Westmoreland Library Network

Storytime STEM-packs™ Orientation and Implementation 2017: Evaluation Report

Stephanie Maietta Romero, Ed.D.

Research Associate

Carolyn Maxwell

Research Assistant

Dr. Cynthia Tananis, Director

Dr. Keith Trahan, Associate Director

September 2017

Introduction

The Allegheny Intermediate Unit's Math & Science Collaborative (MSC) of Western PA developed Storytime STEM-packs through an NSF I-CORPS™ (Award #1546720) and provides the PD. The MSC provides services for 138 public school districts and non-public schools, and is a comprehensive and award-winning organization for advancement of K-12 STEM learning. The MSC has developed a complex model of professional development for teachers, administrators, and institutions of education, which has been customized specifically for this project. The 2016-2017 Storytime STEM-packs orientation and implementation professional development (PD) trained and guided library administrators, staff, volunteers, and third-party providers in STEM content and pedagogy. Participants in this year's project were the Westmoreland Library Network (WLN), Allegheny Headstart (HS), and Reading is Fundamental (RIF).

Survey Design

The Collaborative for Evaluation and Assessment Capacity (CEAC), housed within the University of Pittsburgh's School of Education, was contracted to evaluate the 2017 Storytime STEM-packs orientation and implementation PD with WLN, HS, and RIF participants. Three surveys were constructed, two of them to rate the effectiveness of the two-day Storytime STEM-packs orientation session professional development and the third was to gather data on participants' implementation of the Storytime STEM-packs in the libraries, classrooms, or other programs. The two orientation surveys utilized a retrospective pre-post design to examine change in participants' knowledge of the STEM-packs content and their comfort level with facilitating STEM activities. The surveys also included a section on participants' perception of the user-friendliness of the STEM-packs. The implementation survey utilized a post only design to collect data on which and how many Storytime STEM-packs participants used, their specific applications in the libraries, classrooms, and other programs, and their user-friendliness. The survey also included questions about parent feedback on STEM-packs. The surveys utilized a 5-point scale for multiple choice questions (1-low to 5-high), and included open-ended items to drill down on participants individual experiences and perceptions.

Surveys included the following multiple-choice questions:

Day One Orientation PD Survey
- Prior to and after training:
  - How comfortable were you with how children best learn about the Sun, Earth, Moon system?
  - How comfortable were you as an adult with the content of the Sun, Earth, Moon system?
  - How comfortable were you facilitating STEM activities in general with children at your site?
- How user-friendly did you find the Storytime STEM-packs?
- How valuable was this Storytime STEM-packs Professional Development to you as a teacher/librarian?
- Would you recommend Storytime STEM-packs to your colleagues?

Day Two Orientation Survey

- How useful was learning about how to support young children in building a foundational understanding in select mathematics concepts?
- How useful was learning about how to support young children in engaging in Engineering Design tasks?
- How valuable was this Storytime STEM-packs Professional Development to you as a teacher/librarian?
- Would you recommend Storytime STEM-packs to your colleagues?

Implementation PD Survey
- Which of the following Storytime STEM-packs have you implemented in your classroom/library/program?
- Please rate the specific implementation experiences of Storytime STEM-packs you implemented.
- Do you plan to use the Storytime STEM-packs you received again in the future?
- Are you interested in participating again next year, receiving new Storytime STEM-packs and professional development?

Key Findings

- Of all PD participants, 97.7% (n=43) found the professional development valuable (4) or very valuable (5).
- For all three questions regarding confidence pre- and post-professional development, more than half increased their comfort level in the following areas:
    - 72.7% (n=40) - With the content of the Sun, Earth, Moon system
    - 54.9% (n=37) - With how children best learn about the Sun, Earth, Moon system
    - 53.6% (n=30) – With facilitating STEM activities in general with children at their site
- The most popular Storytime STEM-packs™ were: *Moonbear's Shadow* and *The Big Eclipse* both with 24 respondents selecting them.
- The vast majority of the respondents (73.0%, n=27) rated the STEM-packs that they used as user-friendly (4) or very user-friendly (5), with an overall mean of 3.9 on the scale from 1-5.
- A majority of respondents expressed agreement (4) or strong agreement (5) to these descriptions of the materials: fun and engaging for children (56.8%, n=21); easy to use (facilitate) (62.2%, n=23); and minimal preparation time (64.9%, n=24).
- When asked if they would plan to use the Storytime STEM-packs™ in the future 86.1% (n=31) replied yes. 64.9% (n=24) stated they were interested in participating in the program again next year, and 77.8% (n=28) said they would recommend the Storytime STEM-packs to colleagues.

Storytime STEM-packs™ Professional Development Orientation Survey

### Respondents' Roles in Their Organization

Of the 62 respondents who answered this item on the Day One survey, 33.9% (n=21) were involved with the library system, and 56.5% (n=35) were a part of the Head Start organization. There was an additional 3.2% (n=2) who selected public school teacher. The remaining 6.5% (n=4) selected other, two of which were volunteers, the other was a Non-profit Program Director, and the fourth did not state their position.

There were less respondents (46) to the Day Two survey, but of those 28.3% (n=13) were involved with the library system. The Head Start organization accounted for 71.7% (n=33) of respondents. No public school teachers participated in this survey.

How comfortable were you facilitating STEM activities in general with children at your site?

Of the 56 respondents, prior to the workshop, 23 respondents (41.1%) answered somewhat confident (2) and 16 (28.5%) felt confident (4) in their ability to facilitate STEM activities with children at the library. Only two respondents (3.6%) felt very confident (4). An additional 9 of these respondents (16.1%) were uncertain (3) and 6 (10.7%) participants were not confident (1) at all in their abilities. After the professional development, 57 respondents answered, and the majority shifted to being confident (n=31, 54.4%) and only 1 respondent (1.8%) answered not at all confident in their competency of facilitating STEM activities with children in the library.

Figure 1. Participants' confidence in their ability to facilitate STEM activities with children prior to and after Storytime STEM-packs PD
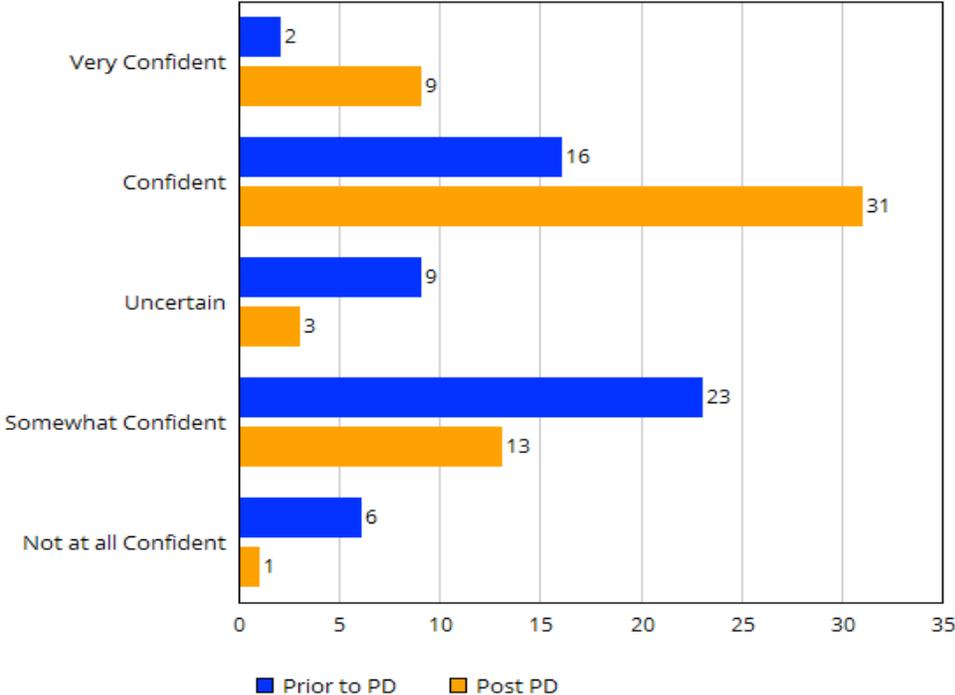
Further insight into the changes among participants looking at the two largest groups, Library staff and Head Start employees, the data shows that the percentage of Head Start staff who rated their confidence higher pre-to-post was slightly higher than that of library staff. Of the 33 participants from Head Start who answered both the prior to and after training questions, 57.6% (n=19) of respondents increased their confidence rating pre-to-post, 36.4% (n=12) did not change their confidence level, and 6.1% (n=2) rated their confidence lower after the PD than before. On the other hand, of the nineteen library staff members who responded to the pre and the post, 52.6% (n=10) of respondents increased their confidence level and 47.4% (n=9) did not change.

There were fifty-six participants who answered both the pre and post portion of the question, how comfortable are you with facilitating STEM activities with children in the library. Of those participants, 53.6% (n=30) increased in confidence level, 44.1% (n=23) stayed consistent in their confidence level, and 5.4% (n=3) decreased. Figure 2 shows how participants felt before and after participating in the professional development. The total length of the bar illustrates respondents' ratings on the post and the color of the stacked components of each bar represent their ratings on the pre. The largest shift came from respondents who rated themselves uncertain about their confidence prior to the PD and then increased their rating to confident afterwards (n=13).

Figure 2. How each participant's confidence in ability to facilitate STEM activities with children in the library changed pre and post Storytime STEM-packs professional development
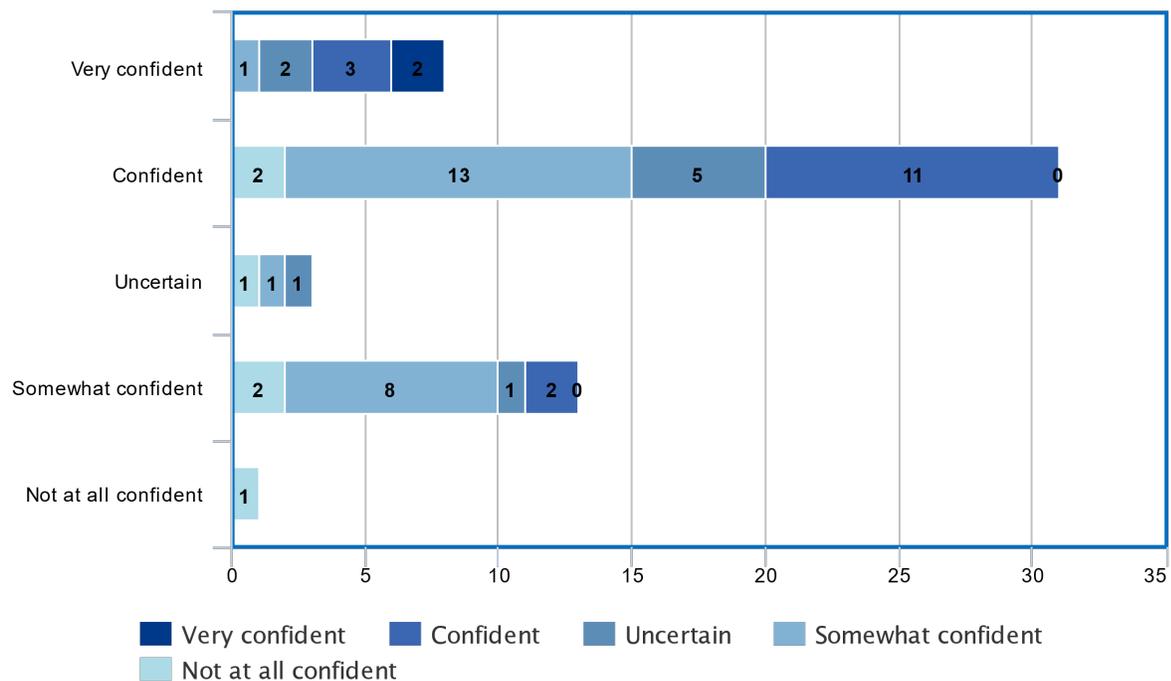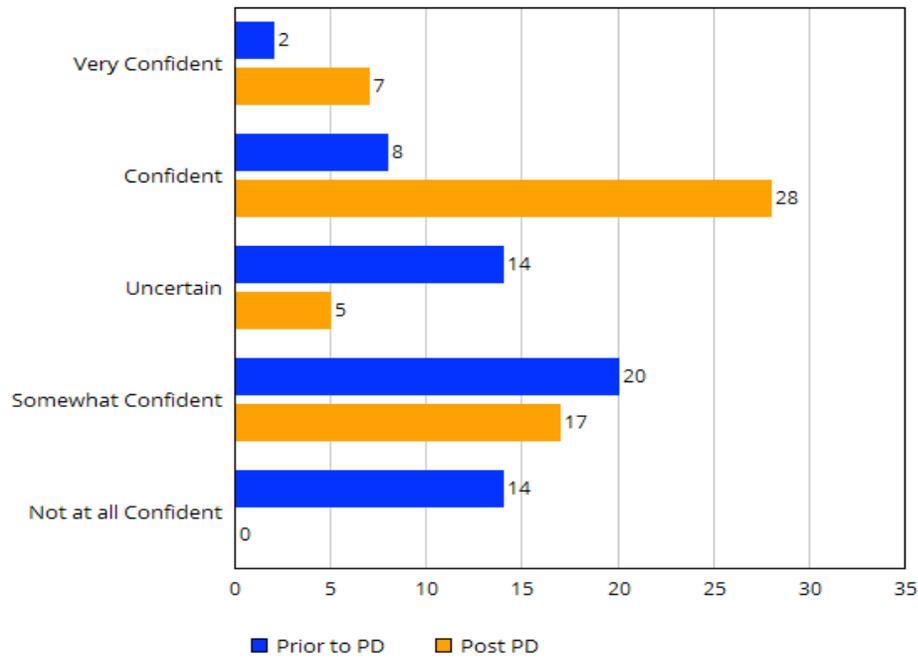

How comfortable were you with how children best learn about the Sun, Earth, Moon system?
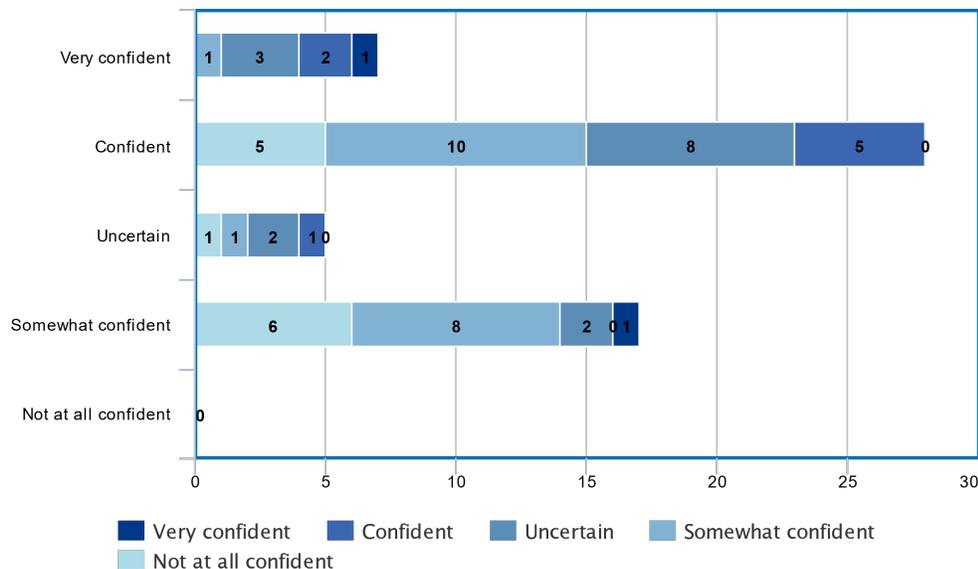
Prior to the workshop, of the 58 participants who provided both pre and post ratings, the largest percentage answered somewhat confident (2) (41.1%, n=20) followed by 24.1% (n=14) who answered not at all confident (1) and the same number who selected uncertain (3). Only 13.8% (n=8) answered confident (4) and 2 respondents (3.5%) selected very confident (5). After the professional development, respondents' most common answer shifted to confident (n=28, 49.1%), with an additional 12.3% (n=7) answering very confident. The remaining 37.9% were either somewhat confident (29.3%, n=17), and five (8.6%) were uncertain, and no one choose not at all confident.

Figure 3. Confidence in knowledge of how children learn best in the library pre and post Storytime STEM-packs professional development

There were 57participants who answered both the prior (pre) and after (post) portions of the question, how comfortable are you with how children best learn about the Sun, Earth, Moon System? Of those participants, 28.1% (n=15) stayed consistent in their confidence level. The largest shift was the 10 (17.5%) who prior to PD were somewhat confident and after PD felt confident in their knowledge of how children learn best.

Figure 4. How confidence of each participant changed in knowledge of how children learn best in the library pre and post STORYTIME STEM-packs professional development
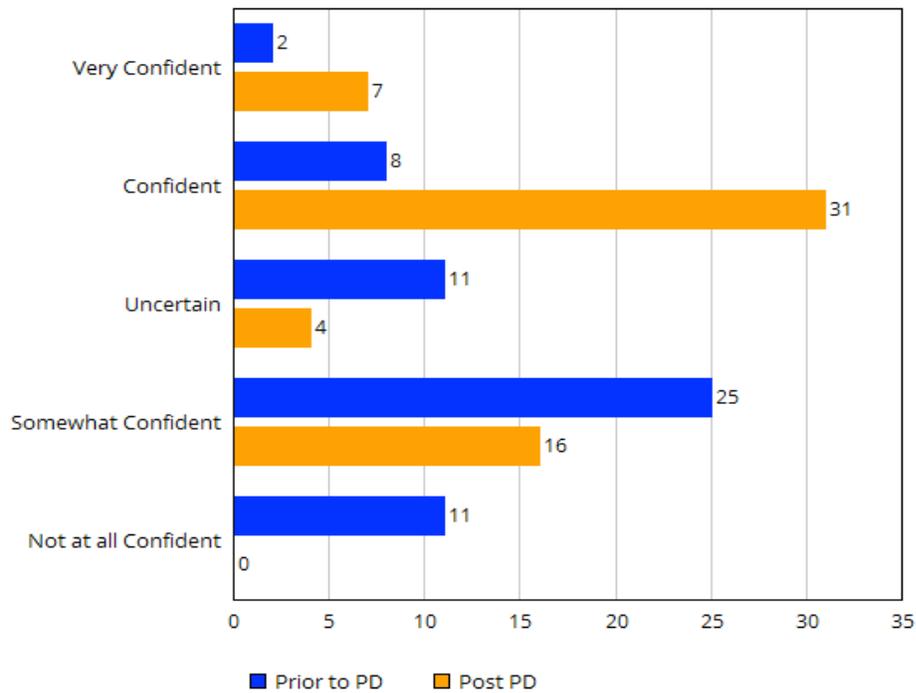
How comfortable were you as an adult with the content of the Sun, Earth, Moon system?

Of the 55 participants that ranked their comfort level, both pre and post PD, with the Sun, Earth, Moon system content, prior to the workshop, the most respondents (n=24, 43.6%) felt somewhat confident. This is followed by not at all confident (20%, n=11), and the same number of respondents choose uncertain. While only 14.5% (n=8) felt confident and 1 respondents (1.8%) felt very confident. After the professional development, the respondents' most common response shifted to confident (n=30, 54.5%). Seven participants (12.7%) were very confident in their understanding, and no one choose not at all confident. The remaining respondents choose, somewhat confident (n=14, 25.5%) and four (7.0%) were uncertain (n=4, 7.3%).

Figure 5. Confidence in the material as an adult pre and post STORYTIME STEM-pack professional development

There were 55 participants who answered both the pre-and post portion of the question, how comfortable are you as an adult with the content of the Sun, Earth, Moon System? Of those participants, 20.0% (n=11) stayed consistent in their confidence level. The largest shift in confidence level was the 30.9% (n=17) who originally choose somewhat confident and selected confident after PD.

Figure 6. How confidence of each participant in the material as an adult changed pre and post Storytime STEM-packs professional development

Legend: Very confident | Confident | Uncertain | Somewhat confident | Not at all confident
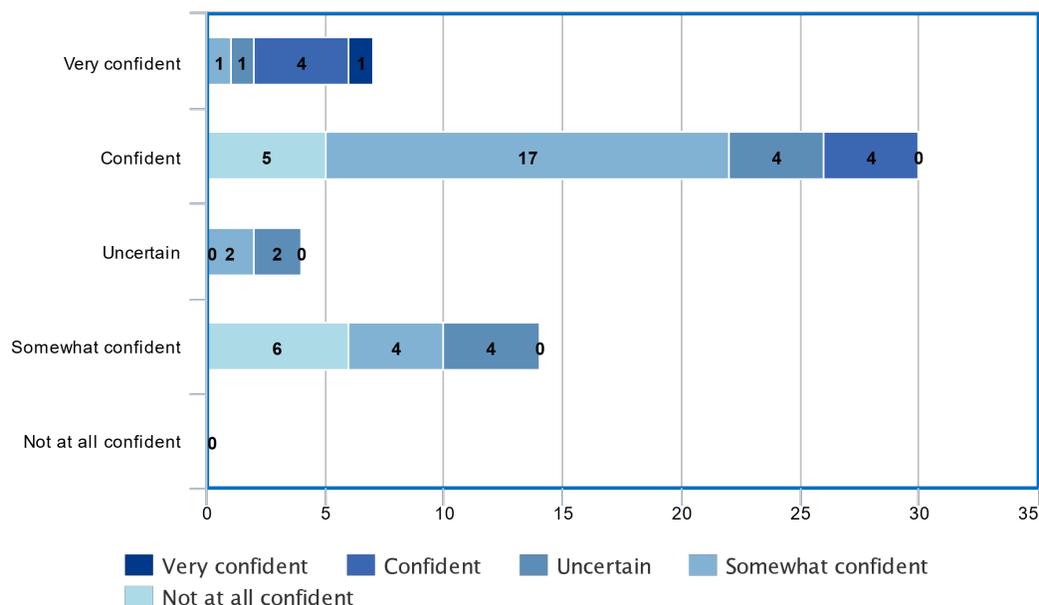
meta—chart.com

How valuable was this Storytime STEM-packs Professional Development to you as a teacher/librarian?

This question was asked on both day one and two surveys. Of the fifty-eight respondents on Day One, twenty-four (41.4%) rated the professional development to be very valuable, and twenty-six (44.8%) more considered it to be valuable. Five participants (8.6%) found the professional development to be moderately valuable and three respondents (5.2%) rated it a little valuable.

Of the 44 respondents on Day Two, twenty-three (52.3%) rated the professional development to be very valuable, and twenty more (45.5%) considered it to be valuable. Only one of the participants (2.2%) found the professional development to be a little valuable.

When asked, suggestions to help improve and change the professional development for the future, most participants did not have any suggestions on how to change the professional development. One requested an increased frequency of these workshops. One of the critiques of the program, is that the two-day format can be condensed into one day because "We don't need books read to us."

How will you use Storytime STEM-packs and what you learned during the professional development in your work in the library?

Many participants considered the Storytime STEM-packs as a good system of implementing STEM concepts, that children see every day, into story time, where they receive a greater understanding, through hands on learning. Some agreed that these packs are a good foundational step towards learning, while others cited them as a good way to build on the children preexisting knowledge. The summer reading theme coincided with the activities, which makes implementation easier for librarians, and they felt as though they were prepared to teach these topics because of the professional development.

Why should librarians and educators use Storytime STEM-packs and/or participate in the professional development sessions? What would you tell them?

The packs are inclusive of all materials needed to give children a more hands on activity to explore the STEM field, which reduces prep time and are user friendly for the librarians. These activities are also well researched, and meet academic standards. Through professional development, there became a greater confidence in how to teach and an overall greater knowledge of the topic among the librarians.

PPG Storytime STEM-packs Implementation Survey

Respondent Characteristics

Thirty-eight participants responded to the survey. 47.4% (n=18) of the respondents worked in the in the library system. 39.5% (n=15) of respondents selected working for Head Start. Four (10.5%) public school teachers participated. The remaining respondent (2.6%) identified as the Program Director at the Reading is Fundamental program.

Analysis Overview and Findings

In analyzing the data, basic descriptive statistics were used for scaled questions. Qualitative analysis strategies were conducted on the open-ended questions of the survey. Many of the open-ended questions elicited a wide range of answers, as is evidenced in the statistics and findings below. The questions were designed to determine degree of implementation and use of STEM-packs™ and elicit feedback from the participants and the families they serve.

STEM-packs Implemented Question

Numeric Question 1 asked: *Which of the following Storytime STEM-packs™ have you implemented in your classroom/library/program? (Select all that apply.)*
All Head Start teachers received the following Storytime STEM-packs: The Sun is My Favorite Star, Moonbear's Shadow, the Big Eclipse, The Secret Life of Squirrels, and on the Construction Site. Librarians all received "On the Construction Site" (PeK-2), but had a choice between a Secret Life of Squirrels (PreK-2; math) or the Rainbow Fish (1-4; math – fractions) and between The Sun is my Favorite Star or Next Time You See a Sunset and Moonbear's Shadow and Dark as a Shadow, depending on the age-range of the children they serve. RIF received three sets for younger children, and three sets for older children.

Table 1. Differing Storytime STEM packs based on topic and appropriate age

Topic	PreK-1 (Head Start)	1-3
1. Sun- Day/Night	The Sun is My Favorite Star	Next Time you See a Sun Set
2. Sun- Shadows	Moon Bear's Shadow	Dark as a Shadow
3. Solar Eclipse	The Big Eclipse	The Big Eclipse
4. Math	The Secret Life of Squirrels (preK-2)- Design an Obstacle Course	The Rainbow Fish – making a stained glass window (math, fractions) Grade 1-4
5. Engineering Design	On the Construction Site (PreK-2)	The Rainbow Fish – making a stained glass window (math, fractions) Grade 1-4

The most frequently implemented does not indicate favorite or most useful STEM pack, due to different packs being automatically supplied to the Head Start teachers and librarians. Librarians also must accommodate for the audience present at their library, more PreK to first grade students or first grade to third grade.

The most frequently implemented STEM pack is The Big Eclipse (n=24), which is designed for the entire age range, and all Head Start teachers received a copy. The least frequently implemented is Rainbow Fish, which was implemented eleven times, but this book was not automatically supplied to any population. Additionally the grade level ranges from first to fourth grade, while all other STEM packs only target at the highest to the third grade.

Figure 7. Most Frequently Implemented Storytime STEM-packs
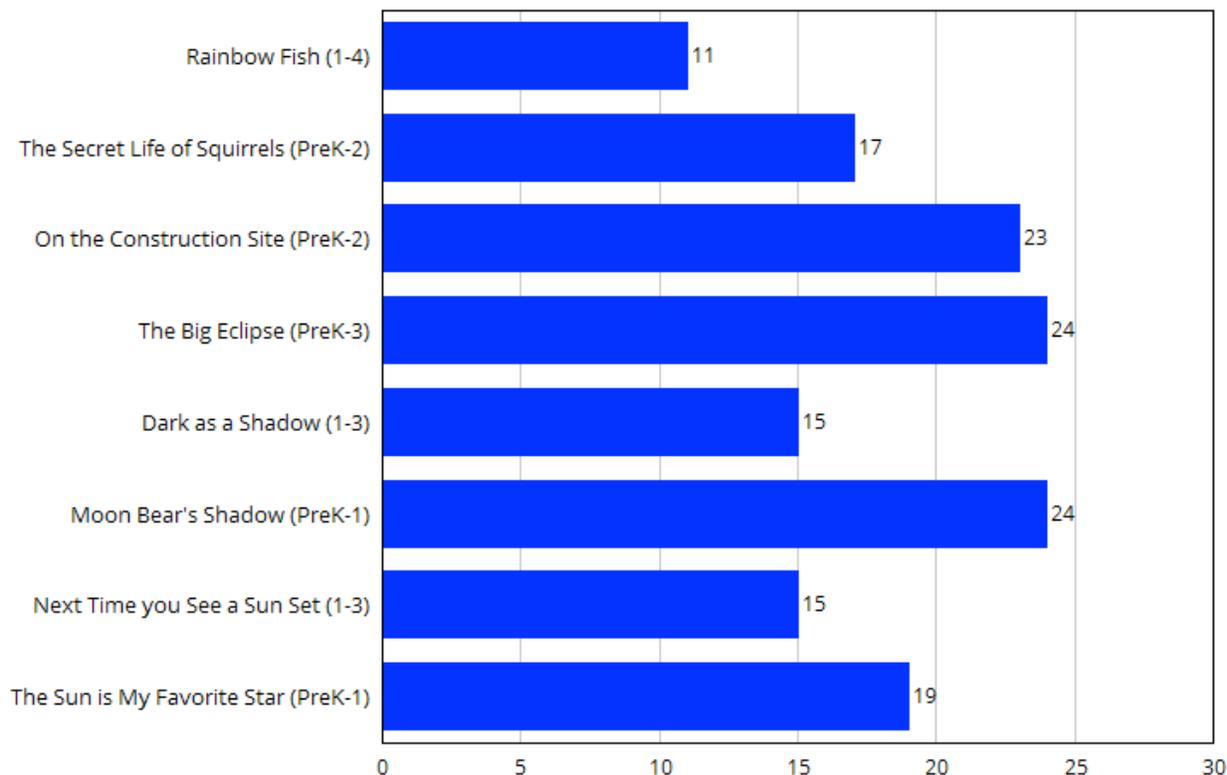
Question 2. (*Please rate the overall user-friendliness of the Storytime STEM-packs you implemented*)
In this scaled question, a large majority of the thirty-seven respondents (73.0%, n=27) rated the STEM-packs as user-friendly (4) or very user-friendly (5), yielding an overall mean of 3.9 on a scale from 1-5. Only 27.0% (n=10) found the materials to be not, a little, or moderately user-friendly.

Looking at the response patterns between the two major groups of participants: the Head Start staff and Library Staff, we see that the Headstart Staff have a slightly more of positive response to this item. Of the 15 respondents, 73.3% (n=11) rating the materials as User-Friendly (4) or Very User-Friendly (5), compared to 60.0% (n=9) of library staff.

The next section asked the thirty-seven respondents to rate the specific implementation experiences of the Storytime STEM-packs™ by expressing agreement or disagreement (on a scale from 1-5) to three measures: fun and engaging for children; easy to use (facilitate); and minimal preparation time. 56.8%

(n=21) of respondents expressed agreement, strongly agreed or agreed, with the materials being fun and engaging for children for an overall mean of 3.6. 62.2% (n=23) found the materials to be easy to use for a mean score of 3.6. And 64.9% (n=24) of respondents agreed that the materials took minimal preparation time to implement, for a mean score of 3.7.

Figure 11. Implementation Experiences
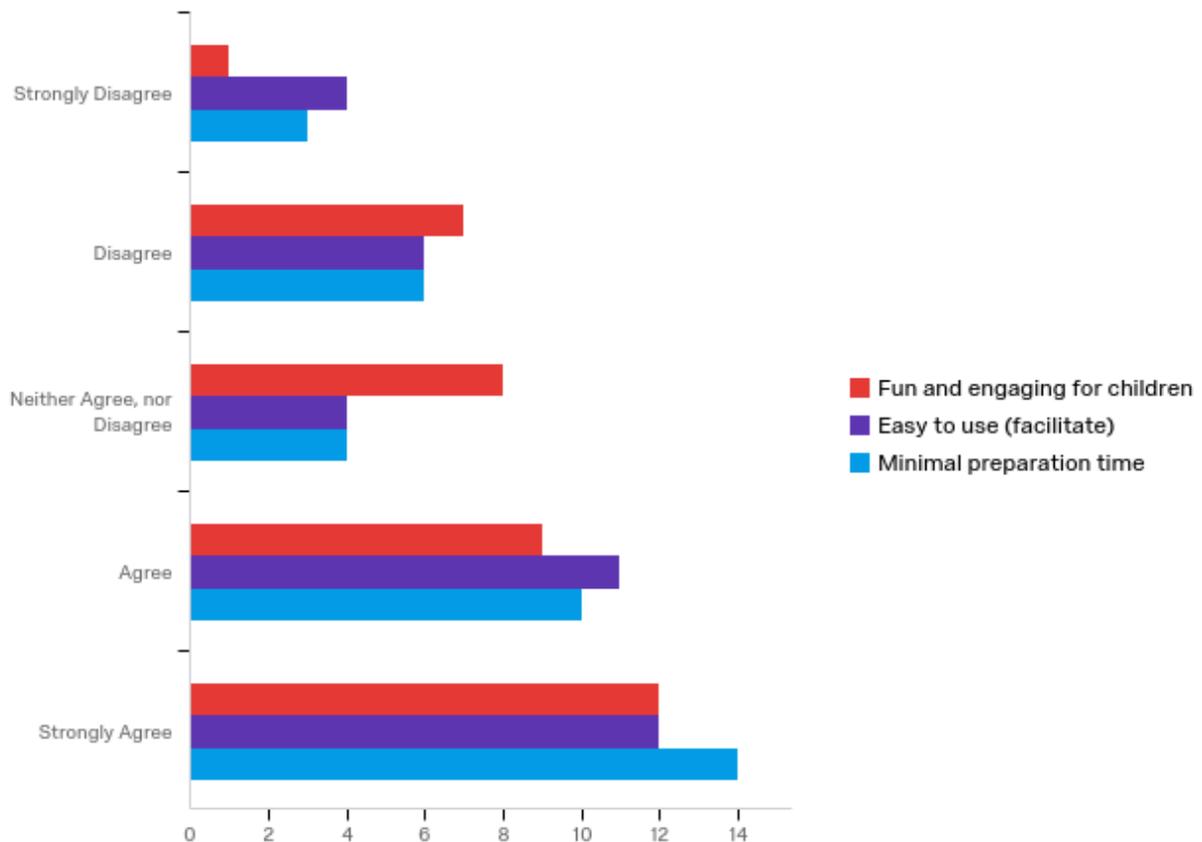
When we separate the responses by the two largest groups of respondents, library and Head Start staff, both groups have respectively 15 respondents. For two of the measures, fun and engaging (n=10, 66.7%) and minimal preparation (n=8, 53.3%), the library staff and Head Start staff had the same amount check agree of strongly agree. For easy to use (facilitate) library staff and Head Start Staff differed in their answer patterns with 53.3% (n=8) of the library staff and 80.0% (n=12) of Head Start Staff agreeing or strongly agreeing.

Scaled Question 4 asked: *Do you plan to use the Storytime STEM-packs™ you received again in the future?* 86.1% (n=31) said yes and 13.9% (n=5) said no. Similarly, when asked Scaled Question 5 (*Would you recommend Storytime STEM-packs™ to your colleagues and/or other organizations?*) 77.8% (n=28) responded yes and 22.2% (n=8) responded no. The final Scaled Question asked participants *Are you interested in participating again next year, receiving new Storytime STEM-packs™ and PD?* In response, 64.9% (n=24) said yes and 35.1% (n=13) said no.

Open-Ended Questions

Twelve respondents replied to Open-Ended Question 1, which asked: *If you had any feedback from parents about Storytime STEM-packs™, please briefly explain below.* Two of those replied that they had

not had any feedback. All others (n=10) noted that that the materials were enjoyable, helpful, and engaging. For example, "these materials helped explain the solar eclipse more clearly to the children." "Parents were excited for their child to be able to learn STEM concepts with these age appropriate and fun stories." "One of the helpers remarked that this was the most engaged and attentive the class had been all summer."

Ten responses were given to Open-Ended Question 2, which asked: *Do you have any other feedback/comments for us on the Storytime STEM-packs™?* Nine out of the ten (90%) had positive feedback regarding the STEM-pack™ materials. Three (30%) respondents mentioned that the *On the Construction Site* STEM-pack™ was their favorite, providing the most engaging activities. Two of the respondents mentioned that the training was inconvenient – either too long or too far away. One participant found the training to be very valuable stating that as a result, "I am feeling more confident with teaching this specific type of subject matter. Thank-you very much!"

One person commented that they did not like the yes/no format of a survey question: "I feel that the YES or NO being the only option for the previous questions is an unfair evaluation of the kits potential or viable use. Many factors come into consideration when developing library programs and whether or not these or other STEM-packs would be introduced and/or used again."

For full results of both open-ended questions please refer to appendix.

For questions regarding Storytime STEM-packs, contact:
Gabriela Rose
Science Coordinator
Math & Science Collaborative
Allegheny intermediate Unit
Homestead, PA 15120
412-394-4636

For questions regarding the evaluation or report, contact CEAC:
Dr. Keith Trahan
Associate Director
School of Education
4139 Wesley W. Posvar Hall
230 S. Bouquet Street
University of Pittsburgh
Pittsburgh, PA 15260
412 - 624-7240
keithtrahan@pitt.edu
www.ceac.pitt.edu

Appendix 1 – Open-Ended Question Responses.

Open-Ended Question 1: *If you had any feedback from parents about Storytime STEM-packs™, please briefly explain below.*

Feedback is based upon the ages of the parents' children involved and their own youngsters' attention spans. The parents who share in the experience often review the content with their children by re-explaining and/or reusing the manipulatives individually with their family members to assess further understanding and concept mastery.

We did not have any feedback from parents.

The parents and kids really enjoyed the hands on activities. Especially the flashlight activity with Moonbear's Shadow.

We enjoyed all the pack we used but the favorite was of course the Big Eclipse. I found the information and visuals helpful for all ages. I'm saving my squirrel pack for fall. Thanks you.

Parents commented that these activities helped explain the solar eclipse more clearly to the children.

when we presented the program to the summer camp at the YMCA, one of the helpers remarked that this was the most engaged and attentive the class had been all summer.

For the Solar Eclipse, the one grandmother said she also learned a lot during the program.

We combined The Sun is My Favorite Star, Moonbear's Shadow, and The Big Eclipse into one session that we did on the morning of the eclipse. We couldn't have used any of the STEM-packs individually since none of them contained enough materials to do an entire library program alone, but together they worked very well. One mother thanked us for doing the program and said it eliminated all of her "mommy-anxiety" about how to prepare her children for the eclipse amongst all the hype, and another mom asked her daughter if she had any more questions or worries about the eclipse before they left the library and the girl said no, the program helped her to understand everything.

Did the house-building activity in "On the Construction Site", and I had several Moms comment that it was a lot of fun for THEM to participate with their kids.

The homeschool families I reacted with loved the program. They appreciated the ideas for lesson plans and tied in lessons at home. I personally only ran 2 of the programs and had 2 volunteers running the other programs. Parents loved the flashlight book in the Construction Site. They also seemed to like the Eclipse activity with holding out your moon and trying to cover the image of the sun. During that segment, parents jumped in to help their children and joined the conversation about why the moon can seem to "cover up" the sun even though it is so much smaller.

The parents were wondering what the white boxes in the classroom were. The teachers explained and the parents were excited for their child to be able to learn STEM concepts with these age appropriate and fun stories. The children loved the STEM packs too and I will be excited to use them for next school year!

None

Open-Ended Question 2: *Do you have any other feedback/comments for us on the Storytime STEM-packs™?*

I feel that the YES or NO being the only option for the previous questions is an unfair evaluation of the kits potential or viable use. Many factors come into consideration when developing library programs and whether or not these or other STEM-packs would be introduced and/or used again.

The success of the Storytime STEM-packs depended on the book and the activity. When we did the "On the Construction Site," the students were very intrigued by the interesting format of the book (using the light to illuminate different things) and loved the building activity! It was really nice to have them plan out their house with a blueprint. The book was a bit long, but certain pages can be skipped. The "Secret Life of Squirrels" book was also a little too long, and the children didn't seem as engaged by the activity. Lastly, in terms of the "Great Eclipse" STEM-pack, the book was helpful in explaining what the eclipse is, but was much too wordy for a read-aloud. Also, a lot of the science went over the students' heads. The activity helped a little with that, but, overall, this activity seemed like it would be a better fit in a school than in a less-structured summer program. They were all very fun to try, and the facilitator's guides were excellent and helpful! Thank you!

On the Construction Site - The children especially enjoyed constructing houses as teams and were excited when they remained water-proof. The flashlights were a big hit with Moon Bear's Shadow.

I said yes to attending again but I'm not sure I can spare the time with the funding cuts. I'm taking on more jobs that others would do. For me, it was an 1hour drive to the IU, 8:30-3:00 class then the hour drive home for 2 days. Will need to think about my attendance but the material offered is good.

I have recommended the StoryTime Stem Packs to a teacher. She is interested in looking at them and possibly borrowing to use with her students.

As I mentioned in an earlier answer, some of the kits aren't elaborate enough to be a self-contained program for us (i.e., we only use the kit itself without having to supplement it in some way) because there just isn't enough content to use for at least 30 minutes. (I have the PreK ones, so I understand the material isn't as elaborate.) But combining them worked very well, so STEM-packs that can be used in conjunction with one another are excellent! Regarding the On the Construction Site STEM-pack: We had 7 children ranging in age from 3 to 10 at that program. All of the participants LOVED designing and drawing their houses and some went into great detail - adding electrical outlets, pipes, bathrooms, and steel pipes in the foundations. This was by far the most popular and engaging book of the four that we used, and it made the biggest impression on the children. The children worked really hard to construct their bear houses, and took a very long time to make them and they all wanted to take them home. So I realized that they did NOT want their creations to be sprayed with water and destroyed. We modified that by holding the spray bottle and discussing which places on their houses might not be water-proof - "What would happen if rain came down on the roof? What it was very windy and the rain blew in sideways? What could we do to fix that?" So we still talked about construction and the importance of design, but the program turned out to have more of

an Art dimension than I had anticipated. So it became a STEAM-pack rather than a STEM-pack for us, and that worked out great. :-)

The training took too long. The materials are OK, but just give them to us and let us figure out how to implement them into our libraries. So much of the instruction was seemingly formed around a classroom, which I don't have. I might have 3 4 year olds, 2 6's and 7 eight year olds. I need to adapt them to my needs. And 2 days of training away from my library was simply too much.

I don't really like the "Rainbow Fish" kit. I have honestly not tried it out yet. I just feel it is a real stretch to introduce that age group to the concept of fractions. There are so many other good math books out there that could be used. I like the Stained Glass idea, but not pairing it with that book. I love the Dark As a Shadow Book and The Next Time you See a Sunset book. I may also suggest to my director to put The Big Eclipse book into circulation because I think it may get more use that way since we may not present that whole kit again since it the Eclipse is over.

I really enjoyed this professional development. I have always struggled to teach STEM concepts in an age appropriate way. This professional development gave easy to implement lessons and resources that the children were excited to learn from. I am feeling more confident with teaching this specific type of subject matter. Thank-you very much!

The Storytime STEM-packs have given us a great resource for our classroom, and I learned a lot about implementing science lessons. The packs are so convenient, having everything you need for the lesson(s) included. Thank you!