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Exploring Parent and Child Perceptions of an Educational Television Show with a Culturally Inclusive Focus to Computational Thinking

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Abstract

The rise in children's media use (Rideout & Robb, 2020) and the prioritization of STEM learning (Fayer et al., 2017) has led to the development of new STEM-related apps, TV shows, and other media for young children. One topic in this area gaining popularity is computational thinking (CT). Researchers refer to CT as an approach to problem solving based in computer science (Barr et al., 2011) that involves concepts such as sequencing and debugging (Grover & Pea, 2013). Research suggests that learning CT at a young age can be beneficial to children's analytical skills and provides them with new approaches to problem solving (Bers, 2018, 2020; Botički et al., 2018).

The television program of focus to this dissertation is *Work it Out Wombats!.* This television program was created with an intentional focus on culturally relevant and inclusive approaches in an effort to support preschool viewers' computational thinking skills. Research has shown that educational media has the potential to support young children's STEM learning, however, there is little research on how to best meet the challenge of creating educational STEM media that effectively engages children of all races and ethnicities and positively impacts their learning. *Work It Out Wombats!* is the first attempt to try and accomplish this. This dissertation explores parents' and children's perception, understanding, and recognition of the culture and inclusion cues and the computational thinking cues embedded in the program.

In this qualitative research study, 30 parent-child dyads were interviewed about their perceptions, understanding, and recognition of the culture and inclusion cues and the computational thinking cues embedded in the program. Interviews were conducted in person and

completed in a University research space or community center in western and central Michigan. A semi-structured interview protocol was utilized to guide the discussion.

The participants in our study shared rich and valuable insights about the *Wombats!* episodes they watched. Parents reported that they would encourage their child to watch the show, especially after learning about its focus on culture and inclusion and computational thinking. Parents identified and discussed the culture and inclusion themes unprompted when asked about their opinions about the show and its characters. Parents reacted positively to the characters and their portrayals, specifically the non-stereotypical portrayals and the non-traditional family structures. Although parents appreciated the culture and inclusion focus, some parents would have preferred for the cues to be more specific, particularly with the animal characters showing diversity and the language cues. Children, however, did not seem to noticed the culture and inclusion cues in these episodes. Regarding computational thinking, a majority of parents had never heard of it and when asked to try and define it, many parents did have aspects of computational thinking in their definitions however, their examples show that they did not have a full and complete understanding of the computational thinking curriculum. Parents believed that computational thinking is an important topic for their children to learn, however, some parents have reservations regarding the abstractness and age-appropriateness of the topic. *Work It Out Wombats!* is a first attempt at trying to create early STEM media that engages children of diverse race/ethnicities. Our results show that this show is an initial step in that direction, where early STEM media has diverse portrayals. More research should be done to measure the educational impact of this show, not only with computational thinking but also the culture and inclusion cues.

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Table of Contents

List of Tables and Figures

Introduction

The rise in children's media use (Rideout & Robb, 2020) and the prioritization of STEM learning (Fayer et al., 2017) has led to the development of new STEM-related apps, TV shows, and other media for young children. For example, *Ada Twist Scientist* and *Earth to Luna* are children's television series with a science focus. *PEG+CAT* and *Ready Jet Go* are examples of children's educational programming with a math and science focus, respectively, funded by the U.S. Department of Education. Research has shown that educational media has the potential to support young children's STEM learning (Grindal et al., 2019; Michael Cohen Group, 2015; Moorthy et al., 2014; Pasnik et al., 2015), however, there is little research on how to best meet the challenge of creating educational STEM media that effectively engages children of all races and ethnicities and positively impacts their learning. *Work It Out Wombats!* is the first attempt to try and accomplish this. This television program was created with an intentional focus on culturally relevant and inclusive approaches to preschool viewers' computational thinking skills. It was also created to facilitate broader, more positive, more inclusive, interest, participation, and attitudes towards science, technology, engineering, and math (STEM) learning and specifically towards computational thinking (CT). This dissertation explores parents' and children's perception, understanding, and recognition of the culture and inclusion cues and the computational thinking cues embedded in the program.

Importance of STEM and Diversity in STEM Fields

Science, technology, engineering, and math education is a priority in the United States. Employment in STEM occupations grew over 10% between 2009 and 2019 while growth in non-STEM occupations was just over 5% (U.S. Bureau of Labor Statistics, 2022b, 2022a). Between

2019 and 2029, STEM occupations are projected to grow by 8%, which would add about 556,000 new jobs (U.S. Bureau of Labor Statistics, 2022b). However, children's science and math achievement in the United States still lags behind their peers around the world (National Science Board, 2018). Internationally, there are two assessments administered to children, the Programme for international Student Assessment (PISA) and the Trends in International Mathematics and Science Study (TIMSS). In the most recent assessment of the PISA in 2018, the United States ranked 36th in math and 13th in science out of the 79 participating countries (U.S. Department of Education, 2018). For the TIMSS, the most recent assessment in 2019 found that the United States ranked 30th in fourth-grade math, 11th in fourth-grade science, 20th in eighth-grade math, and 11th in eighth-grade science out of the 58 participating countries (U.S. Department of Education, 2019). These assessment results show that much more investment needs to be made in order to improve science and math achievement for children in the United States.

To address this gap and the growth in STEM occupations, policy makers have significantly invested in improvements for STEM programs in K-12 education, identified key initiatives to engage youth in STEM outside of school settings, and improve the reach of informal STEM experiences, especially in underserved communities (Handelsman & Smith, 2016). For example, the National Science Foundation has funded programs such as the Advancing Informal STEM Learning (AISL) and the Innovative Technology Experiences for Students and Teachers (ITEST) program. In addition, research has shown that afterschool programs and informal learning experiences are supportive of children's STEM learning (Alexandre et al., 2022; Mallett Moore et al., 2022). Policy makers have also emphasized the

importance of STEM in early childhood education, where STEM learning has been generally underrepresented (Ginsburg & Golbeck, 2004). Research in this area have shown that young children can learn STEM concepts at an early age and that it is beneficial for long-term learning outcomes (Ginsburg et al., 2008; Greenfield et al., 2009; Jordan et al., 2009; Lucas et al., 2014).

Despite these federal investments, American children's interest in STEM learning remains low (Stoet & Geary, 2018). One area of concern is the underrepresentation of individuals from minoritized racial backgrounds in STEM careers. Black and Latine students are still underrepresented in STEM degree programs. In 2019, only 9% of bachelor's degrees in engineering and 10% of bachelor's degrees in computer science were earned by Black/African American students. Hispanic/Latino students earned 12% of bachelor's degrees in engineering and 9% of bachelor's degrees in computer science (National Center for Science and Engineering Statistics, 2021). Black and Latine professionals are also significantly underrepresented in the STEM workforce (Fry et al., 2021). Black and Latine professionals make up 11% and 17% of the total workforce, yet they account for only 9% and 8% of all STEM workers, respectively (Fry et al., 2021).

Much funding and research on diversifying STEM fields has focused on increasing the participation of women and girls and less attention has been given to individuals from minorized backgrounds (Archer et al., 2015). In the United States, both women and individuals from minorized backgrounds are underrepresented in STEM fields (Fry et al., 2021; National Science Board, 2010). These disparities start early. Research shows racial gaps in children's science abilities and achievement starting in preschool and kindergarten (Greenfield et al., 2009), and these gaps persist as children grow older (Morgan et al., 2016). Children from higher

socioeconomic backgrounds tend to have more resources to engage in science at their preschools, for example science and nature area or a sand and water table in their classroom, and as a result are more likely to engage in science activities (Sackes et al., 2009). Young children from low socioeconomic backgrounds enter kindergarten with lower readiness scores in science than in 7 other academic domains (Greenfield et al., 2009). By the start of elementary school, kindergarten students living in poverty display less science knowledge than wealthier children. These gaps in science-related knowledge persist (Sackes et al., 2009) and widen as children reach high school (Morgan et al., 2016). Therefore, if children from lower socioeconomic backgrounds are exposed to science learning early, it can help reduce the income gap in science education (Sackes et al., 2009).

Similar racial and income gaps have also been found in early mathematics education. Early mathematics achievement is a strong predictor of later school achievement. It becomes very difficult for young children who fall behind in mathematics to catch up to their more mathematically proficient classmates when it comes to high-school graduation rates, college readiness, and income as adults (Claessens et al., 2009; Duncan et al., 2007; NAEYC & NCTM, 2010). Clearly, providing young children access to STEM activities can not only help narrow racial gaps, but can also help improve student perceptions of STEM (Bagiati et al., 2010; Bybee & Fuchs, 2006).

There is a great need to increase interest in STEM fields as well as diversify STEM fields, particularly when it comes to addressing racial disparities. Given that these disparities start so young, one potential way to address these issues is through young children's educational media.

Media Portrayals

Increasing diversity in STEM fields is important. One potential contributing factor to the lack of diversity in STEM fields is the underrepresentation of female characters and racially diverse characters in STEM television shows. Generally speaking, in children's television, Black, Latin, Asian, and Native American characters and female characters are underrepresented (Götz & Lemish, 2012; Hamlen & Imbesi, 2020; Klein & Shiffman, 2006, 2009). This is also true within children's STEM television (Aladé et al., 2021; Hamlen & Imbesi, 2020). When minoritized groups are shown in children's programming, often times they are represented in a stereotypical or negative way (Rogers et al., 2021).

Media can affect how young children view the world and these media portrayals can have an effect on young children (Chambers et al., 2018). Research has shown that young children associate race and gender to specific occupations, and these occupational schemas, likely developed from what they view on television, are in place by age six (Bigler et al., 2003; Liben et al., 2001; Signorielli, 2009). Diverse portrayals are beneficial to young children's development and can positively impact children's self-esteem (Ward, 2004). Given this research, there is a need for increasing diversity in STEM portrayals in children's media, and educational television could support this effort to increase diversity through diverse portrayals and other culture and inclusion cues.

Theoretical Framework – Social Learning Theory

Media plays a large role in how people learn and interact with the world around them (Bandura, 1971; Gerbner et al., 1986). Bandura's social learning theory emphasizes observation.

A main component of Bandura's work is modeling, the observation and acquisition of behavior or knowledge from another person (Bandura, 1971). Bandura argues that individuals learn how to behave through the observations of others. Bandura also argues that academic learning is the result of observation and modeling, as in social learning (Bandura, 1986). Bandura's theory on modeling suggests that children can learn from models in everyday life. If children can learn from models in everyday life, children can learn from models on the television as well.

Children model many different people and other things they see around them. Bandura's work found that effective modeling occurs in four steps: attention, retention, reproduction, and motivation. First, one needs to pay attention to the model. Second, one needs to remember what has occurred. Then, one must carry out the behavior that was observed. Finally, one must want to duplicate the behavior, which will depend on what happens to the model. If the model is rewarded for their behavior, one will be more likely to model that behavior. However, if that model is punished for their behavior, one will be less likely to model that behavior. Bandura's on observational learning may also suggest a preference for characters as models. Children would pay attention to the characters on screen, remember what they watched, and duplicate that behavior. Social learning theory, specifically modeling, in the context of this study suggests that children could model the behavior of the characters they see onscreen in STEM television shows. In STEM television shows with diverse portrayals, children may be more likely to model the behaviors they see onscreen because they identify with that character and the story was told from that character's perspective. This could potentially lead children, especially children from minoritized backgrounds, to learn that STEM participation is a behavior to model.

Media as an Intervention

Learning from Educational Media

Although children's media use is spreading across devices, television still remains the most popular form of screen time for children under eight-years-old (Rideout & Robb, 2020). About sixty-eight percent of children between zero and eight-years-old are watching television every day, averaging just under two hours per day, and educational television programs are popular among this age group (Rideout, 2014; Rideout & Robb, 2020).

Research-based educational television programs have had positive effects on children's learning across many domains (Fisch et al., 1999; Piotrowski, 2018). One of these domains is early literacy. Jennings, Hooker, and Linebarger (2009) conducted an observational study on preschool children in the classroom. As a part of group time in the preschool classroom, children watched 18 mini-episodes of Between the Lions for four weeks. Twice a week, child observations were made examining specific behaviors related to literacy skills. The authors found that the content of the specific episodes was seen in children's observed behaviors and that children's literacy skills progressed during the time they viewed the television episodes.

Children have also been able to learn prosocial skills from educational television (Mares & Woodard, 2005). Mares and Woodard (2012) conducted a meta-analysis of over thirty studies of the positive effects of television on children's prosocial behaviors (i.e., social interactions, aggression levels, altruism, and stereotype levels) and found that children who watched prosocial content behaved more positively or held more positive attitudes compared to other children. The

results of this meta-analysis suggest that television has the potential to promote positive social interactions and can be used as a tool to promote positive behavior.

Educational television has also been shown to support the adoption of healthy behaviors. Borzekowski and Macha (2010) examined the effect of a six-week intervention of *Kilimani Sesame*, a Sesame Workshop production, on two hundred and twenty-three preschool children in Tanzania. *Kilimani Sesame* contained content about literacy, mathematics, social behaviors and emotions, and health related information. Results showed that preschool children significantly improved their knowledge of health-related information, in this case, malaria and HIV/AIDS, literacy, mathematical skills, and were better able to describe appropriate behaviors and emotions and appropriate content. The research regarding educational television is clear, educational television has positive effects on young children when viewing age-appropriate and curriculum-driven content.

Learning from STEM Media

Recent studies on media properties funded by the US Department of Education's Ready To Learn (RTL) Initiative, have shown that STEM-focused educational television can have positive effects on preschool-aged children. In 2013, McCarthy, Lee, Atienza, Sexton, and Tiu investigated the effects of four PBS Kids transmedia suites (The Cat in the Hat, Curious George, Dinosaur Train, and Sid the Science Kid) on children's mathematics knowledge, specifically numbers and operations, measurement and data, sorting and patterns, and geometry and spatial sense. Transmedia means the use of familiar characters, settings, and narrative themes or stories across different media formats, such as digital video, interactive online games, and interactive

whiteboard applications, so transmedia suites would be comprised of thematic content presented across different media platforms. The authors found significant improvement in three-year-olds' performance on the Child Math Assessment after viewing episodes of science and math shows and completing related at-home activities with their parents over the course of ten weeks.

A 2014 study looked at engagement with and learning from episodes and interactive games from PEG+CAT, another PBS Kids transmedia property designed to teach early mathematics and problem solving (Moorthy et al., 2014). The pre-post experimental study took place in preschool classrooms over a ten-week period and focused on mathematics skills such as counting, number recognition and subitizing, shapes, and patterns. Researchers found that children's understanding of specific mathematics concepts significantly improved on program-specific assessments as well as a standardized math assessment.

Another study done in 2015 also examined math learning from another set of PBS transmedia and found that all the first and second graders in both the treatment and control groups significantly improved their math skills (measurement, addition, skip counting, and shapes). The treatment group showed significantly greater improvement than the control group in one of those four skills (Michael Cohen Group, 2015). Another PEG+CAT transmedia study focusing on math learning from PEG+CAT in the home, was done in 2015 and the authors also found that children significantly improved their mathematics skills over the twelve-week intervention (Pasnik et al., 2015).

Research has also been done on science-based transmedia properties through the RTL Initiative. In 2019, Grindal and colleagues investigated the effects of The Cat in the Hat Knows a

Lot About That!, another PBS transmedia property consisting of videos and interactive games. The study took place over eight weeks and the participants were randomly assigned to a treatment or control group. Researchers found that exposure to these transmedia had positive impacts on children's physical science knowledge and their ability to engage in science and engineering practices. Specifically, they found that children's understanding of matter and forces, strength and length, texture, and forces in structural ability and movement down and incline. Researchers also found through their parent survey that these transmedia increased children's interest and engagement in science. These studies show that educational media can be beneficial for young children's engagement with early STEM concepts.

Anthropomorphism in Children's Educational Media

Young children's educational television primarily contains cartoon animals rather than real live-action humans, and up to 90% of children's media contains at least one unrealistic element (Bonus & Mares, 2018; Goldstein & Alperson, 2020; Taggart et al., 2019) . Anthropomorphism, animals portraying human-like attributes, is one unrealistic element that is prevalent in over 70% of young children's media (Taggart et al., 2019). Within science media, anthropomorphic characters are present in 40% of books and 75% of videos (Chlebuch et al., 2023). Research findings on the use of anthropomorphism is mixed. Some research has shown that anthropomorphism can interfere with learning. Studies using children's storybooks have shown that anthropomorphism can hinder children from transferring the educational content to real life (Ganea et al., 2014). Studies using children's videos and books have also shown that children will apply anthropomorphic characteristics to objects in the real-world (Ganea et al., 2014; Li et al., 2019). Other studies, however, have shown that anthropomorphism can support

young children's learning. Research has shown that using anthropomorphic pictures can support young children's learning about animals (Ganea et al., 2014). Research using young children's science television showed that children that viewed anthropomorphic content demonstrated the most learning and provided scientifically accurate explanation compared to the other children in their study that did not view this content (Bonus & Mares, 2018).

This research shows that understanding the effects of anthropomorphism in children's media is important. This area is of particular interest to this study because the characters of the show are anthropomorphic. They are wombats with human characteristics. See Figure 1. As the research above has shown, there seems to be some promise for anthropomorphism to support children's science learning. However, there is a dearth of research examining if anthropomorphism could be beneficial to learning about subjects around culture and inclusion.

Figure 1
Work it Out Wombats! Main Characters

Theoretical Framework – Sociocultural Theory

Vygotsky's sociocultural theory focuses on how the values, beliefs, customs, and skills of a particular group are passed on to the next generation (Vygotsky, 1980). According to Vygotsky, social interactions with others are how children learn and this is affected by the child's culture and the world around them. One important part of Vygotsky's sociocultural theory are dominant activities. Dominant activities are everywhere within a child's particular culture and they are important because these activities provide information about that culture (Vygotsky, 1980). This suggests that engaging with television could be considered a dominant activity for children as engaging with the television is a way in which children can learn about their culture and the world around them (Wartella et al., 2016). Given this information, children who engage with diverse STEM television can learn more about STEM concepts, the diverse STEM portrayals, and the culture and inclusion cues shown.

Another important aspect of Vygotsky's sociocultural theory is the zone of proximal development which is the difference in what the child can currently do without help and what they can do with help (Vygotsky, 1980). Vygotsky argues that children can learn when challenged and supported by other people, such as caregivers and teachers, which can also be referred to as scaffolding. This suggests that media, like television or characters on television, could be within this zone of proximal development (Wartella et al., 2016). Parents, caregivers, or even characters on the television could help children learn through scaffolding which would help children learn a particular concept and push the zone of proximal development to the next level. When children watch diverse STEM television, they can learn STEM concepts and recognize the

culture and inclusion cues. Then, their parents can provide the support to apply that knowledge and learn more about these subject areas.

Parent's Role in Children's Media Use

Parents have a role in how their children experience television. Parental mediation examines the different ways in which parental activity may play a role in how much children incorporate the attitudes and beliefs that are presented in the media (Sasson & Mesch, 2019). There are three main types of parental mediation: active mediation, restrictive mediation, and co-viewing. Active mediation involves talking to children about television content and restrictive mediation involves setting rules regarding the television content. Co-viewing is when a parent watches television with children (Clark, 2011). Research in this area has shown that parents set limits, model, and select media for their children (Domoff et al., 2017; Nikken & Schols, 2015; Plowman et al., 2008).

Given the role of parents in children's media use, researchers have asked parents about their media preferences for their children. When asked about STEM media, about two-thirds of parents of preschool children say their child watches TV shows or videos about science weekly or more, and 45% of parents say their child plays video games or uses apps about science weekly or more (Silander et al., 2018). Research done by Common Sense Media showed that Black, Latino/a, and Asian parents were dissatisfied with the diversity of characters, with a majority of these parents wanting media to feature characters that are the same race as their children (Rogers et al., 2021). When Black parents were asked about their media preferences for their children, results showed that they prefer their children seeing Black characters diverse in gender, skin

color, and hair texture (Mares & McClain, 2020). In the context of this study, it is important to understand what parents think about their children's television content because of how active a role some parents may play in choosing that content. It is also important to understand what parents think about their children's television content because it is clear from this research that parents are looking for media that is more culturally inclusive and they are actively looking for these culture and inclusion cues.

Computational Thinking

One topic of STEM learning that is gaining popularity is computational thinking (CT). Researchers refer to CT as an approach to problem solving based in computer science (Barr et al., 2011) rather than the specific act of coding or programming (Shute et al., 2017; Wing, 2006). CT can involve concepts such as sequencing, algorithmic thinking, debugging, or collecting, analyzing and representing data (Grover & Pea, 2013). Research suggests that learning CT at a young age can be beneficial to children's analytical skills and provides them with new approaches to problem solving (Bers, 2018, 2020; Botički et al., 2018).

Learning computational thinking is not without it challenges (Jacob et al., 2018). One of the main challenges teachers face is defining computational thinking (Yadav et al., 2018). One research study done by Sands et al. (Sands et al., 2018) examined teacher perceptions of computational thinking. They found that teachers agreed that computational thinking involved concepts such as problem solving and algorithmic thinking. However, they also found that teachers had some incorrect perceptions of computational thinking, such as doing mathematics, knowing how to use a computer, and playing online games. Studies have shown that, with

intervention, teacher understanding, and confidence improved. Given this research, it is important to learn what parents understand about computational thinking because there is a possibility that they may also have trouble understanding this topic which could potentially lead them to miss the computational thinking cues in the television show.

Research Questions

For this current study, parent-child dyads watched *Work It Out Wombats!* and I interviewed them about their impressions, understanding, and recognition of culture and inclusion cues and computational thinking cues. This study will address these research questions:

1. What culture and inclusion cues do parents and children notice while watching the program?
2. How culturally relevant do parents and children perceive the stories to be to their own lives?
3. What do parents know about computational thinking?
4. To what extent do parents recognize that the program teaches computational thinking and/or STEM-related concepts?
5. What computational thinking cues do parents notice while watching the program?
6. Do parents think that computational thinking is an important subject for their children to learn?

Method

Larger study context

My dissertation project is a part of a larger research study, led by Dr. Fashina Aladé at Michigan State University (MSU). This study is funded by a WGBH Educational Foundation grant. GBH, formerly known as WBGH, produced the television show *Work It Out Wombats!*. In partnership with the executive producers, we designed two qualitative interview studies. The first study, the production study, examined the process and perspectives of show creators about their expected hopes and outcomes for viewers, especially in relation to the culture and inclusion plan. The second study, and the focus of this dissertation, was on the family study which examined parents' and children's attention to, and interpretations of the culture and inclusion and computational thinking cues featured in this program. The executive producers were involved in the initial conceptualization and goals of the study, but then gave our research team full academic freedom and control of the data generation, analysis, and writing processes.

Scope of the dissertation

While I supported the data collection of the production study, the scope of my dissertation includes the family study. I conducted a qualitative interview study where parent-child dyads watched two episodes of this show and answered questions using a semi-structured interview protocol. This interview protocol was designed to ask both the parent and child questions about the show. I conducted around half of the family dyad interviews, with the remainder conducted by other members of the research team. In addition to myself and Dr. Aladé, our team incorporated graduate and undergraduate students who I trained to assist in our overall data collection. I led the coding process, coded a majority of the interviews, and I

conducted the data analysis. Interviews took place in July and August 2022, several months prior to the broadcast of the television series in February 2023.

Recruitment

Participants were recruited from East Lansing, MI, a relatively diverse college town in central Michigan, and Grand Rapids, MI, a mid-sized city with relatively large Black (180%) and Latin (16%) populations. Families from East Lansing, MI were recruited through a Michigan State University participant pool. Families from Grand Rapids, MI were recruited through a local community center. Once contact was made with a potential participant, our screening process occurred. The potential participant completed an online screening questionnaire. Once a potential participant completed the screening process and was eligible for the study, an appointment was scheduled for the parent and child to come and participate in the study. In order to ensure that about half of our participants identified as a member of a minoritized racial group, a purposive sample was used. Participants were compensated $50 for their time. All procedures were approved by the Institutional Review Board at both Northwestern University and Michigan State University.

Participants in Context

A total of 30 English-speaking parent-child dyads, children between the ages of three and six (56% boys; M_{age} = 4.67, SD = 0.80) and one of their parents (83% mothers, M_{age} = 39.4, SD = 5.8), participated in study. Participating children's race/ethnicity was reported as 67% White, 37% Black or African American, 13% Hispanic or Latino/a, 10% Asian or Southeast Asian, 3% Middle Eastern or North African, with 10% reported as "other." Participating parents reported their own race/ethnicity as 77% White, 20% Black or African American, 13% Hispanic or Latino/a, and 3% American Indian, Native American, or Alaskan Native.

Due to the recruitment of participants being from a university participant pool, the sample did skew towards more highly educated parents (57% had a postgraduate degree). Household income ranged from $25,000 to more than $200,000, with an average income of $50,000 to $99,999. Twenty percent of parents reported that languages other than English were spoken at home and 16% of parents reported that a grandparent or other adult relative lives at home with the family. See Table 1 for all demographic information.

Table 1
Participant Demographics

Demographics	Parent		Child	
	n	%	n	%
Gender				
Female	13	43.33	25	83.33
Male	17	56.67	4	13.33
Non-binary	0	0	1	3.33
Race				
White or Caucasian	20	48.65	23	67.65
Black, African American, or African origin	11	29.73	6	17.65
Hispanic, Latino/a, or Spanish origin	4	10.81	4	11.76
Asian or Southeast Asian	3	2.70	0	0
American Indian, Native American, or Alaskan Native	0	0	1	2.94
Middle Eastern or North African	1	0	0	0
Native Hawaiian or Other Pacific Islander	0	0	0	0
Other	3	8.11	0	0
Household Income Last Year				
Less than $10,000	0	0		
$10,000 to $14,999	0	0		
$15,000 to $24,999	0	0		
$25,000 to $49,999	6	20.00		
$50,000 to $99,999	7	23.33		
$100,000 to $149,999	10	33.33		
$150,000 to $199,999	4	13.33		
$200,000 or more	3	10.00		
Parent Education				
Less than high school	0	0.00		
High school diploma or GED	1	3.33		
Some college/vocational school	6	20.00		
Associate degree	1	3.33		

Bachelor's degree	5	16.67
Master's degree	12	40.00
Advanced graduate/professional degree (e.g., JD, MD, PhD)	5	16.67
Partner Education		
Less than high school	0	0.00
High school diploma or GED	3	10.00
Some college/vocational school	1	3.33
Associate degree	1	3.33
Bachelor's degree	11	36.67
Master's degree	3	10.00
Advanced graduate/professional degree (e.g., JD, MD, PhD)	5	16.67

Procedure

Demographics Survey

After the parent consent and child assent process was completed, parents completed a demographics survey. Family demographics were collected via the survey parents completed during the interview. This information included child's age, race, gender, and the family's household income and highest level of education. See Table 1 for all demographic information.

Interview

The interviews were conducted in-person in either a child-friendly university research lab or a quiet office space in a community center. Parents and children were interviewed together by one member of the research team, with another team member present to take notes, provide technical support, or attend to any accompanying siblings. All interviews were video and audio recorded, and each parent-child dyad received $50 for their completion of the interview.

At the beginning of the interview session, the research team received parent consent and child assent. Parents then completed an online demographics survey administered via Qualtrics on a small laptop or tablet provided by the research team. While the parent survey was taken,

researchers worked with the child to complete a card matching activity and coloring activity as a warm-up to establish rapport and help the child feel comfortable with the interviewer.

After these activities were completed, researchers gave a brief overview of the characters and the setting of the television show to provide context before watching the episode. Participants watched two episodes of the show. After watching the first episode, the core of the interview began. A semi-structured interview protocol served as a guide, but researchers allowed the conversation to flow as much as possible. The interview was broken up into three parts for the parent-child dyad. The first two parts of the interview contained questions specific to each episode. The last part of the interview contained questions on their general thoughts on the show. The child was asked their questions first and the parent was asked their questions afterwards. While the parent answered questions, the child was allowed to play with a puzzle or small toy during that time. Please see Appendix A for the full interview protocol.

The first episode shown was watched before the researcher began asking questions. The child was asked their questions first and the parent was asked their questions afterwards. The child was asked questions regarding what happened in the episode and their thoughts about the episode. The child was also asked questions to see if they recognized the culture and inclusion and computational thinking cues in the show and if they believed they learned anything from the episode. Examples of these questions include:

> When the wombats went to the Everything Emporium to get more ingredients, they ran into some of their friends and neighbors. Do you remember what the neighbors said about making cornbread?

In this episode, the problem the wombats had was that they didn't know how to make cornbread, especially after they lost the recipe. Do you think they solved this problem?

For the parent, questions included overall impressions about the episode, the storyline, and the characters as well as their thoughts on the takeaway message of the episode and other topics their child may have learned while watching. It also included questions about how the story reflects their family or a different family. Examples of these questions include: Are there any ways in which you feel this story reflects your family's cultural background and values? Do you think [child's name] might have learned anything from watching that they didn't mention earlier?

After answering these questions, the parent-child dyad watched the second episode and answered questions similar to the questions above that were specific to that episode. In order to make sure that each episode was watched equally across participants, the order in which participants would watch the episodes would alternate with each participant.

During the last part of the interview, the parent-child dyad was asked questions regarding their general impressions about the show. The child was asked questions regarding their favorite character and their intent to watch more episodes. The parent was asked their thoughts about how the show compared to other shows, if they would encourage their child to watch the show, and if they thought their child would learn anything from the show. Then, parents were asked questions regarding computational thinking and culture and inclusion and whether they took notice of any of these topics in the show. Examples of these questions include:

Considering that definition, are there any specific examples from the episodes that you feel directly reflect computational thinking skills?

The creators of this show are making an effort to be very culturally inclusive in the way they are creating this show. Are there any ways in which that came across to you?

Stimulus. *Work it Out Wombats!* is an animated show that teaches young children computational thinking in a culturally affirming way. Due to this focus on culture and inclusion, the show creators of *Work it Out Wombats!*, worked with a team of advisors to develop a "Culture and Inclusion Plan" to guide the production process. This team of advisors included researchers and practitioners with expertise in preschool STEM, digital media, executive function, Universal Design for Learning, early childhood development, and culturally responsive curriculum as well as identity studies, visual culture, and the intersectionality of STEM and race. Following is an excerpt from the Culture and Inclusion Plan, meant to provide context for the stated aims of the production:

> *Wombats!* will promote computational thinking to its preschool audience through developmentally and culturally relevant narratives. These narratives have the opportunity to feature diverse cultural and gender perspectives and begin the process of sharing foundational principles of computational thinking with children before stereotypes take hold.…
>
> We know that we don't want to dictate the race/ethnicity of each of the characters. Rather, we want to leave those details undefined, to give us flexibility in our writing and casting process. Attempting to assign these cultural characteristics without yet having our writers/voice actors in place would prevent us from depicting more nuance in the cultural representation of our characters, and therefore not reflecting the lived experiences of our viewers.

A *Wombats!* character's identity will be made up of a collection of characteristics; every character will be developed three-dimensionally to encompass multiple identities, and; no character will represent one overall experience—rather each character represents their own unique experience. Additionally, what is most important to a character's identity will vary. Some characters may identify most with their love of music, while others may identify with where their parents are from. Some characters, for instance, might identify with being from the Philippines, even if they weren't born there, and others who look just like them, might not. Some characters may speak one language, while others speak many.

It should be noted that the Treeborhood does not have the geographic specificity of *Arthur*'s Elwood City or *Molly of Denali*'s Qyah, Alaska, but rather it is an undefined locale, with the residents sharing a common language (for viewers in the US that language is English!). Some characters have lived in the Treeborhood for generations (the Wombats, for instance, who currently are not connected at all to their Australian roots), but others hail from real places (JunJun's family, for instance).…

Participants watched two *Work It Out Wombats!* stories, A Super Recipe and Special Delivery, and the official story descriptions are as follows:

A Super Recipe. The Wombats are making cornbread for Super as a thank you for fixing Zeke's stuffie Snout. But when they lose the recipe, they must figure out what makes cornbread "cornbready" to perfect their tasty treat. The Wombats notice and describe key attributes of cornbread: it's sweet, yellow and crunchy. They then try to create cornbread that has these three key attributes, using different ingredients. After talking to

Treeborhood community members about the special ingredients they add to their cornbread, the Wombats realize that cornbread can also be cheesy or spicy!

Special Delivery. Malik really wants to bring ice cream to his sick friend, Sammy. There are two sets of ordered steps that Malik can follow, and both get Malik to Sammy's house. One set of steps gets Malik there in a complicated way, requiring more time and effort; the other set gets Malik there more quickly and simply.

These two stories were chosen from a subset of stories that were in "fine cut" stage (i.e., almost finished animation but had no music or sound effects) by the time of interview preparation. These two stories were selected in consultation with the executive producers for the following reasons: (a) covered different aspects of the computational thinking curriculum, (b) featured a different subset of characters, (c) and, from the research team's perspective, had clear culture and inclusion cues that parents and children might pick up on. For example, in A Super Recipe, the Wombats siblings make cornbread, a food deeply rooted in Southern culture with Native American / Indigenous origins. As they figure out how to make cornbread, they talk to the Treeborhood community members and learn that cornbread can taste different depending on who makes it because different cultures sometimes use different special ingredients. During Special Delivery, some of the characters use words and phrases in Spanish and there are certain clothing items and musical instruments associated with Spanish/Latin culture in this story. Non-traditional family structures are featured in both stories; the Wombats siblings live with their grandmother and Sammy lives with his dad who is shown working from home.

Coding and Analysis

All interviews were transcribed verbatim using Rev.com, a crowd-sourced human transcription service. All identifying information was removed or anonymized before I or any

member of the research team engaged with the data. I led the coding and analysis of the interviews, collaborating with other research team members using Dedoose, an online qualitative coding platform.

Prior to coding, I drafted an initial codebook based on the interview questions and the research team's experience conducting the interviews. Then, each member of the research team did close reads of the transcripts. We also completed practice rounds of coding working off the same transcript, but blind to each other's codes. After each practice round, the research team met to discuss our codes and work through any discrepancies or challenges. I made any necessary changes to the codebook. Once we arrived at a final codebook that the research team thought covered a wide range of participant perspectives, I split up the transcripts for individual coding. The final codebook covers themes and topics such as culture and inclusion (e.g., family backgrounds, characteristics of characters, etc.), computational thinking (problem solving, problem decomposition, etc.), and general impressions (overall impressions, favorite characters, takeaway messages, etc.). During the coding process, research team members would also write memos to take notes on themes that were not fully covered by the codebook or to describe any patterns or larger themes that emerged. See Appendix B for the full codebook.

After all the transcripts were coded, data analysis began. My analysis of these interviews was guided by a mix of thematic analysis (Braun & Clarke, 2012) and qualitative content analysis, which allows for systematic approach to analyzing qualitative data (Hsieh & Shannon, 2005; Schreier, 2012). First, the research team wrote down top themes and patterns that we noticed while coding. We then discussed our top themes and patterns to find any similarities or differences. Then, I fleshed out an outline of these themes and patterns for the dissertation. These patterns are discussed in the following results chapters.

Results – Culture and Inclusion Cues

This chapter explores the culture and inclusion cues shown in this television show. Specifically, this chapter answers two of the study's research questions with findings related to parents' impressions and recognition of the culture and inclusion cues. As mentioned in the methods section, parents and children watched at least one episode of the show before being asked these questions. Questions regarding the culture and inclusion cues were asked throughout the interview. For the interview questions, see Appendix A. For the codebook, see Appendix B.

Impressions and Recognition of Culture and Inclusion Cues

Overall Impressions

Parents identified and liked that there as a culture and inclusion focus to the show. Neither our recruitment materials nor our consent form nor our overview of the television show mentioned that this study was focused on the culture and inclusion aspect of the show. Many parents brought these themes up naturally during the interview when asked about their impressions of the stories or characters.

- Researcher: *Any sort of impressions of the storyline or the characters, things that stood out to you?* Parent: *Yeah, I think it's nice to see a mixture of characters in terms of ages and abilities and everybody interacting, and positively for the most part and having different things going on in their lives and different challenges.*
- Researcher: *What did you think about the characters?* Parent: *I like that there's three siblings and most time [on other shows] it's two kids. And I like that there's not a clear depiction of girls vs. boys. It's just sort of, you can sort of put your own thing onto it. And I liked that grandma played basketball.*

- Researcher: *How about the characters? Did any of them stand out to you*? Parent: *Just nice to see, again, different shapes of the people who live in their town and yeah, have different ideas about stuff, but everybody's ideas were listened to and given they all had their space to talk, it was nice.*
- *I liked the diversity of it. The animals are not ones that you see in every kid's show. The names made me think of different ethnicities. I caught that Spanish word too, and I was assuming he was saying, "Bless you."*

In all these quotes, parents reacted positively to the diversity of the characters, particularly the characters being different types of animals living different lives. One parent mentioned the number of siblings with the wombat characters in the show and another parent mentioned the names of the characters reminding them of different ethnicities.

Later in the interview, parents were asked explicitly about the culture and inclusion focus. Specifically, parents were asked if this intentional focus on culture and inclusion would make them more or less likely to encourage their child to watch *Wombats!*. All the parents in our study said it would make them more likely to encourage their child to watch:

- *More likely….Just because we live in a mixing pot in this world and I don't want my kids to not understand certain cultures.*
- *Yeah, probably more likely, especially family we relate to, I mean family structure. For me it's important that she become familiar with a lot of different people with different backgrounds than us. So yeah.*

When asked why parents would encourage their children to watch *Wombats!*, many parents brought up wanting to expose their children to different cultures and people, as shown in two of

the quotes above. It was clear that parents want their children to understand that people come from different cultures and not all families look the same and parents thought that Wombats could be a potential way of exposing them to these things. One parent in particular wanted to hear more about the educational goals of the show so they could understand why they should expose their child to more media:

> *Absolutely more likely, yes….And we parents like to think we're smart and we know what the purpose of all programs are, but it never hurts for me to hear, hey parents, this show is aiming to expose your kids to A, B, and C. Hey, something. Let your parents know. Yeah, you got to learn about this and this, because that's sort of making a pitch and helping me justify more and more time.*

Although parents unanimously liked the culture and inclusion focus of the show, their thoughts were mixed on how it was included. One parent appreciated the subtlety of the culture and inclusion cues:

> *That's what stuck out to me… That no matter who you are, I'm going to help… Subtle but it's there… And that's what we have to do. Can't be in your face… It has to be a learning experience.*

Some parents believed that the cues were too subtle and that their child may not pick up on these cues:

> *I think it made me more likely to encourage him to watch it. I think for me it'd be like, hey man, I would like to see that dialed up a little bit, because I still feel like it's hiding in there. So it's almost like how do I sneak this spinach into this smoothie; as opposed to, there's spinach in the smoothie.*

Another parent gave specific examples on the culture and inclusion cues that were too subtle:

> *Yeah. I mean, certainly you've got different languages going on. I didn't quite catch what the birds said. Something about crunchy… Each one, 'we like spicy', 'we like cheesy', 'we like crunchy.' I think you could almost add more of the foreign language pieces into it. I find when we watch shows that have multilingual components… he really likes Alma's Way, which is also on PBS. And so they'll go through and they'll just speak in Spanish and then you kind of catch up. And I think that kind of immersive quality of you don't have to explain what these words mean, they're contextual… Whereas 'I like my corn to be picante so I add jalapeno', or something like that. I think it could lean in just a little bit more on that. I honestly don't know what the wombats are supposed to, if they are supposed to be like, I'm a little confused by that one. My first thought is wombats are Australian, and it doesn't sound Australian at all. Same thing with the kangaroo. So if there is a diversity component to it, just making it maybe a little more explicit or just pulling that in, not being afraid of what it is… put it right out front.*

This parent thought that there could have been more foreign language cues and that these cues could have been stronger, providing additional context, similar to another PBS show called *Alma's Way*. This parent also thought that if there is a diversity component to the characters, such as nationality or race/ethnicity, to make it just a little bit more explicit. They found the wombats and kangaroo characters because they thought the characters would sound Australian. Currently, these characters are not connected at all to their Australian roots.

Community

One aspect of the show that parents connected with was community. This theme was prevalent amongst the parents of color, specifically, seven out of ten parents of color. Families of

color appreciated how everyone in the treeborhood got along and would support each other which reminded them of their local communities and upbringings.

- *I felt more of the sense of community. And that's how our block is… I'm the one that talks to everybody, but our house [is the one] where everybody navigates to, and they're all so different…*
- *I don't like my kids to judge anybody or to react differently or even I get it when you hear people speak in Spanish and it's all fast and you want to look... But it's not making them feel included or like they don't belong. It's an intentional community, all in one tree.*
- *I also liked how his [Malik's] community came around him and helped him do it, so helping her remember you might not be the friend taking ice cream, but you could be the friend helping get someone there... It's a really good community lesson. Right? We can all play a little role. We can all do what we can do. I really like that a lot, and I still really love that they got the ice cream.*
- *And, just being able to go in and out of people's houses, that's how I grew up. And I know we have close friends like that, that my kids know that they can always just kind of walk in and be a part of the family. So I liked that aspect of the show.*

Research has shown that 74% of parents want their children to be exposed to media that teaches them about different cultures, religions, and lifestyles and over 80% of parents want their children's content to teach them to be accepting of different children and their families (Rogers et al., 2021). This study is in alignment with this research. All the participating parents appreciated the culture and inclusion focus of this show. Many parents talked about the importance of exposing their children to different cultures and family structures. Culture and inclusion are important to parents.

Using Anthropomorphism to Show Diversity

Parent thoughts were also mixed regarding the use of animals to show diversity. Although we did not ask about this directly, it was a common theme discussed during the interview. Some parents questioned the use of animals to represent the diversity of humans:

> *I would just say, for me personally, I would question why they can't be human… Or if it could be one part of the show is the animals… and then there are actual kids, actual children just to see that, or something of that nature, so they wouldn't just think that animals are out here talking, having conversations. That's the only thing I would say that would make it probably more relatable to him if you could actually see children [engaging in these behaviors].*

This parent would have preferred to have human children featured in the show in some way. If the human children were not the main characters, they could potentially be included in a cutaway scene or interstitial, similar to *WildKratts*, for example, that beings and ends with a live-action segment. Another parent also mentioned that the cultural differences between the animals seemed to be hidden:

> Researcher: *Was there anything that you noticed in the show that could be relatable to a different family?*
>
> Parent: *Culturally? I just see basically the fact that they're different colors and they kind of look different and there's different types of animals, but it's not something where they look at it and they see a human and they could see the difference of cultures…So I feel like it might be kind of a hidden thing inside of it. That's not so obvious to them that there's differences, but it teaches them the normalization of having differences around*

them…Other than that, I don't really culturally see anything yet that I can be like, oh, this family. Aside from those things.

This parent thought that the use of animals could teach their young child that there are differences around them but felt that it may not be as obvious that there are cultural differences. This parent thought that the cultural differences could be highlighted more explicitly through the use of human characters.

However, other parents appreciated the use of animals to show diversity:

- *"There seemed to be a good bit of diversity in the characters, I mean, obviously they're animal characters, but I think there was some clear cultural references in the [cornbread] ingredients. And so there was diversity represented there, which I appreciated as well."*
- *"I like the fact that different animals too, to represent the differences."*
- *"It seems like there's some diversity. I mean they're all animals…But some of them had different accents and were speaking some Spanish, I think. So that's cool to show diversity, and that there are different people out there."*

During the child's portion of the interview, children did bring up the show's use of animals. In this case, it was not about whether the animals were being used to show diversity, but rather if their favorite character reflected them or not. Forty percent of children that responded to this question (n=6) said that their favorite character did not reflect them:

- Researcher: *"Were any of them kind of like you?"* Child: *"I don't think so because that one's orange, that one's purple, and that one's blue, and that one's blue. That one's green, and that one's blue."*

- Researcher: *"Are there any of those characters that you think are like you?"* Child: *"No."* Researcher: *"No, they're all different? All right."* Child: *"They're animals."*

Although we did not explicitly ask about the use of animals to show diversity, it was a common theme from parents. Research has shown that Black parents prefer easily identifiable Black characters over anthropomorphic or other metaphorical or ambiguous characters (McClain, 2022). Research has also shown that Asian, Black, and Latin parents are more likely to believe that there isn't enough content with characters with the same race/ethnicity as their child (Rogers et al., 2021). Parents had mixed opinions on the use of these anthropomorphic characters to show diversity.

Language Cues

In one of the episodes, Special Delivery, there are a few instances where Sammy's dad speaks to Sammy in Spanish. In these instances, Sammy's dad would say "salud" after Sammy would sneeze, which translates to "bless you" in English. After watching that episode, we asked children if they noticed any characters speaking a different language. Almost all of the children said "no," One child said "yes" and said that Sammy's dad was speaking "British." Overall, this did not seem to be a culture and inclusion cue that children recognized.

Amongst the parents, mentions of the linguistic diversity featured in the show came through, particularly with the characters' accents and the explicit use of Spanish words: *"I liked the little bit of linguistic diversity. Could be maybe even elevated a little bit more."* Another parent compares *Wombats!* to another show and talks about the character accents:

> *And I could tell a little bit from the voices, it seemed like there were different people of different backgrounds represented by the voices, but they weren't over the top. They were pretty subtle. And it's something I think if you weren't really listening for, you might [not*

> *notice]... In another show that we like the* Octonauts*, their accents are real over the top. And it used to... At first, it really bothered me. It's like, 'Oh, I feel like they are kind of overly caricaturing these groups.' But then it's... I feel over time hearing it again and again, I think it is helpful because the way that they pronounce things is clearly different. And so to have that very clear difference in the way that they're speaking, but they're speaking English so it is words that she recognizes, but I think it's worthwhile to throw in words of other languages there. I wonder if pointing it out specifically would be more helpful because a lot of words she just doesn't know yet. So it could just be an English word that she doesn't know.*

This parent compares *Wombats!* to *Octonauts*, another children's show, and talks about the use of dramatized accents, going into the pros and cons. She also wonders if it would be helpful to her daughter if the show would explicitly point out the use of a different language to help her daughter to differentiate words in other languages from words in English that she had not yet learned.

While watching the episodes, parents would notice the language cues while the children would not. 58% of parents think it is important for their child's media to teach other languages (Rogers et al., 2021). In this interview study, many parents appreciated the use of Spanish in the episodes but felt like there could have been more.

Character Portrayals

Non-stereotypical Portrayals

When asked about their impressions of the characters, many parents mentioned that they liked Gramma Super because her character went against the gender and age norms for a grandmother.

- *I really, really loved that grandma is an athlete. I loved that grandma... It was kind of like crossing gender norm expectations, which I think is really cool and special. A lot of times, shows make a grandparent old, and weak, and feeble, and she was strong, and silly, and athletic, and creative.*
- *Yeah. It was not stereotypical. That's what it was. Grandmother's supposed to knit, and sit in the rocking chair, but she plays basketball, so that was cool. I think that's what made her the best character for me.*
- When asked if any characters stood out to her, another parent shared that they liked that *"Gramma [Super] was getting ready to go shoot some hoops, go play basketball with some friends, but also liked to cook.*

Some parents also spoke about the Wombats siblings, specifically how they were not limited to traditional gender roles. As one parent mentions:

> *I like how non-gendered the kid characters are. I don't think they're very obviously boys or girls, which I think is really fun. I think my kids appreciate that more than the 'this is a girl show and this is [a boys show]' [approach].*

Non-Traditional Family Structures

Parents also appreciated that there were different family structures in the show, such as the wombats living with their grandmother and Sammy being at home with his dad. One parent liked how the show normalized the dad staying at home with the child:

> *Oh, you've got a dad taking care of a kid too. That comes through nicely but feels totally normalized, right? It's not like, oh, they're missing anything. It's just dad's home with this sick kid and working from home.*

One parent spoke about the importance of different family structures for her blended family:

> *I loved how they showed different families and how not everyone lives with mom and dad and some kids live with grandparents. So I really liked it because I thought more kids could identify with parent families that look different, especially because we're a blended family so that's always a question that my kids have.*

Another parent emphasized this as a main takeaway lesson that they hoped their child learned from the show:

> *I think, I don't know if it'd be a lesson, but the fact that there was not a stated mother, father in the household. Not to say that, maybe, I don't know for sure in his mind that's a normal thing, but I think if he were to keep watching the show, it would be normal to be able to compare it to, 'Oh, my friend lives with his grandma too,' or something like that.*

Parents appreciated the different character portrayals in this show. Two main themes that parents mentioned were non-stereotypical portrayals and the non-traditional family structures of the characters. These responses align well with research mentioned earlier in this chapter about parents believing it is important for their children to be exposed to different cultures and lifestyles (Rogers et al., 2021).

Summary

Parents identified and discussed the culture and inclusion themes unprompted when asked about their opinions about the show and its characters. When explicitly asked about the culture and inclusion focus of the show, parents unanimously liked the culture and inclusion focus of the show and said that they would encourage their child to watch the show knowing that it has this focus. Parents reacted positively to the characters and their portrayals, specifically the

non-stereotypical portrayals and the non-traditional family structures. Although parents appreciated the culture and inclusions focus, some parents would have preferred for the cues to be more specific, particularly with the animal characters showing diversity and the language cues.

Results – Computational Thinking Cues

This chapter explores the computational thinking cues shown in this television show. Specifically, this chapter answers three of the study's research questions with findings related to: parents' knowledge of computational thinking, parents' impressions of computational thinking, and parents' recognition of computational thinking cues in the show. As mentioned in the methods section, parents watched at least one episode of the show before being asked these questions. All the questions regarding computational thinking were asked towards the end of the interview. For the interview questions, see Appendix A. For the codebook, see Appendix B.

Parents' Knowledge of Computational Thinking

Given that the show's focus is on computational thinking, I wanted to ask parents about their knowledge of this concept. When asked if they have ever heard of the term "computational thinking," 53% of parents (n=16) said they had never heard the term before participating in the study. One parent shared,

> Researcher: *Have you heard of that term before and have any thoughts about what it might mean for someone his age?*
>
> Parent: *Computation thinking. No. I mean, we talk about computational science, dealing with big data and understanding how they describe phenomena and predict phenomena. But I think computational thinking is new to me.*

This parent does have some familiarity about computer science, an academic discipline, however, they do not have any familiarity with computational thinking. This particular quote is interesting because even with their familiarity with this STEM field, they have never heard of computational thinking. If parents that have familiarity with STEM fields have never heard of computational thinking, there is a possibility that parents without this familiarity with STEM

fields also have not heard of computational thinking. Other parents said that it sounded familiar, but they were not sure what it meant, and only a few parents mentioned that they had heard of computational thinking.

As follow-up question, we asked parents to define or give their best guess as to the meaning of computational thinking. In their responses, many of the parents did have aspects of computational thinking in their definitions, such as problem solving, sequencing, and breaking things down. Examples included:

- *"Compute, break it down. To compute, to try to figure out in a step by step process."*
- *"Processes and just really assessing a situation."*
- *"I have never heard of [it]. I'm going to just say problem solving, trial and error."*

All the parent definitions above include aspects of computational thinking. "Break it down" is a part of problem decomposition. "Figure out in a step by step process" is a part of sequencing. Computational thinking is a problem-solving approach. In their attempt to come up with a definition, a few parents would mention that they think of computers and some parents would mention what they viewed during the episodes:

- *Computational thinking? I mean this episode, at least to have the focus on steps, like step one, step two…So maybe it has to do with thinking through things through in steps.*
- *I mean, in general I think of data, computers, trying to calculate something, math... It was more clear in the second one where there's six steps versus two steps.*

Asking parents to provide an attempt of a definition is an attempt to gain insight into parents current understanding of computational thinking. Given that the majority of the parents had never heard of computational thinking, hearing their guesses contain educational aspects of the

show containing computational thinking cues shows that the parents are recognizing these computational thinking cues prior to being given a definition.

I also asked parents what school subject they think is associated with computational thinking. Many parents (n=9) associated computational thinking with STEM subjects, such as science and math. Other school subjects or topics mentioned were language, social emotional learning, psychology, and self-regulation. Examples included:

- *I mean, guess it seems like a psychology thing, but I'm sure math and engineering probably have some aspect of that, too.*
- *Math and computer science. But I don't know if they do computer science in school.*
- *Probably a few. Certainly science and math. Gosh, I'm thinking back to episode one like that, calculating the length of the route, what's more efficient and the options and for the cornbread, what goes into it, right? Definitely that and a little language involved there too, because when you're calculating things and you're using terms, you're figuring out measurements, you know, have to understand those units, and you have to be able to communicate around those.*
- *I mean, I could see it fitting into math. I could see it fitting into science in terms of trying something new and not working like an experiment or something. And then, are we talking like K through 12? Because I would also see it fitting into a social, emotional learning type category.*

This was another attempt to gain insight into parents' current understanding of computational thinking. When taught in schools, some schools position computational thinking in computing/computer science courses while others position it across different subject areas (Voogt et al., 2015). Researchers have argued that computational thinking skills could be taught

in math, science, social studies, and language arts classes (Lu & Fletcher, 2009). Parent responses to this question included almost all of these subjects even before they had viewed a definition of computational thinking.

Parents' Recognition of CT

During the interview, parents were given a piece of paper with the following explanation of computational thinking to read to themselves:

> The show defines computational thinking as "a creative way of thinking that enables children to solve problems in systematic ways. CT helps children identify and analyze problems, and brainstorm and generate step-by-step solutions that can be communicated to and followed by others." Some of the topics covered include sequencing, patterns, debugging, abstraction, representation, algorithms, and problem decomposition.

This definition was taken from the show's curriculum approach and rationale. After providing parents with a definition of computational thinking, parents were able to recall many aspects of CT from the two stories they viewed. Examples included:

- *The counting the steps to get to the kid's house and then figuring out that the other way was less steps.*
- *Representation would be the maps. And then debugging, maybe this seems like a really long way to go. Let's see if there's a better way or whatever.*
- *When they found the cornbread that was all dried, they decided to try to come up with solutions…. They were going to follow a recipe, which would've been better, but then they lost the recipe book…*
- *Yeah, I mean the step by step part in the second story where they map out his process of getting there. Same thing with the recipe in the first story, the brainstorming thing. In The*

first story they go, well it's all of these things, so what can we do to try and approximate that?

- *Yeah, debugging, right? Figuring out what part of the process is broken and pulling it out. So "yeah, I think they match a lot of this.*

These quotes show that parents were able to recognize some of the computational thinking cues in the episodes. These quotes also show that the parents did not fully recognize the computational thinking cues in the show. Parents recognized problem solving, however, parents only recalled aspects of computational thinking provided in the definition which suggest that they did not have a full and complete understanding of the computational thinking curriculum. Parents' ability to recognize these cues is important because if they are not recognizing the cues, they may not be able to help support their children's learning from television. Parent knowledge and recognition of computational thinking is important because learning from educational media works best when parents co-view media with their children and able to actively scaffold the learning material (Morgenlander, 2010; Neuman et al., 2014). Under Vygotsky's zone of proximal development, to support young children's learning, parents or caregivers would need to have the knowledge to support their child. If parents know what computational thinking is and can recognize it, they will be better able to support their children. These results show that parents do not know very much about computational thinking. However, once they were given a definition of computational thinking and had a better understanding, parents recognized parts of it in the show.

Parent Impressions of CT

After reading a definition of computational thinking, parents were asked questions regarding their impressions of computational thinking. When asked about their initial thoughts on the definition, some parents responded:

- *I guess it should be something that our kids should be more exposed to in shows.*
- *It's very high-level, but it seems like an interesting and probably very productive way to try to teach children to problem-solve, because I think, as all people, we get overwhelmed really quickly with problems and then get really emotional about them. So being able to identify and analyze the steps is crucial, I think, as you grow and into adulthood, so yeah.*
- *I think this is awesome, because I feel like the more and more I think about the Ways that I work at a school. So we're always thinking about getting kids to ask the right questions and become problem solvers. I love this idea of visualizing thinking and I saw that they were doing that with the maps and drawing.*

As shown in the above quotes, many parents said that they liked the definition brought up on their own that it was a topic their children should learn. After asking parents about their initial thoughts, we also asked parents explicitly if computational thinking was a topic their young child should learn. Many parents thought that computational thinking is a topic their young child should learn:

- *Oh, it's never too early to start.*
- *There's no downside to that. I think especially in this world where it can be very easy to get overwhelmed. Showing and modeling in a positive way, how you tackle something that's tough in a very step by step, bite size, approachable way. Yes.*

- *I don't think it's a bad thing. Especially because being able to problem solve and think outside the box when things don't go the way that you plan, is something that people need to know how to do.*
- *Kids are the best experiment builders because they're experimenting all the time because they have no knowledge of the world. I mean he's four years old. So I definitely think that it's something that needs to be addressed early.*
- *Oh yeah. I mean, think this... Problem solving, I think is one of the most important things for children to learn, because ...I don't think a child would be as successful in the actual math, science and things like that if they didn't know how to problem solve first.*
- *Yeah, I think it helps give her more experience outside of school to have those thoughts and think on her own versus feeling like she's in an area where she's being challenged to think about it. It's something that happens more naturally. So I like that idea. I feel like they're hitting on a subject that is just not something we see for their age group that makes sense.*

A common theme across these last two sets of quotes is problem solving. Parents seem to like computational thinking because it is another way of teaching their children to problem solve.

Although there seemed to be a very positive response from parents regarding computational thinking, some parents had reservations about computational thinking being taught to their young children. A few parents felt that there was a possibility that their children would not be able to fully comprehend computational thinking. For example:

- *It's a heavy definition for a kid's show.*
- *I thought it was good. I thought there were obviously the numbers. They're reinforcing the counting and the steps. I think for her she might be still a little too young to*

understand the true problem-solving nature...of what was happening. Probably just more of the fun.

- *Yeah, I mean, it's very high-level, but it seems like an interesting and probably very productive way to try to teach children to problem-solve, because I think, as all people, we get overwhelmed really quickly with problems and then get really emotional about them. So being able to identify and analyze the steps is crucial, I think, as you grow and into adulthood, so yeah.*
- *I wonder if it's the right place in the kid's education to focus on it, though…. Yeah. I mean it … just feels a little abstract to pull it all apart like that, but maybe I'm wrong. You can totally try I guess, see if it works out.*

In the above quotes, parents mentioned that even though they like computational thinking, it is a topic area that is abstract and may be difficult for young children. Some parents thought that the lessons in the show seemed to be hidden:

- *I do. I don't know... So when I think about this show and other shows, other education shows that our kids have watched, the lessons in this, and maybe it's by design, the lessons, I felt like, were still a little hidden or wasn't as out front; they're just kind of going through their day and whatnot. But I do think it's a good lesson to learn.*
- *Yeah, I like the idea and I think that it's not out of her area of being able to comprehend. Yeah. It's nice too... This is a good idea, but I think it was, at the end, you could wrap it up and actually say how the episode fits into this because it is very abstract and this is... It's a lot to infer from just that message. You'd have to really come back to it and think about it in this framework and be like, "Okay, I see what they're doing there." So maybe a little more help with that.*

In the first quote, this parent would have preferred if the computational thinking cues were more explicit in the episodes they had watched. In the second quote, this parent felt that the computational thinking cues included in the episode required a lot of inferring and it would help to have something to summarize or reinforce these cues. Parents want their children to recognize computational thinking cues and feel that making the cues more explicit would be beneficial to their young children's learning. Although there were some reservations about computational thinking, all the parents in our study said that they would encourage their children to watch *Work it Out Wombats!* given the computational thinking focus. Understanding parent impressions is important because parents help decide what their young children watch (Nikken & Schols, 2015). Parent views on the media, whether positive or negative, has an impact on parental mediation (Wang et al., 2023), ways in which parents manage their child's engagement with media (Dias et al., 2016; Domoff et al., 2019).

Summary

A majority of parents never heard of computational thinking. When asked to try and define computational thinking, many parents did have aspects of computational thinking in their definitions, such as problem solving, sequencing, and breaking things down, however, their examples show that they did not have a full and complete understanding of the computational thinking curriculum. Parents came up with a variety of school subjects when asked what school subjects they associate with computational thinking. Parents believe that computational thinking is an important topic for their children to learn, however, some parents have reservations regarding the abstractness and age-appropriateness of the topic.

Discussion

The participants in our study shared rich and valuable insights about the *Wombats!* episodes they watched. Both parents and children conveyed their excitement about the show and its characters. Parents reported that they would encourage their child to watch the show, especially after learning about its focus on culture and inclusion and computational thinking.

Parents identified and discussed the culture and inclusion themes unprompted when asked about their opinions about the show and its characters. Many parents seemed naturally drawn to these culture and inclusion elements of the show because many of the parents spoke about their thoughts prior to the research team sharing that the show had an intentional culture and inclusion focus. When explicitly asked about the culture and inclusion focus of the show, parents unanimously found that focus appealing and said that they would encourage their child to watch the show knowing that it has this focus.

The culture and inclusion cues that came across to parents were community, linguistic diversity, non-stereotypical portrayals, and the non-traditional family structures. When discussing these culture and inclusion cues, parents often brought up how these cues reminded them of their own lives or the lives of others inside and outside of their communities. Black and Latin families in our study seemed to appreciate the community aspect in particular, feeling like it reflected their own communities and upbringing. Thoughts were mixed on the way in which these culture and inclusion cues were presented. Some parents would have preferred more explicit cues for their children. However, other parents appreciated the subtlety of these cues and the fact that its culture and inclusion was not a major focus of the episodes.

Children, however, did not seem to notice the culture and inclusion signals in these episodes. One reason may be that they were unable to communicate these ideas, which is

common in this age group. Research has shown that young children are often unable to communicate prosocial messages included in educational programming, even when these messages are obvious to adults (Mares & Acosta, 2008, 2010). Another potential reason children did not notice these culture and inclusion cues could be the subtlety in which they were presented. As noted in the culture and inclusion plan, it was an intentional choice for these cues to be embedded in the program rather than be an explicit focus of the story lines. However, making these cues more explicit and central to the storylines could potentially help children notice and understand these cues. It is important to note that we do not see this as a failure of the television show. As mentioned in the method, children only watched two of the eighty 11-minute stories developed for Season 1. If given the opportunity to watch multiple episodes over an extended period of time, there is the potential for the show to have a positive impact on children's attitudes and beliefs about the world, regardless of their ability to articulate their learning.

Parents were also asked about the computational thinking, given that is the main goal of the show. A majority of parents never heard of computational thinking. When asked to try and define computational thinking, many parents did have aspects of computational thinking in their definitions, such as problem solving, sequencing, and breaking things down. Parents came up with a variety of school subjects when asked what school subjects they associate with computational thinking. However, once they were given a definition of CT and had a better understanding of its meaning, they recognized and recalled many examples from the stories that showcased CT learning goals. Nearly all parents agree that computational thinking is an important topic for their children to learn, however, some parents have reservations regarding the abstractness and age-appropriateness of the topic. Research has shown that children learn best

from educational media when they are able to co-view with their parents or caregivers and the parents can actively scaffold the learning material (Morgenlander, 2010; Neuman et al., 2019). As such, the production team may want to consider providing clear learning goals and scaffolding suggestions to parents, such as parent videos or other resources, to provide a foundational understanding of computational thinking and what it looks like for their young children.

Implications

Theoretical Implications

Parents are looking for more diverse media for their children. Research has shown that parents believe representation is important, not just with race/ethnicity, but also being culturally and linguistically inclusive (Rogers et al., 2021). The parents in this study made this clear through their recognition of the culture and inclusion cues. Parents spoke about the culture and inclusion cues, for example, linguistic diversity, non-stereotypical portrayals, and the non-traditional family structures, before the research team explicitly brought up this focus of the show. Understanding parent impressions on media representation in their child's media is important because it is clear from this research that parents are looking for media that is more culturally inclusive and they are actively looking for these culture and inclusion cues. It is also important to understand parent impressions on media representation because of the role parents play in deciding what content their young children watch as well as their role in supporting their young children's learning from media. It is important to examine STEM media portrayals. *Work It Out Wombats!* is a first attempt at trying to create early STEM media that engages children of diverse race/ethnicities. Our results show that this show is an initial step in that direction, where early STEM media has diverse portrayals. More research should be done to measure the

educational impact of this show, not only with computational thinking but also the culture and inclusion cues.

There has been a lot of investment in increasing STEM opportunities for young children, including those from minorized communities. The National Science Foundation has funded programs to improve the reach of STEM opportunities in minoritized communities, one in particular being CSforAll, focusing on bringing computer science and computational thinking to K-12 students. STEM media is an additional way to provide exposure and increase interest in STEM for young children and this show has the potential to do this for STEM and computational thinking. Research has shown that children can potentially learn STEM subjects from media (Grindal et al., 2019; Michael Cohen Group, 2015; Moorthy et al., 2014; Pasnik et al., 2015), prosocial behaviors from the media (Mares & Woodard, 2005), and understand race at a young age (Hirschfeld, 2007). However, is it possible to all of this at the same time in a STEM television show?

Practical Implications

This qualitative research study is formative research, meaning the intent of this research is to inform the creation or revision of a television program (Fisch & Truglio, 2001). As detailed in the method, this study was designed in partnership with the executive producers of *Work it Out Wombats!*, who were involved in the initial conceptualization and goals of the study, however, gave our research team full academic freedom and control of the data generation, analysis, and writing processes. Due to this setup, this study is in a unique position to provide direct feedback to the executive producers of the show and affords the opportunity to potentially influence the second season of the show. It also affords the opportunity to influence the parent resources or parent-child activities produced to support young children's learning of

computational thinking. These findings may also inform additional industry work for producers and creators of new STEM media for young children.

Given this research, it is important to talk about the key takeaways. For content creators, it is important to clearly state the learning goals. Parents need a clear understanding of the learning goals so parents know the educational content within a show which will help them scaffold the material for their children. In order for scaffolding to be effective, parents need to understand the learning goals so they can support their child's learning. For example, the learning goals could be made clear in the show through the story, the characters, or through an interstitial. Parent resources or parent-child activities are additional examples of where the learning goals can be made clear for parents.

Another takeaway for content creators would be to highlight the educational cues within the show. In this study, we specifically looked at culture and inclusion cues and computational thinking cues. Some parents had concerns that the cues for both culture and inclusion and computational thinking were too subtle and their child may not understand them. It is important to highlight these cues so that both parents and children understand the cues being shown to them. Using repetition is an example of how these cues can be highlighted in the show.

Limitations and Future Research

As described in the method, my background and positionality likely influenced the interview dynamics, the themes identified, and the analysis and interpretation of the data. There is a possibility that another researcher with a different background and experience may find different themes within these findings.

This sample of parents was from the Midwest region of the United States, specifically the state of Michigan. Although there was a concerted effort to have a diverse sample, the sample

did skew more heavily towards families with a higher parental education and income and may not be generalizable to other regions of the United States. Future research in this area might aim to have a nationally representative sample or have samples that examine the unique experiences of minoritized people.

Our interview protocol was designed to obtain relatively equal feedback from both parents and children, however, parents provided much more input in their responses compared to their children. Therefore, much of the conclusions are based on the parents' viewpoints. Future research in this area might aim to focus on the perspectives of the child viewers.

Additionally, this study was conducted very early in production. The two stories used in this study, A Super Recipe and Special Delivery, were among the first stories produced and when they were shown to families, they were in "fine cut" stage, meaning the animation was nearly complete, but there was no music or sound effects. Therefore, it is very likely that future stories will include more explicit and well-developed culture and inclusion cues.

Future research should examine the current state of STEM media for young children. New media have been created since 2020, which was the most recent content analysis examining young children's STEM television. This content analysis does not take into account the push to create more diverse media and workplaces in media production, which began in the summer of 2020, after the murder of George Floyd and the rising momentum of the Black Lives Matter movement. Also, during this time, new STEM television was created. Also, television should not be the only medium examined. Other media, such as mobile apps, should also be examined. Additionally, future research should examine how parents are using STEM media at home, with a focus on culture and inclusion. A nationally representative survey could allow for the opinions of different racial/ethnic groups as well as geographies to be more generalizable compared to the

interview data provided in this study. Previous research has examined parent perceptions and reported use of science-related media (Silander et al., 2018), however, given the need for more diverse STEM media for children, it is important to understand parent perceptions and preferences in this area.

This television show is an opportunity for parents to informally engage with computational thinking in a culturally inclusive way. This television show could have the potential to support young children's STEM learning at home in a way that engages children of all races and ethnicities. Future research should examine if it is possible to learn computational thinking while also focusing on culture and inclusion.

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Appendices

Appendix A – Interview Protocol

Consent

→ Introduce yourself to the parent and thank them for their time. Briefly go over the consent form, obtain signature, and invite them to keep a copy of the consent form if they'd like.

Parent Survey

- The first thing I'm going to ask you to do is fill out a brief survey to give us a little bit more background information about you and your family. While you're doing that, [child's name] and I are going to get started with a little coloring activity.

→ Set parent up with survey. Be sure to input participant number before they begin.

Child Assent

→ Read child assent script to the child.

- Hi, I am [researcher name] from Michigan State University. I am trying to learn about different TV shows that are made for kids just like you and what you think about them. I would like you to help me with this project. We are going to watch a TV show, and then I will ask you some questions about it. You do not have to help with this project if you do not want to, and you can stop at any time. Nobody will be upset with you if you decide you do not want to do it. Does that all sound okay to you?
    - If yes: Great, let's get started!
    - If no: That's totally okay, maybe another time.

Child Assent Obtained? (circle Y/N) Yes No

BEGIN RECORDING! DO NOT FORGET TO HIT RECORD ON AUDIO AND VIDEO RECORDERS!

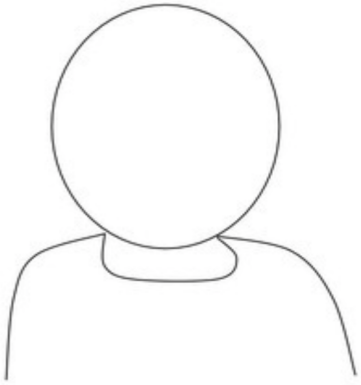
- Make sure your phone is on airplane mode if using your phone for a backup!

Coloring Activity Part 1

→ Give child coloring activity #1 and crayons. Give the child a few minutes to draw the picture.

- The first thing we're going to do is a coloring activity! This is going to help me get to know you a little better. I want you to use this page to draw a picture of yourself. You can choose the crayon colors that you think look most like your skin and hair and eye color.

Use the outline below to draw a picture of yourself.
Choose a crayon color that you think looks most like your skin color.



Me/Not Me Task

- Next we're going to play a game together called the "Me or Not Me" Game. I have cards with different words on them, and we are going to make two piles with these cards: one that describes who you are, the "me" pile, and one that does not describe who you are, the "not me" pile.

→ After initial sort, go through each pile again and ask participant if they want to make any changes. Record final answers.

1.	Boy	Me	Not Me
2.	Girl	Me	Not Me
3.	Daughter	Me	Not Me
4.	Son	Me	Not Me
5.	Brother	Me	Not Me
6.	Sister	Me	Not Me
7.	Asian	Me	Not Me
8.	Black	Me	Not Me
9.	Latino/a	Me	Not Me
10.	White	Me	Not Me
11.	Student	Me	Not Me
12.	Athlete	Me	Not Me
13.	Artist	Me	Not Me
14.	Scientist	Me	Not Me
15.	Problem Solver	Me	Not Me

Video Viewing of "A Super Recipe"

→ Make sure **A Super Recipe** is cued up.

- The first video we are going to watch is called "A Super Recipe". You can get comfortable and watch this together, just like you might do at home, and then I'll ask you both some questions after it's over.

- As soon as they hit play and everything looks good, step back and give the family space to watch. We will be video recording them watching the episode.

"A Super Recipe" Interview Questions

- Alright, let's talk about the show! [child's name], these first few questions are for you. [Direct towards parent] I know sometimes it's tempting to help your child answer questions, but I'm going to ask you to try not to do that. There are no right or wrong answers here, we are just really interested in hearing what [child's name] has to say.

[TO CHILD]

1. Did you like that show you just watched? What did/didn't you like about it?
    a. *Follow up using smiley scale:* Can you tell me how much you liked it using these pictures - you can say not at all, a little, a lot, or a whole lot?
2. Can you tell me what happened in this episode? What problem(s) did the characters have?
    a. *Possible follow-up*: Who were the characters? What were the characters trying to do?
    b. *Possible follow-up*: How did they do that?
    c. *Possible follow-up*: Do you remember anything else they did to do that?
3. Did you learn anything from the story?
    a. What did you learn?
4. Have you ever heard of cornbread before?
    a. *If yes:* Have you ever tasted cornbread? What did it smell/taste/feel like?
        i. *If yes:* Where did you have it? Who were you with when you ate it?
    b. [SHOW PICTURE 1] This was the cornbread the Wombats had.
        i. [If child said they have had cornbread] How was their cornbread the same or different from yours?
        ii. [If never had cornbread] Do you think you'd like to try cornbread someday? Why or why not?
5. *[SHOW PICTURE 2]* Remember in the episode when the wombats lost the family recipe book? How did they figure out how to make cornbread when they couldn't find the recipe book?

6. *[SHOW PICTURE 3]* The first recipe they tried didn't quite work, did it? What did they do differently the second time they made the cornbread?
7. *[SHOW PICTURE 4]* When the wombats went to the Everything Emporium to get more ingredients, they ran into some of their friends and neighbors. Do you remember what the neighbors said about making cornbread?
    a. May want/need to prompt here: "They also talked about cornbread…and how they make it…"
8. *[SHOW PICTURE 5]* In this episode, the problem the wombats had was that they didn't know how to make cornbread, especially after they lost the recipe. Do you think they solved this problem?
    a. *If yes*: How did they solve the problem?
    b. *If no:* Why no?
9. What do you think the wombats mean when they say they can "work it out"?

- Okay, now, I'm going to ask your parent a few questions.

[TO PARENT]

1. What was your overall impression of the episode?
2. What did you think about the storyline?
3. What did you think about the characters? Did any of them stand out to you?
4. What do you see as the main takeaway or message of the episode?
    a. Were there any other, perhaps secondary, takeaways?
5. Are there any ways in which you feel this story reflects your family's cultural background and values?
    a. How so/why not?
6. Was there anything in the episode that made you think of a different culture or something that a different family might relate to?
    a. How so/why not?
7. Do you think [child's name] might have learned anything from watching that they didn't mention earlier?
    a. What did you think they learned, or might learn if they watched this episode again at home?

Video Viewing of "Special Delivery"

→ Make sure **Special Delivery** is cued up.

- Thank you for answering the first set of questions! Now you get to watch another episode! This one is called, "Special Delivery," and just like before, you'll watch it together and then I will ask you questions afterwards.
    - As soon as they hit play and everything looks good, step back and give the family space to watch.

"Special Delivery" Interview Questions

- Now I have a few questions about that episode you just watched.

[TO CHILD]

1. How much did you like that episode?
    a. *Possible follow-up:* Did you like it a whole lot, a lot, a little, or not at all?
    b. Why?
2. Can you tell me what happened in this episode? What problem(s) did the characters have?
    a. *Possible follow-up*: Who were the characters? What were the characters trying to do?
    b. *Possible follow-up*: How did they do that?
    c. *Possible follow-up*: Do you remember anything else they did to do that?
3. Did you learn anything from the story?
    a. What did you learn?
4. *[SHOW PICTURE 6]* When Mailk went to Sammy's house, he talked to Sammy's dad. Did you notice anything about their conversation?
    a. Did you notice Sammy's dad saying words in a different language besides English? What language do you think that was?
    b. What does he tell Malik before Malik goes upstairs to visit Sammy?
        i. Why do you think Sammy's dad said that?
5. When Malik brought Sammy the ice cream, what happened? If they already mentioned the ice cream melted, move to question 5b.

[SHOW PICTURE 7]

   a. [If no mention of the ice cream melting before] Why is the ice cream cone empty?

   b. *[If child already mentioned melting]* What does he do differently the next time he brings Sammy the ice cream?

6. *[SHOW PICTURE 8]* The problem in this episode was that the ice cream kept melting. How did Malik try to solve the problem?

7. What do you think it means when the wombats say they will "step it out"?

- Okay, now it's [mom/dad]'s turn again.

[TO PARENT]

- These are the same questions I asked earlier, but I want to know your answer based on the episode you just watched.

1. What was your overall impression of the show?

2. What did you think about the storyline?

3. What did you think about the characters? Did any of them stand out to you?

4. What do you see as the main takeaway or message of the episode?

   a. Were there any other, perhaps secondary, takeaways?

5. Are there any ways in which you feel this story reflects your family's cultural background and values?

   a. How so/why not?

6. Was there anything in the episode that made you think of a different culture or something that a different family might relate to?

   a. How so/why not?

7. Do you think [CHILD's NAME] might have learned anything from watching that they didn't mention earlier?

   a. What did you think they learned, or might learn if they watched this episode again at home?

Child General Impressions

- Alright, we are in the last part of the interview now! And I have just a few more questions for you.

[TO CHILD]

1. Would you want to watch more episodes of this show when it comes out on TV? Why/why not?
2. Thinking across both of those episodes you just watched, who was your favorite character?
    a. What did you like about that character?
3. Do you think [character's name] is like you at all?
    a. In what ways? How are they like you?
4. If [character's name] was human, what do you think they'd look like?

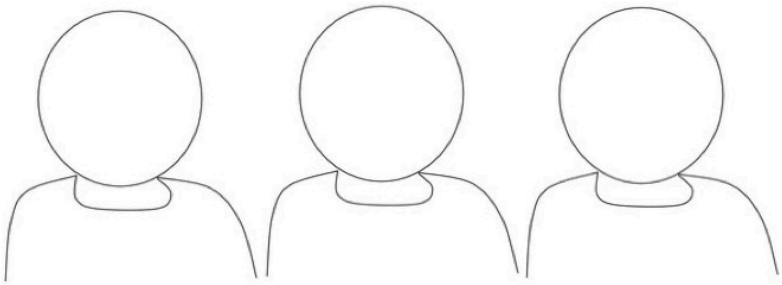
Coloring Activity Part 2

[Child Name], thank you for answering all of those questions! I have one more coloring activity for you to do, while I ask [mom/dad] a few last questions.

→ Give child coloring activity #2 and crayons. Give the child a few minutes to draw the picture. The child can keep coloring while the parent is wrapping up.

- The last time you did this activity, you drew yourself. This time, I want you to use your imagination and think about what the Wombats would look like if they were humans instead of wombats. Can you imagine that and draw a picture for me?
- Use the crayons to show how the wombats would look if they were humans. What colors would their skin and hair and eyes be?

Here is an outline of three humans. Use the crayons to add skin, hair, and faces to show what the wombats would look like if they were human characters.



Parent General Impressions

- [Parent Name], these last few questions are about your general impressions about the show. I want to remind you that we are not the ones creating this show and we have no stake in whether it's successful or not, so please feel free to be totally honest here.

    1. How do you feel this show compares to other (PBS) shows your child typically watches?

    2. Do you think your child would learn anything from watching this program regularly?

    3. Is this a show that you would encourage your child to watch?

        a. Why or why not?

    4. This new educational TV show focuses on the topic of computational thinking. Have you ever heard of computational thinking before?

        a. *If yes:* What have you heard about it?

        b. What do you think it means?

            i. *Possible probe:* What words come to mind when you hear this topic?

        c. What school subject do you think this topic is in?

    5. Here is a sheet that gives you the show's definition of computational thinking. I'd like for you to take a moment to read it and I will ask you a few questions after. If you'd like me to read it for you, I'd be more than happy to.

        a. Any initial thoughts about this definition?

        b. Was this anything close to what you thought it might mean?

        c. Considering that definition, are there any specific examples from the episodes that you feel directly reflect computational thinking skills?

            i. Were there any aspects of the computational thinking definition that you did not feel came through in the episodes?

        d. Do you think that this is an important subject for your child to learn?

    6. The creators of this show are making an effort to be very culturally inclusive in the way they are creating this show. Are there any ways in which that came across to you?

Thanks/Incentives

- Okay, we are all done with our interview! Thank you both so much for taking the time to participate in this study. Do you have any questions for me?

→ Give sticker to child and compensation to parent. Make sure parent has signed forms for receipt of parking pass and compensation.

Appendix B – Images for Child Interview

This is a new show called *Work it Out Wombats!*

These are the wombats…

Malik Zadie Zeke

They are siblings, and they live with their grandma, her name is Super.

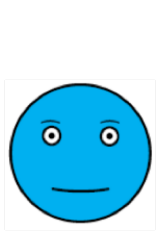
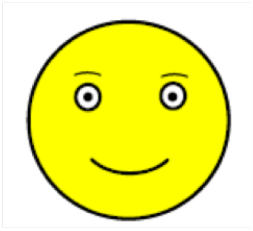
This is their friend Sammy, and Sammy's dad Quique.

These are some of their neighbors who you'll see today: Kat and Kit, Amado and Kaya, Duffy, and Mr. E.

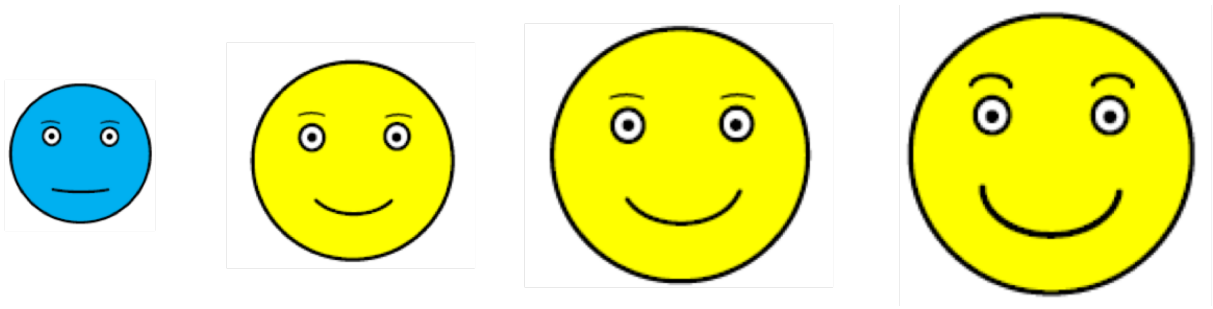
They all live in a place called the

Treeborhood

A Super Recipe

Special Delivery



Appendix B – Codebook

Parent Code	Child Code	Grandchild code	Greatgrandchild code	Definition
Impressions	Child Impressions			Child impressions about the show
	Episode/Storyline Impressions	Positive Impressions Negative Impressions		Impressions about the episodes/storyline
	Character Impressions	Positive Impressions Negative Impressions		Impressions about the characters
Enjoyment of Episode - Child	Not at all A little A lot A whole lot Unknown			Child's enjoyment of the episode
Show Characteristics	Educational Non-violent			characteristics about tv shows that parents mention
Child Learning	Learning from Episode Special Delivery - Child			Child thoughts on if they learned from the episode special delivery
	Learning from Episode Super Recipe - Child			Child thoughts on if they learned from the episode super recipe

	Learning from Episode Special Delivery - Parent			Parent thoughts on if their child learned anything that the child did not already mention from the episode special delivery
	Learning from Episode Super Recipe - Parent			Parent thoughts on if their child learned anything that the child did not already mention from the episode super recipe
	Takeaway Message/Lessons Learned			Parent thoughts on the takeaway message or lessons learned from the episode
Problem Solved Super Recipe	Yes No Not Sure			Child thoughts on if the characters solved the problem in the episode super recipe
Problem Solved Special Delivery	Yes No Not Sure			Child thoughts on if the characters solved the problem in the episode special delivery
Compares to Child Shows	Positive Comparison			positive comparison to another show
	Negative Comparison			negative comparison to another show
CI - Culture and Inclusion	Family Backgrounds	Family is Reflected Family is not reflected Different family is reflected		mention of family background and if family or other families are reflected in the show

		Different family is not reflected		
	CI Watch Wombats	Encourage Discourage		parent thoughts on if they would encourage their child to watch the show now that they know it is about culture and inclusion
	Culture and Inclusion Impressions	Animals		parent general impressions on culture and inclusion
	Items	Food	Cornbread	mention of any cultural foods
		Ingredients	Jalapeños Cornbread mix Pili nuts Cheese Cereal Corn Cobbers	mention of any cultural ingredients
		Clothing		mention of any cultural clothing
		Musical Instruments	Maracas	mention of any cultural instruments
	Characteristics of Characters	Character Names		mention of the names of the character(s)
		Character Voices/Accents		mention of the voices/accents of the character(s)

		Character Languages	English Spanish No Language Noticed	mention of the language the character(s) is speaking
		Character Race or Ethnicity	Black Hispanic/Latino White Asian	mention of the race of the character(s)
	Community			Any reference to community, community building, etc in the episode/show
	Gender Roles	Traditional roles Non-traditional roles		Any mention of gender roles
	Family Structures	Traditional structure Non-traditional structure		Any mention of family structures
Watch Wombats	Parents would encourage Parents would discourage Parents are neutral			parent thoughts on if they would encourage their child to watch the show when it comes out
	Child would watch more Child would not watch more Child might or does not know if they want to watch more			child thoughts on if they would watch more wombats when the show comes out

Favorite Character	Malik Zadie Zeke Grandma Super Sammy Sammy's Dad Kit and Kat Amado and Kaya Duffy Mr. E			the child's favorite character from the show
Similarity to Favorite Character Show - Child	Like the child Not like the child			child thoughts on their favorite character being like them
CT - Computational Thinking	Heard of CT	Have heard Never heard Might have heard		parents' thoughts on if they have heard of CT before
	CT Impressions	CT Learning	Patterns Algorithms Problem Decomposition Cause and Effect Problem Solving Debugging Abstraction Representation Sequencing Critical Thinking Brainstorming STEM	any mention of learning CT and any topics that might fall under CT

		CT Examples		examples of CT from the show
		CT - School Subjects		parents' thoughts on the school subject CT would be in
		CT Positive Impressions		parent positive impressions of CT
		CT Negative Impressions		parent negative impressions of CT
	Watch Wombats CT	Encourage Discourage		parent thoughts on if they would encourage their child to watch the show now that they know it is about CT
Characters	Malik Zadie Zeke Grandma Super Sammy Sammy's Dad Kit and Kat Amado and Kaya Duffy Mr. E			Any mention of the characters
Character Activities	Pretend Play Realistic/Relatable Non-realistic/relatable			Any mention of what activities the characters are engaging in

Prosocial Behaviors	Communication Perspective Taking Asking for Help Collaboration/Teamwork Helping Others Kindness Caring for Others			Any mention of prosocial behaviors and the type of prosocial behavior(s)
Emotions	Positive Emotions	Happy Thankful Excited		Any mention of positive emotions and the type of positive emotion(s)
	Negative Emotions	Mad Frustrated Angry Disappointed		Any mention of negative emotions and the type of negatives emotion(s)

Appendix D – Parent Survey

WOMBATS FAMILY STUDY - PARENT SURVEY
Experimenter enter participant number: _____

First we'd like to get some basic information about the child who is participating in this study.

What is the first name of the child who is participating in this study? _____

What is ${Q1/ChoiceTextEntryValue}'s gender
1. Boy
2. Girl
3. Non-binary, or prefer to describe as: _____

What is ${Q1/ChoiceTextEntryValue}'s date of birth? (MM/DD/YYYY)
1. Which of the following best describe ${Q1/ChoiceTextEntryValue}'s race/ethnicity? (Choose all that apply)
   White or Caucasian
2. Black, African American, or African origin
3. Hispanic, Latino/a, or Spanish origin
4. Asian or Southeast Asian
5. American Indian, Native American, or Alaskan Native
6. Middle Eastern or North African
7. Native Hawaiian or Other Pacific Islander
8. Other (please specify) _____

How many siblings does ${Q1/ChoiceTextEntryValue} have?
1. Older siblings _____
2. Younger siblings _____

What languages does ${Q1/ChoiceTextEntryValue} speak at home? Choose all that apply.
1. English
2. Spanish
3. Other language(s) (please specify) _____

What percent of the time is English spoken at home?
1. 0% (1)
2. more than 0% but less than 25% (2)
3. more than 25% but less than 50% (3)
4. 50% (4)
5. more than 50% but less than 75% (5)
6. more than 75% but less than 100% (6)
7. 100% (7)

Next, we are interested in how much time ${Q1/ChoiceTextEntryValue} spends with various types of media.

We are also interested in who generally uses media with ${Q1/ChoiceTextEntryValue}. Please complete the following questions to the best of your ability.

How much time does ${Q1/ChoiceTextEntryValue} spend watching **television or DVDs**, including streaming services like Netflix, Hulu, or Apple TV, on a typical **weekday**?

	Hours (1)	Minutes (2)
Weekday morning (1)		
Weekday afternoon (2)		
Weekday evening (3)		

How much time does ${Q1/ChoiceTextEntryValue} spend watching **television or DVDs**, including streaming services like Netflix, Hulu, or Apple TV, on a typical **Saturday**?

	Hours (1)	Minutes (2)
Saturday morning (1)		
Saturday afternoon (2)		
Saturday evening (3)		

How much time does ${Q1/ChoiceTextEntryValue} spend watching **television or DVDs**, including streaming services like Netflix, Hulu, or Apple TV, on a typical **Sunday**?

	Hours (1)	Minutes (2)
Sunday morning (1)		
Sunday afternoon (2)		
Sunday evening (3)		

When ${Q1/ChoiceTextEntryValue} does watch **television or DVDs**, what percent of ${Q1/ChoiceTextEntryValue}'s viewing is spent with the following people?

	0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Alone ()	
With a parent/caregiver ()	
With a sibling ()	
With a friend ()	

How much time does ${Q1/ChoiceTextEntryValue} spend playing on a **tablet or smartphone**, including the iPhone, iPad, KindleFire, Samsung Galaxy, or Android phone, on a typical **weekday**?

	Hours (1)	Minutes (2)
Weekday morning (1)		
Weekday afternoon (2)		
Weekday evening (3)		

How much time does ${Q1/ChoiceTextEntryValue} spend playing on a **tablet or smartphone**, including the iPhone, iPad, KindleFire, Samsung Galaxy, or Android phone, on a typical **Saturday**?

	Hours (1)	Minutes (2)
Saturday morning (1)		
Saturday afternoon (2)		
Saturday evening (3)		

How much time does ${Q1/ChoiceTextEntryValue} spend playing on a **tablet or smartphone**, including the iPhone, iPad, KindleFire, Samsung Galaxy, or Android phone, on a typical **Sunday**?

	Hours (1)	Minutes (2)
Sunday morning (1)		
Sunday afternoon (2)		
Sunday evening (3)		

When ${Q1/ChoiceTextEntryValue} does play on a **smartphone or tablet**, what percent of the time is spent playing with the following people?

0 5 10152025303540455055606570758085909510 0

Alone ()	
With a parent/caregiver ()	
With a sibling ()	
With a friend ()	

Now we have a few questions about the kinds of shows and characters ${Q1/ChoiceTextEntryValue} enjoys.

What are ${Q1/ChoiceTextEntryValue}'s 5 favorite shows?

1. Favorite show #1 _____
2. Favorite show #2 _____
3. Favorite show #3 _____
4. Favorite show #4 _____
5. Favorite show #5 _____

For each of ${Q1/ChoiceTextEntryValue}'s favorite shows, would you consider it to be primarily educational or primarily entertainment?

	Completely entertainment (1)	Mostly entertainment (2)	Mix between entertainment and education (3)	Mostly educational (4)	Completely educational (5)
Favorite show #1 (x1)	○	○	○	○	○
Favorite show #2 (x2)	○	○	○	○	○
Favorite show #3 (x3)	○	○	○	○	○
Favorite show #4 (x4)	○	○	○	○	○
Favorite show #5 (x5)	○	○	○	○	○

Do you feel that watching **educational programs** has helped ${Q1/ChoiceTextEntryValue} be prepared for school in the following ways?

	Definitely hurt (1)	Probably hurt (2)	Neither helped nor hurt (3)	Probably helped (4)	Definitely helped (5)
Academic preparation for school (1)	○	○	○	○	○
Social preparation for school (2)	○	○	○	○	○
Emotional preparation for school (3)	○	○	○	○	○

We would also like to learn about the types of activities you and ${Q1/ChoiceTextEntryValue} do at home together.

In the past month, how often have you and ${Q1/ChoiceTextEntryValue} practiced the following skills:

	Never (1)	Less than once a week (2)	Once a week (3)	A few times a week (4)	Daily (5)	Several times a day (6)
Counting (1)	○	○	○	○	○	○
Reciting the alphabet (2)	○	○	○	○	○	○
Adding (3)	○	○	○	○	○	○
Subtracting (4)	○	○	○	○	○	○
Measuring (5)	○	○	○	○	○	○
Sorting (6)	○	○	○	○	○	○
Building/Constructing (7)	○	○	○	○	○	○

How often (if ever) do you do the following?

	Never (1)	Almost (2)	Sometimes (3)	Often (4)
Encourage your child to play educational games (e.g., video game, computer game, app) (1)	○	○	○	○
Encourage your child to watch educational TV programs or films (2)	○	○	○	○
Encourage your child to watch/play media with good emotional or social lessons (3)	○	○	○	○

How often (if ever) do you do the following?

	Never (1)	Almost (2)	Sometimes (3)	Often (4)
Point out when media characters do things that are wrong (4)	○	○	○	○
Explain that things that happen in media are often not possible in real life (5)	○	○	○	○
Explain that real life violence often hurts more than in media (6)	○	○	○	○
Tell your child not to imitate the violence in media (7)	○	○	○	○
Tell your child not to imitate other negative behavior (8)	○	○	○	○

How often (if ever) do you tell your child that he or she is not allowed to do the following?

	Never (1)	Almost (2)	Sometimes (3)	Often (4)
Watch certain TV programs or movies (4)	○	○	○	○
Play a certain game (e.g., video game, computer game, app) (5)	○	○	○	○
Watch a TV program or a film or play a game because it’s too violent (6)	○	○	○	○

How much do these statements fit with your experiences? Please rate the extent to which you agree or disagree with the following statements.

I…

	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
Have spent time trying to find out more about my racial/ethnic group(s), such as its history, traditions, and customs (1)	○	○	○	○	○
Have a strong sense of belonging to my own racial/ethnic group(s) (2)	○	○	○	○	○
Understand pretty well what my racial/ethnic group membership(s) means to me (3)	○	○	○	○	○
Have often done things that will help me understand my racial/ethnic background better (4)	○	○	○	○	○
Have often talked to other people to learn more about my racial/ethnic group (5)	○	○	○	○	○
Feel a strong attachment towards my own racial/ethnic group(s) (6)	○	○	○	○	○

Finally, we have a few questions about you and your household.

Which adults live in the same house as ${Q1/ChoiceTextEntryValue}? Choose all that apply.

1. Mother
2. Father
3. Stepmother
4. Stepfather
5. Grandmother
6. Grandfather
7. Other

What language do you speak most often at home?

1. English
2. Spanish
3. Other language(s) _____

What is your relationship to ${Q1/ChoiceTextEntryValue}?

1. Mother
2. Father
3. Stepmother
4. Stepfather
5. Grandmother
6. Grandfather
7. Other _____

What is your gender?

1. Male
2. Female
3. Non-binary
4. Prefer to describe as _____

What is your age? _____

Please select the option that most accurately reflects your current relationship status:

1. Single/never married
2. Married
3. Living as married
4. Divorced
5. Separated
6. Widowed

What is the highest level of education you have completed?

1. Less than high school
2. High school diploma or GED
3. Some college/vocational school
4. Associate degree
5. Bachelor's degree
6. Master's degree
7. Advanced graduate/professional degree (e.g., JD, MD, PhD)

Which of the following best describe your race and/or ethnicity? (Please select all that apply)

1. White or Caucasian
2. Black, African American, or African origin
3. Hispanic, Latino/a, or Spanish origin
4. Asian or Southeast Asian
5. American Indian, Native American, or Alaskan Native
6. Middle Eastern or North African
7. Native Hawaiian or Other Pacific Islander
8. Other (please specify) _____

If applicable, please select the option that most accurately reflects your husband/wife/partner's current employment status:

1. Employed full-time
2. Employed part-time
3. Student
4. Homemaker
5. Retired
6. Disabled
7. Not employed
8. Does not apply

If applicable, what is the highest level of education your husband/wife/partner has completed?

1. Less than high school
2. High school diploma or GED
3. Some college/vocational school
4. Associate degree
5. Bachelor's degree
6. Master's degree
7. Advanced graduate/professional degree (e.g., JD, MD, PhD)
8. Does not apply

What was your household income last month? _____

What is your average household income in a year?

1. Less than $10,000 (1)
2. $10,000 to $14,999 (2)
3. $15,000 to $24,999 (3)
4. $25,000 to $49,999 (4)
5. $50,000 to $99,999 (5)
6. $100,000 to $149,999 (6)
7. $150,000 to $199,999
8. $200,000 or more (8)

Curriculum Vitae

BRENIEL LEMLEY
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EDUCATION

Northwestern University, Evanston, IL — Fall 2018 – Summer 2023
PhD Candidate, Media, Technology, and Society Doctoral Program,
School of Communication

Northwestern University, Evanston, IL — Fall 2018 – Spring 2021
Masters of Arts in Media, Technology, and Society
School of Communication

University of San Francisco, San Francisco, CA — Fall 2010 – Spring 2014
Bachelor of Arts in Psychology, Minor in Music,
College of Arts of Sciences

GRANTS & FELLOWSHIPS

NSF Graduate Research Fellowship — Spring 2020 - Present
National Science Foundation

Dissertation Research Grant — 2023
Department of Communication Studies, Northwestern University

Michael Haley Travel Grant — Spring 2023
International Communication Association

Conference Travel Grant — 2019, 2020, 2022, 2023
Department of Communication Studies, Northwestern University

Conference Travel Grant — 2019, 2020, 2022, 2023
Media, Technology, and Society Program, Northwestern University

Northwestern Buffett Conference Travel Award — 2022
Buffett Institute of Global Affairs, Northwestern University

Conference Travel Grant — 2022, 2023
The Graduate School, Northwestern University

University Tuition Grant, University of San Francisco — Fall 2010 – Spring 2014

AWARDS & HONORS

SRCD Graduate Student Travel Award — Winter 2023
Society of Research in Child Development

SPOT Award for Employee Excellence — July 2017, March 2017, January 2017, January 2016
Education Division, SRI International

USF Academic Merit Award, University of San Francisco — Fall 2010 – Spring 2011

RESEARCH EXPERIENCE

Graduate Student Researcher, Center on Media and Human Development — September 2018 – August 2023
School of Communication, Northwestern University

EdTech Research Consultant — June 2019 – December 2019
Menlo Education Research

Educational Media Research Consultant — June 2019 – November 2019
KQED Education, KQED, Inc.

Research Analyst II, Center for Technology in Learning — April 2017 – August 2018
Education Division, SRI International

Research Analyst I, Center for Technology in Learning — September 2014 – April 2017
Education Division, SRI International

Senior Research Assistant, Foster Care Research Group — June 2012 – May 2014
Department of Psychology, University of San Francisco

Research Intern, Emotion, Health, and Psychophysiology Laboratory — Summer 2013
University of California, San Francisco

Research Assistant, UCSF Department of Surgery — Spring 2011 – Spring 2013
University of California, San Francisco

Research Intern, UCSF Pediatric Echocardiography Lab — Summer 2010
National Institute of Diabetes and Digestive and Kidney Diseases Short-Term Education Program for Underrepresented Persons (STEP-UP*)*

Research Intern, Biomedical and Health Sciences Internship — Summer 2009
University of California, San Francisco

PUBLICATIONS

Refereed Journal Articles

Diouf, F., **Lemley, B.**, Barth, C., Goldbarg, J., Helgenberger, S., Grimm, B., ... & Bonnevie, E. (2022). Mental Health Stigma Reduction in the Midwestern United States: Evidence from a Digital Campaign Using a Collective Impact Model. Journal of Community Health, 1-8.

Polinsky, N., **Lemley, B.**, Flynn, R., Wartella, E., and Uttal, D. (2022), Children's Spatial Play with a Block Building Touchscreen Application. Frontiers in Educational Psychology. *Frontiers in Education*, 7. https://www.frontiersin.org/article/10.3389/feduc.2022.871895

Lowental, A., **Lemley, B.**, Kipps, A., Brook, M., Moon-Grady, A. J. (2013), Prenatal tricuspid valve size as a predictor of postnatal outcome in patients with severe pulmonary stenosis or pulmonary atresia with intact ventricular septum. *Fetal Diagnosis and Therapy*. doi: 10.1159/000357429

Moon-Grady, A. J., Rand, L., **Lemley, B.**, Gosnell, K., Hornberger, L. K. and Lee, H. (2011), Effect of selective fetoscopic laser photocoagulation therapy for twin–twin transfusion syndrome on pulmonary valve pathology in recipient twins. *Ultrasound in Obstetrics and Gynecology*, 37: 27–33. doi: 10.1002/uog.7748

Technical Reports

Boyce, J., Allen, A., **Lemley, B.**, Krumm, A. (2017). Equity in STEM Education through Project-Based Learning: A Research-Practice Partnership Year 1 Research and Implementation Report. Menlo Park, CA: SRI International

Boyce, J., Allen, A., **Lemley, B.**, Krumm, A. (2017). Equity in STEM Education through Project-Based Learning: OER Report. Menlo Park, CA: SRI International

Arshan, N., Bosetti, K., Fahimuddin, L., **Lemley, B.**, & Tyler, N. (2017). Observations from spring 2016 data collection for Linked Learning: San Bernardino evaluation. Menlo Park, CA: SRI International

Online

Lemley, B., Christensen, C., Hoisington, C. (2018, September 11). Supporting Parents to Support Science [Blog post]. Retrieved from: https://globalfrp.org/Articles/Supporting-Parents-to-Support-Science

Diouf, F., **Lemley, B.**, Barth, C., Goldbarg, J., Helgenberger, S., Grimm, B., Wartella, E., Smyser, J., and Bonnevie, E. (2021) Mental Health Stigma Reduction in the Midwest: Evidence from a Digital Campaign Using a Collective Impact Model. Available at SSRN: https://ssrn.com/abstract=3967697 or http://dx.doi.org/10.2139/ssrn.3967697

CONFERENCE PRESENTATIONS

Vogelman-Natan, K., Lemley**, B.**, & Wartella, E. (2023). We'll Return After These Messages: A Content Analysis of Advertising in Children's Podcasts. To be presented at Association of Internet Researchers Conference, Philadelphia, PA.

Vogelman-Natan, K. & **Lemley, B.** (2023). Tuning into Kidcasts: A Content Analysis of Children's Podcasts and Podcast Advertisements. Presented at the 20 Years of Podcasting: Mapping the Contours of Podcast Studies ICA 2023 Preconference.

Mesyn, T.J., Aladé, F., & **Lemley, B.** (2023). "Shaking things up" / "Fear of F***ing Up": Creating Culturally Inclusive Preschool STEM Television. In Aladé, F. (Chair) Designing Media to Support Diverse Children's Learning. [Paper Session] International Communication Association Conference, Toronto, ON, Canada.

Lemley, B., Aladé, F., Eddie, A., & Mesyn, T.J. (2023). Exploring Black and Latine Parents' Perceptions of Computational Thinking and its Role in Children's TV. In Beltran-Grimm, S. (Chair), Children's Media and Technology: What Context and Content Reveal about children's development and learning. [Symposium] 2023 Society for Research in Child Development Meeting, Salt Lake City, UT, United States.

Aladé, F., Mesyn, T.J., **Lemley, B.** (2022) Creating with Intention: A Phenomenological Case Study of Crafting Children's Media with Intentional Inclusivity. In Jennings, N. (Chair), Race, Representation, and Impact: Honoring Children's PLACE in Media [Symposium] National Communication Association Conference, New Orleans, LA.

Polinsky, N., **Lemley, B.**, Flynn, R., Uttal, D., Wartella, E. (2022). Building Your Dream House Versus Sorting Shapes: How spatial abilities relate to how children play digital games. Presented at the SRCD Special Topics Meeting: Learning through Play and Imagination.

Lemley, B., Christensen, C., Adair, A., Gerard, G. (2019). PBS KIDS ScratchJr Family Creative Learning Workshops: Implementation of a Family Engagement Model in 16 Communities. Presented at the annual meeting of the American Educational Research Association, Toronto, ON.

Christensen, C., Garcia, E., Adair, A., Gerard, G., **Lemley, B.**, Hupert, N. (2018). PBS KIDS ScratchJr Family Creative Learning Workshops: Implementation of a Family Engagement Model in 16 Communities. Presented at the annual meeting of the American Evaluation Association, Cleveland, OH.

Hupert, N., Christensen, C., **Lemley, B.**, Pasnik, S., Vahey, P. (2018). The Role of Mediation in Ready To Learn Children's Media Research: 2008-2017. Presented at the annual meeting of the American Educational Research Association, New York, NY.

Gutierrez, J., Hightower, B., Bookser, B. & **Lemley, B.** (2015). Preschool-centered design: Creating and selecting websites to suit the cognitive development of preschoolers. In D. Slykhuis & G. Marks (Eds.), Proceedings of Society for Information Technology & Teacher Education International Conference 2015 (pp. 1632-1636). Chesapeake, VA: Association for the Advancement of Computing in Education (AACE).

Lemley, B.Q., Aguilar, R.S., Ruff, S.C., and Clausen, J.M. (2014). Ethnic Differences in Therapy Outcome for Foster Youth. Presented at the annual meeting of the Western Psychological Association, Portland, OR.

Rhodes, A.E., **Lemley, B.Q.**, Aguilar, R.M., and Clausen, J.M. (2013). Impact of Open-Ended Psychotherapy with Adults Formerly in Foster Care. Presented at the annual meeting of the Western Psychological Association, Reno, NV.

Moon-Grady, A., **Lemley, B.**, Kipps, A., Brook, M., Rand, L. (2011). Prenatal tricuspid valve size as a predictor of postnatal outcome in patients with severe pulmonary stenosis or pulmonary atresia with intact ventricular septum. Presented at the annual meeting of the Society for Maternal-Fetal Medicine, San Francisco, CA.

Lemley, B., Moon-Grady, A. J., Gosnell, K. (2009) Impact of selective fetoscopic laser photocoagulation on the pulmonary valve pathology of the recipient twin in twin-twin transfusion syndrome. Oral presentation at the Biomedical and Health Sciences Internship Research Symposium, UCSF, San Francisco, CA

TEACHING EXPERIENCE

Teaching

Teaching Assistant, Department of Communication Studies, Northwestern University — Spring 2020
Course: Theories of Persuasion

Teaching Assistant, Department of Psychology, University of San Francisco — Spring 2013 – Spring 2014
Course: Advanced Research Methods

Teaching Assistant, Department of Psychology, University of San Francisco — Fall 2013
Course: Research Design

Assistant Musical Director, Performing Arts and Social Justice Department, University of San Francisco — Spring 2011 – Fall 2013
Choirs: ASUSF Voices, Women's Voices, Men's Voices, Jazz Voices

Guest Lectures

Child and Adolescent Development, Guest Lecturer — October 2021
Department of Communications, Northwestern University

Careers in Psychology, Guest Lecturer — April 2021, March 2020
Department of Psychology, University of San Francisco

MEDIA APPEARANCES

Lost and Found: Childhood Memories Rediscovered — March 2023
WUNR News, Northwestern University

INVITED SPEAKER

Graduate Student Panel — February 2021, March 2019
MTS Doctoral Program Applicant Visit Weekend, Northwestern University

Graduate Student and Postdoctoral Trainee Panel Discussion — September 2020
Fall Success Symposium, Northwestern University

Climbing the SRI Career Lattice: A Brownbag for Junior Researchers — December 2017
Education Division, SRI International

Psi Chi Career Panel — March 2017
Psi Chi, University of San Francisco Chapter, University of San Francisco

Introduction to Qualtrics — December 2016
Data/Statistics Guild, Education Division, SRI International

USF Students Serving the Community: Outreach to Children and Families — February 2014
Child and Youth Studies Minor, University of San Francisco

SERVICE

DevSci Cluster Member — 2018 – 2023
Institute of Innovation for Developmental Science, Northwestern University

Graduate Mentor — January 2021
SRCD Black Caucus Emerging Black Child Development Scholars Program, Society of Research in Child Development

DevSci Mentor — 2020
Institute of Innovation for Developmental Science, Northwestern University

Conference Planning Committee, Northwestern Black Graduate Research Association Conference — Fall 2020
Black Graduate Student Association, Northwestern University

Communications Chair — 2019 – 2022
Black Graduate Student Association, Northwestern University

Co-Publicity Manager, InfoSocial Graduate Research Conference — 2018 – 2019
School of Communication, Northwestern University

LEADERSHIP EXPERIENCE

Communications Team Member — May 2017 – August 2018
Education Division, SRI International

Data Custodian Coordinator — April 2017 – August 2018
Education Division, SRI International

Data Custodian, Center for Technology and Learning — August 2016 – August 2018
Education Division, SRI International

Qualtrics Survey Programmer — May 2016 – August 2018
Education Division, SRI International

Ambassador, Center for Technology in Learning — June 2016, July 2015
Education Division, SRI International

PROFESSIONAL MEMBERSHIPS

American Educational Research Association
Society for Research in Child Development
International Communication Association