



Impact Planning, Evaluation & Audience Research

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Assessment Report:
Science in Pre-K program and web site

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TABLE OF CONTENTS

SUMMARY AND DISCUSSION iii

Introduction	iii
Summary and Discussion	iii
Conclusion	v

INTRODUCTION..... I

Methodology	1
Data Analysis and Reporting Method	2
Human Subject Protection	2

PRINCIPAL FINDINGS: TEACHER INTERVIEWS 3

Introduction	3
Sample Description	3
Overall Professional Development Experiences	3
<i>Science in Pre-K</i> Experiences.....	8

PRINCIPAL FINDINGS: TEACHER DISCUSSION GROUP I I

Introduction	11
Top-of-mind Responses to <i>Science in Pre-K</i> Web Site Organization.....	11
Responses to Specific Web Content.....	13

APPENDICES.....REMOVED FOR PROPRIETARY PURPOSES

SUMMARY AND DISCUSSION

INTRODUCTION

This summary and discussion of findings is intended to frame NASM staff's thinking about next steps for scaling up the *Science in Pre-K* program. Specifically, this summary and discussion highlight what teachers value when it comes to professional development opportunities (whether in-person or online) and how NASM staff might integrate and maintain the characteristics that teachers value when growing the *Science in Pre-K* program.

The findings presented here are among the most salient. Please read the body of the report for a more comprehensive presentation of findings.

SUMMARY AND DISCUSSION

This summary and discussion is divided into three sections that detail three key characteristics of value to teachers when they participate in professional development experiences—relevance/applicability, collaboration/communication, and knowledge-/skill-building.

RELEVANCE/APPLICABILITY

Not surprisingly, a prevalent trend in the interviews (and during the discussion group) was that teachers value knowledge and activities that have direct applicability to their classroom. Whether they participated online or in-person, many interviewees said they highly value learning content and hearing about activities and strategies that are immediately applicable to their Pre-K classroom and curriculum. Teachers emphasized the importance of professional development experiences specifically designed with Pre-K teachers and students in mind (not something designed for older children that an instructor says can be “easily adapted” for Pre-K students). For example, when discussing their *Science in Pre-K* experiences, teachers valued the specific inquiry activities and lessons that they could replicate with their students (such as the one on light and shadows), and several teachers (who participated in *Science in Pre-K* in person) said they benefited from tailored field trips to NASM where they could apply what they learned in *Science in Pre-K* with their students. Interviewees also appreciated an instructor who had a background in early childhood education and knowledge of the unique challenges teachers face (for example, the curricular and assessment constraints under which teachers operate).

During the discussion of the *Science in Pre-K* website, the instructional coaches emphasized the importance of teachers being able to see themselves and their students reflected in the available resources and materials (e.g., videos, images). For example, coaches discussed the value of providing example exchanges between teachers and Pre-K students ranging in age from three to five years. Again, coaches said it is important for teachers who teach younger students to see how a successful inquiry lesson is conducted with three-year-olds (since these teachers sometimes lack the confidence to integrate inquiry into their classroom). Valuing concrete examples and resources is a common thread that carried through to teachers' discussion of another key characteristic they value in professional development—knowledge-/skill-building (see the third section below).

COLLABORATION/COMMUNICATION

Another prevalent trend in the study was that teachers value professional development that provides opportunities to communicate and collaborate with other teachers and knowledgeable instructors. The

environment in which the professional development takes place (in-person or online) was key to this discussion. While a majority of teachers actually expressed a moderate to high level of comfort using technology to participate in professional development experiences, they often found the communicative and collaborative aspects of online professional development experiences lacking. For example, teachers struggled to communicate during online sessions because they could not read the gestures and expressions of the other participating teachers. Several also found the chat or dialogue feature distracting (much like if several teachers were having side conversations during an in-person professional development session). Many felt being there in person eliminated most distractions and allowed them to focus on the task at hand.

However, teachers also discussed strategies that seemed to mitigate some of the challenges they faced collaborating and communicating with others online. Several teachers said they appreciated seeing a visual of the *Science in Pre-K* instructors while they facilitated and conducted experiments during the webinar. Further, teachers said that seeing the instructors' passion and having them respond to queries in real time are two of the reasons they seek out in-person professional development, so they appreciated that these aspects were maintained online.

On the other hand, findings indicate that replicating the collaborative element of in-person professional development is a bit more challenging. For example, teachers said they valued in-person professional development because they enjoy meeting new teachers and sharing ideas. While the Ning site for *Science in Pre-K* was set up to enable collaboration and sharing, few teachers mentioned it as a beneficial aspect of their experience, and a few said they were unsure how to benefit from or use it. Successful use of project sites (such as Ning and Basecamp) as platforms for collaboration is still a bit elusive. Professionals, including teachers, often defer to collaborative strategies that are already integrated into their daily work (such as in-person meetings, e-mails, and telephone calls). One strategy that a few teachers mentioned is that they like participating in online professional development experiences with colleagues from their school in the room so they can discuss and share ideas of how to apply what they are learning to their particular context or situation.

KNOWLEDGE-/SKILL-BUILDING

Another key trend is that teachers value growing their knowledge and building their skill set. While not surprising, teachers said they benefit most from opportunities where they learn something new that they could apply to their work. Teachers also value learning about best practices from a knowledgeable instructor (someone who has experience implementing the strategies they present). This brings up another discussed difference between online and in-person professional development opportunities. Teachers value conducting activities and experiments so they can easily replicate the lessons with their students, and many teachers said they prefer in-person professional development experiences because there were often many opportunities to "learn by doing." Further, many interviewees said that the hands-on aspects of *Science in Pre-K* contribute the most to building their confidence in teaching science and inquiry. Again, teachers who participated in the *Science in Pre-K* webinar discussed strategies that helped mitigate this challenge. For example, teachers said they benefited from receiving a supply list ahead of time so they could conduct the experiment alongside a live feed of the *Science in Pre-K* instructors conducting the same experiment. Teachers also really appreciate receiving any materials (PowerPoint, handouts, workshop goals) ahead of time so they can prepare for and learn the most from the experience.

As mentioned previously, instructional coaches in the discussion group also emphasized the importance of providing concrete examples and resource materials to aid in teachers' learning. For example, coaches said having videos of a teacher conducting an inquiry lesson with Pre-K students of varying ages (three to five years), images of how their classroom should be set up to promote inquiry, and

concrete lesson plans would all go a long way in helping teachers integrate new knowledge. Teachers and coaches also emphasized that seeing instructors who have fun conducting inquiry lessons, as well as having the opportunity to reflect with these instructors (and other teacher participants), is important and instrumental to them integrating new learning.

CONCLUSION

Study findings indicate that what teachers value most about professional development experiences (whether in-person or online) are opportunities that promote relevance/applicability, communication/collaboration, and knowledge-/skill-building. Maintaining these aspects seems to be of utmost importance when scaling up the *Science in Pre-K* program. Study findings indicate where maintaining quality in each of these three aspects may be challenging when migrating to an online format; however, findings also indicate strategies that might help mitigate some of these challenges. These study findings coupled with the two literature reviews—*Scaling Up* and *Distance Education*—will help NASM staff frame their thinking as they begin to consider what they hope to achieve (Outcomes and Indicators Workshop) and how they continually will plan for, evaluate, and improve the *Science in Pre-K* program as it grows. We intend for the Workshop deliverables—the Evaluation Plan and data collection instruments—to support NASM in this endeavor.

INTRODUCTION

The National Air and Space Museum (NASM) contracted with Randi Korn & Associates, Inc. (RK&A) to help determine realistic strategies and next steps for scaling up its *Science in Pre-K* program, a PNC Bank-funded teacher professional development program that supports District of Columbia Public Schools (DCPS) preschool teachers in teaching science through exploration and problem solving. To support this work, RK&A is preparing two literature reviews—*Scaling Up* and *Distance Education*—intended to explore best practices for scaling up non-profit programs and facilitating distance learning programs. This report serves as a companion piece to the literature reviews and presents findings from interviews with teachers who have participated in the *Science in Pre-K* program (in-person or online), as well as findings from a discussion group with DCPS instructional coaches about the *Science in Pre-K* web site. The literature reviews and findings from this report will provide context for a planning workshop where NASM staff will collaborate to determine the ultimate effect they hope to have on DCPS teachers who participate in the *Science in Pre-K* program. This workshop will generate information that RK&A will use to create an Evaluation Plan that NASM can use to guide future planning and evaluation of *Science in Pre-K* programming.

Specifically, the objectives of the teacher interviews and discussion group are to explore:

- ◆ Characteristics of successful professional development opportunities for pre-K teachers, including in-person and online formats;
- ◆ The characteristics of *Science in Pre-K* that teachers find most beneficial to their teaching;
- ◆ The types of technology teachers have access to for online learning;
- ◆ Characteristics of the *Science in Pre-K* web site perceived as most and least beneficial to the development of a Pre-K science curriculum for DCPS; and
- ◆ DCPS instructional coaches' understanding of the conceptual organization, terminology, and text on the *Science in Pre-K* web site.

METHODOLOGY

RK&A employed two methods to explore study objectives: in-depth telephone interviews and a facilitated discussion group.

INTERVIEWS

In-depth interviews produce data rich in information because interviewees are encouraged and motivated to describe their experiences, express their opinions and feelings, and share with the interviewer the meaning they constructed from the program.

NASM provided RK&A with a list of teachers who had participated in the *Science in Pre-K* program in-person or online (through a live webinar). From this list, RK&A randomly selected 21 teachers to participate in a telephone interview about professional development experiences in general as well as their *Science in Pre-K* program experience. RK&A scheduled and conducted interviews with teachers via telephone using an interview guide (see Appendix A). The interview guide was intentionally open-ended

to allow interviewees to discuss what they felt was meaningful. Interviews were audio-recorded with interviewees' permission and transcribed to facilitate analysis.

DISCUSSION GROUP

Discussion groups are a qualitative research method in which a limited number of participants engage in roundtable discussions about topics presented by a moderator. RK&A conducted one discussion group with six DCPS instructional coaches who are part of a working group tasked with integrating science into the new DCPS preschool curriculum, Tools of the Mind. The group was held on Friday, July 26th, 2013 at NASM.

RK&A facilitated a 60-minute conversation using a discussion group guide (see Appendix B) and select text from a Beta version of the *Science in Pre-K* web site. *Science in Pre-K* staff were present to demonstrate navigation of the *Science in Pre-K* web site. Throughout the conversation, RK&A encouraged participants to be candid and honest in their responses. The conversation was audio-recorded with participants' knowledge and transcribed to facilitate analysis.

DATA ANALYSIS AND REPORTING METHOD

In-depth interviews and discussion groups produce descriptive data that are analyzed qualitatively, meaning that the evaluator studies the interview and discussion transcriptions for meaningful patterns and, as patterns and trends emerge, organizes similar responses together. Findings are reported in narrative, and verbatim quotations (edited for clarity) are included to illustrate interviewees' and participants' thoughts and ideas as fully as possible. Within the quotations, the interviewer's questions appear in parentheses and an asterisk (*) signifies the start of a different speaker's comments.

HUMAN SUBJECT PROTECTION

As required by the Smithsonian Institution, RK&A secured approval from the Smithsonian Institution's Internal Review Board (IRB) to conduct research with human subjects. The *Science in Pre-K* study was granted exemption from IRB approval.

Regardless of exemption, RK&A secured verbal consent from all participating teachers. All data generated from the study are confidential and names, telephone numbers, and email addresses collected to conduct interviews were not linked to interviewees' responses (i.e., interviewees were assigned an identification number on the audio recording that was not linked to identifying information).

All data collectors have completed human subject training offered by the National Institutes of Health (available at <http://phrp.nihtraining.com/users/login.php>) or completed an equivalent program. Certificates of completion are on file.

Findings are organized in two sections:

SECTIONS OF THE REPORT:

1. Principal Findings: Teacher Interviews
2. Principal Findings: Teacher Discussion Group

PRINCIPAL FINDINGS: TEACHER INTERVIEWS

INTRODUCTION

RK&A conducted in-depth interviews with 21 teachers who participated in the *Science in Pre-K* program in-person at NASM or online via a live webinar. Interviews were conducted over the telephone during July and August 2013.

SAMPLE DESCRIPTION

Interviewees' years of preschool teaching experience ranges from 1 to 39 years, with a median of 14. About one-half of interviewees teach in public schools; one-quarter teach in private schools; and one-quarter serve in a supportive or consultant role to early childhood educators (e.g., work for a school readiness program). About one-third of interviewees follow the Tools of the Mind curriculum; one-third follow the Creative Curriculum; and the remaining one-quarter of interviewees follow a variety of different curriculums (including: The Reggio Emilia Approach, emergent curriculum, religious-based curriculum, High Scope, and Houghton Mifflin).

OVERALL PROFESSIONAL DEVELOPMENT EXPERIENCES

RK&A asked several questions about professional development experiences in general and teachers' most recent in-person and online professional development experiences specifically.

OVERALL OPINIONS ABOUT PROFESSIONAL DEVELOPMENT EXPERIENCES

RK&A asked interviewees to discuss what they perceive as valuable and overlooked aspects of professional development experiences, their preferences for format and length, their expectations for the resources and support they will receive, and their comfort level using technology for professional development.

VALUABLE ASPECTS OF PROFESSIONAL DEVELOPMENT EXPERIENCES

When asked what elements make professional development opportunities valuable, about two-thirds of interviewees said learning content, activities, and strategies that are immediately applicable to their Pre-K classroom and curriculum; not something designed for older children that can be "easily adapted" for Pre-K students. About one-third also said that learning about something new, whether it is a new resource, strategy, activity, or content is invigorating and of value (see the first quotation below). About one-quarter said they value a knowledgeable instructor (i.e., someone with early childhood development training) and well-researched strategies (see the second quotation). Another one-quarter said that they value opportunities to practice what they will implement in their classroom ("learn by doing"). Two teachers each said they appreciate organized professional development (clear outcomes and goals) and opportunities to interact with other teachers.

We all need to be lifelong learners, and I think that really encourages educators to learn new things; just something that we didn't know makes us think about other things that we would like to learn, or a way to engage the kids and find out what they would like to learn and what they don't know. I think it's kind of exciting. I like to be able to say to the kids 'I found this out and I didn't know this.' I think it makes them feel like we're in it together.

[I like having] people that are in the field of early childhood development who have already experienced and practiced the materials that they are using. There is support for the materials they are showing you. For instance, the cognitive development program I attended, she not only wrote the book, but she created it and she actually practices it in the early childhood development field herself.

OVERLOOKED ASPECTS OF PROFESSIONAL DEVELOPMENT EXPERIENCES

When asked what, if anything, is often overlooked or forgotten in professional development opportunities, interviewees' responses varied widely. About one-third said that knowing one's audience (i.e., the experience level of the teachers attending), as well as the students they serve (e.g., Pre-K students, special education students), is sometimes lacking (see the first quotation below). Several said nothing is lacking. A few said the timing (i.e., offering professional development during the week) and/or length of the program are not well planned (see the second quotation). Two teachers said that an opportunity to reflect or assess is often left out (see the third quotation), and two more said that opportunities for hands-on/practical application of concepts are sometimes left out. The remaining responses were idiosyncratic (e.g., few science professional development opportunities, lack of organization/purpose, no cross-curricular connections, not well-advertised).

We always assume that everyone knows the lingo and has some idea of what the topic is, and you have to realize that a lot of people have not been working with that topic. If you're not a science teacher, then that's not something that you focus on, maybe you're the reading teacher. . . . For the people [who] provide the training and these webinars, sometimes they have to realize that you have some very basic folks coming in.

I feel like [with] online professional development, you usually get a lot more information in a shorter amount of time. Sometimes when you are in person, some things can be consolidated; you could do a half day conference rather than a full day. . . . For instance, I just went to something recently that was 8-4 on a Saturday. We had an hour and a half for lunch, followed by a 45 minute optional panel right in the middle of the day. Just because it is in the evening or on a Saturday doesn't mean that it should be treated like open-ended amounts of time.

The evaluation [is sometimes missing]; the ongoing contact, when they ask you 'did you really feel like you grew?'. . . . Finding out how people fared after the professional development because sometimes you never hear from them. . . . The evaluation gives you the opportunity to go back and think about the professional development; it's not that you forgot, but when you get the evaluation you go back and think about 'this is how I grew and this is how I benefitted; these classes helped me to perform better.'

PREFERENCE FOR FORMAT

When asked whether they prefer in-person or online professional development opportunities, two-thirds of interviewees said, all else being equal, they tend to gravitate towards in-person opportunities. Common reasons for this preference (from most- to least-frequently occurring) included that in-person professional development: creates a more collaborative atmosphere where participants can discuss things with each other and the facilitator; often offers hands-on and interactive activities and exercises; and provides an atmosphere where it is easier to focus (i.e., fewer distractions).

The remaining one-third said they tend to gravitate towards online opportunities. Common reasons for this preference (from most- to least-frequently mentioned) included that online professional development provides convenience and allows participants to move at their own pace.

However, several interviewees said their choice can depend on the context; for example, sometimes the convenience of doing something online outweighs everything else.

PREFERENCES FOR LENGTH

When asked whether they prefer one-time or repeat professional development opportunities, about one-half of interviewees said it depends on the circumstances. These interviewees said that repeat opportunities are ideal when the topic is more complex or requires a lot of practical application to master (such as science). Alternatively, they said that some topics do not lend themselves to extended exposure such as learning how to use a new technology. About one-quarter said they prefer one-time opportunities for the convenience (fitting things into their schedules) and/or because they are seasoned teachers who do not need as much training. The remaining one-quarter said they prefer repeat opportunities because they appreciate covering a topic in depth and having the opportunity for follow-up discussion and support (see the quotation below).

I do look for ones that meet more than once because you can get a better depth, level of knowledge. You can check in. I think that the long-term professional development doesn't have to be slow going in terms of content—you learn something and build on it the next time.

RESOURCE EXPECTATIONS

When asked what resources and/or support they expect when participating in professional-development opportunities online or in-person, one-half of interviewees said they appreciate an advanced organizer or agenda with clearly outlined goals, as well as the materials (PowerPoint presentations, handouts, etc.) to review ahead of time. These interviewees also said they appreciate clearly outlined logistics ahead of time (such as directions for in-person opportunities and instructions and hardware requirements for participating in online opportunities). About one-third said they appreciate when the facilitator or instructor is available for follow-up questions/support and/or maintains consistent communication with participants about upcoming opportunities. A few said they expect to learn about best practices for the topic they are learning about (including the curricular connections). Two teachers said they expect the instructor to be knowledgeable (i.e., about content and challenges teachers face) (see the quotation below). A couple also said they appreciate free technology or other materials for their classroom.

It's really helpful to have trainers that are sensitive to the challenges, not just of teachers, but also those in my own school district. Challenges like limited resources and teacher assessments, new curriculums being presented, those kinds of things.

COMFORT USING TECHNOLOGY

When asked how comfortable they are using technology to participate in professional development opportunities, one-half of interviewees said they are very comfortable. Some of these interviewees just talked about a high level of comfort with webinars, while others talked about a high level comfort with technology in a variety of formats (see the first quotation below). About one-third expressed a moderate level of comfort using technology for professional development; these interviewees tended to express comfort with webinars or general computer use (e.g., word processing) but not with other forms of technology (like SMART Boards); though several expressed excitement that they would soon learn how to use a SMART Board. The remaining almost one-quarter of interviewees said they have little comfort with technology (see the second quotation).

[I am] extremely comfortable. I do all on my lesson planning online; I do all of my material development online. I do things on the computer and then project them onto the white board. I use the camera on my computer as a document scanner.

I'm on the low end of skills, so that is a thing that is most likely to prevent or frustrate me in the process of participating. The online things I've done are pretty much dial up where you put in a code; other ones are computer-based [where you] put a code in and get hooked up.

IN-PERSON PROFESSIONAL DEVELOPMENT EXPERIENCES

Overall, all interviewees have participated in in-person professional development experiences. Two-thirds of interviewees' most recent professional development experience was in-person.

MOST ENGAGING ASPECTS

RK&A probed all interviewees to discuss the most engaging aspects of their most recent in-person professional development experience. About one-half of interviewees said they appreciated the hands-on, experiential aspects of their in-person professional development experience. For example, interviewees said they liked implementing teaching strategies they can use to engage their pre-kindergarten students and participating in the activities that their students would do in the classroom (see the first quotation below). About one-third of interviewees said they appreciated connecting with colleagues in person so they could discuss successes and challenges (see the second quotation). Several remaining interviewees said they appreciated being face-to-face with staff facilitating the professional development so they can see staff model strategies and ask staff for clarification and help as needed.

One [activity] was on teaching reading, and she [the instructor] gave a lot of good information on how to read aloud to children. We did a practice there [at the workshop], and the format and process she used was useful because I went back the next day to my classroom and used it with my kids. It's always good when you can go back the next day and try it out.

When they [the facilitators] [interact] with the audience they do group activities and collaborate with other teachers. [This is] engaging because you learn other people's ideas. . . . I realized I had done lot of those [activities] but not realizing they were science things; it was helpful to realize that other people were doing a lot of the same things I've been doing.

MOST CHALLENGING ASPECTS

RK&A probed all interviewees to discuss the most challenging aspects of their most recent in-person professional development experience. About one-third of interviewees described logistics as somewhat challenging, such as finding time in their schedules, getting to the facility, parking, etc. Another one-third said their experience was challenging because the large number of participants (i.e., difficult to see, hear) and/or lack of handouts made it challenging to follow along (see the first quotation below). About one-quarter said they were either challenged by a lack of familiarity with the content or bored because they were already too familiar with the content (see the second quotation). A few said nothing was challenging about their experience, and the two remaining interviewees said that sharing or discussing in person sometimes can be challenging because people are reticent to share their opinions and/or go off on tangents.

I'm a really visual person and if they don't supply a printed PowerPoint or some other way to be able to follow what they're going through, it's harder for me to follow because I feel like I have to be furiously taking notes.

The way that they taught us how to do different things with the children [was challenging] because it was stuff that I didn't know; like how to do things in the water, they taught us how to do science experiments with the children. That was a challenge to me because some of it was materials that we wouldn't have had ourselves. The materials they had, they gave to us, but I didn't know you could use for science.

ONLINE PROFESSIONAL DEVELOPMENT EXPERIENCES

Overall, many interviewees said they have participated in professional development online (a few have not). One-third of interviewees' most recent professional development experience was online.

MOST ENGAGING ASPECTS

RK&A probed most interviewees to discuss the most engaging aspects of their most recent online professional development experience. About one-half said their most recent experience was engaging because they could share and discuss thoughts with colleagues (i.e., in person, all watching together) or other participants (e.g., comment boxes) (see the first two quotations below). One-quarter said the mixed media used by the facilitator (e.g., online videos, handouts, live demonstrations or visuals of the facilitator) made the experience engaging and less isolating (see the third quotation). Another one-quarter said they liked that the information (e.g., PowerPoint presentation, handouts, videos) was immediately available to share with others and archived for them to reference at a later date. A few also said the convenience of their online professional development experience is what made it most engaging.

I think it [the online experience] was engaging because I did it with two of the other directors here. I think we could on the spot think about what [was] applicable to our school and what wasn't. I think virtually, you are at some level, isolated, and when you are with other people, there is something to that.

Some of the perspectives, reading some of the chat dialogue and discussion boards, it is kind of interesting to hear what different students' perspectives are on the topic you are discussing. Some of the students come from different countries and just to hear their different perspectives on the subjects you are trying to tackle is interesting.

I liked the *Science in Pre-K* [webinar] because the instructors were live on the screen and then they had videos and photos on the screen of things you could do with the children, activities you could do on your playground. . . . There was interaction with that, and you could see where people were typing and how the trainers responded to them and then asked what we thought, so there was interaction with that too.

MOST CHALLENGING ASPECTS

RK&A probed most interviewees to discuss the most challenging aspects of their most recent online professional development experience. About one-third of interviewees said the most challenging aspect was that it did not feel collaborative and was difficult to communicate with others (see the quotations below). A few said they are more easily distracted and get interrupted by colleagues when participating in online professional development. A few said they had technical difficulties, and two teachers said that their online experience was not as interactive. Two more said that it was hard to follow the presenter because they did not have the right materials (handouts).

Not being able to fully see somebody, you might read something, but because you can't see a person's face, you don't get the full story of how they may want to be portrayed or viewed. Since you can't see their expression, you may misunderstand what they are trying to convey.

When they had the little sidebars and people go off on tangents, you want to read what they're writing but you're trying to hear what the trainer says and those sidebars are interesting so they can be distracting.

SCIENCE IN PRE-K EXPERIENCES

RK&A asked interviewees a series of questions about their *Science in Pre-K* experiences. About one-half of the interviewees participated in *Science in Pre-K* in-person through District of Columbia Public Schools, and one-half participated via live webinar. Slightly more than one-half of interviewees are first-time participants (mostly those who participated in the webinar).

MOST BENEFICIAL ASPECTS

When asked which aspects of the *Science in Pre-K* program were most beneficial, two-thirds of interviewees described the practical, hands-on activities and experiments (in-person as well as video examples) that they could immediately implement in their classrooms. Further, many of these interviewees emphasized the value of being able to perform the activities or experiments themselves so they knew how to support their students' learning (see the first two quotations below). About one-third said they appreciated the materials they received before and during the program. Of these, several (who participated online) said they appreciated the supply list so they could follow along and try the activities and experiments themselves; and several said they valued the resource lists (books, web sites) (see the second quotation). One-quarter said they benefited from the opportunity to share ideas with other teachers either in-person or through the web site (see the third quotation). About one-quarter (all who participated in-person) said they benefited from the free field trip opportunities to NASM because they could implement what they learned with their students and, at the same time, have the support of NASM staff (see the fourth quotation). A few praised the instructors as knowledgeable and passionate about early childhood development. The few remaining interviewees said they benefited from learning the science content or theory behind the inquiry teaching strategies used.

The topic itself, which was on shadows and light, was a science topic that was accessible to working with the preschool classroom. It was very relevant; in fact, I was able to do some of the experiments they showed over the next couple of weeks in my classroom. Science tends to still be one of the subjects as far as three-year olds and early childhood development that is difficult to find resources for children of that age, so when you find [a lesson] that you are able to use in the classroom, it is helpful.

There was so much I could use in a classroom setting, so much I could give to the teachers I work with; they gave visuals, there was live visuals of the demos they did, like the light box and they showed the shadows and what happens when you move the flashlight; and they told us to gather a tool kit ahead of time so we could do some of the activities alongside of them and that was so much fun; that was my favorite!

The NING site—I appreciated it a lot and it was very cool to go in and be able to see what other teachers said and download pictures [and] videos of other people's projects and to ask questions.

The field trips were great—they are ways to further reinforce the things that we are teaching. And, sometimes I feel in my classroom like I need someone else's energy to present to these kids not just me, so on the field trips, whether it was story time or science talks, we had the energy of those [NASM] staff people presenting, and they tailor made things for my kids, like taking them to a quieter corner of the Museum or simplifying some of the hands-on materials and providing extra support.

LEAST BENEFICIAL ASPECTS

When asked which aspects of the *Science in Pre-K* program were least beneficial, about one-half of interviewees said nothing was least beneficial. A few said the NING site was least beneficial because they were not sure how to benefit from it (see the first quotation below). A few said the more theoretically (“lecture-style”) aspects (as opposed to the practical, hands-on activities) were least beneficial (see the second quotation). Two teachers said they did not know how to receive continuing education credit for their participation. The remaining responses were idiosyncratic (e.g., the chat boxes during the webinar are distracting, no cross-curricular connections or student assessment instructions provided).

Probably the Ning site; it wasn't bad necessarily, but everything else was so much better as far as my learning with other people. I think that the idea was it [the site] would be a place for us to reflect on what we were doing, but we were all doing the same lessons so it wasn't like I was getting good ideas from what other people were doing because we were all operating on the same plane and doing the same lessons.

I thought there were some lectures at the beginning [that] were kind of long, and it wasn't as worthwhile as it could have been. I guess that part of it is not terribly memorable for me. The parts of it where they quickly cited some research were not as interesting as going into a room with a smaller group of people and a person to guide you through a science experience and talk about why you were doing it.

ASPECTS THAT CONTRIBUTED TO CONFIDENCE IN TEACHING SCIENCE

When asked which aspects of the *Science in Pre-K* program contributed most to building their confidence in teaching science, about one-half of interviewees said the practical, hands-on aspects, such as doing the activities and experiments themselves or applying what they learned in the classroom and sharing it with others, contributed the most to their confidence (see the first quotation below). About one-third said that understanding how broadly science can be applied (“science is everywhere”) and seeing that exploring science with Pre-K students can be simple and straightforward helped them feel less trepidation about not having a science background (see the second quotation). A few interviewees said that having a consistent framework (focused and open exploration) to apply helped build their confidence (see the third quotation). Two teachers said that the passion and knowledge of the instructors helped build their confidence (see the fourth quotation).

The hands-on experience that the presenters gave us [contributed the most]. As a teacher I have worked with blocks for many years and they showed us a different way to use blocks. When we presented it to the children, we could actually see the inquiry and asking questions; we had used water before, and they showed us how to use water from different angles. I think that really enhanced my own interest in working with water and rocks; it was bringing new life to that aspect of it.

It is just knows that it is simple activities and it didn't have to be anything complicated; it's not intimidating for the teachers [to] build on those [activities] with the kids. As a teacher, you don't have to have a lot of science classes or build a big model like the volcano with the vinegar; it can be a lot of [simple] things too.

I would say the presentation of the explorative and focused learning being repeated no matter what theme we were working on, whether it was shadows or water or construction. Another aspect that I thought was really good was they taught us how to have science talks. . . . I thought that was a really good skill that we learned.

I think the enthusiasm of the presenters. You could see that they were enjoying what they were doing and I think that's the way you teach science to kids or anything else. It needs to be interesting. It needs to be something that builds curiosity.

ASPECTS THAT CONTRIBUTED TO CONFIDENCE IN USING INQUIRY

When asked which aspects of the *Science in Pre-K* program contributed most to building their confidence in using inquiry, one-half of interviewees said seeing examples and doing the experiments helped the most to build their confidence using inquiry. About one-third said that learning how to ask open-ended questions and facilitate children asking questions contributed most to building their confidence using inquiry (see the quotation below). A few said they were not sure or could not remember what might have contributed, and two interviewees gave idiosyncratic or general responses (e.g., the instructors made you feel comfortable).

Learning how to ask appropriate questions and giving kids background knowledge and I think helping them make connections to what is part of their life experience. Kids know more and have more experiences than we give them credit for and finding ways to connect that to science. For example, a lot of kids don't realize cooking is science, transforming one thing to another.

PERCEPTIONS OF THE NATIONAL AIR AND SPACE MUSEUM

When asked how their participation in the *Science in Pre-K* program changed their view of the National Air and Space Museum, about two-thirds of interviewees said it increased their awareness of the Museum's resources and helped them see the Museum as a resource for young children and teachers of young children (see the quotation below). About one-third said it enhanced an already positive view of the Museum.

It just opened up my eyes to a lot of the educational resources that they [NASM] have there [at the Museum]. My first year participating in the program was my first year teaching. It was great to see that they had educators and people focused on education at the Museum. And I was really impressed the depth with which they considered their programming for early childhood.

PRINCIPAL FINDINGS: TEACHER DISCUSSION GROUP

INTRODUCTION

RK&A facilitated a discussion group with six DCPS instructional coaches who are part of a work group tasked with integrating science into the preschool curriculum, Tools of the Mind, which is being adopted by DCPS. The 60-minute discussion group took place at NASM on July 26, 2013.

TOP-OF-MIND RESPONSES TO SCIENCE IN PRE-K WEB SITE ORGANIZATION

RK&A posed questions to gauge coaches' top-of-mind responses to the *Science in Pre-K* web site's menu bar categories. These categories included: *What is Inquiry Science?*; *Classroom Resources*; *Beyond the Classroom*; and *Science in Pre-K Calendar*.

WHAT IS INQUIRY SCIENCE?

Coaches said they expected to find information about how to ask preschool-age children questions, as well as information on how to facilitate open exploration (i.e., the teacher's role during the process during the inquiry process). A few coaches said that not including "pre-K" or "early childhood" in the question title might lead Pre-K teachers to assume this section of the web site was generally about inquiry and not tailored to working with preschool-age children (see the excerpt below).

The question though, 'What is Inquiry Science?,' even though this is the Science in Pre-K web page, it says, 'What is Inquiry Science?' It doesn't necessarily mean that when I click on that I'm going to see anything that's relevant to Pre-K. So, if it were to say, 'What is Inquiry Science in Pre-K Classrooms?' Or, 'What is Early Childhood Inquiry Science?' then I would expect to see a definition of what it is, and then, how a teacher can do it.

CLASSROOM RESOURCES

Coaches said they expected to find resources such as videos modeling how a teacher would conduct inquiry in their classroom, instructions on how the classroom should be set up to promote inquiry, what and where to find materials for inquiry activities, samples lesson plans and links to grants for classroom materials (see the excerpts below).

I also think about how to [teach] about science and so, we were talking about in our last meeting, [having] videos [of] a teacher conversing one-on-one with a child about science and scaffolding them and asking them really pointed questions, or [a teacher] having a whole class discussion about [science].

[I would expect to see] how to collect materials. *Because it's a really important part of educating the teachers, the kinds of materials that you use are a very important part of educating the teachers about how to do science in pre-K. Often times, they [think they] have to go buy the butterfly house. They're nice; I'm not saying they're not. But, they want to go buy this experiment kit or something, and they don't have to do that.

Maybe also documents that make doing science inquiry in the classroom easier. So, maybe a planning document, a documentation collecting document. Like, overviews, outlines of what you could be doing in your classroom if you were doing science. *Sample lesson plans.

BEYOND THE CLASSROOM

Coaches said they expected to find resources for how to extend and reinforce science inquiry outdoors (i.e., still at school but not in the classroom) and during out-of-school time. For instance, coaches said they expected to find field trip resources (e.g., opportunities at NASM as well as other D.C. Museums), activities students can engage in at home and during summer break (e.g., nature walks), and activities that can be done outdoors at school (e.g., in a school garden or playground) (see the excerpts below). Coaches also said they expected to see resources for home-school environments and ways parents can engage their children at home using inquiry (see the third excerpt).

Could ‘Beyond the Classroom’ also mean going on a nature walk? That’s outside the classroom. So, perhaps ‘Beyond the Classroom’ could include ways to get out of the classroom during the school day.

[‘Beyond the Classroom’ could show] a kid not in the classroom, like, what a kid who’s gone through this curriculum looks like in the summertime. Like, a parent saying, ‘Oh, my child is so much smarter now,’ or something like that. Like, outside of the classroom, you see your child is more interested.

[I would expect] family engagement; how to engage your parents; field trip opportunities. If this is D.C. specific, which it seems like it is, and since there’s the Air and Space Museum in D.C., then there could be potential Museums or other things. . . . Other community places you can visit in D.C.

SCIENCE IN PRE-K CALENDAR

Coaches had mixed expectations for the *Science in Pre-K Calendar* section. Some coaches expected it might be a scoping sequence that laid out how to implement the *Science in Pre-K* activities and inquiry throughout the school year (see the first excerpt below). Others expected it to be a calendar that outlined NASM-specific programs and events happening each month that are developmentally appropriate for preschool-age children. Coaches expanded on this idea and suggested it would be quite helpful to have a calendar for all the Smithsonian museums that tied programs and events to themes in the preschool classroom (see the second excerpt).

A scoping sequence would be how *Science in Pre-K* happens throughout the school year. *And how it flows over the year. Like, you start with trees because it’s fall, and then you continue to talk about trees again in the springtime because the trees are budding.

I’m thinking, too, with the calendar, it would help a teacher in terms of, ‘Okay, we’re working on themes, and we can see where we are and we can connect those themes, we might be in a certain time of the month. We’re doing family. Okay. We can connect it to the calendar.’ Maybe the Smithsonian is doing something that relates to that theme.

After the facilitator explained the purpose of the calendar (i.e., intended as a scoping sequence with flexibility), coaches said they did not think the word “calendar” properly conveyed the intent (see the first excerpt below). A couple of suggestions included “Science in Pre-K Scoping Sequence” and “Science in Pre-K Timeline.” Further, coaches expressed some concern about having a scoping

sequence because they felt teachers would feel obligated to follow it exactly and overwhelmed if they missed something (see the second and third excerpts).

I don't think the word "calendar" conveys that [scoping sequence]. [When] I think [of] the word 'calendar' on the [National] Air and Space Museum web site, I click it, and it has July.

My thought about that [a scoping sequence] is that it needs to be, well, I would like for it to be not overwhelming. Partly because what we're trying to do in D.C. Public Schools with this, our project [integrating science into the preschool curriculum], is not get into the bind of, 'Oh, my God. That's wonderful! But, who has the time to do that?' You see what I mean?

The thing I worry about with doing a scoping sequence like that, though, is, if I'm a teacher, and it's September, and my school is a gardening school, so we got really into the nitty gritty of gardening, and we didn't get to trees, but trees is on the scoping sequence. Well, you can still do trees in October. But, I feel like the scoping sequence makes you feel like, 'Oh, I didn't do it in September. I can't do this anymore.' You know what I mean? *I think that teachers would feel like they have to do it when it's planned out and not when it naturally arises with [the] interests of the children.

ADDITIONAL THOUGHTS

Coaches said that it is important for any of the resources or materials to be simple and straightforward (i.e., "not exotic").

I think it's important in any of these tabs, but particularly maybe 'Classroom Resources' and maybe also 'Beyond the Classroom' that it emphasizes the non-exotic. That these are opportunities for science talks when the kids just happen to be playing in the water table anyway. You know? And then how you follow children, take the children's lead.

RESPONSES TO SPECIFIC WEB CONTENT

NASM staff prepared draft content for the *What is Inquiry Science?* and *Classroom Resources* sections of the web site. RK&A asked teachers to read through this content and mark anything they found useful or confusing. RK&A then asked coaches a series of questions to gauge their understanding and opinions of the content.

WHAT IS INQUIRY SCIENCE?

At the time of the discussion group, the *What is Inquiry Science?* section of the web site included five sub-sections: *Getting Ready*, *Open Exploration*, *Focused Exploration*, *Documentation*, and *Science Talks*. Teachers read and responded to text prepared for all five sections.

MOST USEFUL ASPECTS

Coaches said they found these aspects most useful:

- ◆ Information delineated by bullets (e.g., A Teacher's Role section)
- ◆ Clear focus on young learners (e.g., "If you already work with young children, you know they have insatiable senses.") (see the first excerpt below)
- ◆ Practicality and brevity of the Getting Ready section (e.g., how to set up your classroom) (see the second excerpt)

- ◆ Links to additional resources and documents embedded within the body of the text
- ◆ The “What?” “Why?” and “How?” structure of the Science Talks section (see the third excerpt)

The language, pretty much all the way through, pops in terms of really hitting the underlying things that we believe teachers need. The way it talks about, ‘If you already work with young children, you know they have insatiable senses.’ You know? Right there, [emphasizing that] this [inquiry] comes from children. This is not something that we are pouring into their little brains.

What stands out to me is the Getting Ready section, and as a teacher, I like it because it’s to the point. It’s not long and drawn out writing. But, it hits on my classroom environment. It just speaks right to it. So, I like the way it’s set up. You know, materials, your turn! No two-, three-, four-page thing.

The formatting in the Science Talk section is what I was trying to convey the whole time. . . . What are they? Why are they important? And, then, how do you facilitate them? Bringing it up that way. That’s really helpful. And then, again, there are bullets under each section, so if I’m reading the web site, my eyes just sort of go right there.

SUGGESTIONS

Coaches had many suggestions for adding to or improving the content, including:

- ◆ Providing more concrete examples of inquiry for preschool-age children (see the first excerpt below)
- ◆ Including resources that demonstrate inquiry with a range of preschool ages (3 to 5 years) (not just the older end of the range) and abilities (e.g., special education) (see the second excerpt)
- ◆ Clarifying the process of transitioning from open to focused exploration with a group of children who may have diverse abilities (see the third excerpt)
- ◆ Simplifying or define some of the language (e.g., “iterative”)
- ◆ Clarifying the purpose and process of documentation as a reflection and learning tool for children (see the fourth excerpt) and/or change the name (e.g., “Documentation as Reflection”)

I feel like for everything, I need more examples. I need concrete specifics. So, I know that as a teacher, I can promote reflection by asking children for their ideas and restating, but can you give me an example of exactly what that looks like, what one of my three-year olds says? Because, then, it’ll really help me internalize that. . . . *A sample conversation.

DCPS is moving toward Pre-K3/Pre-K4. In some respects, the stuff she’s done [referring to another coach] in her preschool class or Pre-K3 class, for example, is stuff that I know a lot of my three-year-old teachers wouldn’t believe that they could even do. And, if you just show [an] example [of] the four-year olds [doing] it, [because] that’s where we get good examples, that’s not going to help my three-year-old teachers who are anxious about that [using inquiry].

Something I did think was missing from that section [Focused Exploration], [which] the book does a really good job of, I had all three-year olds this year, and a lot of students with special needs, and I found whenever I read things like this, I would be, like, ‘Well, what if not all my kids get there at the same time?’ And the book emphasizes that a lot, but I didn’t feel like this document does. When you move to focused exploration, you’re going to have a group that’s [doing] focused exploration, but you might still have a group that’s still doing open exploration. And that’s okay.

I think that we should be explicit, like, ‘Many teachers think about the word ‘documentation’ and immediately think of ‘assessment.’ But, documentation is also a very powerful tool for children to self-reflect.’ Literally, just spelling it out, I think would make it [better].

CLASSROOM RESOURCES

At the time of the discussion group, the *Classroom Resources* section of the web site included two methods for filtering the available resources—subject (e.g., Classroom Environment, Beyond the Classroom, Science Inquiry, and Science Content) and format (e.g., video, document, photograph, etc.). Coaches responded to the usefulness of the search categories and provided suggestions for improvement.

MOST USEFUL ASPECTS

Earlier in the discussion, coaches discussed resources they would find most useful. First, coaches said teachers would find concrete examples of the inquiry process very useful (e.g., sample questions and responses illustrating open and/or focused exploration, videos of the inquiry process in the classroom, sample lesson plans, etc.). They also would like to see photographs or instructions for how to set up their classroom and lists of materials (including book lists categorized by content themes) (see the excerpt below).

Just reading a title of a book is extremely unhelpful. You look at a book list and it’s like, ‘Oh. Look at all these titles. I have no idea what any of them are about. Is this an informational book? [Is this] a book that does vocabulary or, like, a comparison one? I have one that’s about the Sun and the Wind. It’s just teaching vocabulary words. Or is this a book that’s about problem-solving or family relationships?’ (So, having categorized themes?) Yeah; an explanation of what each book could be used for. *If you’re listing books, for example, list why you’re doing [it] that way.

Coaches also said they found the format tags helpful as visual cues (whether something is a document, photograph, video, etc.).

SUGGESTED CHANGES

Coaches struggled the most with how one could search for information and resources. Some coaches argued for a visual representation of the content filters (i.e., a colorful box or tab) rather than a drop down list at the top of the page (see the first excerpt below). Some coaches also said that not all teachers (especially the older generation) know how to use search functions and felt giving those teachers pre-assigned areas to browse would help them process the resource information (see the second excerpt). Another suggestion was simply to provide instructions on how to search (see the third excerpt).

[I would suggest that] if you want to search it [the resources], you can do whatever filters it is that you want. And, then, below, you have, I don’t know, colorful boxes. . . . [For example], you have one that is Classroom Environment. So, you click on that, and it brings you to a page of all the different resources that you have on that. Then, on the Classroom one, it will hyperlink you to a page. . . . It’s like a pre-done search. . . . You could search within that, and it [the other filters] will stay up there. Or, if you’re more sophisticated about using it, you wouldn’t even bother to click on the tabs but you might.

I think [she’s] right that it [the drop down lists and search function] makes it even harder for somebody who’s not tech savvy to conceptualize. [Maybe] they’re not used to doing something like that because they don’t know what they’re looking for or, if they do, they don’t know how to write a search term. *If you go to Classroom Resources and you think, ‘Oh. This is going to

be concrete things that I can use in my classroom,' and then it's like, 'No. You have to first click which format you want,' which I don't know which resource you want.

Maybe you just need an explanation at the top, like, 'click the drop down menu of resource categories and see what is available under each category.'

Other suggestions were about the design and organization of the resources once they appear on the web page after a search. For instance, some coaches thought the number of potential tags was visually overwhelming (see the first excerpt below); others were confused by pages in the same document showing up as individual resources (or thumbnails)¹; and others suggested organizing the resources by format once they appear (see the second excerpt).

I also think that the tags are a little bit overwhelming because you could have one thing that has, like, seventeen. And, then [you are] like, 'Whoa! What in the world!' *Yeah. It's too much.

And why does it [the resources] have to be in columns? *As opposed to what? **A list.
*Because people will not scroll down. **Unless . . . each column is specifically different. Like, one is documents, one is videos, and one is images.

¹ At the time of the discussion, some aspects of the web site design, such as having pages in the same document appear as separate thumbnails, had not been addressed. NASM staff plans to have teachers return to prototype the web site when it is in a more final format.

APPENDICES

APPENDIX A: TEACHER INTERVIEW GUIDE

Removed for proprietary purposes

APPENDIX B: TEACHER DISCUSSION GROUP GUIDE

Removed for proprietary purposes