

# **Building Vocabulary in Young Children by Playing Card Games that Use Smithsonian Collections**

## **Final Evaluation Report**

**Submitted by  
Goodling Institute for Research in Family Literacy  
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## Introduction

Museums offer children, adults, and families opportunities to explore and wonder about new ideas and concepts. However, museum collections are not accessible to those who cannot visit the museum. The Smithsonian Center for Learning and Digital Access (SCLDA) has addressed this dilemma by providing access to its vast resources through digital media with a goal of enhancing learning for educators and others.

SCLDA launched the Smithsonian Learning Lab in June 2016 to enable educators to access all of the Smithsonian's digital collections, putting "the treasures of the world's largest museum, education, and research complex within reach" (Smithsonian Learning Lab website, <https://learninglab.si.edu/>). Educators can develop games and products based on Smithsonian content and collections to support their classroom curriculum as well as to match children's individual interests. The Lab also provides educators with new ideas and methods to augment their teaching strategies.

In Spring 2018, SCLDA engaged the Goodling Institute for Research in Family Literacy at Pennsylvania State University to evaluate the implementation of several Smithsonian Learning Lab collections in classrooms with young learners, as part of the Caplan Foundation for Early Childhood Project. The project's goal was to "increase language development in young children, especially those living in underserved areas." To achieve the goal of increasing language development, SCLDA staff produced downloadable print-and-play cards using the Smithsonian's extensive digital collections. The print-and-play card concept was based on popular card games (e.g., Apples to Apples, Innovation, Story Dice) and the questions within the game were adapted from Harvard's Project Zero *Visible Thinking* strategies.

## Smithsonian Learning Lab and Harvard's Project Zero

A unique aspect of the Learning Lab is that users can develop and personalize collections to meet the needs of their classrooms and share their ideas with a larger community of educators and learners. Each Learning Lab collection is developed from authentic resources accessed from within the Smithsonian museums' digital collections. These Learning Lab collections allow individuals to share across disciplines; mix and match resources from history, science, art, and culture; and develop collections that fit within curricula that meet the needs of each student.

Although people can freely develop their own collections in the Lab, SCLDA staff realized the importance of having a structure or pedagogy to build them. One framework that seemed to complement the purpose of the Learning Lab was Harvard's Project Zero approach—*Visible Thinking*. This approach uses thinking routines or “simple strategies for scaffolding thinking that were designed to be woven into a teacher's ongoing classroom practice” (Ritchhart, Church, & Morrison, 2011, p. xvii). The thinking routines have been used by Smithsonian staff for years (interview with Stephanie Norby) because several routines focus on the arts and many are appropriate to use with museum collections.

Project Zero thinking routines are tools for making thinking visible or, in other words, to teach thinking dispositions to deepen “learning in content areas and to foster thinking skills” (Ritchhart & Perkins, 2008, p. 5), and to enhance the skills necessary to build deeper understanding (Ritchhart, Church, & Morrison, 2011). Three “core practices” are used in the *Visible Thinking* strategy: implementing thinking routines, documenting student thinking, and reflecting on teachers' professional practice.

Project Zero developed more than 30 thinking routines divided into three categories: (1) introducing and exploring ideas, (2) synthesizing and organizing ideas, and (3) digging deeper

into ideas. The routine designated as “good with ambiguous or complex visual stimuli” and involves “describing, interpreting, and wondering” (Ritchhart, Church, & Morrison, 2011, p. 51) is the See-Think-Wonder thinking routine. This routine encourages students to think, wonder, and be curious about what they are seeing. Students are asked three questions in this routine (Ritchhart & Perkins, 2008; Ritchhart, Church, & Morrison, 2011):

- “What do you see?”
- “What do you think is going on?” or “What do you think about that?”
- “What does it make you wonder?”

### **Smithsonian Learning Lab Print-and-Play Cards**

SCLDA staff developed print-and-play card collections to encourage conversation, vocabulary, and language development in young children and to encourage children to examine, sort, and classify museum digital artifacts in the context of Project Zero’s thinking routines. The current project’s goal of enhancing young children’s language development is based on research showing that increasing children’s vocabulary, engaging in conversations, and acquiring background knowledge enhances children’s academic success (Roskos, Tabors, & Lenhart, 2004; Dickinson, Golinkoff, & Hirsh-Pasek, 2010; & Storch & Whitehurst, 2002). In particular, engaging in strategic, purposeful conversations can increase children’s vocabulary, especially if the conversations occurs in contexts related to their experiences (Wasik & Iannone-Campbell, 2012; Harris, Golinkoff, & Hirsh-Pasek, 2011).

The cards were intended to be used by educators, as well as parents, to support children’s language development and to provide a tool and ideas to expand children’s vocabulary. A second purpose was to increase accessibility of the Learning Lab’s collections since most teachers have

access to a computer and printer, but in preschool through primary school few schools provide multiple devices.

### **Evaluation Methods**

The Goodling Institute for Research in Family Literacy was tasked with evaluating the Smithsonian Learning Lab print-and-play card collections being used by four teachers in pre-K, 3-year-old classrooms. The intent of the print-and-play cards was to enhance children’s language development, especially those living in underserved areas, as well as to provide access to museum materials to those individuals who have limited access to technology.

The proposed project originally partnered with the Smithsonian Early Enrichment Center (SEEC); however, due to unforeseen circumstances, the SEEC had to discontinue its participation due to a change in administration and policy. To continue, the Washington International School (WIS) was identified as a new partner since WIS worked with a small cohort of teachers engaged in Project Zero’s Children Are Citizens<sup>1</sup> project and thinking routines.

To examine children’s language development while using the print-and-play cards, three overarching research questions were developed as well as other questions about the use of the print-and-play cards and how they were implemented with families.

- 1) Has there been a perceived change in children’s vocabulary?
- 2) How are the teachers using the Project Zero strategies?
- 3) How are teachers using or adapting the Project Zero approach?

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<sup>1</sup> Project Zero’s Children Are Citizens project began in Washington D.C. in 2014. The purpose of the project was “grounded in the belief that children are not just future citizens but are citizens of the city in the here and now, with the right to express their opinions and participate in the civic and cultural life of Washington, DC” (<http://www.pz.harvard.edu/projects/children-are-citizens>). The Children Are Citizens project is supported by the National Gallery of Art and led by WIS.

- 4) How did the Smithsonian Learning Lab print-and-play cards integrate with the Children Are Citizens project?
- 5) How were the families engaged with the Children Are Citizens project and/or the print-and-play cards?

### **Teacher Interviews**

Four early childhood education teachers, who were participating in the Project Zero Children Are Citizens project, were interviewed at J. O. Wilson Elementary School in May 2018. Interviews lasted from 30 to 45 minutes and were audio-recorded and transcribed verbatim. In 2016-2017, J. O. Wilson Elementary School's enrollment was 496 students and the student demographics were 82% black, 6% Hispanic/Latino, 7% white, 1% Asian, and 3% multiple races. One hundred percent of the students were considered economically disadvantaged and 3% of the students were English Language learners (District of Columbia Public Schools, School Profile).

### **Topics for the Children Are Citizens Project**

During Fall 2017 and Winter 2018, the four early childhood education teachers were asked to identify a Children Are Citizens topic that related to "My Community" and that the children were interested in and wanted to explore. Teachers primarily used the See-Think-Wonder routine to stimulate conversation, observations, discovery, and research about their topics as children discussed, wrote, drew, and acted out what they learned and discovered. The teachers identified the following four topics for their classrooms: Lincoln Park, Recycled Art, Trees – Mystery of the Missing Tree, and Transportation. At the end of the project, each classroom developed a chapter for a *Children Are Citizens Guidebook* that was published by the National Gallery of Art.

## Development of the Print-and-Play Card Collections

In early Spring 2018, the four teachers collaborated with SCLDA staff to develop print-and-play cards using the digital collections to support and augment the teachers' identified Children Are Citizens topic within the context of Project Zero's thinking routines. The collections on the cards were intended to be general enough to relate or be applied to any community or neighborhood, yet specific enough to be used in Washington, D.C. The challenge for the SCLDA staff was to find digital resources that balanced both of these needs. Each collection adapted the See-Think-Wonder thinking routine to fit with the particular topic.

**Lincoln Park.** The print-and-play cards included images of parks, activities that occur at parks, and other images related to parks (i.e., flowers, statues, picnic items). The pdf version of the collection can be found in Appendix A and the digital collection is at:

<https://learninglab.si.edu/collections/parks/Y541nYcNt1dGyqan>). The adapted thinking routine on the pdf included:

- **See:** Take these cards to the park. What do you see that's the same?
- **Sort:** Can you find one image from each season (spring, summer, fall, winter). How can you tell?
- **Study:** Does your park have any statues? Who are they of? What did they do? See if you can find out!

**Recycled Art.** The print-and-play cards included images of trash that were turned to art (i.e., wreaths, statues, pictures, and objects). The pdf version of the collection can be found in Appendix B and the digital collection is at: <https://learninglab.si.edu/collections/recycled-art/Xw3aNErN6HwHsVON>.

The adapted thinking routine on the pdf included:

- **See:** What materials do you see? What objects do you see?



- Spy: Play “Eye Spy” with the cards. Select an object and give a clue. Have the other players search until they’ve found the object, then they select an object to “spy.”
- Create: Using your own recyclables, make something new out of it.

**Trees – Mystery of the Missing Tree.** The print-and-play card collection had images of leaves from trees lining the streets near the elementary school. The pdf version of the collection can be found in Appendix C and the digital collection is at:

<https://learninglab.si.edu/collections/trees/1ctwaebwwpurtm5l#r>. The adapted thinking routine on the pdf included:

- Collect: Collect several tree leaves from your neighborhood.
- Compare: Do any of your leaves look like these? How are they different?
- Describe: Use this chart to describe your leaves.

**Transportation.** The print-and-play cards covered many aspects of travel including balloon, trains, boats, camels, bicycles, blimps, rockets, and boats. The pdf version of the collection can be found in Appendix D and the digital collection is at:

<https://learninglab.si.edu/collections/transportation/ceTPPGVzvKhkmBo8>. The adapted thinking routine on the pdf included:

- Look: What types of transportation can you see in each image?
- Sort by: What they travel across (land, sea, air); How they’re powered (motor, human-powered, air, etc.); When they were made (Which came first? Which is the most recent?)
- Wonder: Where do you imagine the travelers are going?

## Findings

The initial plan for the project focused on training teachers to create Learning Lab collections and use them in classrooms. For several reasons, the project team refocused the work to examine the integration of Project Zero routines into the card play. Consequently, much of the evaluation findings focus on the integration of the Project Zero thinking routines, particularly as this relates to the children's language development and how teachers implement this strategy. The teacher interviews were informative and provided information about the use of the print-and-play card collections and the three overarching research questions on language development and the Project Zero *Visible Thinking* approach. Below we outline the findings related to each question and provide additional information obtained from teachers that we believe will be helpful to SCLDA staff.

### 1) **Has there been a perceived change in children's vocabulary?**

**Vocabulary.** All four teachers viewed the integration of the thinking routines into the class as a resounding success. The four teachers agreed that there was an overall increase in words used and words incorporated into the children's speech. For example, a teacher observed that at the beginning of the year (and perhaps the beginning of the project) there was a child who engaged very little in the conversations, but as the project went on, the child became more engaged. One teacher also noted that the children's speech included more words related to inquiry such as noticing, feeling curious, and wondering.

Two teachers also mentioned that the children enjoyed the idea of doing research or collecting information to find answers to questions, such as asking an expert, looking in a book, or using the computer. For example, to understand how to make the *Children Are Citizens*

*Guidebook*, the students invited a book agent to the class, and teachers believed these discussions and interactions helped children increase vocabulary.

**Conversations.** The ability to engage in conversational discourse can be a challenge for 3-year-olds. These skills include understanding turn-taking, learning to express one's intent, providing appropriate information to listeners, learning how to build on words from conversational partners, and most importantly, taking another person's perspective (Pan & Snow, 1999). Two teachers specifically mentioned the increase in conversational turn-taking skills. For example, one teacher mentioned that "feedback loops" increased in length, where children increased their language use as well as the conversational discourse with other children and with teachers.

All of the teachers mentioned that they engaged in some type of conversational modeling, either related to how to answer the questions that were associated with the thinking routines or how to engage in conversational turn-taking. They all agreed that modeling led to an increase in conversations. One teacher indicated that in early childhood classrooms, young children are primarily asked yes/no questions. Prior to the Children Are Citizens project, if children were asked, "Can you tell me more about that," they did not know what to say. By engaging in thinking routines and open-ended questions, children grew in their ability to talk with their peers and adults.

**Expressing new ideas.** The thinking routines helped children to express new ideas and to engage in research to learn about new ideas. All four teachers mentioned that the children continued to say "I see, I think, I wonder," or a variation of this routine, in contexts outside of the Children Are Citizens project. For example, a child might "wonder" about a topic and come in the next day with additional questions.

**Influence on children’s overall development.** The *Visible Thinking* strategy allowed children to grow in several ways. First, one teacher mentioned that the children learned and had increased language about empathy, perspective-taking, and storytelling. She stated, “Project Zero [is] great at perspective-taking and I think that is one of the most important things too. Looking at the situation from a different point of view and that is really hard for 3’s [3-year-olds].”

Second, a teacher mentioned that the children felt more confident about their knowledge in that they were now “experts” about a topic and that they had published a book. The children took ownership of their learning. She also stated that the Project Zero thinking routines encouraged three learning areas in children: language, idea experts, and ability to do research. Another teacher stated that the children began to realize that there was more than one way to learn and that with the help of the teacher, the children could use the computer to get information about a subject.

## **2) How are the teachers using the Project Zero strategies?**

The four teachers varied in their expertise with the Project Zero strategies. All the teachers attended monthly seminars about the Children Are Citizens project where the purpose was to meet with other teachers in the D.C. area who were also implementing this project. A portion of the monthly seminars was to discuss implementation of the thinking routines, but another aspect was about learning how to value children’s voices. Only one teacher attended a summer training at the Washington International Summer School for Teachers and the week long training at Harvard about Project Zero.

All four teachers integrated the thinking routines throughout the school day and often embedded the routines into conversations outside of the time the teachers were engaged in the Children Are Citizens project. For example, while on the playground, one teacher asked, “What

do you see in the trees?” or “Do you think it is the wind?” or “What do you wonder about that?” This teacher mentioned using the thinking routines to act out appropriate behaviors such as how to cross a street. Another teacher stated that the vocabulary for thinking routines came up naturally throughout the day.

In general, the classroom curriculum emphasized play-based learning and one teacher mentioned connecting and reinforcing the thinking routine vocabulary while children were playing. Over time, teachers noticed that children began to use the words on their own. One teacher stated, “All of them [children] were finding ways to share those questions, or wonderings, or ideas with me in their own way, so through gesture, play, and through words.” Further, a large chart from the National Gallery of Art with the words “Seeing, Thinking, Wondering” helped teachers encourage children’s use of the thinking routine.

One teacher used the thinking routines during book reading. For example, before beginning to read, the teacher would ask the See-Think-Wonder questions about the illustrations on the book cover to help the children make predictions, which also aids comprehension. A second thinking routine, “What makes you say that?”, was often interjected into conversations to encourage children to provide support for their answers to questions.

As part of Project Zero’s *Visible Thinking* strategy, at least two of the teachers recorded or took notes of the conversations they had with the children and then later identified themes in the conversations. By engaging in this strategy, teachers were able to remind children of previous conversations and ask additional questions (e.g., “What do you think about that?”) to encourage more conversation and thinking about the topic.

Another teacher stated that the documentation of children’s conversations allowed her to reflect on the children’s conversations. She mentioned that sometimes, in the moment, a

comment from a child might not seem important, but upon later reflection, she realized that the comment would be interesting to other children and relevant to the Children Are Citizens project. She said that “kids really do benefit from looking back at their work” and that additional conversations are often triggered with these reflections. However, one teacher mentioned the challenge of note-taking, in that it was not natural for her to take notes of activities and behaviors in the classroom.

### **3) How are teachers using or adapting the Project Zero approach?**

The primary Project Zero thinking routine used by all four teachers was See-Think-Wonder. One teacher stated that “See-Think-Wonder [is] wonderful for 3-year-olds because they can tell you what they see and it...gets them thinking.” However, all four teachers had to modify the thinking routines to work with 3-year-olds. The thinking routines are predicated on the idea that there is a conversational interplay between individuals. With 3-year-olds, the skill to engage in a back-and-forth conversation is difficult, since this must be taught intentionally to them. To do this, teachers tended to integrate the “think, pair, share” thinking routine into the conversation:

- ~ “I had to find alternative and nonverbal ways to bring their questions to light and their theories and ideas and sort of give it back to them.”
- ~ “Think is tough, that is hard for 3’s. In the beginning of the year it is hard to describe ... I say, “See” is looking closely with your eyes, “think” is the voice inside your head, and “wonder” is a question you might have.”

Further, all four teachers adapted and included other thinking routines into the classroom throughout the day. The two other routines they used were “think, pair, share” or “what makes you say that?” Again, this latter routine encouraged children to support their answers. If a child

answered the “what do you see” portion of the routine, one teacher tried to have the child support their answer and then try to make predictions for “I wonder.”

#### **4) How did the Smithsonian Learning Lab print-and-play cards integrate with the Children Are Citizens project?**

As mentioned previously, the print-and-play card collections were not available when the teachers were involved in the Children Are Citizens project. Unfortunately, all of the teachers mentioned that they completed the Children Are Citizens project and had moved to new curriculum topics before they could use the cards as intended. One teacher mentioned that she could see the usefulness of the cards for parents or to use them on a field trip to help children focus on similar or different objects they might see on the cards.

However, two teachers managed to use the cards in the classroom in different ways. One teacher used the pictures on the cards in the children’s observation area in the classroom, which was a stool placed near a window. A child took one of the cards, went to the window to look at vehicles passing by, and he/she documented what was seen out of the window. This same teacher used the cards as discussion points about the different types of transportation on the card. She stated, “We did talk some about how what we were seeing was different from what was on the cards.” For example, the teacher used the cards to discuss and compare cars of today and cars of the past or paintings versus photographs.

Another teacher used the cards to supplement the learning topic of trees. For example, this teacher played a matching game with the pictures of leaves by asking the children to compare the picture on the card with the same picture on the card collection on the computer. The children liked the computer version because they could zoom in to look for clues.

The teachers made these comments about the cards and how they might be helpful in the future:

- *Size of the cards.* There were varied opinions about the card size. One teacher stated that the size made them difficult to use, especially in a whole-group setting because they were not big enough to see and appreciate, so turn-taking was difficult. Conversely, another teacher liked the size of the cards because she could do one-on-one activities with the children. She also liked that the children were able to touch the cards. A third teacher mentioned that she thought the print-and-play cards were not engaging to children in her class.
- *Resource Information.* Two teachers mentioned that the cards needed to have more information about the museum artifact on the card, such as location of the artifact or who made it. One teacher mentioned that the information would have helped make a connection to children.
- *Variety of items on cards.* One teacher mentioned that although there was excellent information on the cards, there might be too much.
- *Purpose of cards.* Two teachers misunderstood the purpose of the cards. They both thought that the cards were for them and not for the children. One teacher stated that the cards were a great source for ideas and inspiration.
- *Activities.* Another teacher indicated that the activities (thinking routines) were difficult to implement in the classroom because they were better suited to the outdoors.



- *Development of the cards.* One teacher stated how appreciative she was that the cards were developed for them. Because of her busy schedule, she liked that someone else did the research and developed the cards so that the “task was taken off her plate.”

**5) How were the families engaged with the Children Are Citizens project and/or the print-and-play cards?**

All four teachers made an effort to inform families about the Children Are Citizens project, and to some degree, the print-and-play cards. All of the teachers sent out weekly updates (emails) and newsletters to parents about the project and use of the thinking routines in the classroom. Several teachers included pictures of and quotes from the children as they engaged in the project. Another teacher provided homework to the children to extend the classroom learning of the Children Are Citizens project (e.g., observe garbage trucks while at home). Only two teachers, however, sent the website/link of the Learning Lab print-and-play cards to families. However, these teachers did not inquire further to get feedback from the families or to find out if they tried out the Learning Lab.

## **Discussion**

### **Project Zero Thinking Routines**

Teachers perceived an increase in vocabulary and language use through the Children Are Citizens project and the use of thinking routines in the classroom. Throughout the project, teachers perceived the children using words related to inquiry, curiosity, and research. Children were able to express new ideas about what they were learning. Interestingly, one teacher perceived children as beginning to grasp the concepts of perspective-taking, which often emerges in children a few years later according to Piaget’s theory of cognitive development.

Teachers mentioned that 3-year-olds had difficulty understanding the concepts of the See-Think-Wonder thinking routine. The “see” part was more accessible to children because seeing something was concrete and tangible, whereas the “think” and “wonder” questions focused on more abstract ideas that typically develop later in children. Further, all four teachers mentioned that conversational discourse and complex sentences were a difficult skill for 3-year-olds due to the children’s developmental age. The inability to engage in conversational discourse makes the thinking routines a much more challenging strategy for this age group. However, after intentionally integrating inquiry into conversations, children were perceived as gradually increasing their conversational turn-taking abilities.

The teachers did not engage in Project Zero’s *Visible Thinking* thinking routines in their purest form; however, they adapted the approach to fit with the age of the children in their classes. The teachers fell back on the more familiar, and widely used, “think, pair, share” routine to help children begin the inquiry process. By introducing the “see” concept first, the teachers were able to gradually integrate the other parts of the thinking routine. Ritchhart, Church, and Morrison (2011) mention that as teachers integrate the thinking routines into the classroom and begin asking, “What makes you say that?” children may begin to naturally respond to questions in this way (i.e., providing reasons for their answers). The teacher’s use of the thinking routines in the classroom may help children as they progress academically because the children may become used to thinking about and supporting their answers.

Several teachers mentioned the importance of documenting children’s conversations, which is one of the core practices of the *Visible Thinking* approach (Ritchhart, Church, & Morrison, 2011). Interestingly, one teacher mentioned that documenting children’s conversations allowed her to return to a previous conversation, triggering a whole new conversation and thus

improving language use and conversational discourse. In essence, the questions within the thinking routines are important, but implementation of all three core concepts of the *Visible Thinking* strategy is also important for increasing children's language use.

### **Print-and-Play Card Collections**

The print-and-play card collections covered four diverse topics. However, the cards varied by whether the topics were concrete and tangible (e.g., transportation, trees) versus more abstract (e.g., Lincoln Park, recycled art). Young children move from more concrete to abstract thinking starting around age 3 to 4. Concrete thinking focuses on the here and now while abstract thinking reflects on ideas and concepts and about relationships separate from the object. In the more concrete print-and-play cards, children were able to use and talk about the concepts outside of the Children Are Citizens project. Further, concrete items can help young children better respond to and understand the topics discussed in the classroom. For example, Lincoln Park was an interesting topic for the Children Are Citizens project and relevant to children's lives, but the park itself, what can be found in a park, and what children do at a park are more abstract than a topic like animals or statues in the park. Although the thinking routines, in general, may be more applicable to children who are in elementary school, using *Visible Thinking* strategies with young children may help them be better prepared for challenging questions as they move into elementary school.

The print-and-play card collections can be a useful tool for teachers in the classroom. Although the current print-and-play cards were developed for the Children Are Citizens project, there is great potential for the cards to be used while other topics are taught in the curriculum. The cards need to be developed so they can be used in a variety of ways throughout the school year, particularly if the cards are an adapted version of the thinking routines. All of the teachers

implemented the adapted thinking routines throughout the day, beyond the Children Are Citizens project, thus demonstrating card collections' potential.

The print-and-play card collection exposed children to many digital resources available at the Smithsonian. However, the prompts in the card collections provided suggestions for activities and how to engage children, as opposed to prompts related to a thinking routine, as outlined by the *Visible Thinking* strategies. The teachers perceived changes in children's vocabulary and language use due to using the thinking routines, so it is important to include thinking routine prompts in the card collections. In particular, the prompts need to promote inquiry and curiosity rather than an activity to encourage use of the cards.

### **Partnering with Families**

Partnering with families is an important part of children's learning and development. The parents were introduced to the thinking routines by all of the teachers, and the print-and-play cards by two of the teachers. Although the teachers were uncertain if the parents explored the Learning Lab, the digital collections in the Learning Lab can provide access to numerous museum artifacts and opportunities for parents to talk with their children, which can help improve their children's vocabulary and language skills. The print-and-play cards are also an excellent tool for parents to use as a gateway to the Learning Lab collections. The cards can include prompts to encourage open-ended questions and use of the thinking routines.

### **Challenges and Recommendations**

Based on the challenges teachers faced in using the print-and-play cards, the following recommendations are suggested. See Table 1 for a list of the recommendations.

Table 1  
*Challenges and Recommendations*

Challenge	Recommendation
Size of cards	Provide a variety of card size options to increase versatility.
Resource information	Provide information about the museum artifact, including location, name, and who made or designed it.
Variety of items on the cards	Develop cards that are simpler and that focus on one to two categories within a topic.
Purpose of cards	Provide training or support for teachers about how to use the print-and-play cards in the classroom.
Concrete versus abstract topics	Develop collections that relate to concrete subjects rather than abstract concepts to meet children’s developmental age.
Use of cards in the curriculum	Develop cards that meet the general curriculum implemented in the classroom.
Print-and-play cards and thinking routines	Develop cards that clearly include one of the thinking routines proposed by the <i>Visible Thinking</i> strategy.
Partnering with parents	Provide teachers with training and ideas about how to work with parents to help them explore the Learning Lab and use the print-and-play cards at home.

**Size of cards.** Provide teachers with different sizes of print-and-play cards to use in their classroom. Ideally, teachers should have a set of large and a set of smaller cards to increase versatility of the cards. The larger cards could be used in a large-group setting, while the smaller cards could be used one-on-one or in small groups of children.

**Resource Information.** Provide information about the location of the museum artifact as well as its name, and who made or designed it. One important reason for listing the item location is so that teachers can share this information to encourage parents to go with their children to see the item in one of the museums. Further, by knowing the item name and/or who designed it, a parent or teacher can look for similar items on the Learning Lab or in the museum itself.

**Variety of items on the cards.** Develop cards that are simpler and that focus on one or two categories within a topic. For example, rather than focusing on a wide variety of

transportation vehicles, focus on just trains or cars. This will help young children focus more closely on the topic.

**Purpose of cards.** Provide training and/or support for the teachers about how to use the print-and-play cards with children in the classroom. In particular, model or provide examples about the variety of ways the cards can be used. Although the cards were designed for Children Are Citizens project, teachers can be informed that the cards are applicable to any number of activities.

**Concrete versus abstract topics.** Develop collections that relate to concrete subjects rather than to more abstract concepts to meet children's developmental age. Children will more easily grasp the concepts if the topics are simplified. Further, implementation of the thinking routines is likely to be easier for the teachers.

**Use of cards in the curriculum.** Develop cards that meet the general curriculum implemented in the classroom. Teachers currently integrate the thinking routines throughout the day, so developing cards to meet broad curricular needs is appropriate and increases the cards' usability.

**Print-and-play cards and thinking routines.** Develop print-and-play cards that clearly include one of the thinking routines proposed by the *Visible Thinking* strategy. For example, if the See-Think-Wonder routine is used, then include specific questions that relate to this routine as opposed to an activity for the cards. The specificity would help teachers and parents use the cards and the thinking routines.

**Partnering with parents.** Provide teachers with training and ideas about how to work with parents so they can explore the Learning Lab and use the print-and-play cards at home. In addition, several card sets should be developed so that children can take them home to use with

family members or to take during a museum visit. Finally, the cards could also include simple prompts for parents to encourage open-ended questions and use of the thinking routines. For example, for a painting of a train going over a bridge, add prompts such as:

- What do you see?
  - What do you see in the picture? What colors do you see?
- What do you think about that?
  - Where do you think the train is going? What makes you say that?
- What does it make you wonder?
  - What do you wonder about the train? Do you wonder if the train will be out of fuel?

### **Conclusion**

The *Visible Thinking* strategy, particularly the thinking routines that the four teachers implemented in their classrooms demonstrated an increase in children’s vocabulary and language use. Teachers perceived that children’s vocabulary usage increased, language related to concepts of inquiry increased, and children’s ability to engage in conversations improved. Specifically, children were viewed as being able to have longer conversation after engaging in the thinking routine strategy.

In general, the *Visible Thinking* strategy is an asset to early childhood education programs because it encourages children to think and inquire about new ideas and information. However, implementing the thinking routines in a pre-K classroom is perhaps more challenging because of children’s cognitive skill level. In this evaluation, teachers discussed having to modify the thinking routines in the classroom to match the children’s developmental age and to work slowly with the children, helping them understand the parts of the See-Think-Wonder thinking routine.

If teachers have patience and tenacity, they can modify and model the routines to work with children in their classrooms. In addition, by engaging in the three core practices of the *Visible Thinking* strategy – thinking routines, documentation, and self-reflection – teachers can more easily follow children’s learning progress and modify their teaching practices as necessary when using the thinking routines.

The print-and-play card collections are an excellent tool both to introduce children to the Smithsonian’s vast digital collections and to assist teachers in implementing the modified thinking routines. However, cards need to match the children’s developmental levels in terms of subject matter and simplicity of artifacts. The thinking routines need to be included on the cards in addition to any suggested activities. The cards are also an excellent way to involve parents in their children’s learning by providing an opportunity to expand learning outside of the classroom.



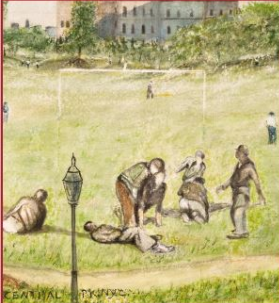
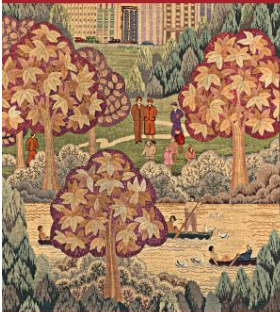

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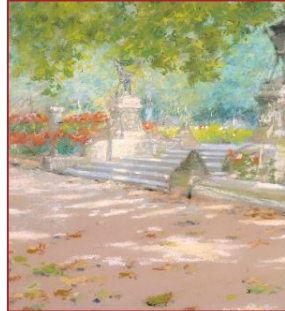
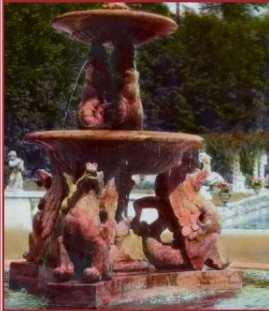

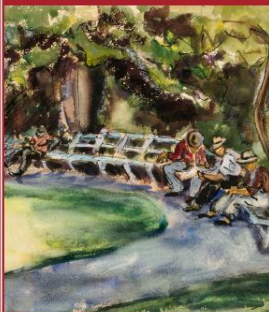
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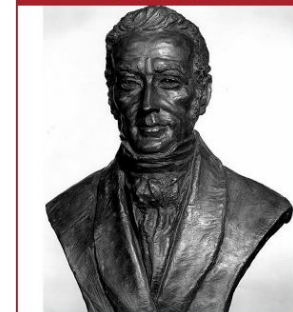
Appendix A

Print-and-Play Collection

Lincoln Park

<p><b>ACTIVITY</b></p> <p><b>A: SEE</b> Take these cards to the park. What do you see that's the same? <i>Features:</i> (trees, benches, fountains) <i>Activities:</i> (sports, sitting, eating)</p> <p><b>B: SORT</b> Can you find one image from each season (spring, summer, fall, winter)? How can you tell?</p> <p><b>C: STUDY</b> Does your park have any statues? Who are they of? What did they do? See if you can find out!</p> <p><a href="http://s.si.edu/cac21">s.si.edu/cac21</a></p>	<p><b>SPORTS</b></p>  <p><a href="http://s.si.edu/cac22">s.si.edu/cac22</a></p>
<p><b>POND</b></p>  <p><a href="http://s.si.edu/cac23">s.si.edu/cac23</a></p>	<p><b>LAMP POST</b></p>  <p><a href="http://s.si.edu/cac24">s.si.edu/cac24</a></p>

<p><b>SHADOWS</b></p>  <p><a href="http://s.si.edu/cac25">s.si.edu/cac25</a></p>	<p><b>FOUNTAIN</b></p>  <p><a href="http://s.si.edu/cac26">s.si.edu/cac26</a></p>
<p><b>FLOWERS</b></p>  <p><a href="http://s.si.edu/cac27">s.si.edu/cac27</a></p>	<p><b>BENCHES</b></p>  <p><a href="http://s.si.edu/cac28">s.si.edu/cac28</a></p>

<p><b>PARK ACTIVITIES</b></p>  <p><a href="http://s.si.edu/cac29">s.si.edu/cac29</a></p>	<p><b>PARK ACTIVITIES</b></p>  <p><a href="http://s.si.edu/cac30">s.si.edu/cac30</a></p>
<p><b>STATUE</b></p>  <p><a href="http://s.si.edu/cac31">s.si.edu/cac31</a></p>	<p><b>PICNIC</b></p>  <p><a href="http://s.si.edu/cac32">s.si.edu/cac32</a></p>



Appendix B

Print-and-Play Collection

Recycled Art

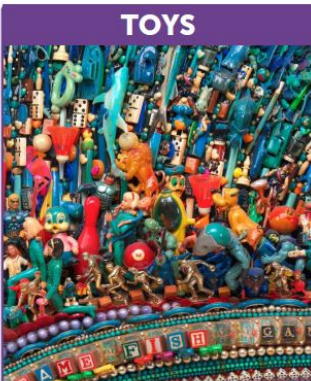
**ACTIVITY**

**A: SEE**  
What materials do you see?  
What objects do you see?

**B: SPY**  
Play "Eye Spy" with the cards.  
Select an object and give a clue.  
Have the other players search until  
they've found the object, then they  
select an object to "spy".

**C: CREATE**  
Using your own recyclables, make  
something new out of it.

[s.si.edu/cac33](http://s.si.edu/cac33)



[s.si.edu/cac34](http://s.si.edu/cac34)



[s.si.edu/cac37](http://s.si.edu/cac37)



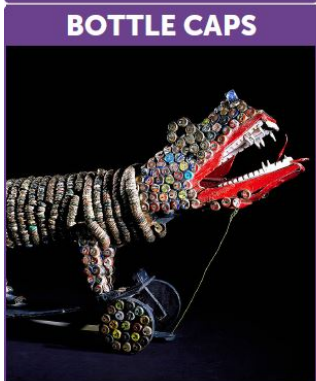
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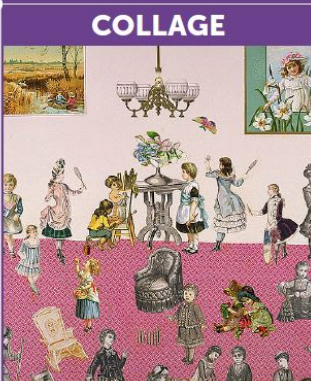
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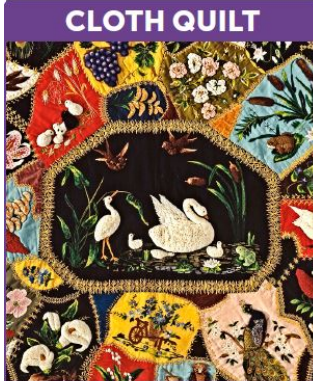
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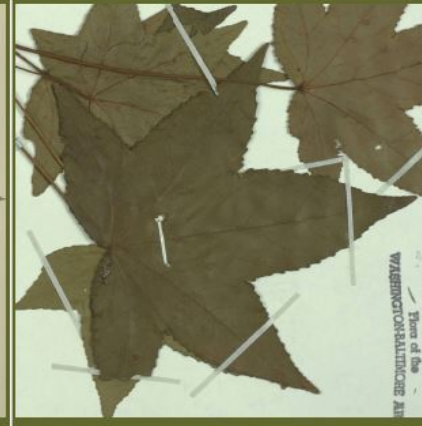

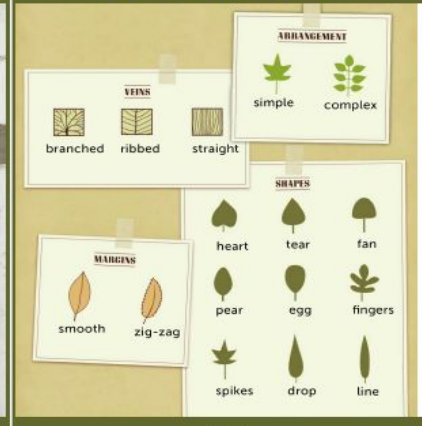


Appendix C

Print-and-Play Collection

Trees – Mystery of the Missing Tree

<p><b>ACTIVITY</b></p> <p><b>A: COLLECT</b> Collect several tree leaves from your neighborhood.</p> <p><b>B: COMPARE</b> Do any of your leaves look like these? How are they different?</p> <p><b>C: DESCRIBE</b> Use this chart to describe your leaves.</p> <p><a href="http://s.si.edu/cac1">s.si.edu/cac1</a></p>	<p><b>SOURWOOD</b></p>  <p><a href="http://s.si.edu/cac2">s.si.edu/cac2</a></p>
<p><b>WILLOW OAK</b></p>  <p><a href="http://s.si.edu/cac3">s.si.edu/cac3</a></p>	<p><b>HACKBERRY</b></p>  <p><a href="http://s.si.edu/cac4">s.si.edu/cac4</a></p>

<p><b>PIN OAK</b></p>  <p><a href="http://s.si.edu/cac5">s.si.edu/cac5</a></p>	<p><b>SWEETGUM</b></p>  <p><a href="http://s.si.edu/cac6">s.si.edu/cac6</a></p>
<p><b>RED OAK</b></p>  <p><a href="http://s.si.edu/cac7">s.si.edu/cac7</a></p>	<p><b>C: DESCRIBE</b></p>  <p><a href="http://s.si.edu/cac8">s.si.edu/cac8</a></p>



Appendix D

Print-and-Play Collection

Transportation

<p><b>ACTIVITY</b></p> <p><b>A: LOOK</b> What types of transportation can you see in each image?</p> <p><b>B: SORT BY</b></p> <ul style="list-style-type: none"><li>• What they travel across (land, sea, air)</li><li>• How they're powered (motor, human-powered, air, etc)</li><li>• When they were made (Which came first? Which is the most recent?)</li></ul> <p><b>C: WONDER</b> Where do you imagine the travelers are going?</p> <p><a href="https://s.si.edu/cac9">s.si.edu/cac9</a></p>	<p><b>BICYCLE &amp; ROWBOAT</b></p>  <p><a href="https://s.si.edu/cac10">s.si.edu/cac10</a></p>	<p><b>CANOE</b></p>  <p><a href="https://s.si.edu/cac13">s.si.edu/cac13</a></p>	<p><b>ROCKET</b></p>  <p><a href="https://s.si.edu/cac14">s.si.edu/cac14</a></p>	<p><b>BALLOON &amp; HORSE</b></p>  <p><a href="https://s.si.edu/cac17">s.si.edu/cac17</a></p>	<p><b>CAR &amp; TRAIN</b></p>  <p><a href="https://s.si.edu/cac18">s.si.edu/cac18</a></p>
<p><b>TRAIN &amp; RICKSHAW</b></p>  <p><a href="https://s.si.edu/cac11">s.si.edu/cac11</a></p>	<p><b>CAMEL</b></p>  <p><a href="https://s.si.edu/cac12">s.si.edu/cac12</a></p>	<p><b>PLANE &amp; BLIMP</b></p>  <p><a href="https://s.si.edu/cac15">s.si.edu/cac15</a></p>	<p><b>STEAMBOAT</b></p>  <p><a href="https://s.si.edu/cac16">s.si.edu/cac16</a></p>	<p><b>SHIP</b></p>  <p><small>FIG. 1.—H.M.S. CHALLENGER, 1873-1876.</small></p> <p><a href="https://s.si.edu/cac19">s.si.edu/cac19</a></p>	<p><b>CARRIAGE</b></p>  <p><a href="https://s.si.edu/cac20">s.si.edu/cac20</a></p>