GOODMAN RESEARCH GROUP, INC.
Program Evaluation ❖ Consultation ❖ Market Research

PEEP and the Big Wide World Explorer's Guide

Final Evaluation Report

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EXECUTIVE SUMMARY

The PEEP Explorer's Guide is a three-unit activity guide for preschool teachers. The three units, in their recommended order of use, include Explore Shadows, Explore Water, and Explore Plants. The overall goal of the Guide is to provide teachers with guidance and ideas for leading hands-on science activities in their classrooms. In spring 2005, WGBH pilot tested the Guide in Head Start classrooms across the country. The pilot test involved a one-day orientation workshop led by WGBH followed by use of the Guide over a three-month period.

The pilot test enabled a formative evaluation of the Guide. The formative evaluation was one component of Goodman Research Group's external evaluation of the first season of PEEP and the Big Wide World. The purpose of the Explorer's Guide evaluation was to inform the final development of the Guide, prior to its broad dissemination. The evaluation was guided by three key questions:

1. How do teachers use the Guide in their classrooms?
2. What are teachers' reactions to the Guide?
3. Do teachers have improved attitudes and practices about teaching preschool science after using the Guide?

Following a description of the evaluation method, this Executive Summary presents the key findings from the evaluation as they relate to these evaluation questions. The full report provides additional findings and recommendations. The Guide does not require large-scale revisions, so these detailed recommendations are provided in the full report.

METHOD

The formative evaluation had a treatment group pre-post design, so results must be viewed in light of the fact there was no comparison group. The sample included 58 teachers distributed among Head Start classrooms in four cities: Chicago (IL), Dorchester (MA), Los Angeles (CA), and Marietta (GA). Most of the teachers were female, and had been teaching an average of six years.

Data were collected from teachers at five time points: prior to the workshop and use of the Guide, at the end of each four-week unit (teachers were encouraged but not required to use each of the three units for the four weeks), and after using the Guide. GRG developed all measures in consultation with WGBH. Head Start contacts administered the surveys and returned them to GRG in postage-paid return envelopes. In addition to the survey data collection, GRG conducted two site visits during the course of the evaluation.

KEY FINDINGS

Teachers used the Guide as recommended, confirming its teacher-friendly design. They introduced their students to the concept of inquiry science through substantive use of the three units. Guide usage patterns suggest teachers became more involved over time, and the Guide was flexible enough to support teacher experimentation with the activities.

Teachers used the Guide units for three to four weeks, as recommended. To our knowledge, this represents an extended focus on science at the preschool level. Moreover, the longer teachers used the Guide, the more time they spent with each unit; they used the second and third units for a week longer than they had used the first unit.

The activities worked well for teachers in their original form, and teachers did not routinely make changes to them. However, more than two-thirds (69%) of the teachers experimented with changes to the activities at some point during their use of the Guide. More than half (56%) of the teachers routinely tried the activities on their own before using them with children, as suggested in the Guide.

Teachers sent the Family Letter home, used the Spanish version of the letter, and gave the children something related to the unit to take home. The use of the letters increased over the course of the units. Although a majority of teachers did not lend videos to families, the percentage doing so increased from 9% for the first unit to 41% for the third unit.

Teachers reacted positively to the Guide. It was a good fit for their classrooms and curricula, it was easy for them to use, and it engaged their students. Most important, it supported their teaching of inquiry science and its integration with literacy and language, both of which were new objectives for many of the participating teachers.

The vast majority of teachers were highly satisfied with all aspects of the Explorer's Guide, including its content, materials, and usability. On average, across all aspects or units of the Guide:

- 83% of teachers were *very* or *extremely* satisfied (the top two ratings)
- 96% found it *very* or *extremely* easy to use the Guide
- 98% found it *very* or *extremely* easy to follow the directions for the activities
- 80% found it *very* or *extremely* easy to incorporate the activities into their curriculum
    - 89% had the necessary space to conduct the activities *most* or *all* of the time
    - 78% had easy access to materials *most* or *all* of the time
- 96% thought the variety of unit activities was *just right*
- 88% thought the number of activities per unit was *just right*

Further, teachers reported the shadow, water, and plant unit activities were very appealing to the children in their classrooms. On a scale of 1-5, with 1 equal to *not at all appealing* and 5 equal to *extremely appealing*, average appeal ratings were 4.2, 4.2, and 3.8, respectively.

Finally, teachers said the Guide enabled connections between science, literacy and language. On a scale of 1-5, with 1 equal to *not at all useful* in making these connections and 5 equal to *extremely useful*, the average usefulness rating was 4.1.

The challenges of teaching preschool science were alleviated after using the Explorer's Guide. After using the Guide, teachers were more confident introducing and leading hands-on science activities in each of the three topic areas addressed by the Guide, and they were better able to create an instructional environment supportive of science education.

After using the Guide, teachers found it less challenging to lead their students in hands-on activities about shadows, water, and plants, teach language and literacy during science activities, teach math during science activities, ask children to share their ideas during small group discussions, and ask children open-ended questions during science activities. As one example of changes in the conduct of hands-on activities, 38% of teachers reported using their water tables in new inquiry-based ways during their science teaching.

Prior to using the Guide, teachers reported they often used most of the instructional practices promoted by the Guide. Therefore, there was little change after using the Guide. Two (out of seven) ways in which instructional practice was different after using the Guide included:

1. more frequent teaching of math during science activities; while teachers often taught math during science activities before using the Guide, they almost always did so afterwards, and
2. more frequent use of videos or TV segments when teaching science; teachers almost never did this before using the Guide, and sometimes did it after using the Guide.

In summary, this external evaluation of the PEEP Explorer's Guide found the Guide effective in meeting its goals. Teachers who used the Guide were extremely satisfied with its content, materials, and usability. They reported the Guide was highly appealing to children, and they used materials from the Guide to forge home-school connections. Teachers found the Guide made useful links between science, literacy, and language. Pre-post comparisons demonstrated that, while teachers were engaged in similar instructional practices before and after using the Guide, the Guide alleviated the challenges of teaching preschool science.

INTRODUCTION

PEEP and the Big Wide World is a multi-media project created and produced by WGBH in Boston. The project aims to innovatively introduce preschoolers to science through a children's television program, web-based interactive games, and an educational resources for parents and teachers.

WGBH contracted with Goodman Research Group, Inc. (GRG) to conduct a summative evaluation of the first season of PEEP and the Big Wide World (PEEP) project. The evaluation individually assessed the outcomes of the television program, the web-based interactive games, and the Explorer's Guide created for teachers. The findings and conclusions for each component have been delivered to WGBH in separate reports.

This report describes the evaluation conducted of the Explorer's Guide, an educational resource for preschool teachers. The Explorer's Guide is a three-unit activity guide intended to provide preschool teachers with guidance and ideas for leading hands-on science activities in their classrooms.

Prior to broadly disseminating the Explorer's Guide to the public, WGBH partnered with Head Start to pilot the Guide in several Head Start classrooms across the country. The findings from this evaluation are intended to inform the final development of the Guide, prior to WGBH initiating broader dissemination strategies. The evaluation was guided by three key questions:

1. How do teachers use the Guide in their classrooms?
2. What are teachers' reactions to the Guide?
3. Do teachers have improved attitudes and practices about teaching preschool science after using the Guide?

METHODS AND MEASURES

The pilot involved Head Start classrooms in Chicago (IL), Dorchester (MA), Los Angeles (CA), and Marietta (GA). Prior to beginning to use the Guide, the participating Head Starts attended a one-day workshop led by WGBH. The workshop introduced the teachers to the overall PEEP project, and provided them with an orientation and first-hand look at the Explorer's Guide.

The evaluation applied a pre-post survey design to assess changes in teachers' attitudes and practices with leading hands-on science activities with their students. Results must be viewed in light of the fact there was no comparison group. Prior to the introductory workshop, GRG developed and administered a **baseline survey** to teachers. The baseline survey collected information from the teachers about their professional background, current classroom practices concerning science activities, and their knowledge of and comfort with leading hands-on science activities.

Lead teachers and classroom assistants were invited to attend the workshop, but evaluation activities were limited to the lead teacher from each participating Head Start classroom. Lead teachers at all four sites were given the baseline survey prior to the workshop, and they were asked to bring the completed survey with them to the workshop.

The Explorer's Guide consists of three units, each of which was to be used in the classrooms for up to four weeks. All classrooms agreed to use the units in the same order and were encouraged but not required to use each unit for a full four weeks. The units, in order of use, were Explore Shadows, Explore Water, and Explore Plants.

GRG developed **unit-specific surveys** for teachers to complete at the end of each four week interval. The Head Start contact was responsible for distributing the surveys to the participating teachers and to return the completed surveys to GRG. GRG provided the Head Start contacts with postage-paid return envelopes.

After teachers had used all three units for up to four weeks each, GRG developed and administered the **post-survey**. The post-survey included questions about teachers' overall opinions about the Guide, as well as questions included on the baseline survey for the purposes of assessing changes in attitudes and practices.

While using the last unit, the plant unit, GRG conducted **site visits** with two of the four sites: Dorchester, MA and Los Angeles, CA. At both sites, GRG visited multiple classrooms participating in the pilot and, when feasible, observed a lead teacher engaging students with a PEEP-related activity. The purpose for conducting the site visits was to inform and support the interpretation of the survey data.

EVALUATION FINDINGS

Following a profile of the sample, the key findings from the evaluation are presented as they relate to the evaluation questions about teachers' use of the Guide, their opinions about the Guide, and changes in their science teaching.

PROFILE OF THE SAMPLE

Fifty-eight lead teachers from four Head Starts participated in the study. Table 1 identifies the number of participants from each site.

Table 1
Respondents by Site

	TOTAL
Chicago, IL	**11**
Dorchester, MA	**13**
Los Angeles, CA	**22**
Marietta, GA	**12**
TOTAL	**58**

The sample consisted primarily of female (97%) teachers who had been teaching for an average of six years, and who had also taught at their respective centers for an average of six years. The evaluation methods asked for only the lead teacher to complete the evaluation surveys, but as determined by the survey responses, the participants included both lead teachers (60%) and non-lead teachers (40%).

All of the children in the participants' classrooms were between the ages of three and five; on average, teachers had twenty children in their classrooms. Eighty-nine percent of the participants said that they have children in their class who speak languages other than English in their homes. The languages being spoken at home included Spanish (62% of responses), Cape Verdean (10%), Creole (10%), Vietnamese (10%), Farsi (5%), and French (3%).

TEACHERS' USE OF THE GUIDE

In order to answer the question of how teachers used the Guide in their classrooms, we asked about the number of weeks over which they used the three units, which outdoor and indoor activities they used, which animated and live-action videos they used, and which family materials they sent home for parents and children. This section of the report presents those results.

Length of Use

Teachers used the Guide units for three to four weeks, as recommended. To our knowledge, this represents an extended focus on science at the preschool level. Moreover, the longer teachers used the Guide, the more time they spent with each unit; on average, they used the second and third units for a week longer than they had used the first unit, as shown in Table 2.

Table 2
Length of Use of the Explorer's Guide Units

Unit	% of sample that used unit for …					Average # weeks
	5 weeks	4 weeks	3 weeks	2 weeks	1 week	
Shadow (N = 48)	0%	50%	25%	17%	8%	3
Water (N = 48)	19%	44%	29%	8%	0%	4
Plant (N = 44)	9%	61%	21%	7%	2%	4

Use of Activities

Shadow Activities

On average, about three-quarters of respondents tried outdoor and indoor shadow activities. The most tried shadow activity was Flashlight Shadows: All Sorts of Shadows. Compared to their use of other activities, fewer teachers tried the Shadow Theater activities; still, six in ten did try them. These results are displayed below in Table 3.

Table 3
Use of the Explore Shadow Activities

Shadow Activities	% of sample that tried the activity
Outdoor Activities	
Take a closer look	78%
Friendly Shadows	75%
Shrinking and Stretching Shadows	67%
Average	73%
Indoor Activities	
Lamp Shadows: Shadow Shapes	80%
Lamp Shadows: Big and Little Shadows	76%
Flashlight Shadows: All Sorts of Shadows	98%
Flashlight Shadows: Making Many Shadows	89%
Shadow Theater: Large Shadow Theater	59%
Shadow Theater: Mini Shadow Theater	60%
Average	77%

N = 45-48

Water Activities

Table 4 shows the use of the water activities. Nearly all of the respondents tried the indoor water activities, and six in ten tried the outdoor activities. All the respondents did the Floating and Sinking activity, while fewer (half) tried Making Rivers and Disappearing Water.

Table 4
Use of the Explore Water Activities

Water Activities	% of sample that tried the activity
Outdoor Activities	
Making Rivers	53%
Disappearing Water	53%
Water Drops	71%
Average	59%
Indoor Activities	
Pour, Squirt and Pump	96%
Floating and Sinking	100%
Water Drops	84%
Average	93%

N = 45-49

Regarding outdoor water activities, 71% of the respondents indicated they had access to water outside and 85% had tried outdoor water explorations with children before. While 89% were impacted by the time of year and were hampered in trying the outdoor activities, 79% of participants had the opportunity to incorporate rain or snow into the children's water explorations.

Participants were asked to describe which of the activities were most and least successful. The most commonly cited successful activities were Disappearing Water (Painting with water), Making Rivers, and Floating and Sinking. Fewer activities were identified as being unsuccessful but, when mentioned, included Pour, Squirt and Pump and Making Rivers. An interesting note is that Making Rivers was frequently mentioned in both the most and least successful categories, suggesting that it either worked really well or not at all.

One hundred percent of the participating classrooms had a water table, and 38% changed their use of the water table as a result of the water unit. The following changes provide an example of changes in the conduct of teachers' hands-on activities:

- Added more or different toys (n = 14)
- Used fewer toys and added more water (n = 3)
- Added snow and ice (n = 2)

Ninety-six percent of respondents said that preschoolers were able to manipulate and use the pipettes, and respondents overwhelmingly thought the pipettes were a useful tool for learning about water and developing children's fine motor skills.

Plant Activities

About two-thirds of respondents, on average, tried outdoor plant activities, while three-quarters tried indoor activities. Eighty percent of participants reported having tried outdoor plant explorations with their children before. Bean Seeds, Grass Seeds, and Look Inside stood out as the most tried activities. Salad sprouts stood out as the only activity tried by less than half of the sample.

Table 5
Use of the Explore Plants Activities

Plant Activities	% of sample that tried the activity
Outdoor Activities	
Trees	56%
Plants on the Ground	68%
Bringing Plants Indoors	67%
Basic Plant Needs	64%
Average	64%
Indoor Activities	
Bean Seeds	96%
Grass Seeds	96%
Onion Bulbs	54%
Measuring Plants	79%
Look Inside	95%
Salad Sprouts	29%
Growing Seeds and Bulbs	81%
Plants We Can Eat	59%
Basic Plant Needs	86%
Average	75%

N = 41-45

Participants' opinions about the most successful plant activities covered the full range of activities, from observing plants on nature walks and growing seeds of their own to tracing the bark on trees. One teacher commented that the children "were really intrigued with the grass and plants outdoors after planting their own."

Teachers' opinions about the least successful plant activities were fewer in number than their opinions about the most successful activities and more narrowly focused. The outdoor activities were less successful than the indoor activities because of the time of year and the prohibitive nature of the weather. In many cases, it was either too cold, too wet or too dark to successfully implement many of the outdoor activities. The two most common limitations to the indoor plant activities were that the seeds didn't grow and that the children had a hard time understanding the activity about measurement.

Teachers' Preparation to Use Activities

On average, more than half (56%) of the teachers routinely tried the activities on their own before using them with children, as suggested in the Guide. Teachers did not routinely make changes to the activities. See Table 6.

Table 6
Teachers' Preparation to Use Activities

	% of respondents that tried activities on their own *most or all of the time*	% of respondents that made changes to activities *most or all of the time*
Shadow (N = 49)	65%	14%
Water (N = 48)	54%	10%
Plant (N = 43-44)	48%	13%
Average	56%	12%

Use of PEEP Videos

Tables 7-9 show the percentages of respondents who showed the videos to their classes, for each unit. On average, six in ten participating teachers used the videos. A slightly higher than average percentage of teachers used the "Shadow Play" animation (71%), and a slightly lower percentage than average used "Exploring Small Space" live-action clip (54%).

Table 7
Use of Shadow Videos

Videos	**% of respondents that showed the video**
PEEP Story "Shadow Play" (animation)	71%
PEEP Story "Night Light" (animation)	68%
Kids Explore "Making Shadows" (live-action)	61%
Kids Explore "Watching Shadows Change" (live-action)	59%
Kids Explore "Playing with Shadow Puppets" (live-action)	57%
Average	63%

N = 44

Table 8
Use of Water Videos

Videos	% of respondents that showed the video
PEEP Story "Fish Museum" (animation)	58%
PEEP Story "Quack Loses His Hat" (animation)	62%
Kids Explore "Making Boats" (live-action)	61%
Kids Explore "Making Rivers" (live-action)	60%
Kids Explore "Making Things Float and Sink" (live-action)	67%
Kids Explore "Painting with Water" (live-action)	59%
Kids Explore "Watching Water Move Things" (live-action)	62%
Average	61%

N = 42

Table 9
Use of Plant Videos

Videos	% of respondents that showed the video
PEEP Story "Peep Feet" (animation)	61%
PEEP Story "Peep Plants a Seed" (animation)	64%
PEEP Story "The Root Problem" (animation)	58%
PEEP Story "Save it for Later" (animation)	57%
Kids Explore "Collecting and Sorting" (live-action)	58%
Kids Explore "Experimenting with Seeds" (live-action)	59%
Kids Explore "Exploring Small Space" (live-action)	54%
Kids Explore "Measuring Heights" (live-action)	55%
Average	58%

N = 41

Respondents indicated that they primarily used the videos as an introduction to an activity in the Guide. When asked why they might not have shown the PEEP videos in class, respondents indicated one of three reasons: not enough time, too complicated to secure the equipment, and the school has a policy that doesn't allow the showing of videos.

Among the videos for the three units, there were eight animated stories and 12 live-action clips. When asked, a majority of respondents did not have a preference for one or the other. Of those who did have a preference, most preferred the animated stories. Table 10 shows these results for each unit. Moreover, there was no significant difference in use of animated versus live-action video segments; on average, 62% of the sample used animated stories and 59% used live-action clips.

Table 10
Preference for Animated Versus Live-action Clips

Unit	No preference	Preferred animated	Preferred live action
Shadow (N = 32)	69%	28%	3%
Water (N = 39)	79%	15%	6%
Plant (N = 31)	94%	6%	0%

Use of Recommended Books, Videos and Web site

Sixty percent of the respondents indicated that they used the recommended books that were included in the Guide. Respondents also used books other than those that were recommended. Several of the respondents indicated that they used the recommended books for circle activities or integrated the books with the PEEP activities either as an introduction or closing to the activity. Multiple respondents commented that they were able to find many of the books in the library.

While not an expectation for using the Guide, about one in ten respondents (9%) said that they used ideas from the PEEP Web site in their classroom. Reasons given for not using the Web site included not having an internet connection and simply feeling that "there was plenty in the unit to work with in the classroom."

Use of Family Resources

The units included several resources that could be shared with families (See Table 11). Of the available resources, most teachers sent the family letter home, used the Spanish version of the letter, and gave the children materials to take home. The use of the letters increased over the course of the units. Although a majority of teachers did not lend videos to families, the percentage doing so increased from 9% for the first unit to 41% for the third unit.

Table 11
Sharing resources with families

	% of teachers who shared resources with families		
	Shadow (N = 43-44)	Water (N = 46-48)	Plant (N = 42-44)
Sent family letter home	78%	83%	89%
Used Spanish version of letter	65%	78%	80%
Gave children materials*	77%	73%	68%
Lend a video to a child or family	9%	34%	41%

*Materials included a flashlight for the Shadow Unit, a pipette for the Water Unit, and a magnifying lens for the Plant Unit.

TEACHERS' REACTIONS TO THE GUIDE

Satisfaction with the Guide

After having the opportunity to try all three units for up to twelve weeks, participants were asked to share their overall opinions of the Explorer's Guide. Respondents rated their satisfaction with the Guide on several dimensions using a 1-5 scale, with 1 equal to *not at all satisfied* and 5 equal to *extremely satisfied*. Close to 80% of respondents were either very or extremely satisfied with each of the aspects of the Guide. Table 12 shows the distribution of responses.

Table 12
Satisfaction with the Guide

How satisfied were you with:	Not at all satisfied	A little satisfied	Moderately Satisfied	Very satisfied	Extremely satisfied
The format	0%	0%	11%	66%	23%
The ease of use	0%	0%	16%	58%	27%
Teacher Preparation Section	0%	0%	16%	62%	22%
Classroom Preparation Section	0%	2%	16%	62%	20%
Indoor Activities	0%	0%	11%	62%	27%
Outdoor Activities	2%	5%	21%	51%	21%
Videos	7%	2%	5%	49%	37%
Family Letters	2%	2%	11%	48%	36%
Family Take-Home Materials	9%	2%	14%	32%	43%

N = 42-45

Presented another way, the average ratings in Table 13 show that teachers' satisfaction was quite consistent across different aspects of the Guide. Their satisfaction with indoor activities was a bit above the overall average rating for the Guide, while their satisfaction with outdoor activities dipped somewhat below the average.

Table 13
Average Satisfaction Ratings

How satisfied were you with:	Average Rating
The format	4.1
The ease of use	4.1
Teacher Preparation Section	4.1
Classroom Preparation Section	4.0
Indoor Activities	4.2
Outdoor Activities	3.8
Videos	4.1
Family Letters	4.1
Family Take-Home Materials	4.0
Average across all aspects	**4.1**

N = 42-45

In addition to rating their overall satisfaction with the Guide, respondents also gave their opinions on whether the variety and number of activities per unit was just right, not enough, or too much. Table 14 presents their opinions. Nearly all respondents thought the variety and number of activities was just right. Of note, one in ten respondents thought there were not enough activities in the water unit.

Table 14
Satisfaction with Variety and Number of Activities per Unit

Unit	Variety of Activities			Number of Activities		
	Just right	Not enough	Too much	Just right	Not enough	Too much
Shadow	94%	4%	2%	90%	6%	4%
Water	96%	4%	0%	83%	13%	4%
Plant	98%	2%	0%	91%	7%	2%

Teachers also rated the Guide's "Classroom Close-Up" segments, intended to provide them with descriptions of other teachers' experiences with shadow, water, and plant science. On average, respondents found these segments to be *very useful* (average rating of 4.0 on a 1-5 scale, with 1 equal to *not at all useful* and 5 equal to *extremely useful*). Respondents further commented on the usefulness of the segments by highlighting that the Close-Up segments provide teachers with "encouragement," "things to look for with the children," and "ideas on how to close the particular segment that the class was working on." One respondent commented that "it was good to hear how the exploration occurred in other rooms and to be more open-minded to other explorations."

Finally, the schedule for doing indoor and outdoor activities during the plant unit was different from the shadow and water unit. The plant unit prescribed which activities to do each week and included both indoor and outdoor activities. Within the water and shadow units, the indoor activities were listed separately

from outdoor activities and the units did not specify which activities to do each week. Sixty percent of respondents did not have a preference, while the remaining 40% of respondents were equally split in their preferences for each structure.

Ease of Using the Guide

Respondents rated the ease of using the Guide with a 1-5 scale, with 1 equal to *not at all easy* and 5 equal to *extremely easy*. Over 90% of respondents found using the Guide and following the activity directions very or extremely easy, while 80% of respondents found it very or extremely easy to incorporate the PEEP activities into their curriculum. Table 15 shows the distribution of responses.

Table 15
Ease of Using the Guide

How easy was it to:	**Not at all easy**	**A little easy**	**Moderately easy**	**Very easy**	**Extremely Easy**
Use the Guide	0%	0%	5%	61%	35%
Follow the activity directions	0%	0%	2%	65%	33%
Incorporate the PEEP activities into your curriculum	2%	2%	16%	54%	26%

N = 43

Respondents also rated the ease of using the individual unit activities. Table 16 shows the distribution of responses. The vast majority of respondents found the directions clear, had space in their classrooms to set up the activities, and found the materials necessary to conduct the activities. Compared to the other units, respondents had a slightly more difficult time locating materials for the plant unit. The reasons for this could not be determined.

Table 16
Ease of Using Unit Activities

	directions clear *most or all of the time*	space for activities *most or all of the time*	found materials *most or all of the time*
Shadow (N = 49)	98%	90%	86%
Water (N=48)	98%	94%	86%
Plant (N=43-44)	93%	84%	61%

N=43-49

Perceived Appeal and Educational Value of the Unit Activities

Teachers reported the shadow, water, and plant unit activities were very appealing to the children in their classrooms. On a scale of 1-5, with 1 equal to *not at all appealing* and 5 equal to *extremely appealing*, average appeal ratings were 4.2, 4.2, and 3.8, respectively.

In particular, teachers thought the shadow unit taught the children in their classrooms many things about light and shadow, including that in order to see shadows there must be some source of light, and how to manipulate the size and shape of shadows by modifying the light source and its relation to an object. Teachers thought the water unit taught the children in their classrooms about how water moves and changes shape (n = 18), about floating and sinking (n = 16), about different states of water (n = 13), and about uses of water (n = 7). Finally, teachers indicated that the plant unit taught the children in their classrooms about the different parts of plants and what plants need to grow. For example, "They learned that some plants can be eaten, some grow as trees, others as vines, and that some plants need more light to grow than others…"

Usefulness of the Guide in Making Science, Literacy and Language Connections

Participants were asked to what extent the Guide made useful connections between science, literacy, and language, using a 1-5 scale with 1 equal to *not at all useful* and 5 equal to *extremely useful*. On average, respondents said that the Guide made *very useful* connections between science, literacy, and language (average rating of 4.1). The high rating indicates the Guide supported respondents' teaching of inquiry science and its integration with literacy and language. During the workshop and the site visits, we learned that both of these objectives were new for many of the participating teachers.

In addition to completing the rating scales, some respondents wrote comments about the Guide's ability to make cross-discipline connections. In particular, their comments highlighted children's acquisition of science vocabulary. The following are representative quotes.

> *"It gave concepts the children could work on as well as vocabulary words to work on."*

> *"I felt that the science experiments tied in very well with literacy and language. The children learned new science words and names of different tools."*

> *"It increased my children's vocabulary and concrete thinking skills. It helped with measurement, predicting, and writing."*

Perceived Influence of Training on Use of the Guide

Participants in this pilot had the benefit of attending the one-day workshop. The national rollout of the Guide will be accompanied by some training at regional conferences. As a result, the developers of the Guide were very interested in learning how the participants' use of the Guide might differ had they not attended the workshop.

Twenty-four of the 58 participating teachers responded to a question about this. Ten of them (42%) said their use of the Guide would have been no different. The remaining 14 (58%) teachers said that without the training using the Guide would have been more difficult. More specifically, respondents thought they would have missed important information and that they benefited from observing and trying the hands-on activities as a form of modeling. Additionally, some respondents commented that if they didn't have the training, they would have needed to read the Guide more carefully and more thoroughly. The training allowed them to use the Guide more as a guide and less as an instructional manual.

Preparing Other Teachers to Use the Units

Participants were asked if they had not participated in the training, what information they would recommend that teachers be given instead in order to facilitate their use of the units. They also were asked to share what they would change, if anything, about the units. Two main themes emerged from their responses.

First, respondents emphasized that, without the training, teachers need to be encouraged to try the activities themselves before doing them with their students. In addition, five of 12 teachers making suggestions about the Shadow unit said that teachers would need more time to plan for the activities.

Second, respondents suggested conducting the activities in the spring or summer, not the winter. Seven of 12 teachers commenting on the Shadow unit, nine of 14 teachers commenting on the Water unit, and four of six teachers writing about the Plant unit expressed concerns about doing the activities in the winter. Most concerns had to do with weather interfering with doing outdoor activities.

In addition, relative to each unit, a couple of teachers commented on materials. They suggested that teachers would need the materials to be provided to them, that teachers should ensure their centers have the materials they would need, that teachers would need time to locate the materials, and that materials might be cost prohibitive for some teachers.

Other comments/suggestions included the following:

- that it was somewhat more difficult to successfully execute the Shadow activities than the Guide suggested
- that the Guide include a list of toxic common plants and easy to grow unusual plants, and also more explanation about what helps plants to grow
- that there be shorter activity times for three year olds, and
- that there be more science information about water in the Water unit.

CHANGES IN TEACHERS' ATTITUDES AND PRACTICES ABOUT TEACHING PRESCHOOL SCIENCE

Two categories of pre-post questions were asked of the pilot participants: questions having to do with the challenge involved with leading preschool science activities, and questions about teachers' likelihood of applying certain classroom practices.

Changes in Reported Challenges of Teaching Preschool Science

Participants were asked before and after using the Explorer's Guide to rate how challenging it was for them to lead hands-on science activities about shadows, water and plants. Respondents rated the degree of challenge they faced using a 1-5 scale, with 1 equal to *not at all challenging*, 2 equal to *a little challenging*, 3 equal to *somewhat challenging*, 4 equal to *very challenging*, and 5 equal to *extremely challenging*. Table 17 shows the average ratings before and after using the Guide.

Table 17
The Challenge of Leading Hands-on Science Activities

How challenging is it to lead children in hands-on science activities about:	**Before**	**After**
Shadows	3.1	1.6*
Water	2.3	1.5*
Plants	2.4	1.5*

N = 21-32; * The mean ratings significantly differ at the level of p<. 01

As the numbers in Table 17 suggest, the responding teachers were significantly less challenged by leading their students in hands-on activities about shadows, water, and plants after using the Explorer's Guide.

Participants were also asked to rate their perceptions of how challenging several instructional strategies were for them both prior to and following their use of the Guide. Respondents made their ratings with the same 1-5 scale described above. Table 18 shows the average ratings before and after using the Guide.

The averages presented in Table 18 indicate that following their use of the Explorer's Guide, teachers felt considerably less challenged by the following:

- teaching language and literacy during science activities,
- teaching math during science activities,
- asking children to share their ideas during small group discussions, and
- asking children open-ended questions during science activities.

Table 18
The Challenge of Applying Certain Instructional Strategies

How challenging is it for you to:	Before	After
Use videos or TV segments when teaching science	2.6	2.7
Ask children to share their ideas in small group discussions	2.5	1.8*
Teach language and literacy during science activities	2.2	1.5*
Teach math during science activities	2.2	1.4*
Ask children open-ended questions during science activities	2.2	1.4*
Try out new materials before doing the activity for the first time	1.9	1.8
Play alongside children to model science process skills	1.6	1.3

N = 14-27; * The mean ratings significantly differ at the level of p<. 01

The averages also show that before and after using the Guide, teachers were only *a little challenged* (rating of 2.0) by the practices of trying out new materials before doing an activity for the first time and playing alongside children to model science process skills. Further, before and after using the Guide, respondents thought it was *somewhat challenging* (rating of 3.0) to use videos or TV segments when teaching science.

Before and after using the guide, respondents indicated their biggest challenges in doing hands-on science activities. The most striking difference between the pre- and post-challenges was that prior to using the Guide, 12 of the 29 said their biggest challenge was locating age-appropriate activities. Not one person indicated this as a challenge after using the Guide.

After using the Guide for up to 12 weeks, 24 respondents identified seven remaining categories of challenge.

- Lack of time in the daily schedule, including time for preparation (n=7)
- Classroom management (e.g., challenges of whole group learning) (n= 6)
- Limited availability of materials (n = 4)
- Difficult to engage children's curiosity (n = 4)
- Absence of support from teaching teammates (n = 2)
- Lack of knowledge about topics (n =1)

Changes in Reported Likelihood of Practicing Key Instructional Strategies

Participants were asked before and after using the Explorer's Guide to rate how often they apply a number of instructional strategies using a 1-5 scale, with 1 equal to *never*, 2 equal to *rarely*, 3 equal to *sometimes*, 4 equal to *often*, and 5 equal to *always*. Table 19 shows the average ratings before and after using the Guide.

Table 19
Frequency of Applying Certain Instructional Strategies

How often do you:	**Before**	**After**
Teach language and literacy during science activities	4.5	4.6
Teach math during science activities	4.1	4.5*
Ask children to share their ideas in small group discussions	3.9	4.3
Try out new materials before doing the activity for the first time	4.0	3.8
Play alongside children to model science process skills	4.4	4.7
Ask children open-ended questions during science activities	4.7	4.8
Use videos or TV segments when teaching science	1.2	2.6**

N = 30-31
* The mean ratings significantly differ at the level of p<. 05
** The mean ratings significantly differ at the level of p<. 01

The pre-post averages presented in Table 19 show that there was little, if any, change in respondents' frequency of engaging in the instructional strategies of interest. The only changes in teachers' use of the presented instructional strategies were increases in how often teachers' taught math during science activities and used videos or TV segments when teaching science.

Using a different scale than the one described with Table 19, participants were asked before and after using the Guide how likely they were to do hands-on activities outdoors. Respondents were asked to use a 1-5 scale, with 1 equal to *not at all likely*, 2 *equal to a little likely*, 3 equal to *somewhat likely*, 4 equal to *very likely*, and 5 equal to *extremely likely*. Respondents' ratings did not differ between the pre- and post-survey. Both before and after using the Guide, respondents indicated that they were *somewhat* or *very likely* to lead science activities outdoors (mean ratings of 3.7 on pre-survey and 3.8 on post-survey).

CONCLUSIONS AND RECOMMENDATIONS

This report summarizes the data collected to evaluate the PEEP Explorer's Guide; a three-unit activity guide intended to provide preschool teachers with guidance and ideas for leading hands-on science activities in their classrooms. The goals of this evaluation were to examine how teachers used the Guide in their Head Start classrooms, to obtain teachers' opinions about the individual units and the Guide overall, and to assess the impact of using the Guide on teachers' comfort and efficacy in leading hands-on science activities with preschoolers. The following conclusions were drawn from the pre-post survey data collected from participating Head Start teachers.

All three units were easily integrated into the classrooms.

Very few participants felt it was necessary to make modifications to the units; suggesting that the units could be easily adapted to a variety of classrooms.

Nearly all respondents (more than 80%) indicated that across all three units the activity directions were easy to follow all or most of the time. Respondents also indicated that it was easy to locate a space to do the activities all or most of the time.

Close to 90% of respondents said that it was easy to locate materials for the shadow and water units all or most of the time, but only 60% of respondents thought it was easy to locate the materials for the plant unit all or most of the time. Close to half of the respondents indicated that they tried the activities on their own before leading their students in those same activities.

Close to 80% of respondents were very or extremely satisfied with the Explorer's Guide.

More than 80% of the respondents were very or extremely satisfied with the format and ease of using the Guide. Of the various components to the Guide, more than 80% of respondents were also very or extremely satisfied with the Teacher and Classroom Preparation sections, Indoor Activities, Videos and Family Letters.

Compared to other aspects of the Guide, respondents were slightly less satisfied with the Outdoor Activities. Teachers cited weather conditions as the primary obstacle in successfully doing the outdoor activities.

Nearly all respondents indicated that the activity directions very or extremely easy to follow and more than three-quarters of respondents found it very or extremely easy to incorporate the PEEP activities into their curriculum.

Teachers' appreciated the inclusion of the Classroom Close-Ups and Recommended Books.

Respondents found the "Classroom Close-Up" segments to be very useful, especially with respect to providing a realistic view of other classroom's science explorations. Respondents commented that they appreciated learning how other teachers lead hands-on science activities and several respondents gained new ideas.

Just over half of the respondents indicated that they used the recommended books that were included in the Guide either for circle activities or as an introduction or closing to an activity. Multiple respondents commented that they were able to find many of the books in the library, and some respondents indicated that they incorporated books of their own.

Teachers' thought the Guide made successful connections between language, literacy and science.

More than 85% of respondents said that the Guide made very or extremely useful connections between science, literacy, and language, particularly by providing children with new and expanded vocabulary.

The introductory workshop contributed to teachers' successful and positive experiences using the Guide.

More than half of the respondents said that using the Guide would have been more difficult if they had not attended the workshop. Respondents benefited from observing and trying the hands-on activities with guidance from the developers, and in the absence of the workshop they would have needed to read the Guide more carefully and thoroughly.

As a result of using the Explorer's Guide, the amount of challenge associated with leading hands-on science activities with preschoolers decreased.

After using the Guide for up to twelve weeks, teachers indicated that it was significantly less challenging to lead students in hands-on activities about shadows, water, and plants.

Respondents also reported that after using the Guide, they felt considerably less challenged by:

- teaching language, literacy, and math during science activities,
- asking children to share their ideas during small group discussions, and
- asking children open-ended questions during science activities.

Respondents' perceptions of challenge did not change with regard to trying out new materials beforehand, playing alongside children to model skills, or using videos or TV segments when teaching. In the case of trying out new materials and playing alongside children, the respondents did not find this to be challenging before or after using the Guide. With respect to using videos or TV

segments, teachers considered this to be somewhat challenging before and after using the Guide.

Prior to using the Guide, teachers reported they often used most of the instructional practices promoted by the Guide, and there was little change after using the Guide.

The Guide included seven instructional strategies considered to be important classroom practices. Teachers' pre-post responses show that there was little, if any, change in respondents' frequency of engaging in the instructional strategies of interest. Before and after using the Guide, respondents were very or extremely likely to apply five of the seven strategies in their classrooms (e.g., asking children to share their ideas, asking children open-ended questions, modeling skills for children). The absence of change is likely due to the fact that teachers were already frequently using these strategies in their classrooms prior to using the Guide.

Teachers' use of two classroom practices did increase following their use of the Guide; respondents were significantly more likely to teach math during science activities and to use videos or TV segments when teaching science after using the Guide.

In consideration of the fact that the national rollout of the Explorer's Guide may not include an orientation workshop or the provision of materials, GRG offers the following recommendations:

- Teachers will need to be able to identify the needed materials quickly and simply. It may be helpful to give suggestions for where materials can be found, to differentiate necessary materials from recommended materials, and to include materials checklists.
- Consider whether it is possible to develop alternate forms of the workshop so that teachers have an opportunity to get a first-hand look at some of the activities. For example, packaging a CD-ROM or instructional video with the Guide.
- Consider whether or not to further encourage teachers' to lead outdoor activities. Weather was cited as a significant barrier for many participants.

In summary, this external evaluation of the PEEP Explorer's Guide found the Guide effective in meeting its goals. Teachers who used the Guide were extremely satisfied with its content, materials, and usability. They reported the Guide was highly appealing to children, and they used materials from the Guide to forge home-school connections. Teachers found the Guide made useful links between science, literacy, and language. Pre-post comparisons demonstrated that, while teachers were engaged in similar instructional practices before and after using the Guide, the Guide alleviated the challenges of teaching preschool science.