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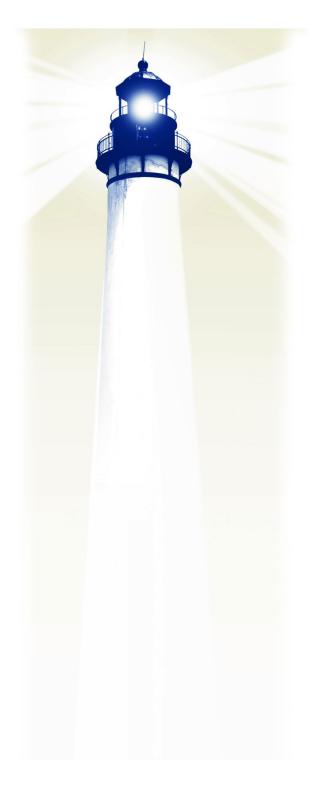**Collaborative for Evaluation and Assessment Capacity**

CEAC

PAsmart Storytime STEM+C Adventures Evaluation Report 2019-2020

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Introduction

The Allegheny Intermediate Unit's Math & Science Collaborative (AIU MSC) of Western PA is a comprehensive and award-winning organization for advancement of K-12 STEM learning that provides services for public school districts and non-public schools. The AIU MSC developed Storytime STEM-packs first through an NSF I-CORPS™ grant and continued the development with a 2019 PAsmart Advancing K12 Computer Science & STEM Education Grant. Along with developing the Storytime STEM-Packs, the AIU MSC created a model of professional development for K-12 and Head Start teachers, and school and public librarians. These educators participated in the 2019 Storytime STEM-packs program. Participants in this year's project included AIU school districts, Westmoreland Intermediate Unit school districts, Allegheny County Head Start (HS) and PreK Counts Centers, Catholic Diocese of Pittsburgh Schools, and public libraries in the Westmoreland Library Network.

In the spring of 2019, there was professional development for the Storytime STEM+C Moon Adventures. Teachers implemented Moon Storytime STEM +C Adventures in their classrooms in spring 2019, with librarians implementing them in their 2019 summer reading programs. There was a second professional development session in the fall of 2019 for the Dragonland Storytime STEM+C Adventures, which were then implemented from fall 2019 to spring 2020. A third Storytime STEM+C Adventure professional development (Earth Day) was scheduled to be conducted virtually during the spring 2020 but then postponed due to the COVID-19 pandemic, and is now available as an asynchronous professional learning opportunity to all grant participants

Key Findings

- All respondents (100%, n=51) planned to use Dragonland Adventures activities again in the future and 97.6% (n=123) of respondents planned to use the Earth and Moon Adventures activities in the future.
- All respondents (100%, n=51) would recommend Dragonland Adventures activities to their colleagues and other organizations and 98.4% (n=124) of respondents would recommend Earth and Moon Adventures activities to their colleagues and other organizations.
- More than 90% of respondents for both Dragonland and Earth and Moon Adventures agreed or strongly agreed that STEM-packs were fun and engaging for kids.
- 84.3% (n=43) of respondents implementing Dragonland Adventures answered that the developmental levels of the activities were "just right" for children.
- All librarian respondents (n=10) who implemented the Dragonland Adventures activities agreed or strongly agreed that it was user friendly and their comfort, interest, and commitment in STEM+C activities increased.
- 95.9% (n=164) of respondents to the spring 2019 PD survey, 86.9% (n=106) of respondents to the fall 2019 PD survey, and 91.4% (n=74) of respondents to the end of the program survey considered the PD valuable or very valuable.
- 88.9% (n=152) of respondents to the spring 2019 PD survey, 76.2% (n=93) of respondents to the fall 2019 PD survey, and 84.0% (n=68) of respondents to the end of the program survey

answered that they increased or greatly increased their interest in STEM and computer science as a result of the Adventures Storytime STEM-pack STEM+C PD.

- 90.1% (n=154) of respondents to the spring 2019 PD survey, 78.7% (n=96) of respondents to the fall 2019 PD survey, and 90.1% (n=73)) of respondents to the end of the program survey answered that they increased or greatly increased their commitment to implement STEM and computer science in their classrooms/libraries.
- 65.5% (n=112) of respondents to the spring 2019 PD survey and 67.9% (n=55) of respondents to the end of the program survey reported an increase in their comfort level with how children best increase their computer science skills from before to after the program.
- 62.6% (n=107) of respondents to the spring 2019 PD survey and 71.6% (n=58) of respondents to the end of the program reported an increase in their comfort level with computer science from before to after participating in the STEM-packs PD.

Evaluation Design

The Collaborative for Evaluation and Assessment Capacity (CEAC), housed within the University of Pittsburgh's School of Education, serves as the evaluation team for the Storytime STEM-packs program since its inception. The external evaluation of Storytime STEM-packs program aimed to measure the effectiveness of the professional development, the implementation of the Storytime STEM-packs, and the program as a whole. The evaluation consisted of five surveys for the program: two professional development surveys, two implementation surveys, and an end of program survey.

CEAC developed five surveys for the program: two professional development surveys, two implementation surveys, and an end of program survey. The two professional development surveys measure the effectiveness of the Storytime STEM-packs orientation professional development sessions. The two implementation surveys collected data on participants' implementation of the Storytime STEM-packs in the libraries and classrooms. The end of the program evaluation survey assessed the totality of the program. The professional development and end of program survey utilized a retrospective pre-post design to examine changes in participants' confidence of the STEM-packs STEM content and their comfort level with facilitating STEM+C 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 and classrooms, and their user-friendliness. 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.

Storytime STEM+C Adventures Professional Development

Four professional development (PD) sessions were held for Earth and Moon Storytime STEM+C Adventures in the spring of 2019. One session was held at Westmoreland County Intermediate Unit for K-12 teachers and WLN librarians. Three sessions were held at the AIU: one for K-12 teachers and two for Head Start teachers. 171 respondents completed the survey. A majority of respondents were from Head Start (54.4%, n=93), followed by K-12 schools (27.5%, n=47),

and public librarians (14.6%, n=25). Of these respondents, the majority (66.7%, n=114) had no prior experience with Storytime STEM-packs and related professional development.
Four PD sessions were held in the fall of 2019 for the Storytime STEM+C Dragonland Adventures. Again, one session was held at WIU for K-12 teachers and WLN librarians, and three sessions were held at the AIU, one for K-12 teachers and two for Head Start teachers. 122 respondents completed the survey, with most coming from either Head Start (45.1%, n=55) or K-12 schools (41.0%, n=50), and the rest from the public libraries (10.7%, n=13).

The PD survey utilized a pre-post design for items related to confidence and comfort with STEM+C content. At the initial PD in spring 2019, participants were asked about their confidence on a series of items before and after the PD. The same set of items were given to new participants at the fall 2019 PD. Returning participants were given the same questions but only asked to rate their current confidence, after the professional development. Finally, participants were asked to rate their confidence levels on the end of program survey administered in late spring 2020. It is also important to remember that the survey was administered at the height of the COVID-19 pandemic, when stay-at-home orders were in place. Thus, response rates are lower.

From this data we were able to compile the cumulative frequency percentage (CFP) of how many participants selected confident (4) or very confident (5) before PD, after the first PD, and after the second PD. Findings showed a low CFP 4-5 prior to professional development for all three statements (Table 1). Each statement increases after their first professional development but the degree to which they increase differs: Comfort with facilitating STEM+C activities and comfort as an adult with computer science increases from approximately 40% to approximately 80% and both of these statements remain in the 80% range after the second PD. As for comfort with how children best increase their computer science skills, the CFP 4-5 increased slightly from before to after the first PD, with a large increase in CFP 4-5 seen after the second PD.

Table 1. CFP (4-5) of Confidence Before and After STEM-packs STEM+C PD

	CFP (4-5) Before PD % (n)	CFP (4-5) After First PD % (n)	CFP (4-5) After Second PD % (n)
Comfort with facilitating STEM+C activities	40.2% (74)	88.0% (162)	88.1% (96)
Comfort with how children best increase their computer science skills	37.2% (68)	43.5% (80)	86.2% (94)
Comfort as an adult with computer science	42.9% (79)	83.7% (154)	79.8% (87)

After the professional development in the spring of 2019, the majority of respondents increased their interest and commitment to implement STEM and computer science. 88.9% (n=152) of respondents answered that they increased or greatly increased their interest in STEM and computer science as a result of the PD. Similarly, 90.1% (n=154) of respondents answered that they either increased or greatly increased their commitment to implementing

STEM and computer science in their classrooms/libraries. Nearly all respondents rated the Storytime STEM+C PD as valuable or very valuable (95.9%, n=164).

Again, after professional development in the fall of 2019, the majority of respondents increased their interest and commitment to implement STEM and computer science. 76.2% (n=93) of respondents answered that their interest in STEM and computer science "increased" or "greatly increased" (CFP 4-5) as a result of the PD. Similarly, 78.7% (n=96) of respondents answered that their commitment to implementing STEM and computer science in their classrooms/libraries "increased" or "greatly increased." The majority of participants (86.9%, n=106) rated the Storytime STEM+C professional development as "valuable" or "very valuable."

Implementation of Storytime STEM+C Moon Adventures

113 Moon Adventures Storytime STEM+C participants responded to the end of school year implementation survey. Head Start teachers (46.0%, n=52), K-12 teachers (38.9%, n=44) and school librarians (9.7%, n=11) were the three main groups of the respondents. The percentage of participants who implemented each of the seven STEM-packs are displayed below in Table 2 as well as the number of children reached. The largest number of respondents implemented Going to the Moon (66.4%, n=75) and the number of children who were taught this STEM-pack was 2,086.

Table 2. The percentage of respondent who implement and the number of children reached

STEM-pack	% respondents who implemented	# children who participated
Going to the Moon	66.4% (75)	2086
Exploring Moon Craters	53.1% (60)	1674
The Most Magnificent Thing	37.2% (42)	1254
Collecting Moon Rocks	31.0% (35)	1209
Footprints on the Moon	28.3% (32)	1386
Mae and the Moon	20.4% (23)	782
Margaret on the Moon	19.5% (22)	870

Additionally, the survey asked the participants who implemented the STEM-pack to rate their developmental appropriateness. The percentage of participants who selected just right, not challenging enough, and too difficult are displayed in Table 3. For all STEM-pack activities the majority selected the developmental level was just right. Finding Footprints on the Moon was the most highly rated with 96.9% (n=31) of respondents selecting just right.

Table 3. Level of Developmental Appropriateness

STEM-pack	Just Right	Not Challenging Enough	Too Difficult
Finding Footprints on the Moon	96.9% (31)	0.0% (0)	3.1% (1)
Collecting Moon Rocks	94.3% (33)	2.9% (1)	2.9% (1)
Mae and the Moon	90.9% (22)	0.0% (0)	9.1% (1)
Margaret and the Moon	90.9% (20)	4.5% (1)	4.5% (1)
Going to the Moon	82.7% (62)	8.0% (6)	9.3% (7)
The Most Magnificent Thing	78.6% (33)	2.4% (1)	19.0% (8)
Exploring Moon Craters	78.3% (47)	1.7% (1)	20.0% (12)

Respondents' experience implementing the STEM-packs was also measured. Statements about how the activity was fun and engaging, required minimal preparation, and was easy to use were assessed. Table 4 displays the ratings for each Earth and Moon STEM-pack activity on all three of these fronts. All activities received a CFP above 80% on each item and four activities received a rating CFP above 90% on each item.

Table 4. CFP 4-5 of Experience Implementing Earth and Moon Storytime STEM-packs

STEM-pack	Fun and engaging for kids CFP 4-5 (n)	Minimal preparation time CFP 4-5 (n)	Was easy to use CFP 4-5 (n)
Mae and the Moon	100.0% (23)	95.7% (22)	100.0% (23)
Collecting Moon Rocks	100.0% (35)	91.4% (32)	97.1% (34)
Going to the Moon	97.3% (73)	94.7% (71)	93.3% (72)
Finding Footprints on the Moon	96.9% (31)	87.5% (28)	96.9% (31)
Margaret and the Moon	95.5% (21)	95.5% (21)	95.5% (21)
Exploring Moon Craters	98.3% (59)	81.7% (49)	90.0% (54)
The Most Magnificent Thing	92.9% (39)	81.0% (34)	88.1% (37)

Overall, participants noted satisfaction with the product. When asked if they planned to use any of the Moon Adventures Storytime STEM+C activities in the future, 97.3% (n=110) of respondents answered yes. When asked if they would recommend Moon Adventures Storytime

STEM+C activities to their colleagues and other organizations, all but one respondent answered "yes" (99.1%, n=112).

Implementation of Storytime STEM+C Dragonland Adventures

For the implementation survey, all respondents (n=51) participate in the Fall 2019 Dragonland Adventures PD and implemented Dragonland Adventures between October 2019 and May 2020. 80.4% of the respondents (n=41) were teachers and 19.6% of the respondents (n=10) are librarians.

Findings from the Dragonland Adventures Implementation survey were overwhelmingly positive. Among all respondents who implemented the Dragonland Adventures STEM-pack, 94.1% (n=48) agreed or strongly agreed that it was fun and engaging for kids. 92.1% (n=47) agreed or strongly agreed that it was easy to use. 86.3% (n=44) agreed or strongly agreed that it required minimal preparation time. 84.3% (n=43) of all respondents thought the developmental levels of the activities were "just right" for children. The participants were also asked about their interest, commitment, and comfort regarding STEM+C activities, with each item receiving a CFP 4-5 over 90%.

End of Program Survey

There were 81 respondents to the End of Program survey. 44.4% (n=36) of the respondents came from K-12 schools and 29.6% (n=24) were from Head Start. An additional 24.7% (n=20) of respondents were from the public library system.

Findings were again very positive. 77.8% (n=63) of respondents reported an increase in their comfort level with computer science from before to after STEM-packs PD. 67.9% (n=55) of respondents reported an increase in their comfort level with how children best increase their computer science skills from before to after the program. 66.7% (n=54) of respondents reported an increase from before to after in their comfort level with the STEM content. 71.6% (n=58) of respondents reported an increase in their comfort level with how children best learn STEM content from before to after STEM-packs PD. 71.6% (n=58) of respondents reported an increase in their comfort level with facilitating STEM+C activities with children at their site in general from before to after PD.

After participating in the professional development, the majority of respondents increased their interest and commitment to implement STEM and computer science. 84.0% (n=68) of respondents answered that they increased or greatly increased their interest in STEM and computer science as a result of the PD. Similarly, 90.1% (n=73) of respondents answered that they either increased or greatly increased their commitment to implementing STEM and computer science in their classrooms/libraries.

Feedback and Suggestions

The vast majority of respondents provided positive feedback regarding their experience of the professional development, which described the PD as informative, interactive, and beneficial.

Nearly all respondents held positive attitudes about how Storytime STEM-packs support effective STEM instructions. The most often cited praise from respondents was the hands-on nature of the STEM-packs, which increased children's engagement. Moreover, respondents emphasized the importance of STEM-packs as the necessary materials and preparation for STEM lessons.

The most modifications during implementation were based on children's age. Also the respondents pointed out that they needed more time to conduct and discuss activities. Thus the structure of activities and difficult level were adjusted. Another highlight of modification was adding more engagement of participants, such as parents in the library and students in the classroom. Some of the participants did not have time to conduct the Dragonland activities this year due to pandemic. They would like to have some remote learning extensions for the STEM-packs.

Spring 2019 Storytime STEM+C Moon Adventures Professional Development Survey: Findings

Key Findings

- 95.9% (n=164) of respondents considered the professional development valuable (4) or very valuable (5)
- 62.6% (n=107) of respondents reported an increase in their comfort level with computer science from before to after STEM-packs PD.
- 65.5% (n=112) of respondents reported an increase from before to after in their comfort level with how children best increase their computer science skills.
- 67.8% (n=116) of respondents reported an increase from before to after PD in their comfort level with facilitating STEM+C activities with children at their site in general.
- 88.9% (n=152) of respondents answered that they increased or greatly increased their interest in STEM and computer science as a result of the PD.
- 90.1% (n=154) of respondents answered that they increased or greatly increased their commitment to implement STEM and computer science in their classrooms/libraries.
- 66.7% (n=114) had no prior experience with Storytime STEM-packs.
- 19% (n=33) of respondents had robots in their classrooms/libraries before the PD, of which 60.6% (n=20) had Bee-Bots.

Results

Role of Respondents in Their Organization

There were 171 respondents attending one of four days (April 12, April 26, May 3 and May 6) of Storytime STEM-packs professional development sessions from Westmoreland IU and Allegheny Intermediate Unit. Most respondents were from the Allegheny Intermediate Unit (n=135, 78.9%).

Table 1. Respondents' location and date (n=171)

Location and Date	N	%
Westmoreland IU April 12	36	21.1%
Allegheny Intermediate Unit April 26	53	31.0%
Allegheny Intermediate Unit May 3	45	26.3%
Allegheny Intermediate Unit May 6	37	21.6%

Respondents from Head Start, schools, and libraries were the three main groups of respondents. 54.4% (n=93) of the respondents were a part of the Head Start organization and 27.5% (n=47) came from K-12 schools. There was an additional 14.6% (n=25) of respondents who were involved with the library system. The remaining 3.5% (n=6) selected "other".

Table 2. Role of respondents (n=171)

	N	%
Head Start Organization	93	54.4%
K-12 School	47	27.5%
Library	25	14.6%
Other	6	3.5%

Of these respondents, the majority (66.7%, n=114) had no prior experience with Storytime STEM-packs and related professional development and the remaining 33.3% (n=57) had prior experience. Of the respondents with prior experience, 45.6%% (n=26) have been involved for one year and 54.4% (n=31) have been involved for two or more years.

Table 3. Experience of respondents with STEM-packs and related PD (n=171)

Experience	N	%
No Prior Experience	114	66.7%
Prior Experience	57	33.3%

Table 4. Length of respondents with prior experience of STEM-packs and related PD (n=57)

Year	N	%
One Year	26	45.6%
Two or More Year	31	54.4%

Prior Robot Implementation Experience

Only 19% (n=33) of respondents had robots in their classroom/library prior to this grant. Of the respondents who reported having robots prior to the PD, 60.6% (n=20) had Bee-Bots. The remaining 39.3% (n=13) had some other kinds of similar robots, including Sphero, Edison, and Ozo bots (Table 8).

Prior to STEM-packs respondents were using the robots in their classrooms/library for teaching as well as developing coding and number recognition skills. Most respondents cited that they used robots as a useful and supplemental material in STEM curricula or activities. However, three respondents answered that they had robots but did not use them.

Table 5. Robots in classroom/ library (n=171)

	N	%
No	138	80.7%
Yes	33	19.3%

Table 6. Type of Robots (n=33)

	N	%
Bee-Bots	9	27.3%
Bee-Bots and Others	11	33.3%
Dash, Dot, Sphero	8	24.2%
Ozobots and Edison Bot	4	12.1%
Robot Mice	1	3.0%

Content and Pedagogical Content Knowledge (STEM+C Comfort and Confidence)

How comfortable are you as an adult with computer science?

62.6% (n=107) of respondents reported an increase in their comfort level with computer science from before to after STEM-packs PD. Prior to the PD, 41.0% (n=70) had a cumulative frequency percentage (CFP) of confident or very confident in their computer knowledge as an adult. Before PD, the majority of respondents felt uncertain (35.7%, n=61) about their computer science knowledge. And there were 8.2% (n=14) of respondents who reported having no confidence. For the post there was a CFP (4-5) of 83.6%

(n=143). The number of participants who felt uncertain (15.2%, n=26) and somewhat confident (1.2%, n=2) about their computer knowledge as an adult decreased.

Table 7. Respondent comfort with computer science before and after STEM-packs STEM+C PD

	Not at all confident % (n)	Somewhat confident % (n)	Uncertain % (n)	Confident % (n)	Very confident % (n)	CFP 4-5 % (n)
Before PD	8.2% (14)	15.2% (26)	35.7% (61)	27.5% (47)	13.5% (23)	41.0% (70)
After PD	0.0% (0)	1.2% (2)	15.2% (26)	45.0% (77)	38.6% (66)	83.6% (143)

How comfortable are you with how children best increase their computer science skills?
65.5% (n=112) of respondents reported an increase from before to after in their comfort level with how children best increase their computer science skills. Prior to the workshop, 38.0% (n=65) were either confident or very confident in their knowledge of how children best increase their computer skills. The largest percentage (31.0%, n=53) of respondents answered uncertain. There were 36 respondents (21.1%) who answered "somewhat confident" and 17 responded "not at all confident" (9.9%). After PD respondents had a CFP 4-5 of 41.0% (n=70) in their comfort level. The response of "uncertain" still represented the highest percentage (35.7%, n=61). The percentages of respondents answering "not at all confident" and "somewhat confident" decreased slightly from before to after PD.

Table 8. Comfort with how children best increase their computer science skills before and after STEM-packs STEM+C PD

	Not at all confident % (n)	Somewhat confident % (n)	Uncertain % (n)	Confident % (n)	Very confident % (n)	CFP 4-5 % (n)
Before PD	9.9% (17)	21.1% (36)	31.0% (53)	26.9% (46)	11.1% (19)	38.0% (65)
After PD	8.2% (14)	15.2% (26)	35.7% (61)	27.5% (47)	13.5% (23)	41.0% (70)

How comfortable are you as an adult with STEM content after PD?
87.1% (n=149) of respondents rated themselves as confident or very confident (CFP 4-5) in their comfort as an adult with the STEM content (engineering design, mathematics, science/moon) after PD. 12.3% (n=21) of respondents answered "uncertain" and only one respondent selected "somewhat confident".

Table 9. Respondent comfort with the STEM content after STEM-packs STEM+C PD

	Not at all confident % (n)	Somewhat confident % (n)	Uncertain % (n)	Confident % (n)	Very confident % (n)	CFP 4-5 % (n)
After PD	0.0% (0)	0.6% (1)	12.3% (21)	50.3% (86)	36.8% (63)	87.1% (149)

How comfortable were you with how children best learn STEM content before PD?

45.6% (n=78) of respondents rated themselves as confident or very confident (CFP 4-5) in their comfort with how children best learn STEM content (engineering design, mathematics, science/moon) before the PD. 28.1% (n=48) of respondents answered "uncertain". The percentage of respondents selecting "not at all confident" and "somewhat confident" was 7.6% (n=13) and 18.7% (n=32) respectively.

Table 10. Comfort with how children learn best STEM content before STEM-packs STEM+C PD

	Not at all confident % (n)	Somewhat confident % (n)	Uncertain % (n)	Confident % (n)	Very confident % (n)	CFP 4-5 % (n)
Before PD	7.6% (13)	18.7% (32)	28.1% (48)	33.9% (58)	11.7% (20)	45.6% (78)

How comfortable are you with facilitating STEM+C activities with children at your site in general?

67.8% (n=116) of respondents reported an increase from before to after PD in their comfort level with facilitating STEM+C activities with children at their site in general. Before professional development, there was a CFP of 40.9% (n=70) for respondents who felt confident or very confident in their comfort level of facilitating STEM+C activities with children in general. Meanwhile, 25.1% (n=43) respondents felt uncertain. The answer not at all confident and somewhat confident accounted for 11.7% (n=20) and 22.2% (n=38) of all respectively. After the workshop, respondents had a CFP 4-5 of 90.1% (n=154). The percentage of uncertain or somewhat confident reduced to 9.4% (n=16) and 0.6% (n=1) respectively.

Table 11. Comfort with facilitating STEM+C activities before and after STEM-packs STEM+C PD

	Not at all confident % (n)	Somewhat confident % (n)	Uncertain % (n)	Confident % (n)	Very confident % (n)	CFP 4-5 % (n)
Before PD	11.7% (20)	22.2% (38)	25.1% (43)	30.4% (52)	10.5% (18)	40.9% (70)
After PD	0.0% (0)	0.6% (1)	9.4% (16)	47.4% (81)	42.7% (73)	90.1% (154)

Interest and Commitment STEM+C

After professional development, the majority of respondents increased their interest and commitment to implement STEM and computer science. 88.9% (n=152) of respondents answered that they increased or greatly increased (CFP 4-5) their interest in STEM and computer science as a result of the PD. Similarly, 90.1% (n=154) of respondents answered that they either increased or greatly increased (CFP 4-5) their commitment to implementing STEM and computer science in their classrooms/libraries.

Table 12. Interest and commitment of respondents changed as a result of the STEM-packs STEM+C PD today?

	Greatly Decreased % (n)	Somewhat Decreased % (n)	Uncertain % (n)	Increased % (n)	Greatly Increased % (n)	CFP 4-5 % (n)
Interest in STEM and Computer Science	0.0% (0)	0.6% (1)	10.5% (18)	39.2% (67)	49.7% (85)	88.9% (152)
Commitment to implement STEM and Computer Science	0.0% (0)	0.6% (1)	9.4% (16)	37.4% (64)	52.6% (90)	90.1% (154)

Value/Usefulness

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

Nearly all respondents rated the Storytime STEM+C PD as valuable or very valuable. 69.0% (n=118) rated the PD to be very valuable and 26.9% (n=46) considered it to be valuable.

Table 13. Value of Storytime STEM-packs STEM+C PD

	Not Very Valuable % (n)	Not Valuable % (n)	Uncertain % (n)	Valuable % (n)	Very Valuable % (n)	CFP 4-5 % (n)
After PD	0.0% (0)	0.0% (0)	4.1% (7)	26.9% (46)	69.0% (118)	95.9% (164)

How can Storytime STEM-packs support effective STEM instruction in your program?

Nearly all respondents held positive attitudes about how Storytime-packs supports effective STEM instruction. The most often cited praise from respondents was the hands-on nature of the STEM-packs, which increased children's engagement. Moreover, respondents emphasized the importance of STEM-packs as the necessary materials and preparation for STEM lessons.

Feedback and suggestions

The vast majority of respondents provided positive feedback regarding their experience of the professional development. Respondents described the PD as informative, interactive, and engaging, and respondents cited that Bee-Bots were particularly impressive. The most often cited critiques by respondents related to the amount of time the PD took and the presentation style. The theme of suggestions for reducing the time of the PD was that a half day was more reasonable and likely as effective. Suggestions for changing the presentation style varied.

Spring 2019 Storytime STEM+C Moon Adventures Implementation Survey: Findings for K-12 and Head Start Teachers

Key Findings

- The Going to the Moon Computer Science Activity was the most frequently implemented STEM-pack; 66.4% (n=75) of respondents reported implementing it, with a total of 2,086 children/students.
- For each of the seven STEM+C challenges:
    - More than 90% of respondents agreed or strongly agreed that STEM-packs were fun and engaging for kids.
    - More than 75% of respondents thought the developmental levels of the activities were "just right" for children.
- All respondents (100%, n=23) who implemented the Storytime STEM-pack Mae and the Moon agreed or strongly agreed that the STEM-pack was fun and engaging for kids.
- Out of the seven STEM+C Challenges, four were modified during implementation by at least half of respondents:
    - 62.5% (n=35) modified "Going to the Moon"
    - 50% (n=14) modified "The Most Magnificent Thing"
    - 61.5% (n=24) modified "Exploring Moon Craters"
    - 56.5% (n=13) modified "Collecting Moon Rocks"
- Margaret and the Moon was the STEM-pack least implemented; 19.5% (n=19) of respondents reported implementing it.
- Mae and the Moon was the STEM-pack with the lowest reported child/student participation number (n=782).
- For two STEM-pack activities "The Most Magnificent Thing" and "Exploring Moon Craters" about 20% of respondents considered it too difficult for PreK-K children, of which nearly all were Head Start teachers.

Results

Role of Participants and Participation

113 PAsmart Storytime STEM+C Moon Adventures participants responded to the end of school year implementation survey. Head Start teachers (46.0%, n=52), K-12 teachers (38.9%, n=44) and K-12 librarians (9.7%, n=11) were the three main groups of the respondents in spring PAsmart Moon Adventures Implementation Survey. The remaining 5.3% (n=6) selected "other." Among 113 participants, 97% (n=110) of respondents participated in the spring 2019 professional development.

Table 1. Role of Participants (n=113)

Role	%	N
Head Start Teacher	46.0%	52
K-12 Teacher	38.9%	44
School Librarian	9.7%	11
Other	5.3%	6

Implementation

A majority of respondents (63.7%, n=72) implemented the PreK-K Moon Adventure STEM-packs and 74.3% (n=84) of respondents have not previously used STEM-packs. Of the prior experience, STEM-packs were implemented more with PreK-K children.

Table 2. Which grade-band Moon Adventure did you implement?

Grade-band	%	N
PreK-K	63.7%	72
Grade 1-2	36.3%	41

Table 3. Experience with using Storytime STEM-packs

	%	N
No Prior Experience	74.3%	84
Prior Experience	25.7%	29

Table 4. Experience with using Storytime STEM-packs by grade-band

	No Prior Experience % (n)	Prior Experience % (n)
PreK-K	54.8% (46)	89.7% (26)
Grade 1-2	45.2% (38)	10.3% (3)

Implementation of the Computer Science Moon Adventure Activity Going to the Moon

66.4% (n=75) of respondents reported implementing the Computer Science Moon Adventure Activity Going to the Moon. 2086 children were reported to have participated in Going to the Moon. On a 5-point scale from strongly disagree to strongly agree, each statement regarding implementation received a cumulative frequency percentage (CFP) of agree and strongly agree greater than 90%. The highest CFP (97.3%, n=73) was for the statement "going to the Moon was fun and engaging for kids".

The majority of respondents (82.7%, n=62) thought the developmental level of Going to the Moon was "just right" for children. 8.0% (n=6) of respondents answered, "it was not challenging enough for my children", 4 of whom were k-12 teachers. Of the 9.3% (n=7) of respondents who answered "too difficult for my children", 6 were Head Start teacher who implemented this pack for PreK-K children.
56 participants responded to the question "Did you modify the activity when implementing with your children/students?" of which 62.5% (n=35) reported modifying the activity, mostly because of time and difficulty.

Table 5. Between April 2019 and August 2019, did you implement the Computer Science Moon Adventure Activity Going to the Moon?

	%	N
Yes	66.4%	75
No	33.6%	38

Table 6. Experience with implementing the Going to the Moon Activity

Going to the Moon…	Strongly disagree % (n)	Disagree % (n)	Neither agree nor disagree % (n)	Agree % (n)	Strongly agree % (n)	CFP 4-5 (n)
Was fun and engaging for kids	1.3% (1)	0.0% (0)	1.3% (1)	37.3% (28)	60.0% (45)	97.3% (73)
Required minimal preparation time	1.3% (1)	1.3% (1)	2.7% (2)	45.3% (34)	49.3% (37)	94.7% (71)
Was easy to use	1.3% (1)	0% (0)	3.3% (2)	36.7% (30)	56.7% (42)	93.3% (72)

Table 7. Developmental level of Going to the Moon

	%	N
It was just right	82.7%	62
It was not challenging enough for my children	8.0%	6
It was too difficult for my children	9.3%	7

Implementation of the Engineering Design Storytime STEM-pack The Most Magnificent Thing

37.2% (n=42) of respondents reported implementing the Engineering Design Storytime STEM-pack The Most Magnificent Thing. 1254 children were reported to have participated in The Most Magnificent Thing. On a 5-point scale from strongly disagree to strongly agree, each statement regarding implementation received a cumulative frequency percentage (CFP) of agree and strongly agree greater than 80%. The highest CFP (92.9%, n=34) was for the statement "the Most Magnificent Thing was fun and engaging for kids".

The majority (78.6%, n=33) of respondents thought the developmental level for Storytime STEM-pack The Most Magnificent Thing was "just right" for children. 19.0% (n=8) of respondents answered "it was too difficult for my children," all of whom were Head Start teachers.
28 participants responded to the question "Did you modify the activity when implementing with your children/students?" of which half of the respondents reported modifying the activity.

Table 8. Between April 2019 and August 2019, did you implement the Engineering Design Storytime STEM-pack The Most Magnificent Thing?

	%	N
Yes	37.2%	42
No	62.8%	71

Table 9. Experience with implementing the Storytime STEM-pack The Most Magnificent Thing

The Most Magnificent Thing…	Strongly disagree % (n)	Disagree % (n)	Neither agree nor disagree % (n)	Agree % (n)	Strongly agree % (n)	CFP 4-5 (n)
Was fun and engaging for kids	2.4% (1)	0.0% (0)	4.8% (2)	38.1% (16)	54.8% (23)	92.9% (39)
Required minimal preparation time	2.4% (1)	7.1% (3)	9.5% (4)	54.8% (23)	26.2% (11)	81.0% (34)
Was easy to use	1.3% (2)	0% (0)	3.3% (3)	36.7% (19)	56.7% (18)	88.1% (37)

Table 10. Developmental level of the Storytime STEM-pack The Most Magnificent Thing

	%	N
It was just right	78.6%	33
It was not challenging enough for my children	2.4%	1
It was too difficult for my children	19.0%	8

Implementation of the Computer Science Activity Exploring Moon Craters

53.1% (n=60) of respondents reported implementing the Computer Science Activity Exploring Moon Craters. 1674 children were reported to have participated in Exploring Moon Craters. On a 5-point scale from strongly disagree to strongly agree, each statement regarding implementation received a cumulative frequency percentage (CFP) of agree and strongly agree greater than 80%. The highest CFP was 98.3% (n=59) which was for the item "Exploring Moon Craters was fun and engaging for kids".

The majority of respondents (78.3%, n=47) thought the developmental level of Exploring Moon Craters was "just right" for children/students. Of the 20.0% (n=12) of respondent who answered "too difficult for my children", all were Head Start teachers.

39 participants responded to the question "Did you modify the activity when implementing with your children/students?" of which 61.5% (n=24) reported modifying the activity, mostly in regard to the sequence of activities, difficulty, and group size.

Table 11. Between April 2019 and August 2019, did you implement the Computer Science Activity Exploring Moon Craters?

	%	N
Yes	53.1%	60
No	46.9%	53

Table 12. Experience with implementing implement the Computer Science Activity Exploring Moon Craters

Exploring Moon Craters…	Strongly disagree % (n)	Disagree % (n)	Neither agree nor disagree % (n)	Agree % (n)	Strongly agree % (n)	CFP 4-5 (n)
Was fun and engaging for kids	0.0% (0)	0.0% (0)	1.7% (1)	33.3% (20)	65.0% (39)	98.3% (59)
Required minimal preparation time	1.7% (1)	6.7% (4)	10.0% (6)	31.7% (19)	50.0% (30)	81.7% (49)
Was easy to use	0.0% (0)	1.7% (1)	8.3% (5)	36.7% (22)	53.3% (32)	90.0% (54)

Table 13. Developmental level of implement the Computer Science Activity Exploring Moon Craters

	%	N
It was just right	78.3%	47
It was not challenging enough for my children	1.7%	1
It was too difficult for my children	20.0%	12

Implementation of the Computer Science Activity Collecting Moon Rocks

31.0% (n=35) of respondents reported implementing the Computer Science Activity Collecting Moon Rocks. 1209 children were reported to have participated in the activity Collecting Moon Rocks. On a 5-point scale from strongly disagree to strongly agree, each statement regarding implementation received a cumulative frequency percentage (CFP) of agree and strongly agree greater than 90%. The highest CFP was 100.0% (n=35), which was for the item "Collecting Moon Rocks was fun and engaging for kids".

Almost all respondents (94.3%, n=33) reported the developmental level of Collecting Moon Rocks as "just right".

23 participants responded to the question "Did you modify the activity when implementing with your children/students?" of which 56.5% (n=13) respondents reported modifying the activity.

Table 14. Between April 2019 and August 2019, did you implement the Computer Science Activity Collecting Moon Rocks?

	%	N
Yes	31.0%	35
No	69.0%	78

Table 15. Experience with implementing the Computer Science Activity Collecting Moon Rocks

Collecting Moon Rocks…	Strongly disagree % (n)	Disagree % (n)	Neither agree nor disagree % (n)	Agree % (n)	Strongly agree % (n)	CFP 4-5 (n)
Was fun and engaging for kids	0.0% (0)	0.0% (0)	0.0% (0)	31.4% (11)	68.6% (24)	100.0% (35)
Required minimal preparation time	0% (0)	2.9% (1)	5.7% (2)	42.9% (15)	48.6% (17)	91.4% (32)
Was easy to use	0.0% (0)	0.0% (0)	2.9% (1)	34.3% (12)	62.9% (22)	97.1% (34)

Table 16. Developmental level of implement the Computer Science Activity Collecting Moon Rocks

	%	N
It was just right	94.3%	33
It was not challenging enough for my children	2.9%	1
It was too difficult for my children	2.9%	1

Implementation of the Computer Science Activity Finding Footprints on the Moon

28.3% (n=32) of respondents reported implementing the Computer Science Activity Finding Footprints on the Moon. 1368 children were reported to have participated in Footprints on the Moon. On a 5-point scale from strongly disagree to strongly agree, each statement regarding implementation received a cumulative frequency percentage (CFP) of agree and strongly agree greater than 85%. The highest CFP was 96.9% (n=31), which was for both the item "Finding Footprints on the Moon was fun and engaging for kids" and "Finding Footprints on the Moon was easy to use". Only one participant thought this activity was too difficult for children.

Only four respondents reported modifying this activity.

Table 17. Between April 2019 and August 2019, did you implement the Computer Science Activity Finding Footprints on the Moon?

	%	N
Yes	28.3%	32
No	71.7%	81

Table 18. Experience with implementing implement the Computer Science Activity Finding Footprints on the Moon

Finding Footprints on the Moon…	Strongly disagree % (n)	Disagree % (n)	Neither agree nor disagree % (n)	Agree % (n)	Strongly agree % (n)	CFP 4-5 (n)
Was fun and engaging for kids	0.0% (0)	0.0% (0)	3.1% (1)	40.6% (13)	56.3% (18)	96.9% (31)

Finding Footprints on the Moon…	Strongly disagree % (n)	Disagree % (n)	Neither agree nor disagree % (n)	Agree % (n)	Strongly agree % (n)	CFP 4-5 (n)
Required minimal preparation time	0% (0)	3.1% (1)	9.4% (3)	40.6% (13)	46.9% (15)	87.5% (28)
Was easy to use	0.0% (0)	0.0% (0)	3.1% (1)	46.9% (15)	50.0% (16)	96.9% (31)

Table 19. Developmental level of the Computer Science Activity Finding Footprints on the Moon

	%	N
It was just right	96.9%	31
It was not challenging enough for my children	0.0%	0
It was too difficult for my children	3.1%	1

Implementation of the Storytime STEM-pack Margaret and the Moon

19.5% (n=22) of respondents reported implementing the Storytime STEM-pack Margaret and the Moon. 870 children were reported to have participated in the Margaret and the Moon STEM-pack. On a 5-point scale from strongly disagree to strongly agree, each statement regarding implementation received a cumulative frequency percentage (CFP) of agree and strongly agree greater than 95%.
All but one respondent (90.9%, n=20) thought that the developmental level of Margaret and the Moon was "just right".

13 respondents responded to the question "Did you modify the activity when implementing with your children/students?" of which 46.2% (n=6) reported modifying the activity.

Table 20. Between April 2019 and August 2019, did you implement the Storytime STEM-pack Margaret and the Moon?

	%	N
Yes	19.5%	22
No	80.5%	91

Table 21. Comfort with implementing the Storytime STEM-pack Margaret and the Moon

Storytime STEM-pack Margaret and the Moon…	Strongly disagree % (n)	Disagree % (n)	Neither agree nor disagree % (n)	Agree % (n)	Strongly agree % (n)	CFP 4-5 (n)
Was fun and engaging for kids	0.0% (0)	0.0% (0)	4.5% (1)	45.5% (10)	50.0% (11)	95.5% (21)
Required minimal preparation time	0% (0)	4.5% (1)	0.0% (0)	45.5% (10)	50.0% (11)	95.5% (21)
Was easy to use	0.0% (0)	0.0% (0)	4.5% (1)	40.9% (9)	54.5% (12)	95.5% (21)

Table 22. Developmental level of implement the Storytime STEM-pack Margaret and the Moon

	%	N
It was just right	90.9%	20
It was not challenging enough for my children	4.5%	1
It was too difficult for my children	4.5%	1

Implementation Activities: Storytime STEM-pack Mae and the Moon

20.4% (n=23) of respondents reported implementing the Storytime STEM-pack Mae and the Moon. 782 children were reported to have participated in Mae and the Moon. On a 5-point scale from strongly disagree to strongly agree, each statement regarding implementation received a cumulative frequency percentage (CFP) of agree and strongly agree greater than 95%. The highest CFP was 100.0% (n=23) for both the item "Mae and the Moon was fun and engaging for kids" and "Mae and the Moon was easy to use".

All but one respondent (90.9%, n=22) thought the developmental level of the Storytime STEM-pack Mae and the Moon was "just right".

15 participants responded to the question "Did you modify the activity when implementing with your children/students?" of which 46.7% (n=7) reported modifying the activity.

Table 23. Between April 2019 and August 2019, did you implement the Storytime STEM-pack Mae and the Moon?

	%	N
Yes	20.4%	23
No	79.6%	90

Table 24. Comfort with implementing the Storytime STEM-pack Mae and the Moon

Mae and the Moon…	Strongly disagree % (n)	Disagree % (n)	Neither agree nor disagree % (n)	Agree % (n)	Strongly agree % (n)	CFP 4-5 (n)
Was fun and engaging for kids	0.0% (0)	0.0% (0)	0.0% (0)	30.4% (7)	69.6% (16)	100.0% (23)
Required minimal preparation time	0% (0)	0.0% (0)	4.3% (1)	30.4% (7)	65.2% (15)	95.7% (22)
Was easy to use	0.0% (0)	0.0% (0)	0.0% (0)	34.8% (8)	65.2% (15)	100.0% (23)

Table 25. Developmental level of the Storytime STEM-pack Mae and the Moon

	%	N
It was just right	90.9%	22
It was not challenging enough for my children	0.0%	0
It was too difficult for my children	9.1%	1

Value/ Usefulness

On a 5-point scale from strongly disagree to strongly agree, each statement regarding implementation received a cumulative frequency percentage (CFP) of agree and strongly agree greater than 75%. The highest CFP 4-5 (85.0%, n=96) was for the statement "my commitment in providing STEM+C activities in my class/library has increased".

When asked if they planned to use any of the Moon Adventures Storytime STEM+C activities in the future, 97.3% (n=110) of respondents answered yes.

When asked if they would recommend Moon Adventures Storytime STEM+C activities to their colleagues and other organizations, all but one respondent answered "yes" (99.1%, n=112).

Table 26. Comfort with facilitating Moon Adventures Storytime STEM+C activities after professional development

	Strongly disagree % (n)	Disagree % (n)	Neither agree nor disagree % (n)	Agree % (n)	Strongly agree % (n)	CFP 4-5 (n)
My interest in STEM+C Science has increased	2.7% (3)	1.8% (2)	16.8% (19)	40.7% (46)	38.1% (43)	78.8% (89)
My commitment in providing STEM+C activities in my class/library has increased	3.5% (4)	0.9% (1)	10.6% (12)	38.9% (44)	46.0% (52)	85.0% (96)
My comfort in facilitating STEM+C Science Activities has increased	2.7% (3)	1.8% (2)	15.0% (17)	41.6% (47)	38.9% (44)	80.5% (91)

Summer 2019 Storytime STEM+C Moon Adventures Implementation Survey: Findings for Public Librarian Participants

Key Findings

- All librarian respondents (n=13) planned to use Moon Adventure Storytime STEM+C activities again in the future.
- 92.3% of librarian respondents (n=12) would recommend Moon Adventure Storytime STEM+C activities to their colleagues and other organizations.
- Going to the Moon Computer Science Activity was the most frequently implemented STEM-pack: 61.5% (n=8) of respondents reported implementing it, with a total of 195 children/students.
- Among seven STEM+C activities:
  - More than 75.0% respondents agreed and strongly agreed that STEM-packs were fun and engaging for kids and easy to use.
  - More than 70.0% respondents agreed and strongly agreed that STEM-packs required minimal preparation time.
- All respondents who implemented the Storytime STEM-pack Margaret and the Moon (n=6) and Finding Footprints on the Moon (n=4) agreed or strongly agreed following three statements:
  - It was fun and engaging for kids.
  - It required minimal preparation time.
  - It was easy to use.
- More than 66.7% of respondents thought the developmental levels of the activities were "just right" for children.

Table 1. Experience with Spring 2019 Professional Development (N=13)

	%	N
No Prior Experience	30.8%	4
Prior Experience	69.2%	9

Table 2. Moon Adventure Implementation in different grade (N=13)

Grade-band	**%**	**N**
PreK-K	38.5%	5
Grade 1-2	61.5%	8

Table 3. Experience with using Storytime STEM-packs (N=13)

	%	N
No Prior Experience	30.8%	4
Prior Experience	69.2%	9

Table 4. Experience with using Storytime STEM-packs by grade-band (N=13)

Grade-band	**No Prior Experience (%) (n)**	**Prior Experience (%) (n)**
PreK-K	100.0% (4)	11.1% (1)
Grade 1-2	0 (0)	88.9% (8)

Table 5. Implementation Number of Moon Adventure Activities (N=13)

Activity	Implementation Number	%
Going to the Moon	8	61.5%
The Most Magnificent Thing	7	53.8%
Collecting Moon Rocks	7	53.8%
Mae and the Moon	7	53.8%
Margaret and the Moon	6	46.2%
Exploring Moon Craters	4	30.8%
Finding Footprints on the Moon	4	30.8%

Table 6.1 Experience with implementing Moon Adventure Activities with the statement: It was fun and engaging for kids

Activity	Strongly disagree % (n)	Disagree % (n)	Neither agree nor disagree % (n)	Agree % (n)	Strongly agree % (n)	CFP 4-5 (n)
Mae and the Moon	0.0% (0)	0.0% (0)	0.0% (0)	71.4% (5)	28.6% (2)	100.0% (7)
Margaret and the Moon	0.0% (0)	0.0% (0)	0.0% (0)	83.3% (5)	16.7% (1)	100.0% (6)
Finding Footprints on the Moon	0.0% (0)	0.0% (0)	0.0% (0)	25.0% (1)	75.0% (3)	100.0% (4)
Going to the Moon	0.0% (0)	0.0% (0)	12.5% (1)	25.0% (2)	62.5% (5)	87.5% (7)
The Most Magnificent Thing	0.0% (0)	0.0% (0)	14.3% (1)	42.9% (3)	42.9% (3)	85.7% (6)
Collecting Moon Rocks	0.0% (0)	0.0% (0)	14.3% (1)	28.6% (2)	57.1% (4)	85.7% (6)
Exploring Moon Craters	0.0% (0)	0.0% (0)	25.0% (1)	25.0% (1)	50.0% (2)	75.0% (3)

Table 6.2 Experience with implementing Moon Adventure Activities with the statement: It required minimal preparation time

Activity	Strongly disagree % (n)	Disagree % (n)	Neither agree nor disagree % (n)	Agree % (n)	Strongly agree % (n)	CFP 4-5 (n)
Margaret and the Moon	0% (0)	0.0% (0)	0.0% (0)	83.3% (5)	16.7% (1)	100.0% (6)
Finding Footprints on the Moon	0% (0)	0.0% (0)	0.0% (0)	50.0% (2)	50.0% (2)	100.0% (4)
The Most Magnificent Thing	0.0% (0)	0.0% (0)	14.3% (1)	71.4% (5)	14.3% (1)	85.7% (6)
Mae and the Moon	0% (0)	0.0% (0)	14.3% (1)	57.1% (4)	28.6% (2)	85.7% (6)
Going to the Moon	0.0% (0)	0.0% (0)	25.0% (2)	37.5% (3)	37.5% (3)	75.0% (6)

Activity	Strongly disagree % (n)	Disagree % (n)	Neither agree nor disagree % (n)	Agree % (n)	Strongly agree % (n)	CFP 4-5 (n)
Exploring Moon Craters	0.0% (0)	0.0% (0)	25.0% (1)	50.0% (2)	25.0% (1)	75.0% (3)
Collecting Moon Rocks	0% (0)	0.0% (0)	28.6% (2)	42.9% (3)	28.6% (2)	71.4% (5)

Table 6.3 Experience with implementing Moon Adventure Activities with the statement: It was easy to use

Activity	Strongly disagree % (n)	Disagree % (n)	Neither agree nor disagree % (n)	Agree % (n)	Strongly agree % (n)	CFP 4-5 (n)
Mae and the Moon	0.0% (0)	0.0% (0)	0.0% (0)	71.4% (5)	28.6% (2)	100.0% (7)
Margaret and the Moon	0.0% (0)	0.0% (0)	0.0% (0)	83.3% (5)	16.7% (1)	100.0% (6)
Finding Footprints on the Moon	0.0% (0)	0.0% (0)	0.0% (0)	50.0% (2)	50.0% (2)	100.0% (4)
The Most Magnificent Thing	0.0% (0)	14.3% (1)	0.0% (0)	57.1% (4)	28.6% (2)	85.7% (6)
Collecting Moon Rocks	0.0% (0)	0.0% (0)	14.3% (1)	57.1% (4)	28.6% (2)	85.7% (6)
Going to the Moon	0.0% (0)	0% (0)	25.0% (2)	25.0% (2)	50.0% (4)	75.0% (6)
Exploring Moon Craters	0.0% (0)	0.0% (0)	25.0% (1)	50.0% (2)	25.0% (1)	75.0% (3)

Table 7. Developmental Level of Moon Adventure Activities

Activity	It was just right % (n)	It was too difficult for my children % (n)
Exploring Moon Craters	100.0% (4)	0.0% (0)
Finding Footprints on the Moon	100.0% (4)	0.0% (0)
The Most Magnificent Thing	85.7% (6)	14.3% (1)
Mae and the Moon	85.7% (6)	14.3% (1)
Going to the Moon	75.0% (6)	25.0% (2)
Collecting Moon Rocks	71.4% (5)	28.6% (2)
Margaret and the Moon	66.7% (4)	33.3% (2)

Table 8. Participation Number of Children in Moon Adventure Activities

Activity	Participation Number
Going to the Moon	195
Collecting Moon Rocks	137
Mae and the Moon	125
The Most Magnificent Thing	114
Finding Footprints on the Moon	68
Margaret and the Moon	64
Exploring Moon Craters	62
Total	765

Table 9. Interest, Commitment, and Comfort with STEM+C after Implementing Moon Adventures activities

	Strongly disagree % (n)	Disagree % (n)	Neither agree nor disagree % (n)	Agree % (n)	Strongly agree % (n)	CFP 4-5 (n)
My interest in STEM+C Science has increased	0.0% (0)	0.0% (0)	30.8% (4)	53.8% (7)	15.4% (2)	69.2% (9)
My commitment in providing STEM+C activities in my class/library has increased	0.0% (0)	0.0% (0)	23.1% (3)	38.5% (5)	38.5% (5)	76.9% (10)
My comfort in facilitating STEM+C Science Activities has increased	0.0% (0)	0.0% (0)	30.8% (4)	30.8% (4)	38.5% (5)	69.2% (9)

In those seven activities, most modifications during implementation were based on children's age. Consistent with school teachers, librarians who modified the activity also considered children's maturity and age and cut or switched some parts of the activity. Some of the librarians emphasized parent engagement and added Bee-Bots during implementation.

The majority librarians provided positive feedback about implementing STEM+C activities. But some of them also pointed out they needed more time to conduct concepts and programs.

Fall 2019 Storytime STEM+C Dragonland Adventures Professional Development Survey: Findings

Key Findings

- 86.9% (n=106) of respondents considered the professional development "valuable" (4) or "very valuable" (5).
- 76.2% (n=93) of respondents answered that they "increased" or "greatly increased" their interest in STEM and computer science as a result of the PD.
- 78.7% (n=96) of respondents answered that they "increased" or "greatly increased" their commitment to implement STEM and computer science in their classrooms/libraries.
- 89.3% (n=109) of fall PD participants also participated in spring PD; 10.7% (n=13) was the new participant
- Over 75% of participants felt "confident" or "very confident" with computer science after STEM-packs PD
  - o 84.6% (n=11), new participants
  - o 79.8% (n=87), prior PD participants
- Over 75% of participants felt "confident" or "very confident" with how children best increase their computer science skills after STEM-packs PD
  - o 76.9% (n=10), new participants
  - o 86.2% (n=94), prior PD participants
- Over 80% of participants felt "confident" or "very confident" with the STEM content after STEM-packs PD
  - o 84.6% (n=11), new participants
  - o 86.2% (n=94), prior PD participants
- 88.1% (n=96) of experienced participants felt "confident" or "very confident" with facilitating STEM+C activities with children at their site in general after PD

Results

Role of Participants in Their Organization

There were 122 respondents attending one of four days of Storytime STEM-packs professional development sessions from Allegheny Intermediate Unit and Westmoreland IU (October 18, November 1, November 8, and November 15). The number of participants was similar at each of the four days. Most respondents participate at the Allegheny Intermediate Unit (n=89, 73.0%).

Table 1. Respondents' location and date (n=122)

Location and Date	N	%
Allegheny Intermediate Unit, October 18	30	24.6%
Allegheny Intermediate Unit, November 1	35	28.7%
Westmoreland IU, November 8	33	27.0%
Allegheny Intermediate Unit, November 15	24	19.7%

Participants from Head Start, K-12 schools and libraries were the three main groups of respondents. 45.1% (n=55) of the respondents were a part of the Head Start organization and 41.0% (n=50) came from K-12 schools. There was an additional 10.7% (n=13) of participants who were involved with the

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public library system. The remaining 3.3% (n=4) selected "other." These participants represented higher administrators and technology positions.

Table 2. Role of participants (n=122)

	N	%
Head Start Organization	55	45.1%
K-12 School	50	41.0%
Library	13	10.7%
Other	4	3.3%

The majority (89.3%, n=109) of fall PD participants had prior experience with Storytime STEM-packs professional development sessions; the remaining 10.7% (n=13) were new participants. Of the new participants, the majority (76.9%, n=10) had no prior experience with implementing Storytime STEM-packs with children and only 23.1% (n=3) of new participants have been involved for more than two years.

Table 3. Experience of respondents with STEM-packs PD (n=122)

Experience	N	%
Prior Experience	109	89.3%
No Prior Experience	13	10.7%

Table 4. Experience of new participants with implementing STEM-packs (n=13)

Experience	N	%
No Prior Experience	10	76.9%
Prior Experience (more than two years)	3	23.1%

New Participants Robot Implementation Experience

In this survey, only new participants responded to robot-related questions. Only 30.8% (n=4) of them had robots in their classroom/library currently. Of the participants who reported having robots, 3 participants reported having Bee-Bots and 1 reported having SAM Labs. However, none of them use robots in their classroom/library.

Table 5. Robots in classroom/ library (n=13)

	N	%
No	9	69.2%
Yes	4	30.8%

Content and Pedagogical Content Knowledge (STEM+C Comfort and Confidence)

How comfortable are you as an adult with computer science?

Prior to the PD, 69.2% (n=9) of new participants answered "confident" or "very confident" (cumulative frequency percent (CFP) 4-5) for their computer knowledge as an adult, compared to a CFP 4-5 of 84.6% (n=11) after PD. In addition, no one responded, "not at all confident" and "somewhat confident" after PD. On an individual level, 38.5% (n=5) of new participants reported an increase in their comfort level with computer science from before to after STEM-packs PD.

Table 6. New participants comfort with computer science before and after STEM-packs STEM+C PD (n=13)

	Not at all confident % (n)	Somewhat confident % (n)	Uncertain % (n)	Confident % (n)	Very confident % (n)	CFP 4-5 % (n)
Before PD	7.7% (1)	0.0% (0)	23.1% (3)	38.5% (5)	30.8% (4)	69.2% (9)
After PD	0.0% (0)	0.0% (0)	15.4% (2)	30.8% (4)	53.8% (7)	84.6% (11)

Participants of prior STEM-packs PD received only the "after PD" item, of which 79.8% answered "confident" or "very confident" (CFP 4-5) with computer science knowledge. The remaining (20.2%, n=22) answered "uncertain."

Table 7. Experienced participants comfort with computer science after STEM-packs STEM+C PD (n=109)

	Not at all confident % (n)	Somewhat confident % (n)	Uncertain % (n)	Confident % (n)	Very confident % (n)	CFP 4-5 % (n)
After PD	0.0% (0)	0.0% (0)	20.2% (22)	46.8% (51)	33.0% (36)	79.8% (87)

How comfortable are you with how children best increase their computer science skills?

Prior to the workshop, 30.8% (n=4) of new participants were either "confident" or "very confident" in their comfort with how children best increase their computer skills. The largest percentage (53.8%, n=7) of respondents answered "uncertain." And two participants (15.4%) answered "not at all confident." New participants had a CFP 4-5 of 76.9% (n=10) in their comfort level after the PD. Individually, 46.2% (n=6) reported an increase from before to after in their comfort level.

Table 8. New participants comfort with how children best increase their computer science skills before and after STEM-packs STEM+C PD (n=13)

	Not at all confident % (n)	Somewhat confident % (n)	Uncertain % (n)	Confident % (n)	Very confident % (n)	CFP 4-5 % (n)
Before PD	15.4% (2)	0.0% (0)	53.8% (7)	7.7% (1)	23.1% (3)	30.8% (4)
After PD	0.0% (0)	0.0% (0)	23.1% (3)	38.5% (5)	38.5% (5)	76.9% (10)

After the PD, 86.2% (n=94) of experienced participants answered "confident" or "very confident" with how children best increase their computer science skills, with 12.8% (n=14) responding "uncertain."

Table 9. Experienced participants' comfort with how children best increase their computer science skills after STEM-packs STEM+C PD (n=109)

	Not at all confident % (n)	Somewhat confident % (n)	Uncertain % (n)	Confident % (n)	Very confident % (n)	CFP 4-5 % (n)
After PD	0.0% (0)	0.9% (1)	12.8% (14)	54.1% (59)	32.1% (35)	86.2% (94)

How comfortable are you as an adult with STEM content after the STEM-packs STEM+C PD?

84.6% (n=11) of new participants rated themselves as "confident" or "very confident" (CFP 4-5) in their comfort as an adult with the STEM content of the STEM-packs after the PD. Comparatively, experienced participants had a CFP of 86.2% (n=94) on the item. Neither new participants nor experienced participants answered "not at all confident" and "somewhat confident" after PD.

Table 10. Comfort with the STEM content after STEM-packs STEM+C PD (n=122)

	Not at all confident % (n)	Somewhat confident % (n)	Uncertain % (n)	Confident % (n)	Very confident % (n)	CFP 4-5 % (n)
New participants (n=13)	0.0% (0)	0.0% (0)	15.4% (2)	53.8% (7)	30.8% (4)	84.6% (11)
Experienced participants (n=109)	0.0% (0)	0.0% (0)	13.8% (15)	48.6% (53)	37.6% (41)	86.2% (94)

How comfortable were you with how children best learn STEM content before STEM-packs STEM+C PD?

38.5% (n=5) of new participants rated themselves as "confident" or "very confident" (CFP 4-5) in their comfort with how children best learn STEM content before the PD. Similarly, 38.5% (n=5) of participants answered "uncertain." The percentage of participants selecting "somewhat confident" was relatively low (23.1%, n=3).

Table 11. New participants comfort with how children learn best STEM content before STEM-packs STEM+C PD (n=13)

	Not at all confident % (n)	Somewhat confident % (n)	Uncertain % (n)	Confident % (n)	Very confident % (n)	CFP 4-5 % (n)
Before PD	0.0% (0)	23.1% (3)	38.5% (5)	38.5% (5)	0.0% (0)	38.5% (5)

How comfortable are you with facilitating STEM+C activities with children at your site in general?

30.8% (n=4) of new participant respondents answered "confident" or "very confident" (CFP 4-5) before PD in their comfort level of facilitating STEM+C activities with children in general. Answers of "uncertain" and "somewhat confident" accounted for 38.5% (n=5) and 30.8% (n=4), respectively. After

the workshop, participants had a CFP 4-5 of 61.5% (n=8). The percentage of "uncertain" or "somewhat confident" decreased to 23.1% (n=3) and 15.4% (n=2), respectively. Individually, 30.8% (n=4) of respondents reported an increase from before to after PD in their comfort level with facilitating STEM+C activities with children at their site in general.

Table 12. New participants comfort with facilitating STEM+C activities before and after STEM-packs STEM+C PD (n=13)

	Not at all confident % (n)	Somewhat confident % (n)	Uncertain % (n)	Confident % (n)	Very confident % (n)	CFP 4-5 % (n)
Before PD	0.0% (0)	30.8% (4)	38.5% (5)	23.1% (3)	7.7% (1)	30.8% (4)
After PD	0.0% (0)	15.4% (2)	23.1% (3)	30.8% (4)	30.8% (4)	61.5% (8)

88.1% (n=96) of experienced participants felt "confident" or "very confident" with facilitating STEM+C activities after PD. Only 11.0% (n=12) and 0.9% (n=1) of respondents answered "uncertain" and "somewhat confident," respectively.

Table 13. Experienced participants comfort with facilitating STEM+C activities after STEM-packs STEM+C PD (n=109)

	Not at all confident % (n)	Somewhat confident % (n)	Uncertain % (n)	Confident % (n)	Very confident % (n)	CFP 4-5 % (n)
After PD	0.0% (0)	0.9% (1)	11.0% (12)	43.1% (47)	45.0% (49)	88.1% (96)

Interest and Commitment STEM+C

After professional development, the majority of respondents increased their interest and commitment to implement STEM and computer science. 76.2% (n=93) of respondents answered that their interest in STEM and computer science "increased" or "greatly increased" (CFP 4-5) as a result of the PD. Similarly, 78.7% (n=96) of respondents answered that their commitment to implementing STEM and computer science in their classrooms/libraries "increased" or "greatly increased" (CFP 4-5).

Table 14. Interest and commitment of respondents changed as a result of the STEM-packs STEM+C PD today? (n=122)

	Greatly Decreased % (n)	Somewhat Decreased % (n)	Uncertain % (n)	Increased % (n)	Greatly Increased % (n)	CFP 4-5 % (n)
Interest in STEM and Computer Science	0.0% (0)	0.0% (0)	23.8% (29)	44.3% (54)	32.0% (39)	76.2% (93)
Commitment to implement STEM and Computer Science	0.0% (0)	1.6% (2)	19.7% (24)	43.4% (53)	35.2% (43)	78.7% (96)

Value/Usefulness

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

The majority of participants (86.9%, n=106) rated the Storytime STEM+C professional development as "valuable" or "very valuable." The remaining of 12.3% (n=15) responded "uncertain" and only one participant (0.8%) rated the PD not very valuable.

Table 15. Value of STEM-packs STEM+C PD

	Not Very Valuable % (n)	Not Valuable % (n)	Uncertain % (n)	Valuable % (n)	Very Valuable % (n)	CFP 4-5 % (n)
After PD	0.8% (1)	0.0% (0)	12.3% (15)	32.0% (39)	54.9% (67)	86.9% (106)

How can Storytime STEM-packs support effective STEM instruction in your program?

Nearly all respondents held positive attitudes about how Storytime-packs support effective STEM instruction. The most often cited comment from respondents was the hands-on nature of the STEM-packs, which was suitable for all grade children and thus increased children's engagement and peaked their interest. Some responses mentioned that children really loved the Bee Bot activities. In addition, some responses stated STEM-packs supported children's critical thinking, math skills, literacy skills, and computer skills. Moreover, respondents emphasized the STEM-packs were easy to use and incorporated literature, core concept, and content in class, which provided good instruction for teachers to operate their class. One participant said that "STEM-packs allow for low-prep, standards-based, fully-equipped and stocked activities".

Feedback and suggestions

The vast majority of respondents provided positive feedback regarding their experience of the professional development, which described the PD as informative, interactive, and beneficial. Most participants said STEM-packs were great hands on experience and they were looking forward to using in their class or libraries. The critiques varied, including providing more explanation for certain ages, improving presentation style, and providing copies of lesson plans for using the activities.

Storytime STEM+C Dragonland Adventures Implementation Survey: Findings

Key Findings

- All respondents (n=51) planned to use Storytime STEM+C Dragonland Adventure activities again in the future.
- All respondents (n=51) would recommend Storytime STEM+C Dragonland Adventure activities to their colleagues and other organizations.
- More than 70% of the respondents' participation number was less than 70 students/kids.
- Among all respondents who implemented the Storytime STEM+C Dragonland Adventures STEM-packs:
    - 94.1% (n=48) agreed or strongly agreed that it was fun and engaging for kids.
    - 92.1% (n=47) agreed or strongly agreed that it was easy to use.
    - 86.3% (n=44) agreed or strongly agreed that it required minimal preparation time.
- All librarian respondents (100%, n=10) who implemented the Storytime STEM+C Dragonland Adventures STEM-packs, agreed or strongly agreed following three statements:
    - It was fun and engaging for kids.
    - It was easy to use.
    - It required minimal preparation time.
- 84.3% of all respondents (n=43) thought the developmental levels of the activities were "just right" for children: All librarian respondents (100%, n=10) thought the developmental levels of the activities were "just right" for children.
- After implementing Storytime STEM+C Dragonland Adventures STEM-packs, more than 90% of the respondents agreed or strongly agreed with following three statements:
    - My interest in STEM+Computer Science has increased.
    - My commitment in providing STEM+C activities in my class/library has increased.
    - My comfort in facilitating STEM+Computer Science Activities has increased.
- As a result of implementing Storytime STEM+C Dragonland Adventures STEM-packs, all librarian respondents (100%, n=10) agreed or strongly agreed to the following three statements:
    - My interest in STEM+Computer Science has increased.
    - My commitment in providing STEM+C activities in my class/library has increased.
    - My comfort in facilitating STEM+Computer Science Activities has increased.

Role of Respondents in Their Organization

All respondents (n=51) answered that they implemented Dragonland Adventures between October 2019 and now. 80.4% of the respondents (n=41) were teachers in the PreK-12 education institute, 19.6% of the respondents (n=10) were librarians.

Table 1. Role of respondents (n=51)

	N	%
Head Start Organization	20	29.6%
PK-12 School	21	44.4%
Library	10	24.7%

Implementation

Among all respondents who implemented the Dragonland Adventures Storytime STEM-pack, 94.1% (n=48) agreed or strongly agreed that it was fun and engaging for kids. 92.1% (n=47) agreed or strongly agreed that it was easy to use. 86.3% (n=44) agreed or strongly agreed that it required minimal preparation time.

Table 2.1 Experience with implementing Dragonland Adventures Activities with the statement: It was fun and engaging for kids

Role	Strongly disagree % (n)	Disagree % (n)	Neither agree nor disagree % (n)	Agree % (n)	Strongly agree % (n)	CFP 4-5 (n)
All participants	3.9% (2)	0.0% (0)	2.0% (1)	21.6% (11)	72.5% (37)	94.1% (48)
Teachers	4.9% (2)	0.0% (0)	2.4% (1)	22.0% (9)	70.7% (29)	92.7% (38)
Librarians	0.0% (0)	0.0% (0)	0.0% (0)	20% (2)	80% (8)	100.0% (10)

Table 2.2 Experience with implementing Dragonland Adventures Activities with the statement: It required minimal preparation time

Role	Strongly disagree % (n)	Disagree % (n)	Neither agree nor disagree % (n)	Agree % (n)	Strongly agree % (n)	CFP 4-5 (n)
All participants	3.9% (2)	2.0% (1)	7.8% (4)	41.2% (21)	45.1% (23)	86.3% (44)
Teachers	4.9% (2)	2.4% (1)	9.8% (4)	36.6% (15)	46.3% (19)	82.9% (44)
Librarians	0.0% (0)	0.0% (0)	0.0% (0)	60% (6)	40% (4)	100.0% (10)

Table 2.3 Experience with implementing Dragonland Adventures Activities with the statement: It was easy to use

Role	Strongly disagree % (n)	Disagree % (n)	Neither agree nor disagree % (n)	Agree % (n)	Strongly agree % (n)	CFP 4-5 (n)
All participants	3.9% (2)	3.9% (2)	0.0% (0)	29.4% (15)	62.7% (32)	92.1% (47)
Teachers	4.9% (2)	0.0% (0)	4.9% (2)	24.4% (10)	65.9% (27)	90.3% (37)
Librarians	0.0% (0)	0.0% (0)	0.0% (0)	50% (5)	50% (5)	100.0% (10)

84.3% of all respondents (n=43) thought the developmental levels of the activities were "just right" for children. The most size of participants was below 20 (35.3%,n=18).

Table 3. Developmental Level of Dragonland Adventures Activities

Role	It was not challenging enough for my children % (n)	It was just right % (n)	It was too difficult for my children % (n)
All participants	3.9% (2)	84.3% (43)	11.8% (6)
Teachers	4.9% (2)	80.5% (33)	14.6% (6)
Librarians	0.0% (0)	100.0% (10)	0.0% (0)

Table 4. Participation Number of Children in Dragonland Adventures Activities

Participation Number	All	Teachers	Librarians
0-19	35.3% (18)	36.6% (15)	30.0% (3)
20-39	21.5% (11)	24.4% (10)	10.0% (1)
40-59	5.9% (3)	7.3% (3)	0.0% (0)
60-79	9.8% (5)	4.8% (2)	30.0% (3)
80-99	5.9% (3)	7.3% (3)	0.0% (0)
100-199	9.8% (5)	7.3% (3)	20.0% (2)
200 and more	11.8% (6)	12.2% (5)	10.0% (1)
Total	51	41	10

25.6% (n=11) of the respondents answered that they modified the activity when implementing with the children/students. Most modifications during implementation were for the content or structure of the activities. The other reason for respondents to modify the activity were children's maturity and age, and time constraints.

Value/Usefulness

On a 5-point scale from strongly disagree to strongly agree, each statement regarding implementation received a cumulative frequency percentage (CFP) of agree and strongly agree greater than 90%. The highest CFP 4-5 (98.0%, n=50) was for the statement "my commitment in providing STEM+C activities in my class/library has increased."

Table 5.1 As a result of implementing Storytime STEM+C Dragonland Adventures STEM-pack, my interest in STEM+C Science has increased

Role	Strongly disagree % (n)	Disagree % (n)	Neither agree nor disagree % (n)	Agree % (n)	Strongly agree % (n)	CFP 4-5 (n)
All participants	0.0% (0)	0.0% (0)	5.9% (3)	51.0% (26)	43.1% (22)	94.1% (48)
Teachers	0.0% (0)	0.0% (0)	7.3% (3)	46.3% (19)	46.3% (19)	92.6% (38)
Librarians	0.0% (0)	0.0% (0)	0.0% (0)	30.0% (3)	70.0% (7)	100.0% (10)

Table 5.2 As a result of implementing Storytime STEM+C Dragonland Adventures STEM-pack, my commitment in providing STEM+C activities in my class/library has increased

Role	Strongly disagree % (n)	Disagree % (n)	Neither agree nor disagree % (n)	Agree % (n)	Strongly agree % (n)	CFP 4-5 (n)
All participants	0.0% (0)	0.0% (0)	2.0% (1)	43.1% (22)	54.9% (28)	98.0% (50)
Teachers	0.0% (0)	0.0% (0)	2.4% (1)	41.5% (17)	56.1% (23)	97.6% (40)
Librarians	0.0% (0)	0.0% (0)	0.0% (0)	50% (5)	50% (5)	100.0% (10)

Table 5.3 As a result of implementing Storytime STEM+C Dragonland Adventures STEM-pack, my comfort in facilitating STEM+C Science Activities has increased

Role	Strongly disagree % (n)	Disagree % (n)	Neither agree nor disagree % (n)	Agree % (n)	Strongly agree % (n)	CFP 4-5 (n)
All participants	0.0% (0)	2.0% (1)	2.0% (1)	41.2% (21)	54.9% (28)	96.1% (49)
Teachers	0.0% (0)	2.4% (1)	2.4% (1)	39.0% (16)	56.1% (23)	95.1% (39)
Librarians	0.0% (0)	0.0% (0)	0.0% (0)	50% (5)	50% (5)	100.0% (10)

The majority of the respondents provided positive feedback about implementing STEM+C activities. But eight of them also pointed out they needed more time to conduct concepts and programs. The other mentioned it was too difficult for the younger kids about three years old.

Spring 2020 Storytime STEM+C Adventures End of Program Survey: Findings

Key Findings

- 91.4% (n=74) of respondents considered the Storytime STEM+C Adventures professional development (PD) valuable or very valuable.
- 90.1% (n=73) of respondents answered that they either increased or greatly increased their commitment to implementing STEM and computer science in their classrooms/libraries.
- 84.0% (n=68) of respondents answered that they increased or greatly increased their interest in STEM and computer science as a result of the PD.
- 77.8% (n=63) of respondents reported an increase in their comfort level with computer science from before to after PD.
- 71.6% (n=58) of respondents reported an increase from before to after PD in their comfort level with facilitating STEM+C activities with children at their site in general.
- 71.6% (n=58) of respondents reported an increase from before to after in their comfort level with how children best learn STEM content.
- 67.9% (n=55) of respondents reported an increase from before to after in their comfort level with how children best increase their computer science skills.
- 66.7% (n=54) of respondents reported an increase from before to after in their comfort level as an adult with the STEM content (engineering design, mathematics, science).
- 60.5% (n=49) had prior experience with Storytime STEM-packs.

Results

Role of Respondents in Their Organization

There were 81 respondents attending Storytime STEM+C Adventures professional development sessions from Westmoreland IU and Allegheny Intermediate Unit. Most respondents were from the Allegheny Intermediate Unit (n=53, 65.4%).

Table 1. Respondents location and date (n=81)

Location and Date	N	%
Westmoreland IU	28	34.6%
Allegheny Intermediate Unit	53	65.4%

Respondents from Head Start, schools and libraries were the three main groups of respondents. 44.4% (n=36) came from K-12 schools and 29.6% (n=24) of the respondents were a part of the Head Start organization. There were an additional 24.7% (n=20) of respondents who were involved with the library system. The remaining one respondent (1.2%) selected "other."

Table 2. Role of respondents (n=81)

	N	%
Head Start Organization	24	29.6%
PK-12 School	36	44.4%
Library	20	24.7%
Other	1	1.2%

Of these respondents, the majority (60.5%, n=49) had prior experience with Storytime STEM-packs and related professional development and the remaining 39.5% (n=32) had no prior experience.

Table 3. Experience of respondents with STEM-packs and related PD (n=81)

Experience	N	%
No Prior Experience	32	39.5%
Prior Experience	49	60.5%

Content and Pedagogical Content Knowledge (STEM+C Comfort and Confidence)

How comfortable are you as an adult with computer science?
77.8% (n=63) of respondents reported an increase in their comfort level with computer science from before to after Storytime STEM+C PD. The other 18 respondents remained the same. With regard to their comfort with computer science prior to the PD, 28.4% (n=23) had a cumulative frequency percentage (CFP) of confident or very confident in their computer knowledge as an adult and the highest percentage of respondents felt uncertain (43.2%, n=35). With regard to respondent comfort after the PD, 82.7% (n=67) of respondents answered confident or very confident (CFP 4-5), with only 16.0% (n=13) of respondents answering uncertain.

Table 4. Respondent comfort with computer science before and after STEM-packs STEM+C PD

	Not at all confident % (n)	Somewhat confident % (n)	Uncertain % (n)	Confident % (n)	Very confident % (n)	CFP 4-5 % (n)
Before PD	7.4% (6)	21.0% (17)	43.2% (35)	21.0% (17)	7.4% (6)	28.4% (23)
After PD	0.0% (0)	1.2% (1)	16.0% (13)	50.6% (41)	32.1% (26)	82.7% (67)

How comfortable are you with how children best increase their computer science skills?
67.9% (n=55) of respondents reported an increase from before to after in their comfort level with how children best increase their computer science skills. 30.9% (n=25) of respondents remained the same or no need to change (reported confident or very confident both before and after the PD).

Only one respondent dropped from "confident" to "uncertain". Prior to the workshop, 29.6% (n=24) were either confident or very confident in their knowledge of how children best increase their computer skills. The highest percentage (46.9%, n=38) of respondents answered uncertain. With regard to respondent comfort after the PD, 82.7% (n=67) of respondents answered confident or very confident (CFP 4-5), with only 16.0% (n=13) of respondents answering uncertain.

Table 5. Comfort with how children best increase their computer science skills before and after Storytime STEM+C Adventures PD

	Not at all confident % (n)	Somewhat confident % (n)	Uncertain % (n)	Confident % (n)	Very confident % (n)	CFP 4-5 % (n)
Before PD	12.3% (10)	11.1% (9)	46.9% (38)	13.6% (11)	16.0% (13)	29.6% (24)

	Not at all confident % (n)	Somewhat confident % (n)	Uncertain % (n)	Confident % (n)	Very confident % (n)	CFP 4-5 % (n)
After PD	0.0% (0)	1.2% (1)	16.0% (13)	45.7% (37)	37.0% (30)	82.7% (67)

How comfortable are you as an adult with STEM content after Storytime STEM+C Adventures PD?

66.7% (n=54) of respondents reported an increase from before to after in their comfort level with the STEM content. The other 33.3% (n=27) of respondents remained the same or no need to change. Prior to the workshop, 40.7% (n=33) rated themselves as confident or very confident in their comfort as an adult with the STEM content (engineering design, mathematics, science). The highest percentage (46.9%, n=38) of respondents felt uncertain. With regard to respondent comfort after the STEM-packs PD, 83.9% (n=68) of respondents answered confident or very confident (CFP 4-5), with only 14.8% (n=12) of respondents answering uncertain.

Table 6. Respondent comfort with the STEM content after STEM-packs STEM+C PD

	Not at all confident % (n)	Somewhat confident % (n)	Uncertain % (n)	Confident % (n)	Very confident % (n)	CFP 4-5 % (n)
Before PD	6.2% (5)	18.5% (15)	34.6% (28)	25.9% (21)	14.8% (12)	40.7% (33)
After PD	0.0% (0)	1.2% (1)	14.8% (12)	39.5% (32)	44.4% (36)	83.9% (68)

How comfortable were you with how children best learn STEM content before Storytime STEM+C Adventures PD?

71.6% (n=58) of respondents reported an increase in their comfort level with how children best learn STEM content from before to after STEM-packs PD. 27.2% (n=22) of respondents remained the same or no need to change. There was one respondent dropped from "very confident" to "uncertain". Prior to the workshop, 40.7% (n=33) of respondents rated themselves as confident or very confident (CFP 4-5) in their comfort with how children best learn STEM content (engineering design, mathematics, science). And the highest percentage of respondents felt uncertain (34.6%, n=28). With regard to respondent comfort after the STEM-packs PD, 83.9% (n=68) of respondents answered confident or very confident (CFP 4-5), with only 12.3% (n=10) of respondents answering uncertain.

Table 7. Comfort with how children learn best STEM content before Storytime STEM+C Adventures PD

	Not at all confident % (n)	Somewhat confident % (n)	Uncertain % (n)	Confident % (n)	Very confident % (n)	CFP 4-5 % (n)
Before PD	6.2% (5)	19.8% (16)	38.3% (31)	23.5% (19)	12.3% (10)	35.8% (29)
After PD	0.0% (0)	1.2% (1)	12.3% (10)	38.3% (31)	48.1% (39)	86.4% (70)

How comfortable are you with facilitating Storytime STEM+C Adventures activities with children at your site in general?

71.6% (n=58) of respondents reported an increase in their comfort level with facilitating STEM+C activities with children at their site in general from before to after PD. The other 28.4% of the respondents (17) remained the same or no need to change. Prior to the professional development, 34.5% (n=28) felt confident or very confident in their comfort level of facilitating STEM+C activities with children in general. The highest percentage of respondents felt uncertain (44.4%, n=36). With regard to respondent comfort after the STEM-packs PD, 81.4% (n=66) of respondents answered confident or very confident (CFP 4-5), with only 17.3% (n=14) of respondents answering uncertain.

Table 8. Comfort with facilitating STEM+C activities before and after Storytime STEM+C Adventures PD

	Not at all confident % (n)	Somewhat confident % (n)	Uncertain % (n)	Confident % (n)	Very confident % (n)	CFP 4-5 % (n)
Before PD	7.4% (6)	13.6% (11)	44.4% (36)	25.9% (21)	8.6% (7)	34.5% (28)
After PD	0.0% (0)	1.2% (1)	17.3% (14)	33.3% (27)	48.1% (39)	81.4% (66)

Value/Usefulness

How valuable was this Storytime STEM+C Adventures Professional Development to you as a teacher/librarian?

Nearly all respondents rated the Storytime STEM+C PD as valuable or very valuable. 67.9% (n=55) rated the PD to be very valuable and 23.5% (n=19) considered it to be valuable.

Table 9. Value of Storytime STEM-packs STEM+C PD

	Not Very Valuable % (n)	Not Valuable % (n)	Uncertain % (n)	Valuable % (n)	Very Valuable % (n)	CFP 4-5 % (n)
	0.0% (0)	1.2% (1)	7.4% (6)	23.5% (19)	67.9% (55)	91.4% (74)

STEM+C Interest and Commitment

After participating in the professional development, the majority of respondents increased their interest and commitment to implement STEM and computer science. 84.0% (n=68) of respondents answered that they increased or greatly increased (CFP 4-5) their interest in STEM and computer science as a result of the PD. Similarly, 90.1% (n=73) of respondents answered that they either increased or greatly increased (CFP 4-5) their commitment to implementing STEM and computer science in their classrooms/libraries.

Table 10. Interest and commitment of respondents changed as a result of the STEM+C Adventures PD today?

	Greatly Decreased % (n)	Somewhat Decreased % (n)	Uncertain % (n)	Increased % (n)	Greatly Increased % (n)	CFP 4-5 % (n)
Interest in STEM and Computer Science	0.0% (0)	0.0% (0)	16.0% (13)	32.1% (26)	51.9% (42)	84.0% (68)
Commitment to implement STEM and Computer Science	0.0% (0)	0.0% (0)	9.9% (8)	40.7% (33)	49.4% (40)	90.1% (73)

How can Storytime STEM-packs support effective STEM instruction in your program?
Nearly all respondents held positive attitudes about how Storytime-packs support effective STEM instruction. The most often cited praise from respondents was the hands-on nature of the STEM-packs, which connecting literature and STEM activities, increased children's engagement. Moreover, respondents emphasized the importance of STEM-packs as the necessary materials and preparation for STEM lessons.

Feedback and suggestions

The vast majority of respondents provided positive feedback regarding their experience of the professional development, which described the PD as informative, interactive, and engaging. It was a great program that children loved and they would consider use it again and look for the future opportunity to participate in the workshop. Some of them didn't have time to use it this year due to pandemic. So they would like to have the materials earlier and some remote learning extensions for the STEM-packs.

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