure below, will appear based on the user's chosen preferences—in sign with captions or listened to in English with or without simultaneous sign interpretation or voice overlay. Additional options include the ability to increase or decrease text size, loudness, and contrast, to play and replay all or parts of a story as often as needed, and to select different options at any time while viewing a story.



¹ CAST (2018). Universal Design for Learning Guidelines version 2.2. Retrieved from: <http://udlguidelines.cast.org>

OBJECTIVES and GOALS

The objectives of the research component of the project were to study: 1) use of the stories during out-of-school time; 2) the impact of the stories on the target audience's awareness of the range of STEM careers that are available to them and of their potential ability to pursue and succeed in a STEM career; and 3) how the stories might be improved and disseminated. The goals of the evaluation were to collect data to answer our five primary research questions: 1) How do parents, club, and teacher leaders make use of the stories? 2) How do adolescents who are deaf or hard of hearing integrate and use digital versions of firsthand stories from members of the STEM workforce? 3) What kinds of outcomes are made possible with use of the stories in terms of interest and engagement in STEM and pursuing a STEM career? 4) What modifications and additions would improve the stories to make them more useful and effective? 5) What dissemination strategies would maximize story use? Answers to the first three questions generated new knowledge about what happens with use of the stories, how it happens, and under what circumstances. Answers to the last two questions generated new knowledge about subsequent design and distribution of the stories.

METHODOLOGY

The proof-of-concept SWS test used a mixed-methods design that integrated qualitative and quantitative methods. The research team collected data from groups of adolescents, parents, and instructors after use of the stories using online post-use surveys that incorporated fixed and open-response items and were tailored for implementation in a range of OST settings. They were designed to provide a robust data set that could be used to support an analysis that was intended to answer our research questions. Appendix A provides examples of the surveys.

PROTOCOLS

Protocols for each group were presented online and accommodated circumstances resulting from the realities of COVID. As few deaf or hard of hearing adolescents had returned to attending activities at boys and girls clubs, and families were overwhelmed with additional requirements, we included informal school learning that takes place in schools outside of the curriculum in extended school settings and includes such things as watching videos and podcasts (Strimel et. al. 2014)² as a source of data. For each setting—families, clubs, schools—Lead Researcher Robillard sent parents a note that included the viewing protocols and a Testing Consent Form. She then worked with parents online prior to and during the viewing period to help them as needed. After they had submitted their surveys, each family received a \$10 Amazon gift card as a token of appreciation.

² Strimel, G., Reed, P., Dooley, G., Bolling, J., Phillips, M., & Cantu, D. V. (2014). Integrating and monitoring informal learning in education and training. *Techniques: Connecting Education & Careers*, 89(3), 48-54.

FAMILIES

Online Viewing Protocols

Step 1: Setting Up Testing with Parents — The Lead Researcher will email parents information, guidance, suggestions, and options for how to conduct the testing. She will also send links for accessing the stories; the parent and student online post-use surveys; and instructions for viewing the stories, generating, and submitting questions to the STEM professional, and completing the surveys. This will help parents decide how best to set up and conduct the testing session. Zoom meetings or phone conversations with the Lead Researcher will be arranged as needed.

Step 2: Testing Sessions — Testing sessions, including preparation time, will be about an hour and can be done at the convenience of the family. Session activities will involve the child in watching one of the stories individually, with siblings, friends, parents, and other family members, and submitting questions to the STEM professional using an online form.

Step 3: Collection of Online Survey Data — After viewing the story, parent and child will each complete a post-use online survey. They will then send the completed surveys to the SWS team for preparation and analysis.

BOYS & GIRLS CLUBS

Online Viewing Protocols

Step 1: Introductory Meeting with the Director — The Lead Researcher and PI will meet (via Zoom) with the Club Director to introduce the project, review testing protocols and instruments, and discuss ideas and plans for conducting testing. Following the meeting, the research team will send the director a link to access the stories. The director will review the stories and identify club leaders who will be involved in planning and implementing testing with students. Club leaders will then have an opportunity to review the site and begin to plan for conducting testing.

Step 2: Planning Meeting with the Director and Club Staff — The Lead Researcher and PI will meet (via Zoom) with the Director and Club leaders to be involved in testing. The meeting will involve a review of the testing protocols and instruments, setting up an implementation schedule, identification of the story students will view, and answering questions that emerge. It may also include a demonstration of how to access the stories and use the interactive UDL features.

Step 3: Testing Sessions — Each testing session, including preparation time, will be about an hour. The Director and Club leaders will schedule sessions at a time that is convenient for them and participating students. Session activities will involve students in watching one of the stories individually or in small or large groups and generating and submitting questions for the STEM professional via the online form provided.

Step 4: Collection of Online Survey Data — After viewing the story, Club leaders and students will complete post-use online surveys and send them to the SWS team for preparation and analysis.

EXTENDED SCHOOL SETTINGS

Online Viewing Protocols

Step 1: Setting Up Testing—The Lead Researcher will email the teacher information, guidance, suggestions, and options for how to conduct the testing. She will also send links for accessing the stories; the teacher and student online post-use surveys; and instructions for viewing the stories, generating, and submitting questions to the STEM professional, and completing the surveys. This will help the teacher decide how to identify which story students will view, and how best to set up and conduct testing sessions. Zoom meetings or phone conversations with the Lead Researcher will be arranged as needed.

Step 2: Testing Sessions—The testing session, including preparation time, will be about an hour. Session activities will involve students in watching one of the stories individually or in small or large groups and generating and submitting questions to the STEM professional via an online form.

Step 3: Collection of Online Survey Data — After viewing the story, the teacher and students will complete post-use online surveys and send them to the SWS team for preparation and analysis.

RESULTS

We organized our results for each of the informal learning settings around each of our five research questions: 1) How do parents, club, and teacher leaders make use of the stories? 2) How do adolescents who are deaf or hard of hearing integrate and use digital versions of firsthand stories from members of the STEM workforce? 3) What kinds of outcomes are made possible with use of the stories in terms of interest and engagement in STEM and pursuing a STEM career? 4) What modifications and additions would improve the stories to make them more useful and effective? 5) What dissemination strategies would maximize story use? The table numbering scheme that is used to present these results, identifies both testing type (families, boys & girls clubs; schools) and testing order. For example, the tables that show results for family testing are designated with the number 1, for a boys and girls club with a 2 etc.

1: FAMILIES

Family testing to date included one family and one child as described in Table 1a.

Table 1a. Family Member Demographics

Group	N	Members	Gender	Age	Race	Hearing Level	Communication Method
A	1 1	Mother Child	Female Female	--- 16	White/Caucasian Asian or Asian American	Hearing Deaf	English ASL

Research Question 1: *How do parents, club leaders, and teachers make use of the stories?*

Table 1b. Story Use by Parents

Group	Family Member	Stories Viewed	Viewers	How Viewed	Integration
A	Mother	Schrage, Naturalist	Child	Alone	Parent used sign to discuss the story afterwards with the child

Research Question 2: *How do adolescents who are deaf or hard of hearing integrate and use digital versions of firsthand stories from members of the STEM workforce?*

Table 1c. Story Use by Adolescents

Group	Family Member	Story Viewed	How Viewed	Languages Used	Features Used & Usefulness	Features Not Used
A	Child	Schrage	Alone	ASL	ASL-Very Useful; Decreased Volume-Very Useful	Text size, Screen brightness, Stop/Replay, Transcript

Research Question 3: *What kinds of outcomes are made possible with use of the stories in terms of interest and engagement in STEM and pursuing a STEM career?*

Table 1d. Adolescents' Interest in Parts of the STEM Professional's Story

Group	Adolescent	Rater	Description of...	Rating
A	Child	Child	What the STEM Career Involves	Interesting
A		Parent	What the STEM Career Involves	Interesting
A	Child	Child	Emergence of STEM Interest	Interesting
A		Parent	Emergence of STEM Interest	Interesting
A	Child	Child	What Sparked STEM Interest	Interesting
A		Parent	What Sparked STEM Interest	Interesting
A	Child	Child	How STEM Interest Maintained	Interesting
A		Parent	How STEM Interest Maintained	Interesting
A	Child	Child	What Continues to Inspire STEM Interest	Interesting
A		Parent	What Continues to Inspire STEM Interest	Interesting
A	Child	Child	Challenges & Obstacles Encountered	Interesting
A		Parent	Challenges & Obstacles Encountered	Interesting
A	Child	Child	Overcoming Challenges & Obstacles	Interesting
A		Parent	Overcoming Challenges & Obstacles	Interesting
A	Child	Child	Images of the Work Setting	Interesting
A		Parent	Images of the Work Setting	Interesting
A	Child	Child	Images of Equipment Used	Interesting
A		Parent	Images of Equipment Used	Interesting
A	Child	Child	Advice About Pursuing STEM & a STEM Career	Interesting
A		Parent	Advice About Pursuing STEM & a STEM Career	Interesting

Table 1e. The STEM Professional's Story Generating Interest & Engagement in STEM and in Pursuing a STEM Career

Group	Adolescent	Rater	Outcome	Rating
A	Child	Child	Found Out Something New About STEM	Strongly Agree
A		Parent	Found Out Something New About STEM	Strongly Agree
A	Child	Child	Found Out More About STEM Careers	Strongly Agree
A		Parent	Found Out More About STEM Careers	Strongly Agree
A	Child	Child	Increased Interest in STEM	Strongly Agree
A		Parent	Increased Interest in STEM	Strongly Agree
A	Child	Child	Increased Interest in a STEM Career	Strongly Agree
A		Parent	Increased Interest in a STEM Career	Strongly Agree
A	Child	Child	Learning How to Overcome Challenges	Strongly Agree
A		Parent	Learning How to Overcome Challenges	Strongly Agree
A	Child	Child	Provided Useful Advice and Encouragement	Strongly Agree
A		Parent	Provided Useful Advice and Encouragement	Strongly Agree
A	Child	Child	Gave Me a More Positive View of Deaf/HH Persons	Strongly Agree
A		Parent	----	----

Research Question 4: *What modifications and additions would improve the stories to make them more useful and effective?*

Parent (Group A)

Since my child was able to navigate and understand the story independently, it says volumes for the quality of the story and how it is distributed. I have no feedback for changes.

Parent & Child (Group A)

Add more career stories by other STEM professionals. Suggestions included stories from a zoologist or any career that has to do with the study of animals and from professionals who study space and the planets.

Research Question 5: *What dissemination strategies would maximize story use?*

Parent (Group A)

Incorporate postings on social media.

2: BOYS & GIRLS CLUBS

Table 2a. Boys & Girls Club Member Demographics

Group	N	Members	Gender	Age	Race	Hearing Level	Communication Method
A	3	Leaders	Female-3	---	White-3	Hearing-2 HH-1	English-3
	44	Participants	Male-16 Female-27 Self descrd.-1	10-31 11-9 13-2 14-1 18-1	Black/AA-1 White-7 Black/AA,Hispanic/Latin X-2 Hispanic/LatinX-28 American Indian, Alaska	Hearing-42 HH (CI)-2	English-42; Simultaneous Communication-1 Other (Creole)-1

					Native, other Indigenous peoples-1 Hispanic/LatinX, White-1 Choose not to respond-1 No Answer-3	
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Research Question 1: *How do parents, club, and teacher leaders make use of the stories?*

Table 2b. Story Use in the Boys & Girls Club Setting

Group	Stories Viewed	Viewers	How Viewed	Integration	Language Used
A	Solomon; Braun	Participants & Leaders	In a group with 3 or more students, with an after-school club leader	We watched the story together and discussed it afterwards	English with ASL and Captions

Research Question 2: *How do adolescents who are deaf or hard of hearing integrate and use digital versions of firsthand stories from members of the STEM workforce?*

Table 2c. Story Use by Hearing Participants (N=42)

Group	Features Used	Usefulness
A	Text size	Very Useful 1; Somewhat Useful 2; 1; Not Sure 3; Never Used 25; No Answer 1
	Increase volume	Very Useful 36; Somewhat Useful 3; Not Useful 2; No Answer 1
	Decreasing volume	Very Useful 8; Somewhat Useful 8; Never Used 24; No Answer 2
	Screen Brightness	Very Useful 22; Somewhat Useful 2; Not Sure 1; Never Used 16; No Answer 1
	Screen Darkness	Very Useful 8; Somewhat Useful 2; Not Sure 1; Never Used 28; Not Useful 1; No Answer 2
	Replaying Story	Very Useful 11; Somewhat Useful 4; Not Sure 2; Never Used 22; No Answer 3
	Replaying Part of Story	Very Useful 23; Somewhat Useful 8; Never Used 7; No Answer 4
	Transcript	Very Useful 11; Somewhat Useful 2; Not Useful 1; Not Sure 2; Never Used 25; No Answer 3

Table 2d. Story Use by Hard of Hearing Participants (N=2)

Group	Features Used	Usefulness
A	Text size	Very Useful 1; Somewhat Useful 1
	Increase volume	Very Useful 1; Somewhat Useful 1
	Decreasing volume	Very Useful 1; Somewhat Useful 1
	Screen Brightness	Very Useful 1; Somewhat Useful 1
	Screen Darkness	Very Useful 1; Somewhat Useful 1
	Replay Story	Very Useful 1; Somewhat Useful 1
	Replaying Part of Story	Very Useful 1; Somewhat Useful 1
	Transcript	Very Useful 1; Somewhat Useful 1

Research Question 3: *What kinds of outcomes are made possible with use of the stories in terms of interest and engagement in STEM and pursuing a STEM career?*

Table 2e. Hearing Participants' Interest in Parts of the STEM Professional's Story

Group	Adolescent	Rater	Description of...	Rating
A	Participant	Hearing Participants	What the STEM Career Involves	Interesting 30; Somewhat Interesting 9; Not Interesting 1; Not Sure 1; No Answer 1
A		Leaders	What the STEM Career Involves	Interesting 3
A	Participant	Hearing Participants	Emergence of STEM Interest	Interesting 25; Somewhat Interesting 12; Not Interesting 2; Not Sure 1; No Answer 2
A		Leaders	Emergence of STEM Interest	Interesting 3
A	Participant	Hearing Participants	What Sparked STEM Interest	Interesting 25; Somewhat Interesting 9; Not Interesting 5; Not Sure 1; No Answer 2
A		Leaders	What Sparked STEM Interest	Interesting 3
A	Participant	Hearing Participants	How STEM Interest Maintained	Interesting 27; Somewhat Interesting 11; Not Interesting 2; Not Sure 1; No Answer 1
A		Leaders	How STEM Interest Maintained	Interesting 3
A	Participant	Hearing Participants	What Continues to Inspire STEM Interest	Interesting 29; Somewhat Interesting 11; Not Sure 1; No Answer 1
A		Leaders	What Continues to Inspire STEM Interest	Interesting 3
A	Participant	Hearing Participants	Challenges & Obstacles Encountered	Interesting 27; Somewhat Interesting 8; Not Interesting 3; Not Sure 2; No Answer 2
A		Leaders	Challenges & Obstacles Encountered	Interesting 3
A	Participant	Hearing Participants	Overcoming Challenges & Obstacles	Interesting 31; Somewhat Interesting 8; Not Interesting 2; No Answer 1
A		Leaders	Overcoming Challenges & Obstacles	Interesting 3
A	Participant	Hearing Participants	Images of the Work Setting	Interesting 30; Somewhat Interesting 8; Not Interesting 2; Not Sure 1; No Answer 1
A		Leaders	Images of the Work Setting	Interesting 3
A	Participant	Hearing Participants	Images of Equipment Used	Interesting 29; Somewhat Interesting 11; No Answer 2
A		Leaders	Images of Equipment Used	Interesting 3
A	Participant	Hearing Participants	Advice About Pursuing STEM & a STEM Career	Interesting 31; Somewhat Interesting 10; Not interesting 1
A		Leaders	Advice About Pursuing STEM & a STEM Career	Interesting 3

Table 2f. Hard of Hearing Participants' Interest in Parts of the STEM Professional's Story

Group	Adolescent	Rater	Description of...	Rating
A	Participant	HH Participants	What the STEM Career Involves	Interesting 1; Somewhat Interesting 1

A	Participant	Leaders	What the STEM Career Involves	Interesting 3
A	Participant	HH Participants	Emergence of STEM Interest	Interesting 1; Somewhat Interesting 1
A		Leaders	Emergence of STEM Interest	Interesting 3
A	Participant	HH Participants	What Sparked STEM Interest	Interesting 1; Somewhat Interesting 1
A		Leaders	What Sparked STEM Interest	Interesting 3
A	Participant	HH Participants	How STEM Interest Maintained	Interesting 1; Somewhat Interesting 1
A		Leaders	How STEM Interest Maintained	Interesting 3
A	Participant	HH Participants	What Continues to Inspire STEM Interest	Interesting 1; Somewhat Interesting 1
A		Leaders	What Continues to Inspire STEM Interest	Interesting 3
A	Participant	HH Participants	Challenges & Obstacles Encountered	Interesting 1; Somewhat Interesting 1
A		Leaders	Challenges & Obstacles Encountered	Interesting 3
A	Participant	HH Participants	Overcoming Challenges & Obstacles	Interesting 1; Somewhat Interesting 1
A		Leaders	Overcoming Challenges & Obstacles	Interesting 3
A	Participant	HH Participants	Images of the Work Setting	Interesting 1; Somewhat Interesting 1
A		Leaders	Images of the Work Setting	Interesting 3
A	Participant	HH Participants	Images of Equipment Used	Interesting 1; Somewhat Interesting 1
A		Leaders	Images of Equipment Used	Interesting 3
A	Participant	HH Participants	Advice About Pursuing STEM & a STEM Career	Interesting 1; Somewhat Interesting 1
A		Leaders	Advice About Pursuing STEM & a STEM Career	Interesting 3

Table 2g. The STEM Professional's Story Generating Interest & Engagement in STEM and in Pursuing a STEM Career for Hearing Participants

Group	Adolescent	Rater	Outcome	Rating
A	Participant	Hearing Participants	Found Out Something New About STEM	Strongly Agree 30; Agree 6; Somewhat Agree 5; No Answer 1
	Participant	Leaders	Found Out Something New About STEM	Strongly Agree 3
A	Participant	Hearing Participants	Found Out More About STEM Careers	Strongly Agree 32; Agree 4; Somewhat Agree 4; Disagree 1; No Answer 1
A	Participant	Leaders	Found Out More About STEM Careers	Strongly Agree 3
A	Participant	Hearing Participants	Increased Interest in STEM	Strongly Agree 25; Agree 7; Somewhat Agree 6; Disagree 2; No Answer 2
A	Participant	Leaders	Increased Interest in STEM	Strongly Agree 3
A	Participant	Hearing Participants	Increased Interest in a STEM Career	Strongly Agree 29; Agree 4; Somewhat Agree 6; Disagree 2; No Answer 1

A	Participant	Leaders	Increased Interest in a STEM Career	Strongly Agree 3
A	Participant	Hearing Participants	Gave Me a More Positive View of Deaf/HH Persons*	Strongly Agree 34; Agree 3; Somewhat Agree 2; Disagree 2; No Answer 1
A	Participant	Leaders	Gave Me a More Positive View of Deaf/HH Persons	Strongly Agree 3

*- They can do anything I can do; I realized how hard it can be to not understand people who do not know ASL

Table 2h. The STEM Professional’s Story Generating Interest & Engagement in STEM and in Pursuing a STEM Career for Hard of Hearing Participants

Group	Adolescent	Rater	Outcome	Rating
A	Participant	HH Participants	Found Out Something New About STEM	Strongly Agree 1; Somewhat Agree 1
A		Leaders	Found Out Something New About STEM	Strongly Agree 3
A	Participant	HH Participants	Found Out More About STEM Careers	Strongly Agree 1; Somewhat Agree 1
A		Leaders	Found Out More About STEM Careers	Strongly Agree=3
A	Participant	HH Participants	Increased Interest in STEM	Strongly Agree 1; Somewhat Agree 1
A		Leaders	Increased Interest in STEM	Strongly Agree 3
A	Participant	HH Participants	Increased Interest in a STEM Career	Strongly Agree 1; Somewhat Agree 1
A		Leaders	Increased Interest in a STEM Career	Strongly Agree 3
A	Participant	HH Participants	Gave Me a More Positive View of Deaf/HH Persons	Strongly Agree 1; Somewhat Agree 1
A		Leaders	Gave Me a More Positive View of Deaf/HH Persons	Strongly Agree 3

Research Question 4: *What modifications and additions would improve the stories to make them more useful and effective?*

Leaders (Group A)

It would be helpful if the talking coincided with the sign instead of after. There were gaps of silence where I think kids may have lost focus for a second.

Since the primary age of the students watching the videos was about 10 years old, having them focus for the entire story was challenging at times. One strategy could be that there is a pause or break in the story for kids to gather their thoughts.

Hearing Participants (Group A)

Add more career stories by other STEM professionals. Reasons for adding stories included: Because I think they give an example of life; Because they are interesting (3) and fun to watch (2); I can learn a lot from them and understand.

Research Question 5: *What dissemination strategies would maximize story use?*

Leaders (Group A): It would be cool to maybe have a club of students that view a different story each week and then can discuss it afterwards. It would be interesting to have someone from the stories or someone in the STEM field come in and meet with a group of students and tell them their story.

3: EXTENDED SCHOOL SETTINGS

Testing to date was done at two schools for the deaf. It included hearing and deaf or hard of hearing participants as described in Table 3a.

Table 3a. School Participant Demographics

Group	N	Members	Gender	Age	Race	Hearing Level	Communication Method
A	17	Teacher Students	Male Male-4 Female-3	--- 14-1 15-2 16-1 17-2 18-1	White/Caucasian Black/African American-3 B/AA, Hispanic/LatinX-3 Hispanic/LatinX-1	Hearing HH-1 Deaf-4 Deaf (CI)-1 HH (CI)-1	English ASL-4 English-1 Spanish-1 Simultaneous Communication-1
B	126	Teacher Students	Female Male-16 Female-10	--- 14-5 15-9 16-6 17-3 18-3	White/Caucasian White Caucasian-3 Hispanic LatinX-17 Hispanic LatinX, WC-3 Indigenous, B/AA-1 Indigenous, B/AA, W C.-1 Not Responded-1	Hearing HH-7 Deaf-16 Deaf (CI)-2 HH (CI)-1	English ASL-22 English-2 Simultaneous Communication-2

Research Question 1: *How do parents, club leaders, and teachers make use of the stories?*

Table 3b. Story Use by Teachers

Group	School Member	Stories Viewed	Viewers	How Viewed	Integration
A	Teacher	Solomon,	Students	Alone	Discussed the story together afterwards
B	Teacher	Schrage, Solomon, Ogunjirin, Braun, Cooke, Manak, Posner	Students	Alone	Discussed the story together afterwards

Research Question 2: *How do adolescents who are deaf or hard of hearing integrate and use digital versions of firsthand stories from members of the STEM workforce?*

Table 3c. Story Use by Adolescents

Group	School Member	Stories Viewed	How Viewed	Languages Used	Features Used & Usefulness
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A	Students	Solomon	Alone	ASL-1 ASL/Captions-4 English/ASL-1 English-1	<i>Changing Text Size</i> -Somewhat Useful 2, Never Used 5 <i>Increasing Volume</i> -Very Useful 2, Somewhat U. 1, Never Used 4 <i>Decreasing Volume</i> - Very Useful 2; Not sure. 1, Never Used 4 <i>Making Screen Brighter</i> -Very Useful 1, Somewhat U. 2; Not Sure 1, Never Used 3 <i>Making Screen Darker</i> - Somewhat U. 1, Never Used 6 <i>Replaying Story</i> -Not Useful 1, Never Used 6 <i>Replaying Parts</i> -Very Useful 1, Somewhat Useful 1; Never Used 5 <i>Downloading Transcript</i> - Not Useful 1, Not Sure 2, Never Used 4
B	Students	Schrage, Solomon, Ogunjirin, Braun, Cooke, Manak, Posner	Alone	ASL-10 ASL/Captions-10 English/ASL-5 ASL/Captions, English/ASL-1	<i>Changing Text Size</i> -Very Useful 3, Somewhat Useful 4, Not Useful 2, Never Used 16, Not Sure 1 <i>Increasing Volume</i> - Very Useful 1, Somewhat Useful 1, Never Used 24, <i>Decreasing Volume</i> -Not Useful 2, Never Used 24 <i>Making Screen Brighter</i> -Very Useful 1, Somewhat U. 4, Not Useful 1, Not Sure 4, Never Used 16 <i>Making Screen Darker</i> -Very Useful 2, Somewhat U. 2, Not Useful 1, Not Sure 3, Never Used 18 <i>Replaying Story</i> -Somewhat Useful 5, Not Useful 1, Never Used 20 <i>Replaying Parts</i> -Very Useful 4 Somewhat Useful 6, Not Useful 2, Not Sure 1, Never Used 13 <i>Downloading Transcript</i> - Somewhat Useful 1, Not Sure 3, Never Used 22

Research Question 3: *What kinds of outcomes are made possible with use of the stories in terms of interest and engagement in STEM and pursuing a STEM career?*

Table 3d. Adolescents' Interest in Parts of the STEM Professional's Story

Group	Adolescent	Rater	Description of...	Rating
A	Student	Student	What the STEM Career Involves	Interesting 12; Somewhat Interesting 12; Not Interesting 1; Not Sure 1
A		Teacher	What the STEM Career Involves	Somewhat Interesting
A	Student	Student	Emergence of STEM Interest	Interesting 15; Somewhat Interesting 6; Not Interesting 3; Not Sure 2
A		Teacher	Emergence of STEM Interest	Somewhat Interesting

A	Student	Student	What Sparked STEM Interest	Interesting 10; Somewhat Interesting 10; Not Interesting 4; Not Sure 1; NA 1
A		Teacher	What Sparked STEM Interest	Interesting
A	Student	Student	How STEM Interest Maintained	Interesting 8; Somewhat Interesting 8; Not Int. 4; Not Sure 2; NA 4
A		Teacher	How STEM Interest Maintained	Somewhat Interesting
A	Student	Student	What Continues to Inspire STEM Interest	Interesting 9; Somewhat Interesting 8; Not Interesting 2; Not Sure 3; NA 4
A		Teacher	What Continues to Inspire STEM Interest	Somewhat Interesting
A	Student	Student	Challenges & Obstacles Encountered	Interesting 15; Somewhat Interesting 8; Not Int. 1; Not Sure 1; NA 1
A		Teacher	Challenges & Obstacles Encountered	Interesting
A	Student	Student	Overcoming Challenges & Obstacles	Interesting 12; Somewhat Interesting 8; Not Int. 4; Not Sure 1; NA 1
A	Teacher	Teacher	Overcoming Challenges & Obstacles	Interesting
A	Student	Student	Images of the Work Setting	Interesting 17; Somewhat Interesting 7; Not Sure 1; NA 1
A		Teacher	Images of the Work Setting	Interesting
A	Student	Student	Images of Equipment Used	Interesting 14; Somewhat Interesting 5; Not Interesting 1; Not Sure 3; NA 3
A		Teacher	Images of Equipment Used	Interesting
A	Student	Student	Advice About Pursuing STEM & a STEM Career	Interesting 15; Somewhat Interesting 8; Not Interesting 3
A		Teacher	Advice About Pursuing STEM & a STEM Career	Interesting
B	Student	Student	What the STEM Career Involves	Interesting 12; Somewhat Interesting 12; Not Interesting 1; Not Sure 1
B		Teacher	What the STEM Career Involves	Somewhat Interesting
B	Student	Student	Emergence of STEM Interest	Interesting 15; Somewhat Interesting 6; Not Interesting 3; Not Sure 2
B		Teacher	Emergence of STEM Interest	Somewhat Interesting
B	Student	Student	What Sparked STEM Interest	Interesting 10; Somewhat Interesting 10; Not Interesting 4; Not Sure 1; NA 1
B		Teacher	What Sparked STEM Interest	Interesting

B	Student	Student	How STEM Interest Maintained	Interesting 8; Somewhat Interesting 8; Not Int. 4; Not Sure 2; NA 4
B		Teacher	How STEM Interest Maintained	Somewhat Interesting
B	Student	Student	What Continues to Inspire STEM Interest	Interesting 9; Somewhat Interesting 8; Not Interesting 2; Not Sure 3; NA 4
B		Teacher	What Continues to Inspire STEM Interest	Somewhat Interesting
B	Student	Student	Challenges & Obstacles Encountered	Interesting 15; Somewhat Interesting 8; Not Int. 1; Not Sure 1; NA 1
B		Teacher	Challenges & Obstacles Encountered	Interesting
B	Student	Student	Overcoming Challenges & Obstacles	Interesting 12; Somewhat Interesting 8; Not Int. 4; Not Sure 1; NA 1
B	Teacher	Teacher	Overcoming Challenges & Obstacles	Interesting
B	Student	Student	Images of the Work Setting	Interesting 17; Somewhat Interesting 7; Not Sure 1; NA 1
B		Teacher	Images of the Work Setting	Interesting
B	Student	Student	Images of Equipment Used	Interesting 14; Somewhat Interesting 5; Not Interesting 1; Not Sure 3; NA 3
B		Teacher	Images of Equipment Used	Interesting
B	Student	Student	Advice About Pursuing STEM & a STEM Career	Interesting 15; Somewhat Interesting 8; Not Interesting 3
B		Teacher	Advice About Pursuing STEM & a STEM Career	Interesting

Table 3e. The STEM Professional's Story Generating Interest & Engagement in STEM and in Pursuing a STEM Career

Group	Adolescent	Rater	Outcome	Rating
A	Student	Student	Found Out Something New About STEM	Strongly Agree 3; Agree 2; Disagree 2
A		Teacher	Found Out Something New About STEM	Strongly Agree
A	Student	Student	Found Out More About STEM Careers	Strongly Agree 1; Agree 4; Somewhat Agree 1; Disagree 1
A		Teacher	Found Out More About STEM Careers	Strongly Agree
A	Student	Student	Increased Interest in STEM	Strongly Agree 1; Somewhat Agree 4; Disagree 2
A		Teacher	Increased Interest in STEM	Strongly Agree
A	Student	Student	Increased Interest in a STEM Career	Agree 3; Somewhat Agree 2; Disagree 2
A		Teacher	Increased Interest in a STEM Career	Strongly Agree
A	Student	Student	Gave Me a More Positive View of Deaf/HH Persons*	Strongly Agree 2; Agree 2; Somewhat Agree 1; Disagree 2

A		Teacher	Gave Students a More Positive View of Deaf/HH Persons	Strongly Agree
B	Student	Student	Found Out Something New About STEM	Strongly Agree 10; Somewhat Agree 6; Agree 10
B		Teacher	Found Out Something New About STEM	Strongly Agree
B	Student	Student	Found Out More About STEM Careers	Strongly Agree 8; Agree 10; Somewhat Agree 8
B		Teacher	Found Out More About STEM Careers	Strongly Agree
B	Student	Student	Increased Interest in STEM	Strongly Agree 3; Agree 9; Somewhat Agree 12; Disagree 2
B		Teacher	Increased Interest in STEM	Agree
B	Student	Student	Increased Interest in a STEM Career	Strongly Agree 3; Agree 6; Somewhat Agree 11; Disagree 5; NA 1
B		Teacher	Increased Interest in a STEM Career	Agree
B	Student	Student	Gave Me a More Positive View of Deaf/HH Persons*	Strongly Agree 9; Agree 10; Somewhat Agree 7
B		Teacher	Gave Students a More Positive View of Deaf/HH Persons***	Somewhat Agree

***Group A (Students)**

Well, I noticed that deaf or hard of hearing persons have changed the world a lot because they (have been able) to stand up for themselves. This is good news and (gives) deaf or hard of hearing persons more opportunities. I saw deaf or hard of hearing persons have experienced frustration throughout life. I appreciated hearing about Dr. Solomon's frustration even in high school. It made me want to seek more help now and in the future.

**** Group B (Students)**

I'm sure (pursuing a STEM career) was full of challenges to face and (the scientist) didn't let doubt get over him and I'm really impressed with that
 They're very hard workers, even though (some) learn sign language late they just keep it up and are very patient with their process of learning.
 That deaf can do it even if the career is involved with hearing. We can use devices for that. Not all deaf people do sign fluently because they grew up from different backgrounds.
 It can be a struggle with real world things such as communicating with hearing people for jobs, transportation, becoming a doctor and more.
 Deaf can support each other, do we can, and what are they capable of.
 Deaf people can succeed and accomplish cool things. We can help inform and advise others.

***** Group B (Teacher)**

Even though the students know "deaf can!", the videos reinforce this idea.

Research Question 4: *What modifications and additions would improve the stories to make them more useful and effective?*

Teacher (Group A)

I thought the stories were wonderful! I can't wait to have more. We are always looking for successful Deaf adults in STEM to use as role models.

Having the English transcript, voice over, and captions helped a few students as they are all at different levels and were watching at the same time. Without it they would have been lost. Having a transcript in different languages would be very helpful, especially one in Spanish as I had to run around to support them.

Students (Group A)

Students who would like to see more career stories 3. Reason- I like learning about science. Types of stories to add-Art and using technology to draw online; Students who would not like to see more career stories 4.

Teacher (Group B)

I would like to see more career stories. These videos are a great idea, especially the opportunity to interact with a scientist. Things that worked well were the variety of choices and that students could control the video and replay if they wanted. Things that could be improved are the size of the box with the interpreter which made the signing hard to follow. Also, the videos are a bit long. It would be nice to have some that are shorter, maybe 8-10 minutes, or to be able to choose between a shorter and longer version of the same video. It would be good to have a second video that involves the scientist in leading students in a short activity or lab.

Students (Group B)

23 of the 26 students would like to see more career stories. They wrote:

I want to learn more new things about work.

I am very curious about different careers.

They help me see jobs I can do.

To show all the opportunities and show all the options that I can use to pick something that relates to what I really love.

I would like to see more people's experiences in a different careers. I would like to see what it is like to be a deaf person working in all kinds of different careers.

They are very interesting to learn about and cool to know how it started and what inspired it and what they did to get where they are and what things or resources they used.

I want to learn how they been living their life and their accomplishments. I would love to know how they do it based on their experiments.

I love seeing a person keeping going toward their goal never giving up or anything.

I want knowledge about deaf/hard of hearing people being successful.

I'm very curious. I want to see more and learn.

I like learning about jobs.

I like the ideas. They give me strength and reasons to watch.

It's cool to see deaf people and their jobs.

Because maybe I will interested in other more different kinds of work.

3 of the 26 students would not like to see more career stories. They wrote:

I want to see more experiments and more of the lab and less talking.

The videos need to be shorter. It was hard for me to focus.

I want to see the person working.

Research Question 5: *What dissemination strategies would maximize story use?*

Teacher (Group A)

Not sure. Just having them available is fantastic.

Teacher (Group B)

It would be good to align the stories to the NGSS or state standards so that work going on outside of class could be demonstrated to support in-class learning and vice versa.

FINDINGS

The quantitative results for families, boys' and girls' clubs, and schools for research questions 1-3. Summaries of the qualitative results for questions 4 and 5 are also provided.

Research Question 1: *How do parents, club leaders, and teachers make use of the stories?*

Person	N	Criteria	Responses
Parents	1	The child viewed the story alone.	1
		Parent used sign to discuss the story afterwards with the child.	1
Club Leaders	3	Participants viewed the story in a group of 3 or more students with an after-school club leader.	3
		They watched the story together and discussed it afterwards.	3
Teachers	2	Students viewed the story alone.	2
		They discussed the story together afterwards.	2

Research Question 2: *How do adolescents who are deaf or hard of hearing integrate and use digital versions of firsthand stories from members of the STEM workforce?*

Languages Used

Person	N	Criteria	Response
Deaf Children	1	Use of ASL	1
HH Club Participants	2	Use of English with ASL and Captions	2
Hearing Club Participants	42	Use of English with ASL and Captions	42
Deaf/HH Students	33	Use of ASL	11
		Use of ASL/Captions	14
		Use of English/ASL	6
		Use of English	1
		Use of ASL/Captions English/ASL	1

Features Used

Person	N	Criteria	Rating
Deaf Children	1	<i>Changing Text Size</i>	Never Used 1
		<i>Increasing Volume</i>	Never Used 1
		<i>Decreasing Volume</i>	Never Used 1
		<i>Making Screen Brighter</i>	Never Used 1
		<i>Making Screen Darker</i>	Never Used 1
		<i>Replaying Story</i>	Never Used 1
		<i>Replaying Parts</i>	Never Used 1
		<i>Downloading Transcript</i>	Never Used 1
HH Club Participants	2	<i>Changing Text Size</i>	Very Useful 1 , Somewhat Useful 1
		<i>Increasing Volume</i>	Very Useful 1 , Somewhat Useful 1
		<i>Decreasing Volume</i>	Very Useful 1 , Somewhat Useful 1
		<i>Making Screen Brighter</i>	Very Useful 1 , Somewhat Useful 1
		<i>Making Screen Darker</i>	Very Useful 1 , Somewhat Useful 1
		<i>Replaying Story</i>	Very Useful 1 , Somewhat Useful 1
		<i>Replaying Parts</i>	Very Useful 1 , Somewhat Useful 1
		<i>Downloading Transcript</i>	Very Useful 1 , Somewhat Useful 1

Hearing Club Participants	42	<i>Changing Text Size</i>	Very Useful 1 , Somewhat Useful 2 , Never Used 25 , Not Sure 3 , No Answer 1
		<i>Increasing Volume</i>	Very Useful 36 , Somewhat U. 3 , Not Useful 2 , No Answer 1
		<i>Decreasing Volume</i>	Very Useful 8 , Somewhat U. 8 , Not Useful 1 , Never Used 24 , No Answer 2
		<i>Making Screen Brighter</i>	Very Useful 22 , Somewhat U. 2 , Not Sure 1 , Never Used 16 , No Answer 1
		<i>Making Screen Darker</i>	Very Useful 8 , Somewhat U. 2 , Not Useful 1 , Not Sure 1 , Never Used 28 , No Answer 2
		<i>Replaying Story</i>	Very Useful 11 , Somewhat Useful 4 , Not Sure 2 , Never Used 22 , No Answer 3
		<i>Replaying Parts</i>	Very Useful 23 , Somewhat Useful 8 , Never Used 7 , No Answer 4
		<i>Downloading Transcript</i>	Very Useful 11 , Somewhat Useful 2 , Not Useful 1 , Not Sure 2 , Never Used 25 , No Answer 3
Deaf/HH Students	33	<i>Changing Text Size</i>	Very Useful 3 , Somewhat Useful 6 , Not Useful 2 , Never Used 21 , Not Sure 1
		<i>Increasing Volume</i>	Very Useful 3 , Somewhat U. 2 , Never Used 28
		<i>Decreasing Volume</i>	Very Useful 2 , Not Useful 1 , Not Sure 1 , Never Used 28
		<i>Making Screen Brighter</i>	Very Useful 2 , Somewhat U. 6 , Not Useful 1 , Not Sure 5 , Never Used 19
		<i>Making Screen Darker</i>	Very Useful 2 , Somewhat U. 3 , Not Useful 1 , Not Sure 3 , Never Used 24 ;
		<i>Replaying Story</i>	Somewhat Useful 5 , Not Useful 2 , Never Used 26 ;
		<i>Replaying Parts</i>	Very Useful 5 , Somewhat Useful 7 , Not Useful 2 , Not Sure 1 , Never Used 18
		<i>Downloading Transcript</i>	Somewhat Useful 1 , Not Useful 4 , Not Sure 2 , Never Used 26

Research Question 3: *What kinds of outcomes are made possible with use of the stories in terms of interest and engagement in STEM and pursuing a STEM career?*

Interest and Engagement in Story Parts

Person	N	Criteria	Rating
Deaf Children	1	<i>What the STEM Career Involves</i> <i>Emergence of STEM Interest</i> <i>What Sparked STEM Interest</i>	Interesting 1 Interesting 1 Interesting 1

		<i>How STEM Interest Maintained</i> <i>What Continues to Inspire STEM Interest</i> <i>Challenges & Obstacles Encountered</i> <i>Overcoming Challenges & Obstacles</i> <i>Images of the Work Setting</i> <i>Images of the Equipment Used</i> <i>Advice About Pursuing STEM & a STEM Career</i>	Interesting 1 Interesting 1 Interesting 1 Interesting 1 Interesting 1 Interesting 1 Interesting 1
HH Club Participants	2	<i>What the STEM Career Involves</i> <i>Emergence of STEM Interest</i> <i>What Sparked STEM Interest</i> <i>How STEM Interest Maintained</i> <i>What Continues to Inspire STEM Interest</i> <i>Challenges & Obstacles Encountered</i> <i>Overcoming Challenges & Obstacles</i> <i>Images of the Work Setting</i> <i>Images of the Equipment Used</i> <i>Advice About Pursuing STEM & a STEM Career</i>	Interesting 1 , Somewhat Interesting 1 Interesting 1 , Somewhat Interesting 1 Interesting 1 , Somewhat Interesting 1 Interesting 1 , Somewhat Interesting 1 Interesting 1 , Somewhat Interesting 1 Interesting 1 , Somewhat Interesting 1 Interesting 1 , Somewhat Interesting 1 Interesting 1 , Somewhat Interesting 1 Interesting 1 , Somewhat Interesting 1 Interesting 1 , Somewhat Interesting 1
Hearing Club Participants	42	<i>What the STEM Career Involves</i> <i>Emergence of STEM Interest</i> <i>What Sparked STEM Interest</i> <i>How STEM Interest Maintained</i> <i>What Continues to Inspire STEM Interest</i> <i>Challenges & Obstacles Encountered</i> <i>Overcoming Challenges & Obstacles</i> <i>Images of the Work Setting</i> <i>Images of the Equipment Used</i> <i>Advice About Pursuing STEM & a STEM Career</i>	Interesting 30 , Somewhat Interesting 9 , Not Interesting 1 , Not Sure 1 , No Answer 1 Interesting 25 , Somewhat Interesting 12 , Not Interesting 2 , Not Sure 1 , No Answer 2 Interesting 25 , Somewhat Interesting 9 , Not Interesting 5 , Not Sure 1 , No Answer 2 Interesting 27 , Somewhat Interesting 11 , Not Interesting 2 , Not Sure 1 , No Answer 1 Interesting 29 , Somewhat Interesting 11 , Not Sure 1 , No Answer 1 Interesting 27 , Somewhat Interesting 8 , Not Interesting 3 , Not Sure 2 , No Answer 2 Interesting 31 , Somewhat Interesting 8 , Not Interesting 2 , No Answer 1 Interesting 30 , Somewhat Interesting 8 , Not Interesting 2 , Not Sure 1 , No Answer 1 Interesting 29 , Somewhat Interesting 11 , No Answer 2 Interesting 31 , Somewhat Interesting 10 , Not Interesting 1
Deaf/HH Students	33	<i>What the STEM Career Involves</i>	Interesting 14 , Somewhat Int. 17 , Not Interesting 1 , Not Sure 1

	<i>Emergence of STEM Interest</i>	Interesting 15 , Somewhat Int. 12 , Not Interesting 3 , Not Sure 3
	<i>What Sparked STEM Interest</i>	Interesting 12 , Somewhat Int. 11 , Not Int. 1 , Not Sure 1 , NA 1
	<i>How STEM Interest Maintained</i>	Interesting 10 , Somewhat Int. 12 , Not Interesting 5 , Not Sure 2 , NA 4
	<i>What Continues to Inspire STEM Interest</i>	Interesting 12 , Somewhat Interesting 11 , Not Int. 2 , Not Sure 4 , NA 4
	<i>Challenges & Obstacles Encountered</i>	Interesting 19 , Somewhat Int. 9 , Not Interesting 3 , Not Sure 1 , NA 1
	<i>Overcoming Challenges & Obstacles</i>	Interesting 15 , Somewhat Interesting 11 , Not Int. 5 , Not Sure 1 , NA 1
	<i>Images of the Work Setting</i>	Interesting 20 , Somewhat Interesting 11 , Not Sure 1 , NA 1
	<i>Images of the Equipment Used</i>	Interesting 16 , Somewhat Int. 9 , Not Interesting 1 , Not Sure 3 , NA 3
	<i>Advice About Pursuing STEM & a STEM Career</i>	Interesting 17 , Somewhat Int. 13 , Not Interesting 3

Interest and Engagement in STEM and STEM Careers

Person	N	Responses	Rating
Deaf Children	1	<i>Found Out Something New About STEM</i> <i>Found Out More About STEM Careers</i> <i>Increased Interest in STEM</i> <i>Increased Interest in a STEM Career</i> <i>Gave Me a More Positive View of Deaf/HH Persons</i>	Strongly Agree 1 Strongly Agree 1 Strongly Agree 1 Strongly Agree 1 Strongly Agree 1
HH Club Participants	2	<i>Found Out Something New About STEM</i> <i>Found Out More About STEM Careers</i> <i>Increased Interest in STEM</i> <i>Increased Interest in a STEM Career</i> <i>Gave Me a More Positive View of Deaf/HH Persons</i>	Strongly Agree 1 , Agree 1 Strongly Agree 1 , Agree 1 Strongly Agree 1 , Agree 1 Strongly Agree 1 , Agree 1 Strongly Agree 1 , Agree 1
Hearing Club Participants	42	<i>Found Out Something New About STEM</i> <i>Found Out More About STEM Careers</i> <i>Increased Interest in STEM</i> <i>Increased Interest in a STEM Career</i>	Strongly Agree 30 , Agree 6 , Somewhat Agree 5 , No Answer 1 Strongly Agree 32 , Agree 4 , Somewhat Agree 4 , Disagree 1 , No Answer 1 Strongly Agree 25 , Agree 7 , Somewhat Agree 6 , Disagree 2 , No Answer 2 Strongly Agree 29 , Agree 4 , Somewhat Agree 6 , Disagree 2 , No Answer 1

		<i>Gave Me a More Positive View of Deaf/HH Persons</i>	Strongly Agree 34 , Agree 3 , Somewhat Agree 2 , Disagree 2 , No Answer 1
Deaf/HH Students	33	<i>Found Out Something New About STEM</i>	Strongly Agree 13 , Agree 10 , Disagree 10
		<i>Found Out More About STEM Careers</i>	Strongly Agree 9 , Agree 14 , Somewhat Agree 9 , Disagree 1
		<i>Increased Interest in STEM</i>	Strongly Agree 4 , Agree 6 , Somewhat Agree 15 , Disagree 7 , NA 1
		<i>Increased Interest in a STEM Career</i>	Strongly Agree 3 , Agree 3 , Somewhat Agree 13 , Disagree 7 , NA 1
		<i>Gave Me a More Positive View of Deaf/HH Persons</i>	Strongly Agree 11 , Agree 12 , Somewhat Agree 8 , Disagree 2

Research Question 4: *What modifications and additions would improve the stories to make them more useful and effective?*

Teachers, club leaders, parents and adolescents would like to see more stories by other STEM professionals, including careers involving the study of animals, use of technology, and the study of astronomy.

One teacher suggested adding additional videos that show the STEM professional leading students in a short activity or lab. Another requested increasing the size of the box where the interpreter is displayed. Teachers would also like the stories and the downloadable transcripts to be available in other languages, especially Spanish, be somewhat shorter (or have the choice to view a shorter version of the existing stories), and have them aligned with science standards.

Students and club participants would like shorter videos that include more footage of the professional working (and less talking). More information about suggested modifications and additions are provided in the Results section.

Research Question 5: *What dissemination strategies would maximize story use?*

Club leaders suggested having students view one story each week and then discuss it afterwards. They also suggested having the STEM professional featured in the stories meet in person with participants. One parent suggested posting about the stories on social media to increase use. More information about dissemination strategies is provided in the Results section.

KEY FINDINGS

Interim testing incorporated use of the stories with four groups of participants in three informal learning settings (homes, Boys & Girls Club of Lynn, Lynn, MA, Horace Mann School for the Deaf, Allston, MA and Phoenix School for the Deaf, Phoenix, AZ). Participant groups, consisted of one family, one club group, and two school groups. The family group consisted of a hearing mother and her deaf child. The club group consisted of three leaders (two hearing and one HH) and 44 adolescent participants (42 hearing and 2 HH). The two schools included teachers who were hearing and consisted of a total of 33 students (10 HH and 23 deaf).

Participants who were deaf or HH communicated using ASL, simultaneous communication, English, Spanish, or Creole. The parent and teachers communicated with participants in ASL or English and facilitated translation of material into Spanish and Creole. Club leaders used English to communicate with participants.

Additional test data will be collected and incorporated into the report during the final year of the project

Key Findings for Research Question 1: *How do parents, club, and teacher leaders make use of the stories?*

The parent and teachers had participants view the stories alone. They assisted on an as needed basis and discussed the stories together afterwards. Club leaders divided students into groups of three or more and paired each group with a leader. Each group watched the story together and discussed it afterwards.

Key Findings for Research Question 2: *How do adolescents who are deaf or hard of hearing integrate and use digital versions of firsthand stories from members of the STEM workforce?*

Participants, hearing and deaf or HH, used the interactive features in ways that met their individual needs. This showed the importance of providing users with options from which to choose. They could select a language or languages, alter volume, change brightness of the screen and size of the text, replay sections, see captions, and view a transcript. Use and usefulness of each feature depended on the needs of the person doing the viewing.

Key Findings for Research Question 3: *What kinds of outcomes are made possible with use of the stories in terms of interest and engagement in STEM and pursuing a STEM career?*

Adults' and adolescents' perceptions often differed concerning the degree to which use of the stories contributed to their interest and engagement in STEM and in pursuing a STEM career. As with use of the interactive features, the degree to which the stories were a factor was highly individual and depended on the person doing the viewing. In general, the data show that the stories positively contributed to increased interest of viewers who are deaf or HH in STEM and in possibly pursuing a STEM career. They also show that they generated an awareness of how to overcome challenges and obstacles along the way. An unexpected outcome was that hearing viewers found the stories valuable in that they increased their respect for persons who are deaf or

hard of hearing and made them aware of the challenges they encounter and what they need to do to pursue what interests them and to realize their career goals.

Research Question 4: *What modifications and additions would improve the stories to make them more useful and effective?*

Viewers would like to have more stories as they find them interesting and provide them with new information that is not available elsewhere. They suggested incorporating stories from professionals who work with animals, involve space, and develop or work with new and emerging technologies. They would also like to have a larger frame to show the signer, have the signing connected more closely to the voiced version, see the scientists at work, have the option to select shorter versions, provide additional mechanisms for direct contact with the professionals, and align the stories with the NGSS or state standards so that work going on outside of class can be demonstrated to support in-class learning and vice versa.

Research Question 5: *What dissemination strategies would maximize story use?*

Users suggested advertising the stories on as many networks as possible. The development team is working with the TERC marketing team to do this. They are also working with interested parent groups, clubs, and schools for the deaf across the country to offer the stories to visitors. The CAISE website will have links to the stories. Information about the stories will be presented at the 2022 ASTC annual meeting. A video is also available for viewing as part of the 2022 STEM for All Video Showcase. Other avenues of dissemination that have emerged in comments from Video Showcase viewers and other contacts will be pursued.

Appendix A
RESEARCH INSTRUMENTS

Online Post-use Survey for Parents

Part 1: Tell Us About Yourself

1. Gender

Female

Male

Non-Binary

Prefer to self describe*

Choose not to respond

*Self description:

2. Race/Ethnicity (Check all that apply)

American Indian, Alaska Native, other Indigenous peoples

Middle Eastern

Asian or Asian American

Native Hawaiian or other Pacific Islander

Black/African American

Hispanic/LatinX

White/Caucasian

Prefer to self describe*

Choose not to respond

*Self description:

3. Hearing Level

Hearing

Hard of Hearing

Deaf

Hearing with Cochlear Implant

Hard of Hearing with Cochlear Implant

Deaf with Cochlear Implant

4. Preferred method of communication

ASL

Simultaneous Communication

English

Spanish

Other Language (Please describe)*

*Other language description:

Part 2: Tell Us How Your Child Used the Stories, What They Learned, and How We Can Make Them Better

1. How many different stories did your child watch? (drop down choices 1-8)

2. Which stories did your child watch?

Dr. Derek Braun, Microbiologist

Dr. Michelle Cooke, Geologist

Sarah Hein, Nurse Practitioner

Melissa Manak, UX/UI Designer

Dr. Adebowale Ogunjirin, Pharmacologist

Mick Posner, Educator

Alma Schrage, Naturalist

Dr. Caroline Solomon, Water Quality Analyst

3. If your child watched more than one story, please choose one story to consider when answering the survey questions that follow.

Which story will you consider while answering the survey questions?

Dr. Derek Braun, Microbiologist

Dr. Michelle Cooke, Geologist

Sarah Hein, Nurse Practitioner

Melissa Manak, UX/UI Designer

Dr. Adebowale Ogunjirin, Pharmacologist

Mick Posner, Educator

Alma Schrage, Naturalist

Dr. Caroline Solomon, Water Quality Analyst

4. Who viewed the story? (check all that apply)

the child only

the child and sibling(s)

the child and other children (friends, cousins, etc.)

the child and one or more parents

the child and other adults (grandparents, family members, etc.)

5. Which of the following best describes the way the story was viewed?

We watched the story together and discussed it afterwards

We watched the story together and did not discuss it afterwards

The story was watched without parental involvement and discussed afterwards

The story was watched without parental involvement and not discussed afterwards

Other

Other: please describe

6. Rate how useful each of the following was for your child:

(Very Useful, Somewhat Useful, Not Useful, Not Sure, Never Used)

Changing the text size

Increasing the volume

Decreasing the volume

Making the screen brighter

Making the screen darker

Replaying all of a story

Replaying parts of a story

Downloading the story transcript

7. How informative was the information in the story?

Very Informative

Somewhat Informative

Not Informative

8. Rate how interesting each of the following parts of the story was for your child:

(Interesting, Somewhat Interesting, Not Interesting, Not Sure, Not Applicable)

Description of the professional's STEM Career

When the professional became interested in STEM

What sparked the professional's interest

How the professional's interest was maintained

What continues to inspire the professional

Learning about the challenges and obstacles the professional faced

Seeing what the professional did to get around challenges and obstacles

Images of the work setting
Images of the equipment used
Being able to submit questions to the STEM professional
Receiving and viewing responses from the STEM professional
Encouragement and advice from the professional about pursuing STEM and a STEM career

9. Rate how much you agree or disagree with the following:
(Strongly Agree, Agree, Somewhat Agree, Disagree)

The story helped my child find out more about STEM careers
The story taught my child something new about STEM
The story was inspirational
The story increased my child's interest in STEM
The story increased my child's interest in a STEM career
The story helped my child learn about ways to overcome challenges
The story gave my child useful advice and encouragement

10. Do you think your child would like to see more career stories told by other STEM professionals?

Yes

No

11. If you answered yes to Q10 above, what kinds of careers do you think your child would like to learn about?

12. Did your child submit questions to ask the STEM professional?

Yes

No

13. If you answered yes to Q12 above, what were their questions?

14. How might the stories be improved?

15. How might the story Web site be improved?

16. Is there anything else you would like to tell us about the stories? If your answer is yes, please type it here:

Part 3: Tell Us About Your Implementation of the Stories

1. How did you implement the story at home?

2. What worked well?

3. What was challenging or difficult?

4. What additional materials or strategies might be needed to help you implement the story more effectively?

5. Do you have any suggestions for other settings in which the stories might be used?

6. How might we increase awareness of the stories?

7. How might we increase use of the stories?

Online Post-use Survey for Children

Part 1: Tell Us About Yourself

1. Gender

Female

Male
Non-Binary
Prefer to self describe*
Choose not to respond
*Self description:

2. Age (drop-down choices 10-18)

3. Grade (drop-down choices 5-10)

4. Race/Ethnicity (Check all that apply)
American Indian, Alaska Native, other Indigenous peoples
Middle Eastern
Asian or Asian American
Native Hawaiian or other Pacific Islander
Black/African American
Hispanic/LatinX
White/Caucasian
Prefer to self describe*
Choose not to respond
*Self description:

5. Hearing Level
Hearing
Hard of Hearing
Deaf
Hearing with Cochlear Implant
Hard of Hearing with Cochlear Implant
Deaf with Cochlear Implant

6. Preferred method of communication
ASL
Simultaneous Communication
English
Spanish
Other Language (Please describe)*
*Other language description:

Part 2: Tell Us How You Used the Stories, What You Learned, and How We Can Make Them Better

1. Which story did you watch?
Dr. Derek Braun, Microbiologist
Dr. Michelle Cooke, Geologist
Sarah Hein, Nurse Practitioner
Melissa Manak, UX/UI Designer
Dr. Adebawale Ogunjirin, Pharmacologist
Mick Posner, Educator
Alma Schrage, Naturalist
Dr. Caroline Solomon, Water Quality Analyst

2. How did you view the story? (Check all that apply)
Alone
With sibling(s)
With other children (friends, cousins, etc.)
With one or more parents
With one or more other adults (grandparents, family members, etc.)

3. Which languages did you use when viewing the stories? (Check all that apply)

Sign

Sign with Captions

English with sign interpretation

English without sign interpretation

4. Rate how useful each of the following was to you:

(Very Useful, Somewhat Useful, Not Useful, Not Sure, Never Used)

Changing the text size

Increasing the volume

Decreasing the volume

Making the screen brighter

Making the screen darker

Replaying all of a story

Replaying parts of a story

Downloading the story transcript

5. How informative was the information in the story?

Very Informative

Somewhat Informative

Not Informative

6. Rate how interesting each of the following parts of the story were to you:

(Interesting, Somewhat Interesting, Not Interesting, Not Sure, Not Applicable)

Description of the professional's STEM Career

When the professional became interested in STEM

What sparked the professional's interest

How the professional's interest was maintained

What continues to inspire the professional

Learning about the challenges and obstacles the professional faced

Seeing what the professional did to get around challenges and obstacles

Images of the work setting

Images of the equipment used

Being able to submit questions to the STEM professional

Receiving and viewing responses from the STEM professional

Encouragement and advice from the professional about pursuing STEM and a STEM career

7. Rate how much you agree or disagree with the following:

(Strongly Agree, Agree, Somewhat Agree, Disagree)

The story helped me find out more about STEM careers

The story taught me something new about STEM

The story was inspirational

The story increased my interest in STEM

The story increased my interest in a STEM career

The story helped me learn about ways to overcome challenges

The story gave me useful advice and encouragement

8. Would you like to see more career stories told by other STEM professionals?

Yes

No

9. If you answered yes to Q8 above, what kinds of careers would you like to learn about?

10. Is there anything else you would like to tell us about the stories? If your answer is yes, please type it here:

11. Did you ask the STEM professional a question?

Yes

No

12. If you answered yes to Q11 above, what was your question?

Online Post-Use Survey for Boys & Girls Club Leaders

Part 1: Tell Us About Yourself

1. Gender

Female

Male

Non-Binary

Prefer to self describe*

Choose not to respond

*Self description:

2. Race/Ethnicity (Check all that apply)

American Indian, Alaska Native, other Indigenous peoples

Middle Eastern

Asian or Asian American

Native Hawaiian or other Pacific Islander

Black/African American

Hispanic/LatinX

White/Caucasian

Prefer to self describe*

Choose not to respond

*Self description:

3. Hearing Level

Hearing

Hard of Hearing

Deaf

Hearing with Cochlear Implant

Hard of Hearing with Cochlear Implant

Deaf with Cochlear Implant

4. Preferred method of communication

ASL

Simultaneous Communication

English

Spanish

Other Language (Please describe)*

*Other language description:

Part 2: Tell Us How Students Used the Stories, What They Learned, and How We Can Improve Them

1. Which story did students watch?

Dr. Derek Braun, Microbiologist

Dr. Michelle Cooke, Geologist
Sarah Hein, Nurse Practitioner
Melissa Manak, UX/UI Designer
Dr. Adebowale Ogunjirin, Pharmacologist
Mick Posner, Educator
Alma Schrage, Naturalist
Dr. Caroline Solomon, Water Quality Analyst

2. How did students view the story? (check all that apply)

alone
with another student
in a group with 3 or more students
with an after school club leader

3. Which of the following best describes the way students viewed the story?

We watched the story together and discussed it afterwards
Students watched the story on their own and we discussed it afterwards
Students watched the story alone with no discussion afterwards
Students watched the story in a group with no discussion afterwards
Other
Other: please describe

4. Which languages did students use when viewing the story? (Check all that apply)

Sign
Sign with captions
English with sign interpretation
English without sign interpretation

5. Rate how interesting each of the following parts of the story was for students:
(Interesting, Somewhat Interesting, Not Interesting, Not Sure, Not Applicable)

Description of the professional's STEM Career
When the professional became interested in STEM
What sparked the professional's interest
How the professional's interest was maintained
What continues to inspire the professional
Learning about the challenges and obstacles the professional faced
Seeing what the professional did to get around challenges and obstacles
Images of the work setting
Images of the equipment used
Being able to submit questions to the STEM professional
Receiving and viewing responses from the STEM professional
Encouragement and advice from the professional about pursuing STEM and a STEM career

6. Rate how much you agree or disagree with the following:
(Strongly Agree, Agree, Somewhat Agree, Disagree)

The story helped students find out more about STEM careers
The story taught students something new about STEM
The story increased students' interest in STEM
The story increased students' interest in a STEM career
The story helped students have a more positive view of persons who are deaf or hard of hearing*

*Please explain how their view about persons who are deaf or hard of hearing has been changed:

7. Do you think students would like to see more career stories?

Yes

No

8. How might the stories and/or the website interface be improved?

9. Is there anything else you would like to tell us about the stories? If your answer is yes, please type it here:

Tell Us About Implementation with Students

1. How did you implement the stories with students?

2. What worked well?

3. What was challenging or difficult?

4. What additional materials or strategies might be needed to help you implement the story more effectively?

5. How might we increase use of the stories?

Online Post-Use Survey for Boys & Girls Club Students

Part 1: Tell Us About Yourself

1. Gender

Female

Male

Non-Binary

Prefer to self describe*

Choose not to respond

*Self description:

2. Age (drop down choices 10-18)

3. Grade (drop down choices 5-12)

4. Race/Ethnicity (Check all that apply)

American Indian, Alaska Native, other Indigenous peoples

Middle Eastern

Asian or Asian American

Native Hawaiian or other Pacific Islander

Black/African American

Hispanic/LatinX

White/Caucasian

Prefer to self describe*

Choose not to respond

*Self description:

5. Hearing Level

Hearing

Hard of Hearing

Deaf

Hearing with Cochlear Implant

Hard of Hearing with Cochlear Implant

Deaf with Cochlear Implant

6. Preferred method of communication

ASL
Simultaneous Communication
English
Spanish
Other Language (Please describe)*
*Other language description:

Part 2: Tell Us How You Used the Stories, What You Learned, and How We Can Make Them Better

1. Which story did you watch?

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Dr. Michelle Cooke, Geologist
Sarah Hein, Nurse Practitioner
Melissa Manak, UX/UI Designer
Dr. Adebowale Ogunjirin, Pharmacologist
Mick Posner, Educator
Alma Schrage, Naturalist
Dr. Caroline Solomon, Water Quality Analyst

2. How did you view the story? (Check all that apply)

Alone
With another student
In a group with 3 or more students
With a teacher or after school club leader

3. Which languages did you use when viewing the story? (Check all that apply)

Sign
Sign with Captions
English with sign interpretation
English without sign interpretation

4. Rate how useful each of the following was for you:

(Very Useful, Somewhat Useful, Not Useful, Not Sure, Never Used)

Changing the text size
Increasing the volume
Decreasing the volume
Making the screen brighter
Making the screen darker
Replaying all of a story
Replaying parts of a story
Downloading the story transcript

5. Rate how interesting each of the following parts of the story were to you:

(Interesting, Somewhat Interesting, Not Interesting, Not Sure, Not Applicable)

Description of the professional's STEM Career

When the professional became interested in STEM

What sparked the professional's interest

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Seeing what the professional did to get around challenges and obstacles

Images of the work setting

Images of the equipment used

Encouragement and advice from the professional about pursuing STEM and a STEM career

6. Rate how much you agree or disagree with the following:

(Strongly Agree, Agree, Somewhat Agree, Disagree)

The story helped me find out more about STEM careers

The story taught me something new about STEM

The story increased my interest in STEM

The story increased my interest in a STEM career

The story helped me have a more positive view of persons who are deaf or hard of hearing*

*Please explain how your view about persons who are deaf or hard of hearing has been changed:

7. Would you like to see more career stories?

Yes

No

Please explain why or why not?

8. Is there anything else you would like to tell us about the stories? If your answer is yes, please type it here:

Online Post-Use Survey for School-based Leaders

Part 1: Tell Us About Yourself

1. Gender

Female

Male

Non-Binary

Prefer to self describe*

Choose not to respond

*Self description:

2. Race/Ethnicity (Check all that apply)

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Middle Eastern

Asian or Asian American

Native Hawaiian or other Pacific Islander

Black/African American

Hispanic/LatinX

White/Caucasian

Prefer to self describe*

Choose not to respond

*Self description:

3. Hearing Level

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Hearing with Cochlear Implant

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4. Preferred method of communication

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Simultaneous Communication

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Spanish
Other Language (Please describe)*
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Mick Posner, Educator
Alma Schrage, Naturalist
Dr. Caroline Solomon, Water Quality Analyst

2. How did students view the story? (check all that apply)

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with a teacher

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6. Rate how much you agree or disagree with the following:
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The story increased students' interest in a STEM career
The story helped students have a more positive view of persons who are deaf or hard of hearing*

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8. How might the stories and/or the website interface be improved?

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