Monkeying Around Media and Hands-On Activity Prototypes:

Formative Research Report

Heather J. Lavigne, Leslie Cuellar

Education Development Center

Author Note

Abstract

MONKEYING AROUND is a new project that uses animation, live-action videos, and hands-on activities to support joint engagement of children and caregivers around computational thinking concepts and practices. WGBH is developing prototypes of media and hands-on activities around the project's computational thinking learning goals for young children. This phase of research is intended to examine strategies that best support the project's learning goals. Education Development Center (EDC), WGBH's research partner for the project, conducted a small formative study with 15 English-speaking families (children and their caregivers) to test out these media and activity prototypes. During the video viewing session, researchers showed children three different video prototypes and engaged in an interview protocol immediately following viewing. During the hands-on activity session, caregivers reviewed a hands-on activity prototype and conducted the activity with their child. Following the activity session, researchers interviewed the caregiver about their experience.

Keywords: computational thinking, Pre-K, formative research, informal learning

Monkeying Around Media and Hands-On Activity Prototypes: Formative Research Report

Introduction

Computational thinking (CT) supports learning in a variety of disciplines by providing children with a systematic way of thinking about and solving problems. Referenced as "the new literacy of the 21st Century" (Wing, 2011), CT can help children understand when problems require deconstruction, discover problem-solving tools, decide which tools to apply or adapt for a given problem, and recognize how to solve a problem in a new way.

Early childhood is an ideal time period to lay the foundation for computational thinking skills. To build a solid basis for problem-solving skills later in life, children ages 4 through 5 need early, introductory experiences both to learn and to practice the skills necessary for CT (Bers, 2008; Gelman & Brenneman, 2004).

MONKEYING AROUND is an iterative, research-design project that is examining how parent/child engagement with digital media and hands-on activities can improve preschool children's early learning of computational thinking. As a part of the project, WGBH and EDC have collaborated to develop a learning blueprint to articulate the goals of computational thinking for preschoolers in non-programming contexts. WGBH is now building on this blueprint to develop MONKEYING AROUND, a new media property that uses animated stories, live-action videos, music videos, and hands-on activities to enhance children's understanding of CT.

The majority of these resources addressed debugging, which the project defined as the process for fixing and improving solutions to problems. One of the resources focused on promoting teamwork and persistence as part of computational thinking and problem solving. EDC conducted the current phase of formative research using early/prototype versions of these

resources. The animated stories and music videos were produced in animatic format (a prototype form of animation created by shooting successive sections of a storyboard and adding an audio soundtrack.) The live action video appeared more like its final format, with children performing actions with a surprise inclusion of animated monkeys at the end.

Following a media viewing session by children, parents and children engaged in a hands-on activity geared toward joint engagement around debugging. Table 1 summarizes the resources tested during this research phase, including the title, its format, and the target learning concept.

To inform the development of the media and hands-on activities, and to learn more about the factors that contribute to CT engagement, EDC conducted a pilot test with a subset of resources in Summer 2017.

Five questions guided this phase of the research:

1. To what extent are the videos comprehensible and appealing to preschool children?

2. What evidence exists that preschool children focus on the core concepts of CT during video viewing?

3. To what extent are the parent/child hands-on activities useable and appealing to parents?

4. What evidence exists that parent/child hands-on activities, when used during co-engagement between parent and child, promote CT concepts?

5. What factors work together to support or impede effective use of the parent/child hands-on activities?

Theoretical Background

The planned MONKEYING AROUND intervention (digital media and parent/child activities) will present parents with a cohesive unit of activities and hands-on materials. The

intent for the final intervention is for parents and children to jointly view media and engage in hands-on activities to further support experience and practice with CT concepts. It is anticipated that these activities will lead children to improved understanding of computational thinking concepts and practices (e.g., sequencing, modularity, design process) and will increase parent comfort in leading CT activities with their children.

This part of the research process focused on formative testing of the prototype story animatics, music video animatics, live-action video, and hands-on activities to examine evidence as to what extent children enjoyed the materials, understood the stories, and focused on the CT concepts. Further, hands-on activities were tested to examine their usability, appeal, and the extent to which they promote CT concepts. By engaging in formative research at this early stage, the intervention materials (current prototypes and future developments) will benefit from revisions that will be informed by evidence collected from these parent and child experiences. The analysis of children's responses to questions about the media will help increase the likelihood that MONKEYING AROUND is effective and accessible prior to national dissemination. Data on how to stimulate interest in hands-on activities and the necessary scaffolds to support parental involvement in the development of children's CT will help broaden participation by building parents' capacity to support STEM learning.

Methods

Sample

EDC worked with two early childhood education centers in New York City to recruit children and parents for this study. The sample for media observations (N = 16) included an

equal number of girls and boys (8 girls, 8 boys), and a mix of preschool-age children (8 four-

year-olds, 7 five-year-olds, and 1 unknown[1]).

The sample for hands-on activity observations (n = 15) shared a similar mix of gender

and age characteristics (8 girls, 7 boys; 8 four-year-olds and 7 five-year-olds). In addition, a

parent or caregiver participated with each child for the hands-on activity (12 mothers, 1 father,

and 2 grandmothers).

Sixty percent of families were self-reported as Hispanic or Latino, and 40% from other

ethnic backgrounds. Of that 40%, one child was identified as African American; one child was

white; one child was identified as Hispanic or Latino and African American; one child was

identified as white and Hispanic or Latino; and one child was identified as Hispanic or Latino,

African-American and Asian American. Roughly 67% spoke both English and Spanish at home,

and 33% spoke only English in the home. In terms of parental education, 53% of mothers had a

high school diploma or GED, 20% had a Bachelor's degree, and 13% had some high school

education. Among fathers, 33% had a high school diploma or GED, 27% some college or

technical training, and 13% some high school education. One father had a bachelor's degree, one

had a graduate degree, and two fathers' educational attainment levels were unknown. Three

children had known IEPs.

Data Collection

EDC researchers obtained consent from parents before conducting two-part sessions with

children. The first session was always a media observation session with the child that lasted

approximately 25 minutes. During this session, children watched one prototype video at a time,

---

[1] This child's parent did not complete the demographic survey because they did not take part in the hands-on activity session. Therefore, the child's exact birthdate was unknown.

and were led through a series of questions about that video by the researcher before moving on to the next. Children had picture props available to use as they responded to questions about the prototype story animatic. The second session was a dyad activity observation session for which the parent and child completed a 15-minute hands-on activity together. The researcher followed this session with a 15-minute structured interview with the parent. During each session, the observer collected a set of notes. To support these notes, EDC videotaped the child media observations and parent/child activity sessions, and created audio recordings of the follow-up parent interviews.

Analysis

For analysis, researchers first assigned items from each of the observation protocols and the parent interview to one of the research questions of interest. Then the research team synthesized observation notes composed by each session's observer to create summary data across the observation sessions. Recorded video or audio files were consulted to pull direct quotations from parents or children and to provide supporting evidence around engagement and parent strategies whenever appropriate. Any responses pulled from recordings of individual children or parents were reported without disclosing the individual's identity. Researchers transcribed child responses to each question from the media observation protocol and assigned a code to each to sort responses into categories (e.g., highest level of comprehension, moderate comprehension, low comprehension). Dyad activity sessions were coded for evidence of target behaviors, specifically those related to the CT concept of debugging, which we have defined as the process of fixing or improving solutions to problems. Parent quotations were pulled from the activity sessions to examine parent instructions and scaffolds to support engagement with debugging. Parent interview responses were examined and quotations were pulled for the

research questions of interest. Members of the research team coded parent interview responses

for major themes as they relate to the research questions of interest. For all observation protocol

and interview responses, members of the research team met to confirm agreement in all response

coding and to discuss any discrepancies in how responses were coded.

Results

Family Media Habits

All 15 parents mentioned that their child watches media on a tablet or other handheld

media device, although very few regularly reported watching broadcast television. Several

parents (4 out of 15) mentioned that children enjoy watching videos on Youtube more than

watching broadcast TV. These parents mentioned that their children enjoy watching music

videos and videos of kids playing with toys or building things.

When parents were asked about their child's favorite shows, they mentioned the

following programs (numbers correspond to the number of mentions): *Peppa Pig* (4), *Spongebob*

Squarepants (3), *Paw Patrol* (2), *PJ Masks* (2), *Daniel Tiger's Neighborhood* (1), *Odd Squad*

(1), *Dinosaur Train* (1), *Thomas and Friends* (1), *Franklin and Friends* (1), *Mutt and Stuff* (1),

Oddbots (1), and *Steven Universe* (1).

Other parents made generic comments such as "cartoons," "Mickey Mouse," "Disney

Junior," or "Nick Jr." More than half of the parents (9 out of 15) mentioned that their child does

not watch PBS, or that they used to watch at one point but do not watch it anymore. However,

this finding was likely only in reference to PBS as a broadcast station. Parents may not have been

including engagement with PBS on digital or on-demand services as part of this answer.

Therefore, the biggest conclusion to be drawn here is that parents are unclear about the full reach

of PBS's affiliation with children's digital media beyond its broadcast channel. Future research is necessary to better understand families' exposure to PBS-branded materials on all platforms

Results for Video Prototypes

The following results represent findings gathered from children's media viewing sessions. All children started by viewing the story animatic "Going Bananas with Lemons." This story begins when the four main monkey characters learn that a fun fair is coming to town. They brainstorm ways to make money, and decide to make and sell lemonade. The first batch of lemonade the monkeys make tastes sour, and as the story progresses, the monkeys attempt to correct the steps involved in making lemonade to make it taste better. Finally, they make a successful batch and sell enough lemonade to earn the money to go to the fair.

Next, all children viewed a live action video titled "Monkeying Around with Paint." In this video, two children attempt to create dark green paint that matches their house, so that they can paint their playhouse the same color. The children try several combinations of paint before they realize that yellow and blue make green. Then they fine tune their paint "recipe" to create the dark green shade of paint that matches their house. When they have the right shade of paint, they paint their playhouse.

Finally, children were randomly assigned to view one of three music video animatics. "Check Your Steps" is a short song about using the debugging process to check one's steps in order to find an error. In this case, the monkeys are correcting their process for building a block tower. "Good Time" is a short song about using a mixture of teamwork and persistence in order to get a job done before enjoying the fruits of one's labors. In this case, the monkeys need to persist in cleaning their room before they can go to the beach. "Monkey See, Monkey Do (Clap,

Stomp, Spin)" is a short song in which one monkey teaches his siblings a dance routine. Throughout, the monkeys use debugging skills to correct their missteps.

In all cases, children first watched the story animatic and were led through a series of questions about the video. Then they were shown the live action video and asked a short set of questions. Subsequently, they viewed the music video animatic and answered several questions. Finally, they were asked some general appeal questions about all the videos they saw. Children were given props (paper cutouts of key characters and objects that appeared in the story) in order to aid them in answering questions.

Finding 1. Children liked the characters and the plot of the videos. (Media Appeal: RQ1). Children found all three media formats (story animatic, live-action video, and music video animatic) appealing. Even in animatic form, the story and the music videos held most children's attention. Additionally, although several children experienced distractions during the video that temporarily took their attention from the screen to some aspect of their environment, all children had some level of attention to each of the media formats. Appeal was also consistent across all media formats, indicating that the current approach of using stories, playful characters, and music is an effective format to capture children's attention for the context of developing children's CT skills.

"Going Bananas with Lemons" Story Animatic. For "Going Bananas with Lemons," most of the 16 children who watched were either attentive and focused or periodically attentive during video viewing. Two of the 4 periodically attentive children were distracted by aspects of the testing environment, but this did not prevent them from being verbal in their responses about the video. Children smiled or laughed when the monkeys were sleeping/snoring, when the lemon fell on one monkey's head, when the flamingoes appeared, when the monkeys struck their

thinking positions, when monkeys counted the sand dollars, when monkeys made exclamations ("No way!" "Yahoo!"), and when the monkeys showed excitement (flipping, running).

"Monkeying Around with Paint" Live Action Video. For "Monkeying Around with Paint," almost all children were attentive and focused during video viewing. There was a child (1 out of 16) who occasionally attended to an environmental distraction in the testing environment but was verbal during her interview about the video. Children commented, smiled, or laughed when the children in the video were mixing the paints, while the children were painting the house, and during the appearance of the monkeys at the end of the video.

Music Video Animatics. Children found all three music videos appealing. For "Check Your Steps," 3 of 6 children were attentive and sat still while watching; 2 children were attentive and danced to the music; and 1 child was periodically focused due to an environmental interruption. Children commented when they saw the monkeys building "a school" and when the monkeys finished building "a house." For "Good Time," 3 of 5 children were attentive and sat still; 1 child was attentive and danced; and 1 child was disinterested. Children commented, smiled, or laughed when the monkeys appeared in the video and while listening to the music (e.g., children liked the "ooh, ooh, ooh-ooh" part of the song). For "Monkey See, Monkey Do (Clap, Stomp, Spin)," 3 of 5 children were attentive and sat still and 3 children were attentive and danced to the music. Children smiled or laughed when the monkeys clapped, stomped, and spun around.

At the end of the video viewing session, children were asked what they liked about all the videos. Several children mentioned they liked the videos in general, with a few children mentioning that they liked the monkeys. When asked what they did not like about the videos without specific prompts, no systematic responses were collected.

   Finding 2. Children exhibited high levels of plot comprehension. (Media Comprehensibility: RQ1). Children had high levels of plot comprehension when it came to the media's main objective. Even in the unfinished animatic format, children were able to follow the main story arc and the character's actions.

   "Going Bananas with Lemons" Story Animatic. When asked to retell the story they saw during "Going Bananas with Lemons," 12 of the 16 children included two or more of the major plot points in their retelling of the story (e.g., wanting to go to the fair, monkeys needing money, making lemonade to earn money). Below are two examples of children's stories that include different levels of detail.

- "It was mad and sad. They didn't have enough money for good stuff. They didn't get money because they didn't have no money left. They … lemon … and it tasted good."

- "They were going to the fun fair and used lemonade to make lemonade and they were going to the fun fair. Make lemonade to sell to the flamingoes. Sour lemons and that's how they made it good with ice cubes."

   When asked questions about specific plot points in "Going Bananas with Lemons," children displayed high levels of recall. Most children (12 of 16) understood the monkeys' goal of wanting to go to the fun fair. Most children knew that the monkeys needed money for the fair and could identify one or more ways the monkeys tried to get juice out of lemons, with 7 children identifying more than one way. Nearly all children (15 of 16) knew the lemonade tasted bad at the first taste test, and 14 children recognized that it was sour or tasted bad. Almost all children were able to identify that, after the lemonade tasted good, the monkeys either received money or they got to go to the fun fair.

The steps needed to make the lemonade were less clear to children than were other parts of the story. When asked what steps the monkeys took to make the lemonade, 4 of 16 children described the process for making lemonade that resembled that from the animatic using a combination of props and language (lemon in cup, sugar, water, spoon, pitcher); 3 children described a similar lemonade-making process with some elements out of order to what was modeled in the animatic (e.g., lemon in cup, spoon, water, sugar, pitcher), and 9 children described what appeared to be an unorganized or illogical process for making lemonade.

"Monkeying Around with Paint" Live-Action Video. When asked what this video was about, 13 of 16 children described that the video was about children painting the playhouse or mixing colors. When asked how the children in the video worked together to make the paint for the playhouse, almost all children responded that the children mixed black, yellow, and blue paint together.

Music Video Animatics. Children understood that the monkeys were trying to accomplish a goal in each music video. After watching "Check Your Steps" (n = 6), 4 children said that the monkeys were singing about building a tower. One child said that the building process was difficult for the monkeys but the others helped out. After watching "Good Time" (n = 5), 3 children said that the song was about going to the beach or having a good time. One child said that the song was about cleaning up and working together. After watching "Monkey See, Monkey Do (Clap, Stomp, Spin)" (n = 5), all of the children said that the song was about dance steps. None of the children mentioned that it was about learning or fixing steps to a dance.

Finding 3. Fewer children provided evidence of attention to the target CT concepts as compared to overall plot comprehension; attention to general problem solving and solutions to the problems was more apparent than was an understanding of using specific

techniques to improve a solution (debugging). Evidence of understanding the CT concept was more apparent after viewing the live action video. (CT Concepts in Video: RQ2). Children had variable levels of CT concept comprehension as observed in their responses to questions about each video.

      "Going Bananas with Lemons" Story Animatic. In "Going Bananas with Lemons," the debugging CT concept (i.e., monkeys checking and correcting the steps used to make the lemonade) was difficult for many children to verbally articulate. When asked, "When the monkeys knew that their lemonade tasted bad, how did they figure out what went wrong? What did they do to make it taste good?" 6 of 16 children mentioned one step (e.g., "they added sugar") and 3 children mentioned more than one step (e.g., "added water and sugar"). Seven children had off-target responses (e.g., "It's good" or "To make people happy"), and no children mentioned anything about the monkeys checking their steps. These results suggest that, although the children did not mention the monkeys checking their steps as part of the process for correcting the lemonade, this should not be taken as evidence of wholly misunderstanding the concept of debugging. Instead, the variability in children's responses may signal that children know that, when something goes wrong with a process, actions can be taken to correct it. This question prompt is quite nuanced for 4- and 5-year-olds. Their responses could be interpreted as if they recognized that the monkeys needed to make a change to the lemonade in response to the sour taste. Instead of imposing a correct or incorrect label to children's responses, the research team suggests that this variability in children's responses may reflect the different levels of understanding debugging that children may take away from this animated story.

      "Monkeying Around with Paint" Live Action Video. Evidence was stronger that children focused on the specific actions of the on-screen kids in the live action video. When

asked what went wrong with the paint, 11 of 16 children identified that the paint was too light or that the children in the video needed to make it darker by using black paint. The research team makes the same interpretation here as above: By reporting the changes that the on-screen kids made to the paint, children demonstrate an implicit understanding that a change can be made to correct a problem using a process. Yet no children reported anything about the specific strategies the on-screen kids took to match the shade of paint to that of their house. While this live action video is short, it does provide evidence that children clearly perceive the change the on-screen kids make to correct an issue, but it is not clear whether they explicitly attended to the strategies required to identify the correct change in order to solve the problem.

Music Video Animatics. Similarly, most of the children did not explicitly articulate the target CT concept in each music video. For "Check Your Steps" (target content—debugging), only 2 of 6 children responded with some understanding that the monkeys were trying to fix the tower (e.g., "They was making a castle I don't know what they was using. They put two blocks on the bottom and put it together like these blocks is holding the table."). For "Good Time" (target content—teamwork and persistence), only 2 of 5 children responded that the song was about working together to clean up fast, or using music to clean up. For "Monkey See, Monkey Do (Clap, Stomp, Spin)"(target concept—debugging*)*, only 1 of 5 children noted that the monkeys could not get the dance right and couldn't spin around. Others just discussed that the monkeys were learning how to dance.

Synthesis

Children enjoyed and appeared to grasp the plot of the animated story animatic, the music video animatics, and the live action video. Children seemed able to follow character actions and to understand their motivations. Children also seemed to understand that, in each video, a

problem had to be solved. After the story animatic, most children identified one or two changes that were made during the lemonade-making process. Similarly, nearly all children identified the change on-screen kids made to the paint shade in the live action video. These responses signal that children at least understood that if there's something wrong with the solution to a problem, you can change or fix one of the steps. What appears less obvious is to what degree the children understood that there are specific strategies one can use to figure out which step to change. The research team interprets this as children having varying levels of engagement with the debugging concepts modeled in the videos. Also, it is worth noting that the types of questions that researchers asked children may not have picked up on children's nuanced comprehension of debugging. For example, when asking what the monkeys did when they realized the lemonade tasted bad, and what they did to fix it, many children responded by saying adding sugar and/or water. These answers are not considered to be wrong. It could be that the question that was asked didn't elicit responses from children that demonstrated their understanding of what was happening in terms of the monkeys using a process to fix their recipe.

In light of these findings, EDC suggests that WGBH more strongly emphasize the strategies used by the monkeys to debug the solutions to their problems. For example, simplifying the number of problems that the monkeys have to solve in the story animatic may allow for more time to focus attention on the steps to make the lemonade and the strategies characters use to identify and correct errors. Beyond plot simplification, the use of specific child-friendly CT vocabulary might be helpful to emphasize when the characters are focused on creating or revising their steps. The project team should consider developing a child-friendly set of CT vocabulary for all learning goals addressed in the intervention, which could be used consistently across media and hands-on activities. In the music videos, content developers might

consider using short snippets of dialogue around the songs to frame and emphasize the song's target message. For example, in "Good Time," the monkeys have to clean their room before going to the beach. Some dialogue could be added to say that it would take much too long to clean up if they do not work together. If they organize and work as a team, they will be on their way to fun much sooner. A snippet of dialogue could also be added to the end for the monkeys to congratulate each other for working as a team.

Beyond the key findings discussed in this report, EDC has provided two appendices to provide summaries of child responses specifically to the media prototypes—the first appendix is organized by child, and the second is organized in the order of the media observation protocol. These appendices have been supplied to support content developers' understanding of what children recalled from the videos and the depth of detail in their responses.

Results for Hands-On Activities

The following section reports on the parent-child dyad experiences from three hands-on activity prototypes. "Take Me to the Fun Fair" is an activity that asks dyads to build a ramp out of everyday household materials with the objective of getting a toy car to a picture of a fun fair. Parents and children have to engage in debugging (by changing the height of the ramp, the starting point of the car on the ramp, or the distance between the ramp and the picture of the fun fair) in order to get the car to land at the fun fair. For "Mix & Match," dyads have to mix paint colors in order to make green, and then make two shades of green in order to match the colors of a shirt and hat on a printout of a monkey. For "Monkeys In a Row," dyads have to take a set of cards that depict monkeys that are different colors and wearing different items of clothing and create a sequenced row in which each monkey card matches its predecessor by either color or item of clothing. In each hands-on activity, dyads were observed to examine evidence of CT skill

exploration. In follow-up interviews, parents were asked about the activity's appeal, usability,

the activity's objective, and about perceptions of at-home implementation. Five dyads were

randomly assigned to test one of three hands-on activities focused on the debugging as a CT

concept.

**Finding 4. Parents unanimously reported that their child enjoyed the activity and/or
the activity was fun for them. Reflecting on their own and their child's experiences, very
few dislikes were reported by parents. (Activity Appeal: RQ3).** Parents were asked to report

what they thought their child liked and disliked about the activity they experienced; their reports

compliment observational findings. Parents also were asked what they themselves liked and

disliked about the hands-on activities. Findings are broken down for each of the hands-on

activities below.

"Take Me To the Fun Fair". Parents thought their children enjoyed rolling and playing

with the cars and building ramps. In addition to these, observational findings show that children

also appeared most engaged when they successfully got the car to the fun fair and when the car

went really fast. Parents liked that the activity kept their child entertained, the fact that they had

to try different ways to get the car to the fair, and that it made their child use his/her brain. One

parent said that the activity could incorporate more objects that could be rolled down the ramp.

"Mix & Match". Parents thought that their children enjoyed mixing paint and colors,

experimenting, and painting. Observations also show children appeared most engaged when they

saw the water changing colors when cleaning paint brushes and when paint mixtures got lighter

or darker. For parents who experienced "Mix & Match," they liked that it was educational. They

also enjoyed mixing the colors and the fact that they were bonding and spending time with their

child. One parent said that the child wanted to keep mixing colors and not paint the shirt and hat

as directed. Another parent reported that their child disliked not being able to choose and mix their favorite colors. Another parent said that she did not like when her child was distracted during the activity.

"Monkeys in a Row". Parents thought their children enjoyed the colors on the cards, counting the cards and monkeys, and matching. Observations also show children got excited when they found or placed cards correctly. Parents liked that it was a learning activity that made their child think. One parent reported that their child did not like them telling him what to do. Parents reported very few personal dislikes about the activity. However, two parents reported dislikes: one said that the instructions were hard to follow (see Finding 5 section for details) and the other said that the cards themselves could be more appealing to use. (Since they were a prototype, there wasn't final art and design.)

Finding 5. Instructions were clear to parents for two of the three activities. (Activity Usability: RQ3). During the follow-up interview, parents were asked about the clarity of the instructions for the activity they experienced. Activity usability findings are broken down for each activity.

"Take Me To the Fun Fair". Parents reported that the instructions for this activity were clear. However, researchers observed that some of the parents focused simply on accomplishing the stated objective (getting the car to the Fun Fair), rather than extending the activity to support additional opportunities for debugging (e.g., use of other materials, or trying other ways to get the car to the fair).Below are several ways in which parents introduced the activity to their child at the beginning of the session.

- "You gotta make a ramp so the car can go down." (*Parent showed the child the picture on the directions sheet and laid out the materials for the little girl to see. Daughter asked the mom to do it.*) "No, you do it."

- "So, we're going to make a ramp for the car so the car can go to the fun fair. The fun fair is going to be over here." (*Parent placed the fun fair graphic on a place on the floor.*) "So this is going to be the ramp." (*Parent used copy paper reams, a clip board, and piece of cardboard to make a ramp.*)

- "Want to make a racetrack? How you want to do it?" (*Parent and child set up a small ramp and then parent took the materials and made a flat ramp with the blocks at each end.*) "Can you make your own ramp?"

"Mix & Match". For "Mix & Match, " parents also reported that the activity instructions were clear. Nearly all (4 of 5) of the parents were observed to relay an accurate depiction of the activity's objective (creating the right shade of paint for the monkey's shirt and hat) to their child at the beginning of the session. Below are some of the ways in which parents introduced the activity to their child at the beginning of the session.

- "We have to make green; how do we make green? Blue and what other color? See, this is the color we need to make." (*Parent points to the shirt color.*) "The hat has to be light. The hat is lighter than the t-shirt. So let's do the t-shirt first and then the hat."

- "Remember, we're trying to make the same color as the t-shirt. You want to start with blue? We have to make the t-shirt green. What other color is going to make it green?"

- "Match the green shirt with the paint. Want to try?" (*Each took a paintbrush.*) "Want to try to match the hat or the shirt?"

"Monkeys in a Row". Parents reported difficulty comprehending the instructions for the "Monkeys in a Row" activity. Researchers observed that all parents had trouble meeting the overall objective of the activity. For some parents, this difficulty was evident in the way they described the activity to their child. Most parents did not lead with the objective of the activity or mention creating a row. Instead, many focused on the matching element of selecting monkeys that are the same color or wearing the same clothing. To display the variability in parent instruction, below are instructions that parents gave to their child at the beginning of the session.

- (*The parent put the four red and then four brown monkeys in a row of eight*.) "Which ones look the same?" (*As a dyad, they began to match red and orange monkeys together based on what they are wearing*.) "Which one's got glasses?" "Which one's got the scarf?" (*Had to read the instructions multiple times throughout the activity. Then, later asked ...*) "Are they the same or different?"

- (*Parent flipped through the cards until they found a monkey that is orange. When they did, parent consulted the instructions again. Then they looked for another card*.) "Now we gotta find another one with a scarf." (*They continued flipping through the cards looking for a monkey with a scarf*.) You need to put the monkeys with the same color or with the same object."

- (*Parent consulted instructions and asked the researcher for some guidance. But the researcher encouraged her to use the instructions*.) "Put the monkeys in a row."

- "Do I have to put them in order, or do you put them in order? So what's the same about each card?"

- "Look what we're gonna do, we're going to put this in order, okay? First we're going to do the red one with the hat. And then you have to continue and find the other one with the hat and put it right next to each other."

As demonstrated by the quotes above, some parents were able to find some moderate level of success getting their children started in the activity. But those that did ended up struggling to scaffold the step-by-step instructions in order to create a line and then debug the order of cards. Because of this reported difficulty, researchers asked parents how the activity's instructions could be altered. Parents' suggested simplifying the instructions by using less text and/or adding more illustrations (i.e., step-by-step visuals).

Finding 6. "Take Me to the Fun Fair" and "Mix & Match" were the two activities that engaged families most successfully in CT skills and behaviors. (Evidence of Activity's CT Objective: RQ4). Researchers observed each of the parent-child dyads as they engaged in the hands-on activity experience. Researchers coded for whether or not the dyads displayed exploration of the target CT concept. The results for each activity are presented below.

"Take Me to the Fun Fair". For "Take Me to the Fun Fair," researchers coded for whether or not the dyad made changes to the ramp to alter the distance that the car traveled. During "Take Me to the Fun Fair," 4 of 5 dyads displayed CT skill exploration (fixing or improving a solution); 1 dyad did not (child's age was 4). The average length of time dyads took to complete this activity was 10 minutes 15 seconds.

"Mix & Match". For "Mix & Match," researchers coded for whether or not the dyad fixed or improved the paint shade that was created to make different shades of green for painting the shirt and the hat. For "Mix & Match," 4 of 5 dyads displayed CT skill exploration (fixing or

improving a solution); 1 dyad did not (child age 5). The average length of time dyads took to complete this activity was 9 minutes 50 seconds.

"Monkeys In a Row". For "Monkeys in a Row," researchers coded for whether or not the dyad made changes to the card sequence that was created to match the activity's stated objective. For "Monkeys in a Row," 3 of 5 dyads displayed CT skill exploration but only after researcher guidance and intervention. This means that the researcher asked the parent to try their best to follow the instructions. Then, when the parent thought they had completed the activity's objective, albeit not completely, the researcher gave some guidance (e.g., "Can you try to put all the monkey cards into one row like in the picture?"). Two parents did not get far enough to benefit from this intervention (their children were ages 4 and 5). The average length of time dyads took to complete this activity was 15 minutes, and several were stopped at the maximum time allowed for activity completion.

Finding 7. All parents had no prior knowledge of computational thinking or debugging. Although they had no prior knowledge, parents reported that the information provided was sufficient to do the activity themselves. In follow-up prompts, parents discussed factors that would alter the experience if they tried to do the activity together at home, citing siblings and differences in the child's behavior as influential factors. (Factors to Support Activity Usage: RQ5). Almost all of the participating parents had not previously heard the term "computational thinking." Two parents had heard the term before, but didn't know what it meant. Here are some of the terms or phrases they used when asked to provide some guesses as to what it meant:

- "Critical thinking."
- "I think it comes with tablets or technology. Thinking."

- "Um, like trying to fix something, try to analyze something and fix the situation."

- "Like a complex kind of thinking?"

- "Computation would be like calculating steps to get somewhere."

- "Trying to figure out stuff."

- "Like, if you go to the computer and look for information?"

When asked whether the activity helped their child learn new things, most parents said yes. Many also thought that the activity allowed children to practice something they already knew or helped their child develop non-computational thinking skills. Several parents thought their activity emphasized things their kids already knew (e.g., building ramps, mixing colors). Other parents talked about how the activity supported non-computational thinking skills (e.g., trying out ramps, matching games, and how to mix colors). One-third of the parents mentioned specific ways that the activity helped their children learn debugging skills. When asked to explain how, parents responded with the following answers:

- "To put the cards in the same pattern."

- "How, by stacking the papers higher, you could go further, a shorter distance or a longer distance by adjusting the height."

- "How to find different ways to, trying to think … Well, I told her to get the car to the fun fair. And showed her, you know, I asked her how fast the car went, if it was slower or faster."

- "And the finding the colors, the darker green and the lighter green."

- "He learned like he can, with one little thing, he can turn it a little more lighter or darker."

Similarly, none of the parents had heard of the term "debugging" before participating in this study. About half of the parents thought the description of debugging was clear.

Of those who said the description of debugging was clear, researchers asked what they thought their child learned during the activity:

- "Adjusting the height of the ramp." ("Take Me to the Fun Fair")

- "How to find different ways to … trying to think." ("Take Me To the Fun Fair")

- "Mixing colors—and with one little thing he can turn it a little more lighter or darker." ("Mix & Match")

- "I think so, the mixing the colors, right? And the finding the colors, the darker green and the lighter green." ("Mix and Match")

- "Mixing and matching (the monkeys) by different colors and categories by glasses, scarf, or hats." ("Monkeys In a Row")

In examining these responses, it is clear that while some parents understood and implemented debugging as part of the activity, others who reported that the explanation of debugging was clear did not emphasize it as the central concept for hands-on exploration.

Parents who said that the description of debugging was not clear described how or why it was confusing. One parent suggested that the definition or concept be broken down a little bit more, both for her own understanding as well as how to explain it to a child. Another parent said that she had to read the description of debugging several times because she did not get it the first time around.

After the researcher and parent had a conversation about the definition of debugging, almost all parents responded positively when asked if the activity helps kids learn debugging.

For parents who gave specific reasons why, here are two examples of their responses, along with the activities that they experienced:

- "Because they could analyze the situation and work with it to try to fix it. To figure out how to solve the problem." ("Take Me to the Fun Fair")

- "Because you get them to think. That's why I said to him, 'Think.' Thinking. Sit down and think and you can figure it out. That's just what this is. Figure this out. How can we go about fixing this problem and make a change." ("Mix & Match")

When asked to reflect on what this hands-on activity experience would be like outside of this research context, all parents said that the activity gave them enough information for doing it at home. Of the parents (n = 9) who responded to the question about the required setup and cleanup for the activity, all 9 parents reported that it would be easy to set up and clean up at the end.

When asked what would have happened if they had done this activity at home, 6 out of 15 parents said it would have gone differently at home, 8 said it would have gone the same, 1 said "I don't know." Here are the answers from parents who said the experience would have been different:

- 2 parents think there would be less focus at home because of siblings.

- 1 parent would have added more things to make it (ramp building) more challenging.

- 1 parent would have Googled the word "debugging."

- 1 parent said their child would experiment more on his own at home.

- 1 parent reported that the activity (painting) would be messier.

In conclusion, parents responded very positively to the hands-on activities, even though the educational content was new to them. Parents responded positively to the descriptions of computational thinking and debugging, but may have found it challenging to integrate their new understanding of these concepts into the hands-on activities with their child. However, upon reflection on the CT content of these activities, parents almost unanimously agreed that these skills are important for their child to learn. Parents responded positively to the possibility of conducting these types of activities at home, and felt confident that they would have the resources to do so. Slight alterations to the activities would be expected, depending on the characteristics of the home environment, but parents seemed confident in how to deal with those alterations.

Synthesis

Overall, parents found all three activities usable. However, evidence of parents' understanding of the activity (and the use of the CT concept) was variable. In future activities, it is suggested that the instructions be as simple as possible in terms of how much text is required for parents to understand the activity's goal and progression. When multiple steps are required, parents suggested the use of visuals to support their understanding of how the activity should progress. These suggestions could be pilot-tested prior to full-scale implementation to determine whether or not the use of visuals supports an increase in parent understanding of the activity.

Broad Impact and Recommendations for Future Development

The current report is a synthesis and summary of data collected from 15 parent-child dyads. This small sample study provides early evidence of the findings stated above, which will be continuously researched and refined in upcoming phases of research.

The findings detailed in this report have the potential to broadly impact the field in several ways. First, this study serves as evidence to suggest that parents (specifically those with children enrolled in early childhood education centers that serve high-need families) do not have preexisting knowledge about computational thinking or the CT concept of debugging. Parents were enthusiastic about introducing computational thinking to their children and, through discussions about it as a topic, researchers noted that parents did see the value of CT in their children's lives. This research is an early evidence of the promise for joint engagement. In regards to the media, an additional finding is that children appear interested in stories that use appealing characters to deliver targeted educational content around computational thinking. Even after short periods of viewing, children were able to recall the important plot elements of stories that contain CT concepts. Finally, parent-child dyads can successfully engage in hands-on activities that promote joint engagement around computational thinking. Parents generally were responsive to parent-friendly materials that provide instructional practices to support their facilitation of these types of activities at-home. Further, the review of early media and hands-on activity prototypes have resulted in a set of recommendations for the future development of digital media and activities that support joint engagement around CT. These recommendations will be revisited through various phases of research for this project and refined as more is learned about the promising strategies for engaging parents and children around CT concept learning.

Recommendations for Computational Thinking Digital Media

From the findings presented in this report, the project team has assembled a set of recommendations to support further development of digital media and hands-on activities to promote the development of computational thinking skills. These recommendations reflect what we have learned from observing children as they viewed video prototypes, and what was learned

from hands-on activity observations and follow-up parent interviews. We believe that these recommendations may have broad implications for educational resources intended to teach computational thinking to young children.

- Simplify the storyline of media as often as possible to allow for more focus on specific plot points and CT content.

- Find ways to bring CT content to the forefront. Engage in repetition or consistent strategies across animated stories for the strategies that characters use for a CT-oriented approach to problem solving.

- Consider the use of key CT vocabulary as a way to bring CT to the forefront and a method to highlight how the characters' CT-driven approach is distinct from general problem solving. Vocabulary also could be emphasized during hands-on activities to bridge gaps and support parents' engagement with the CT content.

Recommendations for Hands-On Activities

Consistent with the approach already taken by this set of hands-on activities, future resources should:

- provide children an opportunity to explore CT concepts through active, hands-on experiences;

- use basic household materials, or discuss any required preparation for setup and cleanup before starting the activity;

- include clearly written definitions of any CT concepts that might be new to parents, particularly those that relate to their ability to emphasize the targeted CT concept (since parents reported that the definitions were clear, but it was not evident that they focused on these definitions when emphasizing learning opportunities for their children);

- develop ideas for question prompts that parents can use to scaffold the experience with their children.

Based on lessons learned from this formative research, additional recommendations to consider as new resources are developed include the following:

- Ensure that hands-on activity instructions are clear and, whenever possible, simplify text and emphasize the use of visuals to convey the step-by-step process for parents to follow.

- Find ways to emphasize the key information required for parents to support and scaffold CT exploration with their children.

- Include suggestions on how to make the activity either easier or more challenging, depending on the child's skill level.

References

Wing J. (*2011*). Research notebook: Computational thinking—What and why? *The Link*

Magazine, Spring. Carnegie Mellon University, Pittsburgh. Retrieved from

https://www.cs.cmu.edu/link/research-notebook-computational-thinking-what-and-why.

Gelman, R. & Brenneman, K. (2004). Science learning pathways for young children. *Early*

Childhood Research Quarterly, 19, 150-158.

Table 1

Media Tested During Formative Research

Resource Name	Format	Learning Concept
Going Bananas with Lemons	Story animatic	Debugging
Monkeying Around with Paint	Live action video	Debugging
Check Your Steps	Music video animatic	Debugging
Good Time	Music video animatic	Teamwork
Monkey See, Monkey Do (Clap, Stomp, Spin)	Music video animatic	Debugging
Take Me to the Fun Fair	Hands-on activity	Debugging
Mix & Match	Hands-on activity	Debugging
Monkeys in a Row	Hands-on activity	Debugging

Appendix A: Child Media Observations Verbal Responses by Protocol

Researcher probes are in italics and parentheses. The child's age is listed in the underscore after the subject number. For example C001_4_G means that this was subject 1 who was 4 years old and a girl. Child 002's age is unknown due to non-completion of the parent survey.

1. **Can you tell me the story that you just watched? What happened in the video? (Comprehension)**
   a. C001_4_G – "I don't want to watch again."

   b. C002_U_B – "Four monkeys—there was a goat and a froggie. They need four coins, and two ducks, and they pour juice and water and they tasted it and he got hurts. Because you need sauce for watermelon."

   c. C003_5_G – "The lemon was not good. The monkeys wanted to put sugar in here."

   d. C004_4_G – "It was mad and sad. They didn't have enough money for good stuff. They didn't get monkey because they didn't have no money left. They … lemon … and it tasted good."

   e. C005_4_B – "They wanted to go to the lemonade."

   f. C006_4_B – "He was watching the fair and then he put water and then he put something in there. And then he tasted it, and it tasted good. And then there was a counting. And then the boy flamingo tasted it and it gave them money."

   g. C007_5_G – (*What did the monkeys want to do?*) "Sell lemonade. To get sand dollars." (*Why?*) "For the parade."

   h. C008_4_B – (Child pointed to each prop) "To go to their momma and dadas." (*What did the monkeys want to do?*) "Go to the park."

i. C009_5_B – "I just saw them. They were going to the fun fair and used lemonade to make lemonade and they were going to the fun fair. Make lemonade to sell to the flamingoes. Sour lemons and that's how they made it good with ice cubes."

j. C010_5_G – "They did lemonade. Wanted to go to the circus."

k. C011_4_G – "This is the rides." (*What happened in the story?*) This. (Child points to the fun fair picture prop). "This. This. And this." (Points at several of the other picture props: monkeys, pitcher, and lemon.)

l. C012_5_B – "They went in the fair. The ducks wanted to taste the lemonade."

m. C013_4_B – "They trying to get lemons for free. They gave the flamingoes lemon and to the crabs. And then the crabs liked it because they put sugar and the flamingo liked. But before, when they first drinked it, they didn't like it. And then they put sugar and then the flamingo liked it and the crabs liked it."

n. C014_5_G – "They made some for ostriches and for crabs and for flamingo again." (*What did they make?)* "Lemonade." (*What did the monkeys want to do with the lemonade*?) "Give it to the people." (*Why?)* "Because they have to drink it." (*Why did they have to drink it?)* "Because they like it."

o. C015_5_B – "The monkeys wanted the sand money." (*What did the monkeys want to do with the money?*) "They wanted to go somewhere." (*Where?)* (Child pointed to the fun fair picture prop.)

p. C016_4_G – "Monkeys!" (*What were the monkeys doing?)* "They were going to the show … they were going." (*Where were they going? Can you tell me with the cards?*) "The show." (*What were they doing at the show?)* "They money." (*What were they doing at the show?)* (Child pointed to lemon picture prop.) "They were

making lemonade." (*Anything else?*) (Child pointed to flamingoes.) "She was tasting it. Yes. And he was tasting it."

2. **When the monkeys woke up, what did they see outside their window? (*Potential follow-ups:* What was coming to town? What did that make them want to do?) (Comprehension)**

   a. C001_4_G – (Child pointed to flamingoes. After no other response, researcher told her the monkeys wanted to go to the fair.)

   b. C002_U_B – "The monkeys would go have fun on the frog." (*They saw the fair?*) "Yes."

   c. C003_5_G – "A train." (*They saw a fair?*) "Yes."

   d. C004_4_G – "A circus—they wanted to go to a circus."

   e. C005_4_B – "The car. A person." (*They wanted to go to the fair?*) "Three lemons."

   f. C006_4_B – "The fair."

   g. C007_5_G – "The parade." (*What did the monkeys want to do?*) "Sell lemonade."

   h. C008_4_B – "A picnic." (*What was coming to town?*) "A park." (*What did they want to do?*) "Go to the park."

   i. C009_5_B – "A long line of the flamingoes. And the fun fair." (*What did it make them want to do?*) "Make lemonade, and they were all happy."

   j. C010_5_G – "The circus, like the fair."

k. C011_4_G – "The giraffe." (*What was coming to town?*) "The turtle." (*What did that make them want to do?*) "To drive. I want to watch again." (*You want to watch again?*) "Yeah."

l. C012_5_B – "The fair. It made them happy."

m. C013_4_B – "They saw the roller coaster."

n. C014_5_G – "A fair. (*What did that make the monkeys want to do?*) "Make lemonade so the people give them sand tickets." (*Or sand dollars, right?*) "Yeah."

o. C015_5_B – "They saw a dog." (Child pointed to the fun fair picture prop.) (*What did it make them want to do?*) "They wanted to play there."

p. C016_4_G – (Child pointed to the fun fair picture prop.) (*What did it make them want to do?*) "Make lemonade."

3. **But why couldn't the monkeys go to the fair? How did they try to solve their problem? (*If the child references it, the researcher could rephrase to* "How did the monkeys try to get sand dollars?" *or* "How did the monkeys try to make money?")**

   a. C001_4_G – (Child shook head. Researcher reminded them they had no sand dollars. Researcher also reminded her about selling lemonade.)

   b. C002_U_B – "Because they didn't have coins. They got a lot of juice from the tree."

   c. C003_5_G – "Because they didn't have much coins. They were going to drink some …" (Child pointed to lemon picture prop.)

   d. C004_4_G – "They didn't have no money. They get money."

e. C005_4_B – "The monkeys want to go to the fair. (*Why couldn't they*?) "Four monies with this." (Child pointed to lemon picture prop.) "They give it to the animals."

f. C006_4_B – "They didn't have money. 'Cuz they put salt in there. They did something and they have them quarters. And they needed one more quarter."

g. C007_5_G – "They didn't have money." (*What did they do?*) "Sell lemonade."

h. C008_4_B – "They want to." (*Why couldn't they go?*) "There were bees in there." (*How did they try to make money to go to the fair?*) (Child just pointed to a number of picture props.) (*Why did they want to make money?*) "Because they want to."

i. C009_5_B – "Because they didn't make lemonade. No, that's why they didn't." (*What was the problem?*) "Because they didn't have any sand coins." (*So what did they do to try to make money?*) "Make lemonade."

j. C010_5_G – "They didn't have money. Making lemonade. So they could get money."

k. C011_4_G – "'Cuz they wanted to go to the fun fair, the giraffe and everything, so they could be excited." (*But do you remember, why couldn't they go?*) "Because they could do something (inaudible)." (*How were the monkeys going to make money? Do you remember?*) "Yeah, they got make money with …" (Researcher reminded the child that the monkeys were going to make money selling lemonade.)

l. C012_5_B – "Because they have to get money. They had to get cash." (*How did they get cash?*) "From the flamingoes." (*What did they make?*) "Some lemonade."

m. C013_4_B – "Because they needed the stuff. The four stuff." (*What is that stuff?*) "Let's watch it again." (*Was that stuff the sand dollars?*) "Yes! Yeah, they needed the sand dollars."

n. C014_5_G – "Because they didn't have any tickets. Fred wasn't happy." (Researcher reminded the child that the monkeys wanted to go to the fair but they didn't have any money. So they wanted to make lemonade so they could sell it.)

o. C015_5_B – "'Cuz they had no money." (*How did they try to solve the problem?*) "With money." (*How did they try to get money*?) (Child pointed to flamingoes.) "They gave money to them. And the crabs, too."

p. C016_4_G – "Make lemonade." (*When the monkeys woke up what did they see outside their window?*) (Child pointed to fun fair.) (*What did that make the monkeys want to do?*) "Make lemonade." (*They wanted to go to the fair, but why couldn't they?*) "Because they want to be sad." (*Why do they want to be sad?*) "Because they go." (*How did they try to go there? What didn't they have?*) (Child pointed to flamingoes.) (*What did the monkeys need to go here? They needed sand money. To get money to go to the fair.*)

4. **How did the monkeys try to get the juice out the lemons? (*Follow-up, if they only mention poking a hole:* Did they try anything else? *Follow-up, if they mention more than one:* So, what worked the best? *Follow-up, if they just say squeezing the lemon inside the cup:* Why was that a good idea?) (Comprehension)**

   a. C001_4_G – "They made holes." (Researcher reminded the child that the monkeys put a lemon in a cup and squeezed it.)

b. C002_U_B – "They needed to put the lemons in the cup and squeeze it. They poured water in and it wasn't good. They put stuff in it." (*What was it?*) "Sugar."

c. C003_5_G – "You have to put two holes in it and squeeze it. Just squeeze it." (*Did they try to do anything else?*) "No."

d. C004_4_G – "They was trying to put a hole in it and didn't work, so they sewed it up and shake it and put it out, and then they put it in the cup and it worked."

e. C005_4_B – "Lick it off. Want to go to the fair. The monkeys (inaudible) to the animals. And the animals like it."

f. C006_4_B – "'Cuz they were squeezing it. With their hand. And then they put sugar in it."

g. C007_5_G – "They squeezed it."

h. C008_4_B – (After no response, the researcher described squeezing process. Child nodded.)

i. C009_5_B – "They make holes." (Child pointed to the lemon prop.) "He did." (*Why did they put holes?*) "Because only one drop came out." (*Did it work then?*) "No. Nothing come out. Just one drop." (*Did they try anything else?*) "Yeah. They put ice cubes, water, and lemonade." (*But how did they get the juice out of the lemons?*) "From a cup." (*What did they do with a cup?*) "Make the hole and then they squeezed it out." (*So what worked the best?*) "Making a hole." (*Just making a hole?*) "Yeah."

j. C010_5_G – "They squeezed the cup." (*Why was that a good idea? Did they try anything else?*) "They put a hole in it." (*Did that work?*) (Child shook head no.)

k. C011_4_G – "'Cuz they gotta drink it." (*Do you remember what ways they tried to get the juice out?*) "You gotta go see the giraffe first." (Researcher reminded the child that the monkeys poked a hole and then they squeezed it in a cup to get the juice out.)

l. C012_5_B – "They had to poke their lemon and squeeze it and put it in the cup."

m. C013_4_B – "Because the … they just gotta squeeze it really hard and then you get it, and then they got the sand dollars. And then they went to watch it and then the sand dollars went to go to the carnival and then they gave it to the men to pay the carnival."

n. C014_5_G – "They got something and they squeezed the thing and it came out." (*What did they use to squeeze it?*) "I don't remember." (*Were there other ways they tried to get the juice out of the lemons?*) "Yes. You could squish them like this." (*Do you remember what worked the best?*) "Squeezing them." (*Was that a good idea?*) (Child nodded head yes.)

o. C015_5_B – "They squeezed it. To give it to them." (Child pointed to flamingoes picture prop.) (*Did they try anything else?*) "The thing." (*What worked the best*?) "They squeezed it."

p. C016_4_G – "Umm, they make this and then it tasted good." (Child pointed to the lemon picture prop.) (*What were the ways they got the juice out of the lemon*?) "They went to the cup." (*What did they do with the cup?*) "They put water in the cup. Yeah." (*Okay, so they poked holes in the lemon and they couldn't get the juice, only one drop fell out, and what did they do after that?*) "They tasted it."

(Researcher reminded the child that the monkeys put the lemon in the cup and they squeezed it.)

5. **When Mrs. Flamingo tasted the lemonade for the first time, did she like it? (*If no, ask:* Why didn't she like it? *If yes, or I don't know, use prompt below*.) (*Follow-up: How do you think it tasted?*) (Comprehension)**

   a. C001_4_G – (Child shook head no.) "It was sour."

   b. C002_U_B – (Child shook head no) "Because there was just water and lemon. It tasted not good."

   c. C003_5_G – "No. Because you needed to add sugar to it."

   d. C004_4_G – "No. Because it was only with lemon. And then they put sugar and it tasted good."

   e. C005_4_B – (Child shook head no) "Because it was boring." (*How did it taste?*) "It tasted not good."

   f. C006_4_B – "No. Because when didn't put sugar in it and she didn't like it. When they put sugar in it and then the boy flamingo liked it."

   g. C007_5_G – (Child shook head no.) "Because it was sour."

   h. C008_4_B – (Child shook head no.) "The mama didn't like it. Only the daddy liked it." (*Why didn't she like it?*) "They didn't want to try it."

   i. C009_5_B – (Child shook head no.) "Because it was super sour."

   j. C010_5_G – (Child shook head no) "They only put lemonade and water." (*How did it taste?*) "Bad."

k. C011_4_G – "Yes." (*She did?*) "She did like, and Mr. Flamingo, they like it."
   (Researcher reminded the child that Mrs. Flamingo didn't like it because it was
   sour.) "It was sour?"

l. C012_5_B – (Child shook head no.) "Because it was water. Because the
   lemonade has to taste good."

m. C013_4_B – (Child shook head no.) "Because the four monkeys didn't put sugar
   inside it." (*How did it taste?*) "It tasted yucky. And then the other time, two times,
   one time the girl flamingo she didn't like it, and then the other time she did. And
   he liked it, she didn't taste it, but he did."

n. C014_5_G – (Child shook head no.) "Because they didn't have any sugar in it."
   (*How do you think it tasted?*) "Bad—if you don't put sugar in it, it won't taste
   good. And the Mister one liked it when they put sugar in it."

o. C015_5_B – "No. 'Cuz it's soft." (*How do you think it tasted?*) "Bad." (*Like
   sour?*) "Yeah, like Sour Patch Kids."

p. C016_4_G – "No. Because it was not good." (*Do you think it was sour?*) "Yeah."

6. **When the monkeys knew that their lemonade tasted bad, how did they figure out
   what went wrong? What did they do to make it taste good? (*Potential follow-ups if
   children are having a hard time:* Did they add something to their lemonade? What
   was it? After they added sugar, did it fix the problem with the lemonade?)
   (Debugging)**

   a. C001_4_G – (No immediate response.) (*What did they add?*) "Water."

   b. C002_U_B – "They added sugar."

c. C003_5_G – "Add sugar." (*Did it fix the problem?*) "Yeah."

d. C004_4_G – (Child did not answer.)

e. C005_4_B – "It's good (inaudible)." (*Did they add something?*) "In a cup. (*Did they add sugar?*) "Yeah."

f. C006_4_B – "They added sugar and water." (*After they added sugar, did it fix the problem?*) (Child nodded head yes.)

g. C007_5_G – "They didn't put sugar in it." (*What happened after they added sugar?*) "It tasted good."

h. C008_4_B – (Child was distracted by picture props.) (*Did the monkeys add sugar?*) "They made sugar some out of the watermelon."

i. C009_5_B – "They didn't put no ice cubes." (*So what did they do to make it good?*) "They used ice cubes. They used sugar ice cubes." (*After they added the sugar cubes, did it fix the problem?*) "Yes."

j. C010_5_G – "To mix it up." (*What did they mix it with?*) "Water and sugar." (*Did it fix the problem?*) "Yes." (*Was it sour?*) "No."

k. C011_4_G – "If you do something to the lemonade, they go with the animals." (*They forgot to add sugar.*) "I don't eat sugar. 'Cuz they're nasty."

l. C012_5_B – "To make the people happy to go to the fair." (*What did they add to the lemonade to make it taste good?*) "Some … some lemonade." (*Did sugar fix the problem with the lemonade?*) (Child nodded head yes.)

m. C013_4_B – "They didn't add sugar, they just added water and lemon."

n. C014_5_G – (*What steps did they take to figure out what went wrong?*) "They didn't remember." (*They added the sugar—did that fix the problem?*) "Yes."

o.   C015_5_B – "Because of that." (Child pointed to lemon picture prop.) (*Did they*

add something to the lemonade?) "That's it." (*Did they add sugar?*) "Yes." (*After*

they added sugar, did it fix the problem?) (Child nodded head yes.)

p.   C016_4_G – "Sugar." (*After they added sugar, did it fix the problem?*) "Yeah."

(Researcher reminded the child that monkeys checked their steps and added sugar

to make it sweet.)

7. **Do you remember the steps the monkeys used to make their lemonade? Here are**

some pictures of things that they used to make the lemonade. Can you show me

what they did to make it? (*Potential prompt if the child struggles:* What did they do

first? What did they do after that?) (Comprehension)

(Note: The research team mostly recorded the order that children pointed to

picture props. In the event that there was deliberate child language, it was

recorded.)

a.   C001_4_G – lemon+cup, pitcher, sugar, spoon, full pitcher

b.   C002_U_B – lemon+cup, pitcher, sugar, spoon, full pitcher

c.   C003_5_G – "Put a hole in the cup and squeeze it in the cup. Put the water in, put

the sugar, mixed it with the spoon, then they had the lemonade."

d.   C004_4_G – "Pitcher and put sugar in it."

e.   C005_4_B – "They drink it. They drinking the lemon."

f.   C006_4_B – "Add water, sugar, the lemon squeeze, spoon, lemonade."

g.   C007_5_G – lemon+cup, sugar, water, spoon, lemonade

h. C008_4_B – "Sugar. This (pitcher) and sugar. Put it in there. And then squeeze it. Used the fork, the spoon to put it in here."

i. C009_5_B – "And then they mixed it up."

j. C010_5_G – lemon+cup, sugar, water, "spoon to put the sugar in, make the lemonade."

k. C011_4_G – "They do this, and then sugar… They try to take it out but they didn't like it. If you put … I don't drink soda and lemonade."

l. C012_5_B – "They used ice, spoon, put some holes in that (lemon), then (points to pitcher). First add some sugar, then (point to spoon), then …" (points to lemon+cup and then pitcher)

m. C013_4_B – "They squeezed the lemon to put it in the cup, and then they put sugar, and then they add the spoon to put the spoon in the sugar, and then the spoon had to dip it in the cup, and then this (they added water) and then (pitcher with lemon on it)."

n. C014_5_G – "They squeezed the lemon, and then they poured water inside, and then they put the lemon on top, and then the put the sugar inside, and then they drink it."

o. C015_5_B – lemon+cup, and then pointed to spoon, sugar, pitcher (Disorganized multiple attempts)

p. C016_4_G – lemon pitcher, sugar, pitcher again, lemon + cup, water

8. **What happened after the monkeys made their lemonade taste good? (*Potential follow-ups:* Who tasted it? Did they like it? How do you know?) (Comprehension)**

a. C001_4_G – (Researcher asked who tasted it again—child pointed to flamingoes.)

b. C002_U_B – "The ducks were happy. It was very good. They gave them a sand coin."

c. C003_5_G – "They got their sandals." (inferred sand dollars)

d. C004_4_G – "They put sugar in it. It tasted good. The boy, he tasted it. It tasted good for him, and they got money."

e. C005_4_B – "They took a spoon." (*Who tasted it?*) "Daisy." (*Did she like it?*) "Yes."

f. C006_4_B – "They went to the fair."

g. C007_5_G – "They put sugar in it." (*Who tasted it?*) "The flamingo." (*Did they like it?*) (Child nodded head yes.)

h. C008_4_B – (Child was inaudible._ (*Who? Did Mr. Flamingo taste it?*) "Yeah. They feel good and they liked it."

i. C009_5_B – "They made the lemonade good with sugar." (*And who tasted it?*) "The ..." (Child pointed to flamingoes.) (*Anybody else?*) "He said that was super good." (*Anybody else try it?*) "Just them." (*How do you know he liked it?*) "Because they put sugar in it."

j. C010_5_G – (*Who tasted it?*) "The crabs and Mr. Flamingo." (*Did they like it?*) "They put sugar and water in it."

k. C011_4_G – "Let me show you." (Child picked up the flamingoes picture prop.) "Miss Flamingo tasted it. She didn't it was sour."

l. C012_5_B – (*Who tasted it?*) (Child pointed to Mr. Flamingo.) (*Did he like it?*) (Child nodded head yes.) "He liked it because it was good."

m. C013_4_B – "They went to the carnival."

n. C014_5_G – (*Who tasted it?)* "The flamingoes, the crabs, and then the flamingoes again." (*Did they like it?)* "Because they put sugar inside."

o. C015_5_B – "They made it taste better with sugar." (*Who tasted it*?) "The flamingoes." (*Anybody else?*) "The crabs. Crabs liked it." (*How do you know the crabs like it?*) "Because it's soft."

p. C016_4_G – "It was good." (*Who tasted it?*) "Flamingoes." (*Did they like it?*) "Yes." (*How do you know?)* "It was good." (*Anybody else try it?*) "The flamingo."

9. **What happened at the end of the story? (*Potential follow-up:* Could the monkeys go to the fair at the end? Why?) (Comprehension)**

a. C001_4_G – (*Did they go to the fair?*) (Child nodded head yes.)

b. C002_U_B – "It was the end because the juice was good." (*Did they get to go to the fair?*) "Yes. They need a paper towel so their hands won't get cold."

c. C003_5_G – "Yes." (*Did they get their sand dollars?*) "Because they got their four sand dollars."

d. C004_4_G – "They got they money and they got to go to the circus."

e. C005_4_B – "They going to the fun." (*Why?)* "Because they liked it." (*Did they have the money?*) "No."

f. C006_4_B – (Child did not respond.)

g. C007_5_G – "They went to the parade."

h. C008_4_B – (*Could they go to the fair at the end?*) "Yes. Because they wanted to."

i. C009_5_B – "They put sugar and water." (*Could the monkeys go to the fun fair?*) "Yes, because they made lemonade." (*When they made lemonade, what did they get?*) "Sand coins." (*Could they go to the fair now?*) (Child nodded head yes.)

j. C010_5_G – "They went to the circus." (*Why could they go?*) "Because they had money."

k. C011_4_G – "They was laughing ha ha ha."

l. C012_5_B – "The dad tasted the lemonade and it tasted good and they went to the fair." (*Could the monkeys go?*) (Child nodded head yes.) (*Why?*) "They had cash."

m. C013_4_B – "They just went there. And then they gave some money to pay for the carnival."

n. C014_5_G – "About the flamingoes when they put sugar inside." (*Could the monkeys go the fair?*) "Yes. Because I saw right there. They were walking and running. Because they have to wait until it's morning."

o. C015_5_B – (*Could the monkeys go to the fun fair at the end?*) "Yes. Because they had money."

p. C016_4_G – "The crabs liked it." (*Could the monkeys go to the fair?*) "Yes." (*Why?*) "They don't have money." (*They don't have money? At the end did they have money?*) (Child nodded head yes.)

10. What did the kids do in the video? (Comprehension)

 a. C001_4_G – (Child did not respond).

 b. C002_U_B – "They were painting the house the same as the other house."

 c. C003_5_G – "They mixed blue and red. Because it was not the same. They needed like dark green."

 d. C004_4_G – "That's cool! They made their house special. So they could live in house forever. They built it with cardboard."

 e. C005_4_B – "They painting the house."

 f. C006_4_B – "They put one squirt blue, one squirt yellow, one squirt black and they mixed it."

 g. C007_5_G – "They made colors. They painted the house."

 h. C008_4_B – "I don't know."

 i. C009_5_B – "They painted their house the same color as the real house but the light green wasn't the same color. The house was darker but they didn't make the same color. That's why they mixed the dark green with black. (*They made it with just black?*) They mixed it up with yellow, black, and blue."

 j. C010_5_G – "They painted their house."

 k. C011_4_G – "They was painting the house."

 l. C012_5_B – "They painted some black, blue, and yellow to make green. To make it more darker."

 m. C013_4_B – "They tried to make darker blue. They added purple and yellow but it didn't make the right green to their house. But they added black, and yellow, and blue and they made the perfect color to their house."

n. C014_5_G – "Made painting a house."

o. C015_5_B – "They paint the house dark green."

p. C016_4_G – "They painted the house."

11. How did the kids work together to make the paint for their playhouse? (*Follow-up: What did they do to make green paint?*) (Comprehension)

a. C001_4_G – (Child shook head—did not remember.)

b. C002_U_B – "They mixed their paint like the regular house. They put yellow, blue, and black."

c. C003_5_G – "They used black, yellow, and blue, and no red."

d. C004_4_G – "They put glue together so it doesn't break." (*What about the paint, what did they do?*) "They used black, yellow, blue to make the house a special color."

e. C005_4_B – "Colors. They paint it. Yellow, blue, and black."

f. C006_4_B – "They put black, and yellow, and then blue."

g. C007_5_G – "They helped each other. They painted the house. And squirted the paint."

h. C008_4_B – "They mixed it. With black, and blue, and yellow."

i. C009_5_B – (Child answered this probe in the last question)

j. C010_5_G – "Black, white, and blue. Black, yellow, and blue."

k. C011_4_G – "They was getting dark paint. "

l. C012_5_B – "Because they wanted to make the colors the black, the blue, and the yellow—to make it darker."

m. C013_4_B – "Because they wanted to make the playhouse. The same house like their real house. They added yellow, black, and blue."

n. C014_5_G – "You mean green? You mean the dark green? The black, the yellow, and the blue." (*And the first time, what did they use?*) "Paint."

o. C015_5_B_5 – "They used yellow, and blue, and black. (*It made the green paint?*) (Child nodded yes.)

p. C016_4_G_4 – "Black." (*What did they do to make the green paint?*) "They put yellow and blue, and black. And they mix it."

12. **What was wrong with the green paint when they made it? How did they fix it?**

    (Debugging)

    a. C001_4_G – "One squirt of yellow, one squirt of red, one squirt of red."

    b. C002_U_B – "It was light green, but they wanted dark green like the other house."

    c. C003_5_G – "It was not … they needed to make dark green. They put black, yellow, green."

    d. C004_4_G – "It didn't get the same color as their house. They added black and blue and yellow."

    e. C005_4_B – (*How did they fix it?*) With green.

    f. C006_4_B – "It was light. They put one blue, one yellow, and one black and they made a lot."

    g. C007_5_G – "Black, yellow, and blue. It was light. Different colors." (*Which color did they add?*) "I don't know."

h. C008_4_B – "They were sad." (*Why were they sad? What was wrong?*) "I don't know." (*Was it the wrong color green?)* "I don't know."

i. C009_5_B – "They didn't have green paint." (*How did they fix it again?*) "With dark green."

j. C010_5_G – (*How did they fix it?)* (Child did not respond.)

k. C011_4_G – "They put black first, put green paint first, and blue paint first, and yellow paint first. You could mix it with purple." (*What was wrong with the green paint when they made it the first time?*) "I did paint in my class." (*In the video, what was wrong with the green paint?*) (Child walked out of the room because she saw her mother.)

l. C012_5_B – "They put some yellow, some blue, and some black, and then they mixed it and they painted." (*Did they find the right color?)* "Mmhmm." (Perceived as an affirmative answer.)

m. C013_4_B – "They fixed it with the paintbrush." (*What was wrong with the paint they made? The first green?*) "They remade all the stuff. They added a blue, a black, a yellow, and it makes the right green for their house, and then they made a playhouse they wanted to be the same as their real house."

n. C014_5_G – "They made purple." (*And what else did they make?*) "I don't remember." (*What was the first problem they had with the first green? Do you remember how they fixed the green*?) "Black, and the blue."

o. C015_5_B – "It was light green." (*How did they fix it?*) "It was … yellow, and blue, and black." (*And that fixed it?*) "Yes." (*What did they put in the first time?*) "The paint it."

p. C016_4_G – "Two of them." (*What was wrong with it? Do you remember?*)

"They put in black. The house and they painted it together."

13. **What were the monkeys singing about? (*If necessary:* What did the monkeys want to do?) (Comprehension)**

   a. Check Your Steps

      i. C001_4_G – (Child did not respond.)

      ii. C002_U_B – "Like building something—building a giant castle.

      iii. C003_5_G – They was making a castle."

      iv. C004_4_G – "One monkey tried to build a school, but it was hard for him. So they helped him and made a school."

      v. C005_4_B – "They did it. The monkeys. Build a house. Because he's little and he can't do the house."

      vi. C013_4_B – "They were singing about helping and fixing together, and fixing and no mistakes, and by accident one of the monkeys says sorry."

   b. Good Time

      i. C006_4_B – "They want to have a good time."

      ii. C007_5_G – "Putting clothes away."

      iii. C008_4_B – "I don't know. Monkeys."

      iv. C009_5_B – "They want to have some sunshine because there's no sunshine because …" (*What did the monkeys want to do?*) "Have some sunshine and have fun at the beach."

      v. C010_5_G – "Wanted to go to the beach."

c. Monkey See, Monkey Do (Clap, Stomp, Spin)

    i. C011_4_G – "They were singing … I don't know … clapping, stomping.

       And clapping their hands."

   ii. C012_5_B – "Clap, stomp, clap, stomp, spin. They wanted to (inaudible)."

  iii. C014_5_G – "A dance. Dance clap and they spin."

  iv. C015_5_B – "The clap and stomp and spin."

   v. C016_4_G – "The little monkeys dancing." (*What did they want to do?*)

       "They sing."

14. Special video question (Debugging)

a. Check Your Steps: When Bo's tower kept falling down, how did the monkeys fix it?

    i. C001_4_G – "Nothing."

    ii. C002_U_B – "They put it back together and then he was happy."

    iii. C003_5_G – "They was making a castle, I don't know what they was using. They put two blocks on the bottom and put it together like these blocks is holding the table."

    iv. C004_4_G – "They build it with glue."

    v. C005_4_B – (*How did they fix it?*) "With blocks. Building."

    vi. C013_4_B – "They wanted to help building something." (*So Bo's tower kept falling down; how did the monkeys fix it?*) "They want to fix it. They liked it. They fixed it and they didn't break it again."

b. Good Time: How did the monkeys finish cleaning their room so they could get to the beach?

    i. C006_4_B – "They put all the clothes away. Put toys away."

    ii. C007_5_G – "Worked together and cleaned up fast."

    iii. C008_4_B – "Only they have sand and water."

    iv. C009_5_B – "By having some music."

    v. C010_5_G – "They were cleaning everything up."

c. Monkey See, Monkey Do (Clap, Stomp, Spin): What happened when the monkeys tried to learn the dance?

      i. C011_4_G – "They was so fun." (*What about when the monkeys tried to learn the dance?*) "They tried to, but they can't. They couldn't spin around."

      ii. C012_5_B – "They wanted to clap and stomp and when the crabs were coming."

      iii. C014_5_G – (*Did they get it right the first time?*) "Yes."

      iv. C015_5_B – "They were clapping, and stomping, and spinning around." (*And could they do it on the first try?*) (Child nodded head yes.)

      v. C016_4_G – "Um, they playing, they playing and dancing." (*What were the steps, do you remember?*) "No." (*That's okay.*)

15. **Think about all three videos you just watched. What did you think about the videos? (*Follow-up*: What did you like? Was there anything you did not like?)**

    C001_4_G – (Child did not respond.)

    a. C002_U_B – "Lemonade. I don't like the taste of lemonade. I just like juice. I do like the lemonade." (*Did you like the painting?*) "I don't like when it was dark. The dark. Like the house. Everything was dark." (*Did you like the music?*) "Yeah, I liked that there was sharing."

    b. C003_5_G – "Good."

    c. C004_4_G – "Interesting. I liked the story one because I get to dance. I liked the circus one. One thing I didn't like. I didn't like the ice tea because I don't like ice."

d. C005_4_B – "They're good. The four monkeys. (*Did you have a favorite*

*monkey?) "*The boy. I liked everything."

e. C006_4_B – "Good. I liked everything."

f. C007_5_G – "Three videos all together. They were making lemonade. They were

painting the house. They were cleaning up."

g. C008_4_B – "I don't know. I want to tell my mama. I didn't like them."

h. C009_5_B – "I liked the girl and the boys. I didn't like the mess." (*Did you like*

the monkeys?) "Yeah, I liked the monkeys."

i. C010_5_G – "They're good. The one that was third. The song. And the second

story. That they want to go to the circus."

j. C011_4_G – "Eww … I don't like crabs because they bite." (*So did you like the*

videos?) "Yeah. I liked that one, that one, that one, that one." (*Pointing to*

monkeys). "I didn't like this one (the crabs). Because they eat you up."

k. C012_5_B – "I did like the first one." (*What didn't you like?*) "In the end. That

the crabs were coming." (*Why didn't you like them*?) "Because the crabs were

dancing with the monkeys."

l. C013_4_B – "When I was watching them it was good!"

m. C014_5_G – "They were great. All of them I love them. Because they are so

nice." (*Was there anything you didn't like?*) "No, I love it."

n. C015_5_B – "Good." (*What did you like?*) "The monkeys dancing." (*What didn't*

you like?) "They weren't learning how to dance."

o. C016_4_G – "They were good." (*What did you like?*) "The little monkeys." (*Was there anything you didn't like?*) "Yes." (*What didn't you like?*) "The lemonade." (*Why didn't you like the lemonade? You like it? Okay*.)

Appendix B: Child Media Observations Verbal Responses by Child

Researcher probes are in italics and parentheses. The child's age is listed in the underscore after the subject number. For example C001_4_G means that this was subject 1 who was 4 years old and a girl. Child 002's age is unknown due to non-completion of the parent survey.

<u>**C001_4_G Responses**</u>

1.**Can you tell me the story that you just watched? What happened in the video? (Comprehension)**

"I don't want to watch again."

2. **When the monkeys woke up, what did they see outside their window? (***Potential follow-ups:* **What was coming to town? What did that make them want to do?)** **(Comprehension)**

(Child pointed to flamingoes. After no other response, researcher told her the monkeys wanted to go to the fair.)

3. **But why couldn't the monkeys go to the fair? How did they try to solve their problem? (***if the child references it, the researcher could rephrase* **to "How did the monkeys try to get sand dollars?" or "How did the monkeys try to make money?"***)

(Child shook head. Researcher reminded her they had no sand dollars. Researcher also reminded her about selling lemonade.)

4. **How did the monkeys try to get the juice out the lemons? (***Follow-up, if they only mention poking a hole:* **Did they try anything else?** *Follow-up, if they mention more than one:* **So, what worked the best?** *Follow-up, if they just say squeezing the lemon inside the cup:* **Why was that a good idea?) (Comprehension)**

"They made holes." (Researcher reminded the child that the monkeys put a lemon in a cup and squeezed it.)

5. When Mrs. Flamingo tasted the lemonade for the first time, did she like it? (*If no, ask:* Why didn't she like it? *If yes, or I don't know, use prompt below*.) (*Follow-up:* How do you think it tasted?) (Comprehension)

(Child shook head no.) "It was sour."

6. When the monkeys knew that their lemonade tasted bad, how did they figure out what went wrong? What did they do to make it taste good? (*Potential follow-ups if children are having a hard time:* Did they add something to their lemonade? What was it? After they added sugar, did it fix the problem with the lemonade?) (Debugging)

(No immediate response.) (*What did they add?*) "Water."

7. Do you remember the steps the monkeys used to make their lemonade? Here are some pictures of things that they used to make the lemonade. Can you show me what they did to make it? (*Potential prompt if the child struggles:* What did they do first? What did they do after that?) (Comprehension)

(Note: The research team mostly recorded the order that children pointed to picture props. In the event that there was deliberate child language, it was recorded.)

lemon+cup, pitcher, sugar, spoon, full pitcher

8. What happened after the monkeys made their lemonade taste good? (*Potential follow-ups:* Who tasted it? Did they like it? How do you know?) (Comprehension)

(Researcher asked who tasted it again—pointed to flamingoes.)

9. What happened at the end of the story? (*Potential follow-up:* Could the monkeys go to the fair at the end? Why?) (Comprehension)

(*Did they go to the fair?*) (Child nodded head yes.)

10. What did the kids do in the video? (Comprehension)

(Child did not respond.)

11. How did the kids work together to make the paint for their playhouse?

(*Follow-up:* What did they do to make green paint?) (Comprehension)

(Child shook head—did not remember.)

12. What was wrong with the green paint when they made it? How did they fix it?

(Debugging)

"One squirt of yellow, one squirt of red, one squirt of red."

13. What were the monkeys singing about? (*If necessary:* What did the monkeys

want to do?) (Comprehension)

"Nothing."

14. When Bo's tower kept falling down, how did the monkeys fix it? (Check Your

Steps: Comprehension)

(Child did not respond.)

15. Think about all three videos you just watched. What did you think about the

videos? (*Follow-up*: What did you like? Was there anything you did not like?)

(Child did not respond.)

C002_U_B Responses

1. Can you tell me the story that you just watched? What happened in the video? (Comprehension)

"Four monkeys—there was a goat and a froggie. They need four coins, and two ducks, and they pour juice and water and they tasted it and he got hurts. Because you need sauce for watermelon."

2. When the monkeys woke up, what did they see outside their window? (*Potential follow-ups:* What was coming to town? What did that make them want to do?) (Comprehension)

"The monkeys would go have fun on the frog." (*They saw the fair?*) "Yes."

3. But why couldn't the monkeys go to the fair? How did they try to solve their problem? (*If the child references it, the researcher could rephrase to* "How did the monkeys try to get sand dollars?" or "How did the monkeys try to make money?")

"Because they didn't have coins. They got a lot of juice from the tree."

4. How did the monkeys try to get the juice out the lemons? (*Follow-up, if they only mention poking a hole:* Did they try anything else? *Follow-up, if they mention more than one:* So, what worked the best? *Follow-up, if they just say squeezing the lemon inside the cup:* Why was that a good idea?) (Comprehension)

"They needed to put the lemons in the cup and squeeze it. They poured water in and it wasn't good. They put stuff in it." (*What was it?*) "Sugar."

5. When Mrs. Flamingo tasted the lemonade for the first time, did she like it? (*If no, ask:* Why didn't she like it? *If yes, or I don't know, use prompt below*.)
(*Follow-up:* How do you think it tasted?) (Comprehension)

(Child shook head no.) "Because there was just water and lemon. It tasted not good."

6. When the monkeys knew that their lemonade tasted bad, how did they figure out what went wrong? What did they do to make it taste good? (*Potential follow-ups if children are having a hard time:* Did they add something to their lemonade? What was it? After they added sugar, did it fix the problem with the lemonade?) (Debugging)

"They added sugar."

7. Do you remember the steps the monkeys used to make their lemonade? Here are some pictures of things that they used to make the lemonade. Can you show me what they did to make it? (*Potential prompt if the child struggles:* What did they do first? What did they do after that?) (Comprehension)
(Note: The research team mostly recorded the order that children pointed to picture props. In the event that there was deliberate child language, it was recorded.)

lemon+cup, pitcher, sugar, spoon, full pitcher

8. What happened after the monkeys made their lemonade taste good? (*Potential follow-ups:* Who tasted it? Did they like it? How do you know?) (Comprehension)

"The ducks were happy. It was very good. They gave them a sand coin."

9. What happened at the end of the story? (*Potential follow-up:* Could the monkeys go to the fair at the end? Why?) (Comprehension)

"It was the end because the juice was good." (*Did they get to go to the fair?*) "Yes. They need a paper towel so their hands won't get cold."

10. What did the kids do in the video? (Comprehension)

"They were painting the house the same as the other house."

11. How did the kids work together to make the paint for their playhouse? (*Follow-up:* What did they do to make green paint?) (Comprehension)

"They mixed their paint like the regular house. They put yellow, blue, and black."

12. What was wrong with the green paint when they made it? How did they fix it? (Debugging)

"It was light green but they wanted dark green like the other house."

13. What were the monkeys singing about? (*If necessary:* What did the monkeys want to do?) (Comprehension)

"Like building something—building a giant castle."

14. When Bo's tower kept falling down, how did the monkeys fix it? (Check Your Steps: Debugging)

"They put it back together and then he was happy."

15. Think about all three videos you just watched. What did you think about the videos? (*Follow-up*: What did you like? Was there anything you did not like?)

"Lemonade. I don't like the taste of lemonade. I just like juice. I do like the lemonade." (*Did you like the painting?*) "I don't like when it was dark. The dark. Like the house. Everything was dark." (*Did you like the music?*) "Yeah, I liked that there was sharing."

C003_5_G Responses

1. Can you tell me the story that you just watched? What happened in the video? (Comprehension)

"The lemon was not good. The monkeys wasted to put sugar in here."

2. When the monkeys woke up, what did they see outside their window? (*Potential follow-ups:* What was coming to town? What did that make them want to do?) (Comprehension)

"A train." (*They saw a fair?*) "Yes."

3. But why couldn't the monkeys go to the fair? How did they try to solve their problem? (*If the child references it, the researcher could rephrase to* "How did the monkeys try to get sand dollars?" or "How did the monkeys try to make money?")

"Because they didn't have much coins. They were going to drink some …" (Child pointed to lemon picture prop.)

4. How did the monkeys try to get the juice out the lemons? (*Follow-up if they only "mention poking a hole:* Did they try anything else? *Follow-up, if they mention more than one:* So, what worked the best? *Follow-up, if they just say squeezing the lemon inside the cup:* Why was that a good idea?) (Comprehension)

"You have to put two holes in it and squeeze it. Just squeeze it." (*Did they try to do anything else?*) "No."

5. When Mrs. Flamingo tasted the lemonade for the first time, did she like it? (*If no, ask:* Why didn't she like it? *If yes or I don't know, use prompt below*.)

(*Follow-up*: How do you think it tasted?) (Comprehension)

"No. Because you needed to add sugar to it."

6. When the monkeys knew that their lemonade tasted bad, how did they figure out what went wrong? What did they do to make it taste good? (*Potential follow-ups if children are having a hard time:* Did they add something to their lemonade? What was it? After they added sugar, did it fix the problem with the lemonade?) (Debugging)

"Add sugar." (*Did it fix the problem?*) "Yeah."

7. Do you remember the steps the monkeys used to make their lemonade? Here are some pictures of things that they used to make the lemonade. Can you show me what they did to make it? (*Potential prompt if the child struggles:* What did they do first? What did they do after that?) (Comprehension)
(Note: The research team mostly recorded the order that children pointed to picture props. In the event that there was deliberate child language, it was recorded.)

"Put a hole in the cup and squeeze it in the cup. Put the water in, put the sugar, mixed it with the spoon, then they had the lemonade."

8. What happened after the monkeys made their lemonade taste good? (*Potential follow-ups:* Who tasted it? Did they like it? How do you know?) (Comprehension)

"They got their sandals." (Inferred sand dollars.)

9. What happened at the end of the story? (*Potential follow-up:* Could the monkeys go to the fair at the end? Why?) (Comprehension)

"Yes." (*Did they get their sand dollars?*) "Because they got their four sand dollars."

10. What did the kids do in the video? (Comprehension)

"They mixed blue and red. Because it was not the same. They needed like dark green."

11. How did the kids work together to make the paint for their playhouse? (*Follow-up:* **What did they do to make green paint?**) **(Comprehension)**

"They used black, yellow, and blue, and no red."

12. What was wrong with the green paint when they made it? How did they fix it? (Debugging)

"It was not … they needed to make dark green. They put black, yellow, green."

13. What were the monkeys singing about? (*If necessary:* What did the monkeys want to do?) (Comprehension)

"They was making a castle."

14. When Bo's tower kept falling down, how did the monkeys fix it? (Check Your Steps: Debugging)

"They was making a castle, I don't know what they was using. They put two blocks on the bottom and put it together like these blocks is holding the table."

15. Think about all three videos you just watched. What did you think about the videos? (*Follow-up*: What did you like? Was there anything you did not like?)

"Good."

C004_4_G Responses

1. Can you tell me the story that you just watched? What happened in the video? (Comprehension)

"It was mad and sad. They didn't have enough money for good stuff. They didn't get monkey because they didn't have no money left. They… lemon… and it tasted good."

2. When the monkeys woke up, what did they see outside their window? (*Potential follow-ups:* What was coming to town? What did that make them want to do?) (Comprehension)

"A circus—they wanted to go to a circus."

3. But why couldn't the monkeys go to the fair? How did they try to solve their problem? (*If the child references it, the researcher could rephrase to "How did the monkeys try to get sand dollars?" or "How did the monkeys try to make money?"*)

"They didn't have no money. They get money."

4. How did the monkeys try to get the juice out the lemons? (*Follow-up if they only mention poking a hole:* Did they try anything else? *Follow-up, if they mention more than one:* So, what worked the best? *Follow-up, if they just say squeezing the lemon inside the cup:* Why was that a good idea?) (Comprehension)

"They was trying to put a hole in it and didn't work, so they sewed it up and shake it and put it out, and then they put it in the cup and it worked."

5. When Mrs. Flamingo tasted the lemonade for the first time, did she like it? (*If no, ask:* Why didn't she like it? *If yes, or I don't know, use prompt below.*)

(*Follow-up:* How do you think it tasted?) (Comprehension)

"No. Because it was only with lemon. And then they put sugar and it tasted good."

6. When the monkeys knew that their lemonade tasted bad, how did they figure out what went wrong? What did they do to make it taste good? (*Potential follow-ups if children are having a hard time:* Did they add something to their lemonade? What was it? After they added sugar, did it fix the problem with the lemonade?) (Debugging)

(Child did not answer.)

7. Do you remember the steps the monkeys used to make their lemonade? Here are some pictures of things that they used to make the lemonade. Can you show me what they did to make it? (*Potential prompt if the child struggles:* What did they do first? What did they do after that?) (Comprehension)
(Note: the research team mostly recorded the order that children pointed to picture props. In the event that there was deliberate child language, it was recorded.)

"Pitcher and put sugar in it."

8. What happened after the monkeys made their lemonade taste good? (*Potential follow-ups:* Who tasted it? Did they like it? How do you know?) (Comprehension)

"They put sugar in it. It tasted good. The boy, he tasted it. It tasted good for him and they got money."

9. What happened at the end of the story? (*Potential follow-up:* Could the monkeys go to the fair at the end? Why?) (Comprehension)

"They got they money and they got to go to the circus."

10. What did the kids do in the video? (Comprehension)

"That's cool! They made their house special. So they could live in house forever. They built it with cardboard."

11. How did the kids work together to make the paint for their playhouse? (*Follow-up:* **What did they do to make green paint?**) **(Comprehension)**

"They put glue together so it doesn't break." (*What about the paint, what did they do?*) "They used black, yellow, blue to make the house a special color."

12. What was wrong with the green paint when they made it? How did they fix it? (Debugging)

"It didn't get the same color as their house. They added black and blue and yellow."

13. What were the monkeys singing about? (*If necessary:* What did the monkeys want to do?) (Comprehension)

"One monkey tried to build a school but it was hard for him. So they helped him and made a school."

14. When Bo's tower kept falling down, how did the monkeys fix it? (Check Your Steps: Debugging)

"They build it with glue."

15. Think about all three videos you just watched. What did you think about the videos? *Follow-up***: What did you like? Was there anything you did not like?**

"Interesting. I liked the story one because I get to dance. I liked the circus one. One thing I didn't like. I didn't like the ice tea, because I don't like ice."

C005_4_B Responses

1. Can you tell me the story that you just watched? What happened in the video? (Comprehension)

"They wanted to go to the lemonade."

2. When the monkeys woke up, what did they see outside their window? (*Potential follow-ups: What was coming to town? What did that make them want to do?*) (Comprehension)

"The car. A person." (*They wanted to go to the fair?*) "Three lemons."

3. But why couldn't the monkeys go to the fair? How did they try to solve their problem? (*If the child references it, the researcher could rephrase to "How did the monkeys try to get sand dollars?" or "How did the monkeys try to make money?"*)

"The monkeys want to go to the fair. (*Why couldn't they*?) "Four monies with this." (Child pointed to lemon picture prop.) "They give it to the animals."

4. How did the monkeys try to get the juice out the lemons? (*Follow-up if they only mention poking a hole: Did they try anything else? Follow-up, if they mention more than one: So, what worked the best? Follow-up, if they just say squeezing the lemon inside the cup: Why was that a good idea?*) (Comprehension)

"Lick it off. Want to go to the fair. The monkeys (inaudible) to the animals. And the animals like it."

5. When Mrs. Flamingo tasted the lemonade for the first time, did she like it? (*If no, ask: Why didn't she like it? If yes, or I don't know, use prompt below.*)

(*Follow-up: How do you think it tasted?*) (Comprehension)

(Child shakes head no.) "Because it was boring." (*How did it taste?*) "It tasted not good."

6. When the monkeys knew that their lemonade tasted bad, how did they figure out what went wrong? What did they do to make it taste good? (*Potential follow-ups if children are having a hard time:* Did they add something to their lemonade? What was it? After they added sugar, did it fix the problem with the lemonade?) (Debugging)

"It's good. (Inaudible)" (*Did they add something?*) "In a cup." (*Did they add sugar?*) "Yeah."

7. Do you remember the steps the monkeys used to make their lemonade? Here are some pictures of things that they used to make the lemonade. Can you show me what they did to make it? (*Potential prompt if the child struggles:* What did they do first? What did they do after that?) (Comprehension)
(Note: The research team mostly recorded the order that children pointed to picture props. In the event that there was deliberate child language, it was recorded.)

"They drink it. They drinking the lemon."

8. What happened after the monkeys made their lemonade taste good? (*Potential follow-ups:* Who tasted it? Did they like it? How do you know?) (Comprehension)

"They took a spoon." (*Who tasted it?*) "Daisy." (*Did she like it?*) "Yes."

9. What happened at the end of the story? (*Potential follow-up:* Could the monkeys go to the fair at the end? Why?) (Comprehension)
"They going to the fun." (*Why?*) "Because they liked it." (*Did they have the money?*) "No."

10. What did the kids do in the video? (Comprehension)

"They painting the house."

11. How did the kids work together to make the paint for their playhouse? (*Follow-up:* **What did they do to make green paint?**) **(Comprehension)**

"Colors. They paint it. Yellow, blue, and black."

12. What was wrong with the green paint when they made it? How did they fix it? (Debugging)

(*How did they fix it?*) "With green."

13. What were the monkeys singing about? (*If necessary:* **What did the monkeys want to do?**) **(Comprehension)**

"They did it. The monkeys. Build a house. Because he's little and he can't do the house."

14. When Bo's tower kept falling down, how did the monkeys fix it? (Check Your Steps: Debugging)

(*How did they fix it?*) "With blocks. Building."

15. Think about all three videos you just watched. What did you think about the videos? (*Follow-up*: **What did you like? Was there anything you did not like?**)

"They're good. The four monkeys." (*Did you have a favorite monkey?*) "The boy. I liked everything."

C006_4_B Responses

1.Can you tell me the story that you just watched? What happened in the video? (Comprehension)

"He was watching the fair and then he put water and then he put something in there. And then he tasted it and it tasted good. And then there was a counting. And then the boy flamingo tasted it and it gave them money."

2. When the monkeys woke up, what did they see outside their window? (*Potential follow-ups:* What was coming to town? What did that make them want to do?) (Comprehension)

"The fair."

3. But why couldn't the monkeys go to the fair? How did they try to solve their problem? (*If the child references it, the researcher could rephrase to "How did the monkeys try to get sand dollars?" or "How did the monkeys try to make money?"*)

"They didn't have money. Cuz they put salt in there. They did something and they have them quarters. And they needed one more quarter."

4. How did the monkeys try to get the juice out the lemons? (*Follow-up if they only mention poking a hole:* Did they try anything else? *Follow-up, if they mention more than one:* So, what worked the best? *Follow-up, if they just say squeezing the lemon inside the cup:* Why was that a good idea?) (Comprehension)

" 'Cuz they were squeezing it. With their hand. And then they put sugar in it."

5. When Mrs. Flamingo tasted the lemonade for the first time, did she like it? (*If no, ask:* Why didn't she like it? *If yes, or I don't know, use prompt below.*)

(*Follow-up:* How do you think it tasted?) (Comprehension)

"No. Because when didn't put sugar in it and she didn't like it. When they put sugar in it and then the boy flamingo liked it."

6. When the monkeys knew that their lemonade tasted bad, how did they figure out what went wrong? What did they do to make it taste good? (*Potential follow-ups if children are having a hard time:* Did they add something to their lemonade? What was it? After they added sugar, did it fix the problem with the lemonade?) (Debugging)

"They added sugar and water." (*After they added sugar, did it fix the problem?*) (Child nodded head yes.)

7. Do you remember the steps the monkeys used to make their lemonade? Here are some pictures of things that they used to make the lemonade. Can you show me what they did to make it? (*Potential prompt if the child struggles:* What did they do first? What did they do after that?) (Comprehension)
(Note: The research team mostly recorded the order that children pointed to picture props. In the event that there was deliberate child language, it was recorded.)

"Add water, sugar, the lemon squeeze, spoon, lemonade."

8. What happened after the monkeys made their lemonade taste good? (*Potential follow-ups:* Who tasted it? Did they like it? How do you know?) (Comprehension)

"They went to the fair."

9. What happened at the end of the story? (*Potential follow-up:* Could the monkeys go to the fair at the end? Why?) (Comprehension)

(Child did not respond.)

10. What did the kids do in the video? (Comprehension)

"They put one squirt blue, one squirt yellow, one squirt black, and they mixed it."

11. How did the kids work together to make the paint for their playhouse?

(*Follow-up:* **What did they do to make green paint?) (Comprehension)**

"They put black, and yellow, and then blue."

12. What was wrong with the green paint when they made it? How did they fix it?

(Debugging)

"It was light. They put one blue, one yellow, and one black, and they made a lot."

13. What were the monkeys singing about? (*If necessary:* What did the monkeys

want to do?) (Comprehension)

"They want to have a good time."

14. How did the monkeys finish cleaning their room so they could get to the beach?

(Good Time: Teamwork)

"They put all the clothes away. Put toys away."

15. Think about all three videos you just watched. What did you think about the

videos? (*Follow-up*: What did you like? Was there anything you did not like?)

"Good. I liked everything."

C007_5_G Responses

1. Can you tell me the story that you just watched? What happened in the video? (Comprehension)

(*What did the monkeys want to do?*) "Sell lemonade. To get sand dollars (*Why?*) For the parade.

2. When the monkeys woke up, what did they see outside their window? (*Potential follow-ups:* What was coming to town? What did that make them want to do?) (Comprehension)

"The parade." (*What did the moneys want to do?*) "Sell lemonade."

3. But why couldn't the monkeys go to the fair? How did they try to solve their problem? (*If the child references it, the researcher could rephrase to "How did the monkeys try to get sand dollars?" or "How did the monkeys try to make money?"*)

"They didn't have money." (*What did they do?*) "Sell lemonade."

4. How did the monkeys try to get the juice out the lemons? (*Follow-up if they only mention poking a hole:* Did they try anything else? *Follow-up, if they mention more than one:* So, what worked the best? *Follow-up, if they just say squeezing the lemon inside the cup:* Why was that a good idea?) (Comprehension)

"They squeezed it."

5. When Mrs. Flamingo tasted the lemonade for the first time, did she like it? (*If no, ask:* Why didn't she like it? *If yes, or I don't know, use prompt below.*)

(*Follow-up:* How do you think it tasted?) (Comprehension)

(Child shook head no.) "Because it was sour."

6. When the monkeys knew that their lemonade tasted bad, how did they figure out what went wrong? What did they do to make it taste good? (*Potential follow-ups if children are having a hard time:* Did they add something to their lemonade? What was it? After they added sugar, did it fix the problem with the lemonade?) (Debugging)

"They didn't put sugar in it." (*What happened after they added sugar?*) "It tasted good."

7. Do you remember the steps the monkeys used to make their lemonade? Here are some pictures of things that they used to make the lemonade. Can you show me what they did to make it? (*Potential prompt if the child struggles:* What did they do first? What did they do after that?) (Comprehension)

(Note: The research team mostly recorded the order that children pointed to picture props. In the event that there was deliberate child language, it was recorded.)

Lemon+cup, sugar, water, spoon, lemonade

8. What happened after the monkeys made their lemonade taste good? (*Potential follow-ups:* Who tasted it? Did they like it? How do you know?) (Comprehension)

"They put sugar in it." (*Who tasted it?)* "The flamingo." (*Did they like it?)* (Child nodded head yes.)

9. What happened at the end of the story? (*Potential follow-up:* Could the monkeys go to the fair at the end? Why?) (Comprehension)

"They went to the parade."

10. What did the kids do in the video? (Comprehension)

"They made colors. They painted the house."

11. How did the kids work together to make the paint for their playhouse?

(*Follow-up:* What did they do to make green paint?) (Comprehension)

"They helped each other. They painted the house. And squirted the paint."

12. What was wrong with the green paint when they made it? How did they fix it?

(Debugging)

"Black, yellow, and blue. It was light. Different colors." (*Which color did they add?*) "I

don't know."

13. What were the monkeys singing about? (*If necessary:* What did the monkeys

want to do?) (Comprehension)

"Putting clothes away."

14. How did the monkeys finish cleaning their room so they could get to the beach?

(Good Time: Teamwork)

"Worked together and cleaned up fast."

15. Think about all three videos you just watched. What did you think about the

videos? (*Follow-up*: What did you like? Was there anything you did not like?)

"Three videos all together. They were making lemonade. They were painting the house.

They were cleaning up."

C008_4_B Responses

1. Can you tell me the story that you just watched? What happened in the video? (Comprehension)

(Child pointed to each prop) "To go to their momma and dada's." (*What did the monkeys want to do?)* "Go to the park."

2. When the monkeys woke up, what did they see outside their window? (*Potential follow-ups:* What was coming to town? What did that make them want to do?) (Comprehension)

"A picnic." (*What was coming to town?*) "A park." (*What did they want to do?)* "Go to the park."

3. But why couldn't the monkeys go to the fair? How did they try to solve their problem? (*If the child references it, the researcher could rephrase to "How did the monkeys try to get sand dollars?" or "How did the monkeys try to make money?"*)

"They want to." (*Why couldn't they go?)* "There were bees in there." (*How did they try to make money to go to the fair?)* (Child just pointed to a number of picture props.) (*Why did they want to make money?*) "Because they want to."

4. How did the monkeys try to get the juice out the lemons? (*Follow-up if they only mention poking a hole:* Did they try anything else? *Follow-up, if they mention more than one:* So, what worked the best? *Follow-up, if they just say squeezing the lemon inside the cup:* Why was that a good idea?) (Comprehension)

(After no response, the researcher described squeezing process. Child nodded.)

5. When Mrs. Flamingo tasted the lemonade for the first time, did she like it? (*If no, ask:* Why didn't she like it? *If yes, or I don't know, use prompt below.*)

(*Follow-up:* How do you think it tasted?) (Comprehension)

(Child shook head no.) "The mama didn't like it. Only the daddy liked it." (*Why didn't she like it?)* "They didn't want to try it."

6. When the monkeys knew that their lemonade tasted bad, how did they figure out what went wrong? What did they do to make it taste good? (*Potential follow-ups if children are having a hard time:* Did they add something to their lemonade? What was it? After they added sugar, did it fix the problem with the lemonade?) (Debugging)

(Child was distracted by picture props.) (*Did the monkeys add sugar?*) "They made sugar some out of the watermelon."

7. Do you remember the steps the monkeys used to make their lemonade? Here are some pictures of things that they used to make the lemonade. Can you show me what they did to make it? (*Potential prompt if the child struggles:* What did they do first? What did they do after that?) (Comprehension)

(Note: The research team mostly recorded the order that children pointed to picture props. In the event that there was deliberate child language, it was recorded.)

"Sugar. This (pitcher) and sugar. Put it in there. And then squeeze it. Used the fork, the spoon to put it in here."

8. What happened after the monkeys made their lemonade taste good? (*Potential follow-ups:* Who tasted it? Did they like it? How do you know?) (Comprehension)v

(Child was inaudible.) (*Who? Did Mr. Flamingo taste it?*) "Yeah. They feel good and they liked it."

9. What happened at the end of the story? (*Potential follow-up:* Could the monkeys go to the fair at the end? Why?) (Comprehension)

(*Could they go to the fair at the end?)* "Yes. Because they wanted to."

10. What did the kids do in the video? (Comprehension)

"I don't know."

11. How did the kids work together to make the paint for their playhouse? (*Follow-up:* What did they do to make green paint?) (Comprehension)

"They mixed it. With black, and blue, and yellow."

12. What was wrong with the green paint when they made it? How did they fix it? (Debugging)

"They were sad." (*Why were they sad? What was wrong?*) "I don't know." (*Was it the wrong color green?)* "I don't know."

13. What were the monkeys singing about? (*If necessary:* What did the monkeys want to do?) (Comprehension)

"I don't know. Monkeys."

14. How did the monkeys finish cleaning their room so they could get to the beach? (Good Time: Teamwork)

"Only they have sand and water."

15. Think about all three videos you just watched. What did you think about the videos? (*Follow-up*: What did you like? Was there anything you did not like?)

"I don't know. I want to tell my mama. I didn't like them."

C009_5_B Responses

1. Can you tell me the story that you just watched? What happened in the video? (Comprehension)

"I just saw them. They were going to the fun fair and used lemonade to make lemonade and they were going to the fun fair. Make lemonade to sell to the flamingoes. Sour lemons and that's how they made it good with ice cubes."

2. When the monkeys woke up, what did they see outside their window? (*Potential follow-ups:* What was coming to town? What did that make them want to do?) (Comprehension)

"A long line of the flamingoes. And the fun fair." (*What did it make them want to do?*) "Make lemonade, and they were all happy."

3. But why couldn't the monkeys go to the fair? How did they try to solve their problem? (*If the child references it, the researcher could rephrase to "How did the monkeys try to get sand dollars?" or "How did the monkeys try to make money?"*)

"Because they didn't make lemonade. No that's why they didn't." (*What was the problem?*) "Because they didn't have any sand coins." (*So what did they do to try to make money?*) "Make lemonade."

4. How did the monkeys try to get the juice out the lemons? (*Follow-up if they only mention poking a hole:* Did they try anything else? *Follow-up, if they mention more than one:* So, what worked the best? *Follow-up, if they just say squeezing the lemon inside the cup:* Why was that a good idea?) (Comprehension)

"They make holes." (Child pointed to the lemon prop.) "He did." (*Why did they put holes?*) "Because only one drop came out." (*Did it work then?*) "No. Nothing come out. Just one drop."

(*Did they try anything else?*) "Yeah. They put ice cubes, water, and lemonade." (*But how did they get the juice out of the lemons?*) "From a cup." (*What did they do with a cup?*) "Make the hole and then they squeezed it out." (*So what worked the best?*) "Making a hole." (*Just making a hole?*) "Yeah."

5. When Mrs. Flamingo tasted the lemonade for the first time, did she like it? (*If no, ask:* Why didn't she like it? *If yes, or I don't know, use prompt below.*)

(*Follow-up*: How do you think it tasted?) (Comprehension)

(Child shook head no.) "Because it was super sour."

6. When the monkeys knew that their lemonade tasted bad, how did they figure out what went wrong? What did they do to make it taste good? (*Potential follow-ups if children are having a hard time:* Did they add something to their lemonade? What was it? After they added sugar, did it fix the problem with the lemonade?) (Debugging)

"They didn't put no ice cubes." (*So what did they do to make it good?*) "They used ice cubes. They used sugar ice cubes." (*After they added the sugar cubes, did it fix the problem?*) "Yes."

7. Do you remember the steps the monkeys used to make their lemonade? Here are some pictures of things that they used to make the lemonade. Can you show me what they did to make it? (*Potential prompt if the child struggles:* What did they do first? What did they do after that?) (Comprehension)

(Note: The research team mostly recorded the order that children pointed to picture props. In the event that there was deliberate child language, it was recorded.)

"And then they mixed it up."

8. What happened after the monkeys made their lemonade taste good? (*Potential follow-ups:* Who tasted it? Did they like it? How do you know?) (Comprehension)

"They made the lemonade good with sugar." (And who tasted it?) "The ... " (child pointed to flamingoes) (*Anybody else?*) "He said that was super good." (*Anybody else try it?*) "Just them." (*How do you know he liked it?*) "Because they put sugar in it."

9. What happened at the end of the story? (*Potential follow-up:* Could the monkeys go to the fair at the end? Why?) (Comprehension)

"They put sugar and water." (*Could the monkeys go to the fun fair?*) "Yes, because they made lemonade." (*When they made lemonade what did they get?*) "Sand coins." (*Could they go to the fair now*?) (Child nodded head yes.)

10. What did the kids do in the video? (Comprehension)

"They painted their house the same color as the real house, but the light green wasn't the same color. The house was darker, but they didn't make the same color. That's why they mixed the dark green with black. (*They made it with just black?*) They mixed it up with yellow, black, and blue."

11. How did the kids work together to make the paint for their playhouse? (*Follow-up:* What did they do to make green paint?) (Comprehension)

(Child answered in the last question)

12. What was wrong with the green paint when they made it? How did they fix it? (Debugging)

"They didn't have green paint." (*How did they fix it again?*) "With dark green."

13. What were the monkeys singing about? (*If necessary:* What did the monkeys want to do?) (Comprehension)

"They want to have some sunshine because there's no sunshine because …" (*What did the monkeys want to do?*) "Have some sunshine and have fun at the beach."

14. How did the monkeys finish cleaning their room so they could get to the beach? (Good Time: Teamwork)

"By having some music."

15. Think about all three videos you just watched. What did you think about the videos? (*Follow-up*: What did you like? Was there anything you did not like?)

"I liked the girl and the boys. I didn't like the mess." *(Did you like the monkeys?)* "Yeah, I liked the monkeys."

C010_5_G Responses

1. Can you tell me the story that you just watched? What happened in the video? (Comprehension)

"They did lemonade. Wanted to go to the circus."

2. When the monkeys woke up, what did they see outside their window? (*Potential follow-ups:* What was coming to town? What did that make them want to do?) (Comprehension)

"The circus, like the fair."

3. But why couldn't the monkeys go to the fair? How did they try to solve their problem? (*If the child references it, the researcher could rephrase to "How did the monkeys try to get sand dollars?" or "How did the monkeys try to make money?"*)

"They didn't have money. Making lemonade. So they could get money."

4. How did the monkeys try to get the juice out the lemons? (*Follow-up if they only mention poking a hole:* Did they try anything else? *Follow-up, if they mention more than one:* So, what worked the best? *Follow-up, if they just say squeezing the lemon inside the cup:* Why was that a good idea?) (Comprehension)

"They squeezed the cup." (*Why was that a good idea? Did they try anything else?*) "They put a hole in it." (*Did that work?)* (Child shook head no.)

5. When Mrs. Flamingo tasted the lemonade for the first time, did she like it? (*If no, ask:* Why didn't she like it? *If yes, or I don't know, use prompt below.*)

(*Follow-up*: How do you think it tasted?) (Comprehension)

(Child shook head no) "They only put lemonade and water." (*How did it taste?)* "Bad."

6. When the monkeys knew that their lemonade tasted bad, how did they figure out what went wrong? What did they do to make it taste good? (*Potential follow-ups if children are having a hard time:* Did they add something to their lemonade? What was it? After they added sugar, did it fix the problem with the lemonade?) (Debugging)

"To mix it up." (*What did they mix it with?*) "Water and sugar." (*Did it fix the problem?*) "Yes." (*Was it sour?*) "No."

7. Do you remember the steps the monkeys used to make their lemonade? Here are some pictures of things that they used to make the lemonade. Can you show me what they did to make it? (*Potential prompt if the child struggles:* What did they do first? What did they do after that?) (Comprehension)
(Note: The research team mostly recorded the order that children pointed to picture props. In the event that there was deliberate child language, it was recorded.)

lemon+cup, sugar, water, "spoon to put the sugar in, make the lemonade."

8. What happened after the monkeys made their lemonade taste good? (*Potential follow-ups:* Who tasted it? Did they like it? How do you know?) (Comprehension)

(*Who tasted it?*) "The crabs and Mr. Flamingo." (*Did they like it?*) "They put sugar and water in it."

9. What happened at the end of the story? (*Potential follow-up:* Could the monkeys go to the fair at the end? Why?) (Comprehension)

"They went to the circus." (*Why could they go?*) "Because they had money."

10. What did the kids do in the video? (Comprehension)

"They painted their house."

11. How did the kids work together to make the paint for their playhouse?

(*Follow-up:* What did they do to make green paint?) (Comprehension)

"Black, white, and blue. Black, yellow, and blue."

12. What was wrong with the green paint when they made it? How did they fix it?

(Debugging)

(*How did they fix it?*) (Child did not respond.)

13. What were the monkeys singing about? (*If necessary:* What did the monkeys

want to do?) (Comprehension)

"Wanted to go to the beach."

14. How did the monkeys finish cleaning their room so they could get to the beach?

(Good Time: Debugging)

"They were cleaning everything up."

15. Think about all three videos you just watched. What did you think about the

videos? (*Follow-up*: What did you like? Was there anything you did not like?)

"They're good. The one that was third. The song. And the second story. That they want to

go to the circus."

C011_4_G Responses

1. Can you tell me the story that you just watched? What happened in the video? (Comprehension)

"This is the rides." (*What happened in the story?*) This. (Child points to the fun fair picture prop.) "This. This. And this." (Points at several of the other picture props—monkeys, pitcher, and lemon.)

2. When the monkeys woke up, what did they see outside their window? (*Potential follow-ups:* What was coming to town? What did that make them want to do?) (Comprehension)

"The giraffe." (*What was coming to town?*) "The turtle." (*What did that make them want to do?*) "To drive. I want to watch again." (*You want to watch again?*) "Yeah."

3. But why couldn't the monkeys go to the fair? How did they try to solve their problem? (*If the child references it, the researcher could rephrase to "How did the monkeys try to get sand dollars?" or "How did the monkeys try to make money?"*)

"'Cuz they wanted to go to the fun fair, the giraffe and everything, so they could be excited." (*But do you remember, why couldn't they go?*) "Because they could do something (inaudible)." (*How were the monkeys going to make money? Do you remember?*) "Yeah, they got make money with … " (Researcher reminded the child that the monkeys were going to make money selling lemonade.)

4. How did the monkeys try to get the juice out the lemons? (*Follow-up if they only mention poking a hole:* Did they try anything else? *Follow-up, if they mention more than one:* So, what worked the best? *Follow-up, if they just say squeezing the lemon inside the*

cup: **Why was that a good idea?) (Comprehension)**

"'Cuz they gotta drink it." (*Do you remember what ways they tried to get the juice out?*) "You gotta go see the giraffe first." (Researcher reminded the child that the monkeys poked a hole and then they squeezed it in a cup to get the juice out.)

5. When Mrs. Flamingo tasted the lemonade for the first time, did she like it? (*If no, ask:* Why didn't she like it? *If yes, or I don't know, use prompt below.*)

(*Follow-up*: How do you think it tasted?) (Comprehension)

"Yes." (*She did?*) "She did like, and Mr. Flamingo, they like it." (Researcher reminded the child that Mrs. Flamingo didn't like it because it was sour.) "It was sour?"

6. When the monkeys knew that their lemonade tasted bad, how did they figure out what went wrong? What did they do to make it taste good? (*Potential follow-ups if children are having a hard time:* Did they add something to their lemonade? What was it? After they added sugar, did it fix the problem with the lemonade?) (Debugging)

"If you do something to the lemonade, they go with the animals." (*They forgot to add sugar.*) "I don't eat sugar. 'Cuz they're nasty."

7. Do you remember the steps the monkeys used to make their lemonade? Here are some pictures of things that they used to make the lemonade. Can you show me what they did to make it? (*Potential prompt if the child struggles:* What did they do first? What did they do after that?) (Comprehension)
(Note: The research team mostly recorded the order that children pointed to picture props. In the event that there was deliberate child language, it was recorded.)

"They do this and then sugar … They try to take it out, but they didn't like it. If you put … I don't drink soda and lemonade."

8. What happened after the monkeys made their lemonade taste good? (*Potential follow-ups:* Who tasted it? Did they like it? How do you know?) (Comprehension)

"Let me show you." (Child picked up the flamingoes picture prop). "Miss Flamingo tasted it. She didn't, it was sour."

9. What happened at the end of the story? (*Potential follow-up:* Could the monkeys go to the fair at the end? Why?) (Comprehension)

"They was laughing ha-ha-ha."

10. What did the kids do in the video? (Comprehension)

"They was painting the house."

11. How did the kids work together to make the paint for their playhouse? (*Follow-up:* What did they do to make green paint?) (Comprehension)

"They was getting dark paint."

12. What was wrong with the green paint when they made it? How did they fix it? (Debugging)

"They put black first, put green paint first, and blue paint first, and yellow paint first. You could mix it with purple." (*What was wrong with the green paint when they made it the first time?*) "I did paint in my class." (*In the video, what was wrong with the green paint?*) (Child walked out of the room because she saw her mother.)

13. What were the monkeys singing about? (*If necessary:* What did the monkeys want to do?) (Comprehension)

"They were singing … I don't know … clapping, stomping. And clapping their hands."

14. What happened when the monkeys tried to learn the dance? (Clap, Stomp, Spin: Debugging)

"They was so fun." (*What about when the monkeys tried to learn the dance?*) "They tried to, but they can't. They couldn't spin around."

15. Think about all three videos you just watched. What did you think about the videos? (*Follow-up*: What did you like? Was there anything you did not like?)

"Eww … I don't like crabs, because they bite." (*So did you like the videos?*) "Yeah. I liked that one, that one, that one, that one." (*Pointing to monkeys*). "I didn't like this one (the crabs). Because they eat you up."

C012_5_B Responses

1. Can you tell me the story that you just watched? What happened in the video? (Comprehension)

"They went in the fair. The ducks wanted to taste the lemonade."

2. When the monkeys woke up, what did they see outside their window? (*Potential follow-ups:* What was coming to town? What did that make them want to do?) (Comprehension)

"The fair. It made them happy."

3. But why couldn't the monkeys go to the fair? How did they try to solve their problem? (*If the child references it, the researcher could rephrase to "How did the monkeys try to get sand dollars?* or *"How did the monkeys try to make money?"*)

"Because they have to get money. They had to get cash." (*How did they get cash?)* "From the flamingoes." (*What did they make?*) "Some lemonade."

4. How did the monkeys try to get the juice out the lemons? (*Follow-up if they only mention poking a hole:* Did they try anything else? *Follow-up, if they mention more than one:* So, what worked the best? *Follow-up, if they just say squeezing the lemon inside the cup:* Why was that a good idea?) (Comprehension)

"They had to poke their lemon, and squeeze it, and put it in the cup."

5. When Mrs. Flamingo tasted the lemonade for the first time, did she like it? (*If no, ask:* Why didn't she like it? *If yes, or I don't know, use prompt below.*)

(*Follow-up*: How do you think it tasted?) (Comprehension)

(Child shook head no.) "Because it was water. Because the lemonade has to taste good."

6. When the monkeys knew that their lemonade tasted bad, how did they figure out what went wrong? What did they do to make it taste good? (*Potential follow-ups if children are having a hard time:* Did they add something to their lemonade? What was it? After they added sugar, did it fix the problem with the lemonade?) (Debugging)

"To make the people happy to go to the fair." (*What did they add to the lemonade to make it taste good?*) "Some … some lemonade." (*Did sugar fixr the problem with the lemonade?*) (Child nodded head yes.)

7. Do you remember the steps the monkeys used to make their lemonade? Here are some pictures of things that they used to make the lemonade. Can you show me what they did to make it? (*Potential prompt if the child struggles:* What did they do first? What did they do after that?) (Comprehension)
(Note: The research team mostly recorded the order that children pointed to picture props. In the event that there was deliberate child language, it was recorded.)

"They used ice, spoon, put some holes in that (lemon), then (points to pitcher). First add some sugar, then (point to spoon), then (points to lemon+cup and then pitcher)."

8. What happened after the monkeys made their lemonade taste good? (*Potential follow-ups:* Who tasted it? Did they like it? How do you know?) (Comprehension)

(*Who tasted it?*) (Child pointed to Mr. Flamingo.) (*Did he like it?*) (Child nodded head yes). "He liked it, because it was good."

9. What happened at the end of the story? (*Potential follow-up:* Could the monkeys go to the fair at the end? Why?) (Comprehension)

"The dad tasted the lemonade and it tasted good and they went to the fair." (*Could the monkeys go?*) (Child nodded head yes.) (*Why?*) "They had cash."

10. What did the kids do in the video? (Comprehension)

"They painted some black, blue, and yellow to make green. To make it more darker."

11. How did the kids work together to make the paint for their playhouse? (*Follow-up:* What did they do to make green paint?) (Comprehension)

"Because they wanted to make the colors the black, the blue, and the yellow—to make it darker."

12. What was wrong with the green paint when they made it? How did they fix it? (Debugging)

"They put some yellow, some blue, and some black, and then they mixed it and they painted." (*Did they find the right color?*) "Mmhmm." (Perceived as an affirmative answer.)

13. What were the monkeys singing about? (*If necessary:* What did the monkeys want to do?) (Comprehension)

"Clap, stomp, clap, stomp, spin. They wanted to (inaudible)."

14. What happened when the monkeys tried to learn the dance? (Clap, Stomp, Spin: Debugging)

"They wanted to clap and stomp, and when the crabs were coming."

15. Think about all three videos you just watched. What did you think about the videos? (*Follow-up*: What did you like? Was there anything you did not like?)

"I did like the first one." (*What didn't you like?*) "In the end. That the crabs were coming." (*Why didn't you like them*?) "Because the crabs were dancing with the monkeys."

C013_4_B Responses

1. Can you tell me the story that you just watched? What happened in the video? (Comprehension)

"They trying to get lemons for free. They gave the flamingoes lemon, and to the crabs. And then the crabs liked it because they put sugar, and the flamingo liked. But before, when they first drinked it, they didn't like it. And then they put sugar, and then the flamingo liked it and the crabs liked it."

2. When the monkeys woke up, what did they see outside their window? (*Potential follow-ups:* What was coming to town? What did that make them want to do?) (Comprehension)

"They saw the roller coaster."

3. But why couldn't the monkeys go to the fair? How did they try to solve their problem? (*If the child references it, the researcher could rephrase to "How did the monkeys try to get sand dollars?" or "How did the monkeys try to make money?"*)

"Because they needed the stuff. The four stuff." (*What is that stuff?*) "Let's watch it again." (*Was that stuff the sand dollars?*) "Yes! Yeah, they needed the sand dollars."

4. How did the monkeys try to get the juice out the lemons? (*Follow-up if they only mention poking a hole:* Did they try anything else? *Follow-up, if they mention more than one:* So, what worked the best? *Follow-up, if they just say squeezing the lemon inside the cup:* Why was that a good idea?) (Comprehension)

"Because the … they just gotta squeeze it really hard, and then you get it and then they got the sand dollars. And then they went to watch it, and then the sand dollars went to go to the carnival, and then they gave it to the men to pay the carnival."

5. When Mrs. Flamingo tasted the lemonade for the first time, did she like it? (*If no, ask:* Why didn't she like it? *If yes, or I don't know, use prompt below*.)

(*Follow-up*: How do you think it tasted?) (Comprehension)

(Child shook head no.) "Because the four monkeys didn't put sugar inside it." (*How did it taste?*) "It tasted yucky. And then the other time, two times, one time the girl flamingo, she didn't like it, and then the other time she did. And he liked it, she didn't taste it, but he did."

6. When the monkeys knew that their lemonade tasted bad, how did they figure out what went wrong? What did they do to make it taste good? (*Potential follow-ups if children are having a hard time:* Did they add something to their lemonade? What was it? After they added sugar, did it fix the problem with the lemonade?) (Debugging)

"They didn't add sugar, they just added water and lemon."

7. Do you remember the steps the monkeys used to make their lemonade? Here are some pictures of things that they used to make the lemonade. Can you show me what they did to make it? (*Potential prompt if the child struggles:* What did they do first? What did they do after that?) (Comprehension)
(Note: The research team mostly recorded the order that children pointed to picture props. In the event that there was deliberate child language, it was recorded.)

They squeezed the lemon to put it in the cup, and then they put sugar, and then they add the spoon to put the spoon in the sugar, and then the spoon had to dip it in the cup, and then this (they added water), and then (pitcher with lemon on it)."

8. What happened after the monkeys made their lemonade taste good? (*Potential

***follow-ups:* Who tasted it? Did they like it? How do you know?) (Comprehension)**

"They went to the carnival."

9. What happened at the end of the story? (*Potential follow-up:* Could the monkeys

go to the fair at the end? Why?) (Comprehension)

"They just went there. And then they gave some money to pay for the carnival."

10. What did the kids do in the video? (Comprehension)

"They tried to make darker blue. They added purple and yellow, but it didn't make the

right green to their house. But they added black, and yellow, and blue, and they made the perfect

color to their house."

11. How did the kids work together to make the paint for their playhouse?

(*Follow-up:* What did they do to make green paint?) (Comprehension)

"Because they wanted to make the playhouse. The same house like their real house. They

added yellow, black, and blue."

12. What was wrong with the green paint when they made it? How did they fix it?

(Debugging)

"They fixed it with the paintbrush." (*What was wrong with the paint they made? The first

green?*) "They remade all the stuff. They added a blue, a black, a yellow, and it makes the right

green for their house, and then they made a playhouse they wanted to be the same as their real

house."

13. What were the monkeys singing about? (*If necessary:* What did the monkeys

want to do?) (Comprehension)

"They were singing about helping, and fixing together, and fixing, and no mistakes, and by accident one of the monkeys says sorry."

14. When Bo's tower kept falling down, how did the monkeys fix it? (Check Your Steps: Debugging)

"They wanted to help building something." (*So Bo's tower kept falling down—How did the monkeys fix it?*) "They want to fix it. They liked it. They fixed it, and they didn't break it again."

15. Think about all three videos you just watched. What did you think about the videos? (*Follow-up*: What did you like? Was there anything you did not like?)

"When I was watching them, it was good!"

C014_5_G Responses

1. Can you tell me the story that you just watched? What happened in the video? (Comprehension)

"They made some for ostriches and for crabs and for flamingo again." (*What did they make?*) "Lemonade." (*What did the monkeys want to do with the lemonade*?) "Give it to the people." (*Why?*) "Because they have to drink it." (*Why did they have to drink it?*) "Because they like it."

2. When the monkeys woke up, what did they see outside their window? (*Potential follow-ups:* What was coming to town? What did that make them want to do?) (Comprehension)

"A fair. (*What did that make the monkeys want to do?*) "Make lemonade so the people give them sand tickets." (*Or sand dollars, right?*) "Yeah."

3. But why couldn't the monkeys go to the fair? How did they try to solve their problem? (*If the child references it, the researcher could rephrase to "How did the monkeys try to get sand dollars?" or "How did the monkeys try to make money?"*)

"Because they didn't have any tickets. Fred wasn't happy." (Researcher reminded the child that the monkeys wanted to go to the fair, but they didn't have any money. So they wanted to make lemonade so they could sell it.)

4. How did the monkeys try to get the juice out the lemons? (*Follow-up if they only mention poking a hole:* Did they try anything else? *Follow-up, if they mention more than one:* So, what worked the best? *Follow-up, if they just say squeezing the lemon inside the cup:* Why was that a good idea?) (Comprehension)

"They got something, and they squeezed the thing, and it came out." (*What did they use to squeeze it?*) "I don't remember." (*Were there other ways they tried to get the juice out of the*

lemons?) "Yes. You could squish them like this." (*Do you remember what worked the best?*) "Squeezing them." (*Was that a good idea?*) (Child nodded head yes.)

5. When Mrs. Flamingo tasted the lemonade for the first time, did she like it? (*If no, ask:* Why didn't she like it? *If yes, or I don't know, use prompt below*.)

(*Follow-up*: How do you think it tasted?) (Comprehension)

(Child shook head no.) "Because they didn't have any sugar in it." (*How do you think it tasted?*) "Bad—if you don't put sugar in it, it won't taste good. And the Mister one liked it when they put sugar in it."

6. When the monkeys knew that their lemonade tasted bad, how did they figure out what went wrong? What did they do to make it taste good? (*Potential follow-ups if children are having a hard time:* Did they add something to their lemonade? What was it? After they added sugar, did it fix the problem with the lemonade?) (Debugging)

(*What steps did they take to figure out what went wrong?*) "They didn't remember." (*They added the sugar – did that fix the problem?*) "Yes."

7. Do you remember the steps the monkeys used to make their lemonade? Here are some pictures of things that they used to make the lemonade. Can you show me what they did to make it? (*Potential prompt if the child struggles:* What did they do first? What did they do after that?) (Comprehension)
(Note: The research team mostly recorded the order that children pointed to picture props. In the event that there was deliberate child language, it was recorded.)

"They squeezed the lemon, and then they poured water inside, and then they put the lemon on top, and then they put the sugar inside, and then they drink it."

8. What happened after the monkeys made their lemonade taste good? (*Potential follow-ups:* Who tasted it? Did they like it? How do you know?) (Comprehension)

(*Who tasted it?*) "The flamingoes, the crabs, and then the flamingoes again." (*Did they like it?*) "Because they put sugar inside."

9. What happened at the end of the story? (*Potential follow-up:* Could the monkeys go to the fair at the end? Why?) (Comprehension)

"About the flamingoes when they put sugar inside." (*Could the monkeys go the fair?*) "Yes. Because I saw right there. They were walking and running. Because they have to wait until it's morning."

10. What did the kids do in the video? (Comprehension)

"Made painting a house."

11. How did the kids work together to make the paint for their playhouse? (*Follow-up:* What did they do to make green paint?) (Comprehension)

"You mean green? You mean the dark green? The black, the yellow, and the blue." (*And the first time, what did they use?*) "Paint."

12. What was wrong with the green paint when they made it? How did they fix it? (Debugging)

"They made purple. (And what else did they make?) I don't remember." (*What was the first problem they had with the first green. Do you remember how they fixed the green*?) "Black, and the blue."

13. What were the monkeys singing about? (*If necessary:* What did the monkeys want to do?) (Comprehension)

"A dance. Dance, clap, and they spin."

14. What happened when the monkeys tried to learn the dance? (Clap, Stomp, Spin: Debugging)

(*Did they get it right the first time?*) "Yes."

15. Think about all three videos you just watched. What did you think about the videos? (*Follow-up*: What did you like? Was there anything you did not like?)

"They were great. All of them, I love them. Because they are so nice." (*Was there anything you didn't like?*) "No, I love it."

C015_5_B Responses

1. Can you tell me the story that you just watched? What happened in the video? (Comprehension)

"The monkeys wanted the sand money." (*What did the monkeys want to do with the money?*)

"They wanted to go somewhere." (*Where?)* (Child pointed to the fun fair picture prop).

2. When the monkeys woke up, what did they see outside their window? (*Potential follow-ups:* What was coming to town? What did that make them want to do?) (Comprehension)

"They saw a dog." (Child pointed to the fun fair picture prop.) (*What did it make them want to do?)* "They wanted to play there."

3. But why couldn't the monkeys go to the fair? How did they try to solve their problem? (*If the child references it, the researcher could rephrase to "How did the monkeys try to get sand dollars?" or "How did the monkeys try to make money?"*)

" 'Cuz they had no money." (*How did they try to solve the problem?*) "With money." (*How did they try to get money?*) (Child pointed to flamingoes.) "They gave money to them. And the crabs, too."

4. How did the monkeys try to get the juice out the lemons? (*Follow-up if they only mention poking a hole:* Did they try anything else? *Follow-up, if they mention more than one:* So, what worked the best? *Follow-up, if they just say squeezing the lemon inside the cup:* Why was that a good idea?) (Comprehension)

"They squeezed it. To give it to them." (Child pointed to flamingoes picture prop.) (*Did they try anything else?)* "The thing." (*What worked the best*?) "They squeezed it."

5. When Mrs. Flamingo tasted the lemonade for the first time, did she like it? (*If no, ask:* Why didn't she like it? *If yes, or I don't know, use prompt below*.)

(*Follow-up*: How do you think it tasted?) (Comprehension)

"No. 'Cuz it's soft." (*How do you think it tasted?)* "Bad." (*Like sour?*) "Yeah, like Sour Patch Kids."

6. When the monkeys knew that their lemonade tasted bad, how did they figure out what went wrong? What did they do to make it taste good? (*Potential follow-ups if children are having a hard time:* Did they add something to their lemonade? What was it? After they added sugar, did it fix the problem with the lemonade?) (Debugging)

"Because of that." (Child pointed to lemon picture prop.) (*Did they add something to the lemonade?*) "That's it." (*Did they add sugar?*) "Yes." (*After they added sugar, did it fix the problem?*) (Child nodded head yes.)

7. Do you remember the steps the monkeys used to make their lemonade? Here are some pictures of things that they used to make the lemonade. Can you show me what they did to make it? (*Potential prompt if the child struggles:* What did they do first? What did they do after that?) (Comprehension)
(Note: the research team mostly recorded the order that children pointed to picture props. In the event that there was deliberate child language, it was recorded.)

lemon+cup, and then pointed to spoon, sugar, pitcher (Disorganized multiple attempts.)

8. What happened after the monkeys made their lemonade taste good? (*Potential follow-ups:* Who tasted it? Did they like it? How do you know?) (Comprehension)

"They made it taste better with sugar." (*Who tasted it*?) "The flamingoes." (*Anybody else?*) "The crabs. Crabs liked it." (*How do you know the crabs like it?*) "Because it's soft."

9. What happened at the end of the story? (*Potential follow-up:* Could the monkeys go to the fair at the end? Why?) (Comprehension)

(*Could the monkeys go to the fun fair at the end?*) "Yes. Because they had money."

10. What did the kids do in the video? (Comprehension)

"They paint the house dark green."

11. How did the kids work together to make the paint for their playhouse? (*Follow-up:* What did they do to make green paint?) (Comprehension)

"They used yellow, and blue, and black. (*It made the green paint?*) (Child nodded yes.)

12. What was wrong with the green paint when they made it? How did they fix it? (Debugging)

"It was light green." (*How did they fix it?*) "It was … yellow, and blue, and black." (*And that fixed it?*) "Yes." (*What did they put in the first time?*) "They paint it."

13. What were the monkeys singing about? (*If necessary:* What did the monkeys want to do?) (Comprehension)

"They clap and stomp and spin."

14. What happened when the monkeys tried to learn the dance? (Clap, Stomp, Spin: Debugging)

"They were clapping, and stomping, and spinning around." (*And could they do it on the first try?*) (Child nodded head yes.)

15. Think about all three videos you just watched. What did you think about the videos? (*Follow-up*: What did you like? Was there anything you did not like?)

Good." (*What did you like?*) "The monkeys dancing." (*What didn't you like?*) "They weren't learning how to dance."

C016_4_G Responses

1. Can you tell me the story that you just watched? What happened in the video? (Comprehension)

"Monkeys!" (*What were the monkeys doing?*) "They were going to the show … they were going." (*Where were they going? Can you tell me with the cards?*) "The show." (*What were they doing at the show?*) "They money." (*What were they doing at the show?*) (Child pointed to lemon picture prop.) "They were making lemonade." (*Anything else?*) (Child pointed to flamingoes.) "She was tasting it. Yes. And he was tasting it."

2. When the monkeys woke up, what did they see outside their window? (*Potential follow-ups:* What was coming to town? What did that make them want to do?) (Comprehension)

(Child pointed to the fun fair picture prop.) (*What did it make them want to do?*) "Make lemonade."

3. But why couldn't the monkeys go to the fair? How did they try to solve their problem? (*If the child references it, the researcher could rephrase to "How did the monkeys try to get sand dollars?" or "How did the monkeys try to make money?"*)

"Make lemonade." (*When the monkeys woke up, what did they see outside their window?*) (Child pointed to fun fair.) (*What did that make the monkeys want to do?*) "Make lemonade." (*They wanted to go to the fair, but why couldn't they?*) "Because they want to be sad." (*Why do they want to be sad?*) "Because they go." (*How did they try to go there? What didn't they have?*) (Child pointed to flamingoes.) (*What did the monkeys need to go here? They needed sand money. To get money to go to the fair.*)

4. How did the monkeys try to get the juice out the lemons? (*Follow-up if they only mention poking a hole:* **Did they try anything else?** *Follow-up, if they mention more than one:* **So, what worked the best?** *Follow-up, if they just say squeezing the lemon inside the cup:* **Why was that a good idea?**) **(Comprehension)**

"Umm, they make this, and then it tasted good." (Child pointed to the lemon picture prop.) (*What were the ways they got the juice out of the lemon*?) "They went to the cup." (*What did they do with the cup?*) "They put water in the cup. Yeah." (*Okay, so they poked holes in the lemon and they couldn't get the juice, only one drop fell out, and what did they do after that?*) "They tasted it." (Researcher reminded the child that the monkeys put the lemon in the cup and they squeezed it.)

5. When Mrs. Flamingo tasted the lemonade for the first time, did she like it? (*If no, ask:* **Why didn't she like it?** *If yes, or I don't know, use prompt below.*)

(*Follow-up***: How do you think it tasted?**) **(Comprehension)**

"No. Because it was not good." (*Do you think it was sour?)* "Yeah."

6. When the monkeys knew that their lemonade tasted bad, how did they figure out what went wrong? What did they do to make it taste good? (*Potential follow-ups if children are having a hard time:* **Did they add something to their lemonade? What was it? After they added sugar, did it fix the problem with the lemonade?**) **(Debugging)**

"Sugar." (*After they added sugar, did it fix the problem?*) "Yeah." (Researcher reminded the child that monkeys checked their steps and added sugar to make it sweet.)

7. Do you remember the steps the monkeys used to make their lemonade? Here are some pictures of things that they used to make the lemonade. Can you show me what they did to make it? (*Potential prompt if the child struggles:* **What did they do first? What did**

they do after that?) (Comprehension)

(Note: The research team mostly recorded the order that children pointed to picture props. In the event that there was deliberate child language, it was recorded.)

lemon pitcher, sugar, pitcher again, lemon + cup, water.

8. What happened after the monkeys made their lemonade taste good? (*Potential follow-ups:* Who tasted it? Did they like it? How do you know?) (Comprehension)

"It was good." (*Who tasted it?*) "Flamingoes." (*Did they like it?*) "Yes." (*How do you know?*) "It was good." (*Anybody else try it?*) "The flamingo."

9. What happened at the end of the story? (*Potential follow-up:* Could the monkeys go to the fair at the end? Why?) (Comprehension)

"The crabs liked it." (*Could the monkeys go to the fair?*) "Yes." (*Why?*) "They don't have money." (*They don't have money? At the end did they have money?*) (Child nodded head yes.)

10. What did the kids do in the video? (Comprehension)

"They painted the house."

11. How did the kids work together to make the paint for their playhouse? (*Follow-up:* What did they do to make green paint?) (Comprehension)

"Black." (*What did they do to make the green paint?*) "They put yellow, and blue, and black. And they mix it."

12. What was wrong with the green paint when they made it? How did they fix it? (Debugging)

"Two of them." (*What was wrong with it? Do you remember?*) "They put in black. The house, and they painted it together."

MONKEYING AROUND FORMATIVE RESEARCH

13. What were the monkeys singing about? (*If necessary:* What did the monkeys want to do?) (Comprehension)

"The little monkeys dancing." (*What did they want to do?*) "They sing."

14. What happened when the monkeys tried to learn the dance? (Clap, Stomp, Spin: Debugging)

"Um, they playing, they playing and dancing." (*What were the steps, do you remember?*) "No." (*That's okay*.)

15. Think about all three videos you just watched. What did you think about the videos? (*Follow-up*: What did you like? Was there anything you did not like?)

"They were good." (*What did you like?*) "The little monkeys." (*Was there anything you didn't like?*) "Yes." (*What didn't you like?*) "The lemonade." (*Why didn't you like the lemonade? You like it? Okay*.)

MONKEYING AROUND FORMATIVE RESEARCH   113

13. What were the monkeys singing about? (*If necessary:* What did the monkeys want to do?) (Comprehension)

"The little monkeys dancing." (*What did they want to do?*) "They sing."

14. What happened when the monkeys tried to learn the dance? (Clap, Stomp, Spin: Debugging)

"Um, they playing, they playing and dancing." (*What were the steps, do you remember?*) "No." (*That's okay*.)

15. Think about all three videos you just watched. What did you think about the videos? (*Follow-up*: What did you like? Was there anything you did not like?)

"They were good." (*What did you like?*) "The little monkeys." (*Was there anything you didn't like?*) "Yes." (*What didn't you like?*) "The lemonade." (*Why didn't you like the lemonade? You like it? Okay*.)