Interaction design strategies for open-ended play

Michael Tschampl
Iowa State University

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Interaction design strategies for open-ended play

by

Michael Tschampl

A thesis submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of

MASTER OF INDUSTRIAL DESIGN

Major: Industrial Design

Program of Study Committee:
Seda Yilmaz, Major Professor
Stephen Gilbert
Steven Herrnstadt
Kevin Owens

Iowa State University
Ames, Iowa
2014

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ABSTRACT

Open-ended play is initiated by the child where he/she is in full control of the entire play experience, without imposed rules or external structure. This play experience is rewarding, engaging and desirable for children. It is also valued by parents, educators, and psychologists as it aids healthy development of the child, both cognitively and physically. Despite its proven value, children have been initiating open-ended play less often while their use of digital media devices has become more common. There is an opportunity to encourage open-ended play through interaction design. However, designing for open-ended play is difficult due to its complexity and ever-changing nature.

This thesis explores how children between the ages of 5-12 engage in open-ended play (undefined, unstructured, free play) and how they use digital devices such as tablets or smartphones in their play experiences. It outlines a process children go through when engaging in open-ended play, identifies patterns in open-ended play, and proposes four strategies for designing physical and digital interactions to encourage open-ended play experiences. These strategies are a means for designers to facilitate open-ended play in the development of products, services and systems for children. They can also be used by educators in creating curricula to help the development of self-regulation in young children. Parents can also use these strategies as a means to encourage and participate in their children’s open-ended play experiences.
CHAPTER 1. INTRODUCTION

Background

Open-ended play is essential to the psychological, social, emotional and physical development of children. Unfortunately, it is on decline in the United States due to the increase of structured activities (Chudacoff, 2011; Miller & Almon, 2009). The increased use of mobile media devices such as smart phones and tablets among children do not contribute to the decline of open-ended play but present new possibilities to encourage it. It is difficult to design for open-ended play because the child is in control of creating the play experience and not the designer. However, interaction design offers possibilities to encourage open-ended play through the design of both physical and digital interactions. This study seeks to answer the following questions: 1) How do children participate in open-ended play? 2) How can open-ended play be measured? 3) How does one design for open-ended play?

Play is notoriously difficult to define because it can change depending on the context and can often be very similar to other behaviors (such as fighting) (Burghardt, 2011). Burghardt (2011) defines play through the following criteria:

Play [1] is incompletely functional in the context it appears; [2] is spontaneous, pleasurable, rewarding or voluntary; [3] differs from other more serious behaviors in form (e.g., exaggerated) or timing (e.g., occurring early in life before the more serious version is needed); [4] is repeated, but not in abnormal and unvarying stereotypic form (e.g., distressed rocking, pacing); and [5] is initiated in the absence of acute or chronic stress. (p. 17)

This satisfies what is meant by play in this study and the remainder of this study will focus specifically on open-ended play.

Open-ended play can be described as play that is not bound by preset limitations and is ever-changing. It is spontaneous, voluntary and constantly built upon or
restructured. Current research on open-ended play focuses heavily on several stages children go through when they play and the benefits they gain from playing (Sutton-Smith, 1997). However, the research does not describe any process or patterns of open-ended play or how to measure it. This thesis addresses these gaps in literature.

Open-ended play benefits the psychological, social, emotional and physical wellbeing of children (Miller & Almon, 2009). Specifically, it helps develop self-regulation in children which is crucial for their self-esteem and helps them handle stress and frustration (Diamond, 2012; *Self-regulation you and your foster child*, n.d.). Children who develop better self-regulation grow up to have better academic success, better health, earn more money, be happier and commit less crimes (Moffitt, Poulton, & Caspi, 2013). Open-ended play also includes several other types of play and therefore opens up the possibility for these types of play and their benefits. Most importantly, open-ended play is beneficial from the child’s perspective. Children define play as open-ended showing their preference for it and it creates more interest and longer engagement compared to structured activities (Bekker, Hopma, & Sturm, 2010; Karrby, 1990).

Despite these benefits to open-ended play, it is declining in the United States. Experts believe this is due to the lack of resources and ongoing standardization of school activities (Chudacoff, 2011; Miller & Almon, 2009). This is also due to an increase of structured activities outside of school (Chudacoff, 2011). There is some concern that the increase of use of digital media has taken away from the time spent on open-ended play though research shows otherwise (Goldstein, 2011; Rideout, 2013).

Mobile media devices present great opportunities for open-ended play because their ability to understand and leverage contextual play cues in the child’s environment. The mobility and availability of computing offers the opportunity for it to be a part of the open-ended play experience. However, this thesis illustrates that children rarely use digital media in open-ended play experiences. Open-ended play is difficult to design for as the child is in control of the experience and digital media usually offers a very structured experience (Resnick, 1996). Digital media is integrated into the play experience with the rest of the child’s surroundings when they use it in open-ended play (Eisenberg & Eisenberg, 1998). Therefore, design for open-ended play will have to take
into account both physical and digital interactions. Interaction design is necessary to design for open-ended play experiences because they are primarily about interactions (Valk et al., 2012).

**Outcomes**

This study brings a design perspective to the research of open-ended play. The goals and outcomes show *how* children participate in open-ended play as opposed to attempting to answer *why*. This study contributes a model of the open-ended play process and a coding schema as a means to measure the range of actions and cues that initiate the play experience. This study describes several patterns present in open-ended play. Four interaction design strategies were developed based on these patterns. The intended audience for these strategies are designers, educators and parents. They are a means to encourage open-ended play in the development of products, systems, services, curricula and playtime.

**Structure**

This thesis begins with a literature review of open-ended play, the influence of digital media on it and its connection to interaction design. Next, the methods chosen for this thesis will be described. These include contextual inquiry, parental interviews and cultural probes. The results of the studies include mapping of the open-ended play process, coding schema, identification of patterns of open-ended play and interaction design strategies for open-ended play. They are broken up into chapters 4 and 5 and discussion for each set of results can be found at the end of the corresponding chapters. The thesis will finish with the conclusion, appendices and references.
CHAPTER 2. LITERATURE REVIEW

Open-Ended Play

Definition of Open-ended Play

Open-ended play has many definitions in literature (Frost, Brown, Sutteby, & Thornton, 2004; Santer, Griffiths, & Goodall, 2007; Valk, Bekker, & Eggen, 2013). Other names describing open-ended play include free play, unstructured play, child-initiated play and spontaneous play. Santer et al. (2007) define free play as, “children choosing what they want to do, how they want to do it and when to stop and try something else. Free play has no external goals set by adults and has no adult imposed curriculum” (p. xi). This definition is the closest one depicted in prior research (Frost et al., 2004; Miller & Almon, 2009) that describes the type of play referred to in this thesis. On the other hand, the term open-ended play is most often referred to in studies about playgrounds and outdoor environments as it suggests many possibilities to those who engage in it. The term open-ended play is chosen for this project due to the fact that it more accurately represents the many possibilities for play. This aspect of open-ended play was a key factor of in the collected data.

Valk et al. (2012) define open-ended play as not having predefined rules. This is close to Santer et al.’s (2007) definition of free play except that Valk et al. (2012) also add the meaning of objects and interactions to the definition. Valk et al. (2013) argue that open-ended play is slightly more restrictive than free play because it includes a designed object. This distinguishing factor of open-ended play is unique to their research.

Frost et al. (2004), on the other hand, defines open-ended as play that does not have preset limitations which allows participants to make their own play decisions. This definition is closer to the previously mentioned definition of free play and is what is meant by open-ended play with respects to this thesis except for this one modification. Open-ended play is not static and always includes building or restructuring. Miller and Almon (2009) describe this as “ever-changing” (p. 43). This is a factor of the open-
endedness and is an important distinction to this type of play that was observed in the data.

In this thesis, open-ended play is defined as play that is not bound by preset limitations and is ever-changing. Those participating in open-ended play are in control of the play experience. It is spontaneous and voluntary. Open-ended play cannot include rules except those made by the participants and those rules must remain flexible and changeable.

**Previous Research of Open-Ended Play**

Most prior research of open-ended play and free play, in particular, is established in the fields of cognitive and developmental psychology. It is generally concerned with the intellectual or cognitive benefits, and development of children with respect to play. Sutton-Smith (1997), who is seen as one of the foremost contemporary experts on play, mentions that, “most psychological play scholarship in this century has focused on developmental stages children go through in their play” (p.35). One such example is Parten’s (1932) stages of social play from her seminal work “Social Participation Among Preschool Children.” Work on free play specifically looks at certain factors such as how age or environment affect free play (Ruff & Lawson, 1990; Veitch, Bagley, Ball, & Salmon, 2006). The outcomes of this research are most commonly applied to the development of school curriculum and programs (Bergen, 2001; Hanley & Cammilleri, 2007; Kontos, 1999) or the design and benefits of playgrounds and outdoor environments (Frost et al., 2004; Veitch et al., 2006).

Design is another field that is present in the research of play; however, very little design research addresses open-ended play, specifically, and it usually includes interaction design (Bekker, Hopma, et al., 2010; Valk et al., 2012). This will be discussed further in the section on interaction design and open-ended play.

**Gaps in Research of Open-Ended Play**
Overall, there is very little research done on the processes and patterns of open-ended play itself. Although there is a body of work on the stages of play describing the play process, prior research lacks a special emphasis on open-ended play. Many of these stages, such as Parten’s (1932) stages of social play, address only one type of play that is included under the umbrella of open-ended play. As described by Parten (1932), the stages of play focus on the child’s development with relation to the type of play and not at the process or stages of the type of play itself. One research question that this study seeks to address is: “How do children participate in open-ended play?” Understanding of the open-ended play process and patterns will successfully answer this question.

Furthermore, there is little known about the metrics that would be used to quantify or measure open-ended play. This might also be due to the lack of research on the process of open-ended play. Hanley and Cammilleri (2007) propose a method for measuring the preference of play activities; many of which are open-ended. While this gives some insight on measuring preference of open-ended play activities, it does not give understanding to the breadth and types of activities included in open-ended play experiences. This leads to another research question: How can open-ended play be measured? A method for measuring and categorizing open-ended play will show the patterns in open-ended play.

This thesis addresses these gaps in the research of open-ended play by defining the process and patterns of open-ended play and developing a coding schema for investigating contextual play cues and play actions present in this type of play (Chapters 4 and 5).

Benefits of Open-Ended Play

There is much research on the cognitive and developmental benefits of play in general, and, specifically, on open-ended play. Most notably, there is evidence that open-ended play benefits executive functions, particularly self-regulation. Diamond (2012) is one of the foremost experts on executive function (executive control). She describes executive functions as, “a family of control functions needed when you have
to concentrate and think, when acting on your initial impulse might be ill-advised” (Diamond, 2012, p. 335). They include self-regulation (inhibition), cognitive flexibility and working memory. Diamond cites the benefits of improved executive functions leading to reduced incidence and/or severity of disorders such as ADHD, addictions, and conduct disorder. This is a large concern for children. According to Visser et al. (2014), as of 2011, 11% of children and adolescents ages 4-17 have at some point received a diagnosis for ADHD. This is up from 6% in the late 1990’s (Visser et al., 2014). Reduced incidence or severity of ADHD alone makes improving executive functions worth it. There are many ways to help build executive functions including, computer training programs, traditional martial arts, and a few school curricula (Diamond, 2012).

Open-ended play helps build self-regulation by allowing children the chance to structure their own play experience. According to Diamond (2012), inhibition (self-regulation) is important for controlling one’s behavior, exerting self-control and exercising discipline. Bodrova and Leong (2001) spearheaded one of the school curricula Diamond, Barnett, Thomas and Munro (2009) found to help improve executive functions, called “Tools of the Mind”. “Tools of the Mind” improves self-regulation in children ages between 3.5 and 7 by encouraging open-ended play; specifically pretend play (Bodrova & Leong, 2001). It seems contradictory that to gain the ability to follow rules, the type of play should not be prescribing rules. Bodrova and Leong (2008) explain this contradiction by arguing that in the case of children, the rules are regulated by a teacher or parent and not the children themselves. Self-regulations means not only following rules given to them by someone else but also setting rules for themselves and applying those rules to themselves (Bodrova & Leong, 2008).

Improving the self-regulation is important because of the many benefits it yields. According to the Office for Childhood Development at the University of Pittsburgh (Self-regulation you and your foster child, n.d.), self-regulation facilitates more independence, more self-confidence, higher self-esteem, better ability to handle stress and frustration and better chance of enjoying success as an adult. Moffitt, Poulton and Caspi (Moffitt et al., 2013) produced a longitudinal study that explains what it means for a better chance of enjoying success as an adult, through better self-regulation as a child. The study
found that children ages 3-11 with better self-regulation grew up to have better academic grades, better health, earn more money, be happier and commit less crimes (Moffitt et al., 2013). It is easy to see the importance of designing for open-ended play given the success of the “Tools of the Mind” and the benefits of better self-regulation.

The benefits of open-ended play are not limited only to improved self-regulation. Open-ended play encourages a wide range of play types, each with their own benefits. There are several types of play described in previous research (as cited in Else, 2009; Gielen & Leeuwen, 2013; Miller & Almon, 2009; Yardley-Matwiejczuk, 1997). Table 1 shows the types of play reported in literature that were also observed and recorded in the data collected for this thesis as a part of open-ended play. These types of play are organized into 6 categories and 15 subcategories of play. This table was created and organized specifically as a part of this thesis.
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<th>Creative Play</th>
<th>Play with the Arts</th>
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<td>“Enjoying creation with a range of materials and tools for its sake.” (as cited in Else, 2009, p. 46)</td>
<td>“Children integrate all forms of art into their play, using whatever materials are at hand to draw, model, create music, perform puppet shows, and so on.” (Miller &amp; Almon, 2009, p. 54)</td>
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<tr>
<td>Imaginative Play</td>
<td>Construction Play</td>
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<td>“Play where the conventional rules, which govern the physical world, do not apply.” (as cited in Else, 2009, p. 46)</td>
<td>“Building houses, ships, forts, and other structures is a basic form of play that requires skill and imagination.” (Miller &amp; Almon, 2009, p. 53)</td>
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<td>Object Play</td>
<td>Dramatic Play</td>
<td>Role Play</td>
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<tr>
<td>Exploratory Play</td>
<td>Symbolic Play</td>
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<tr>
<td>“Play to access factual information consisting of manipulative behaviours such as handling, throwing, banging or mouthing objects.” (as cited in Else, 2009, p. 46)</td>
<td>“Using symbols in play to represent other ‘real’ objects.” (Miller &amp; Almon, 2009, p.54)</td>
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<td>Mastery Play</td>
<td>Sensory Play</td>
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<td>“Control of the physical and affective ingredients of the environments.” (as cited in Else, 2009, p. 46)</td>
<td>“Most children enjoy playing with dirt, sand, mud, water, and other materials with different textures, sounds, and smells.” (Miller &amp; Almon, 2009, p. 54)</td>
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<td>Risk-taking play</td>
<td>Small-motor Play</td>
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<td>“Children extend their abilities through risky play and learn to master challenging environments.” (Miller &amp; Almon, 2009, p. 54)</td>
<td>“Play with small toys and activities like stringing beads, playing with puzzles, and sorting objects into types develops dexterity.” (Miller &amp; Almon, 2009, p. 53)</td>
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<td>Locomotor Play</td>
<td>Large-motor play</td>
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<td>“Movement in any and every direction for its own sake.” (as cited in Else, 2009, p. 46)</td>
<td>“Children love to climb, run, slide, swing, jump, and engage in every type of movement possible.” (Miller &amp; Almon, 2009, p. 53)</td>
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<td>Rough-and-Tumble Play</td>
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<td>“Close encounter play which is less to do with fighting and more to do with touching, tickling, gauging relative strength, discovering physical flexibility and the exhilaration of display.” (as cited in Else, B. Hughes, 1996, p. 47)</td>
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Some types of play were grouped together or renamed to show where they fit in this thesis. For example, sensory play was present as a part of experimenting. In this thesis, playing with the arts is considered a part of creative play, which also includes construction play. Large motor and rough-and-tumble play were grouped together under active play. There were some types of play in the previous research that were not observed in this study including parallel play, language play and recapitulative play (as cited in Else, 2009; Miller & Almon, 2009; Parten, 1932).

Open-ended play can include the benefits of all of these types of play. Miller and Almon (2009) mention that these types of play improve cognitive, social, emotional, and physical development. They also carry with them increased ability for, “vocabulary, language comprehension, attention span, imagination, concentration, impulse control, curiosity, problem-solving strategies, cooperation, empathy, and group participation” (as cited in Bodrova & Leong, 2003, p. 50). The presence of such play experiences and their benefits to children’s development emphasize the importance of designing for open-ended play.

While much of the previous research illustrates the benefits of open-ended play to children, very little it is known about the play experience from the child’s perspective. The user is most important when it comes to the design of any product, service or system. Understanding why children engage in open-ended play is part of understanding why and how to design for open-ended play. Open-ended play makes it possible to create more interest and longer engagement (Bekker, Hopma, et al., 2010).
In a study by Karrby (1990), children perceived open-ended play as a “whole event” and were able to recount, describe and explain the play experience with more detail than they were for structured activities. According to his study, children also described open-ended play activities such as, choosing freely, pretending, enacting, fantasy and drama as their definition of play (Karrby, 1990). While open-ended play has several cognitive and developmental benefits, it is also more interesting and it encourages longer engagements than structured play. This provides a strong case for why it is important to design for open-ended play and how products, services and system can benefit from design for open-ended play.

**Decline of Open-Ended Play**

Despite the importance and preference for open-ended play, the amount of time children spend in open-ended play has been declining in the United States (Goldstein, 2011). Structuring of school activities and unrealistic standards for school curriculum is perhaps the most researched and cited reason for the decrease of open-ended play (Miller & Almon, 2009). Miller and Almon (2009) show the decrease in choice time in an analysis of nine studies concerning free-play and choice time in kindergartens across the United States. The summary of the results is devastating as it shows standardized testing as a daily activity in kindergartens that lack the materials for open-ended play for all of the children in the class. It also describes that on average, less than 30 min a day was spent on free-play or choice time in kindergarten and in many cases, there was no free playtime at all. Miller and Almon (2009) stress that, “Without play in early childhood, cognitive, social, emotional, and physical development is at risk” (p .56).

Unfortunately, this decline in open-ended play is not just in schools. Increasing adult control and structured activities outside of school has also led to such impacts. Chudacoff (2011) also attributes more detail in toys and the rise of electronic media to the diminishing time spent on open-ended play. The rise of electronic and digital media is sure to have an effect on how children play, but has it really been a contributing factor to the decline of open-ended play? Understanding the effects of digital media on open-ended play is important to understanding how to design for open-ended play.
Influence of Digital Media on Open-Ended Play

There is no current evidence in literature that suggests the use of digital media contributes to the decline of open-ended play. In the two years following Chudacoff’s (2011) research, digital media use has increased while overall screen time was cut down for children ages 0-8 (Rideout, 2013). In fact research also shows that digital media has no discernable effect on creative or imaginative play (Bergen, 2004; Plowman & Luckin, 2004). Goldstein (2011) argues that, “children are far from being passive recipients of media” (p. 327). However, the introduction of digital media into play is still relatively new and the understanding of how it affects play may change with new research.

Rideout’s (2013) study not only shows the increase of digital media, but it also shows a rapid increase of mobile media devices (such as smartphones or tablets). Between 2011 and 2013, the use of mobile media in children ages 0-8 nearly doubled. Ownership of tablets has more than quadrupled. Rideout is certain that tablet ownership by children will continue to increase (Traylor, 2014). To support this argument, out of the pool of participants in this study, 3 had their own smartphone, which were passed down from the parents, and 4 had their own tablets. This fits almost exactly with what Rideout (2013) found in her study. Since the introduction of mobile media devices, computing now has the possibility of going almost anywhere making digital interactions more common.

Despite the increase of mobile media devices, design for open-ended play using digital media is still uncommon. In the data for this study, mobile media was used as a part of structuring open-ended play in only 13 actions compared to 340 total recorded actions. The most common examples where using a mobile media device to draw or as an influence contextual play cue. It is difficult to design for open-ended play in general, let alone for digital media. This is because the child is in control of the open-ended play experience, not the designer. To design for open-ended play is to, in essence, design for designers. This is what Resnick (1996) considers constructional design. Experts in design for children such as Richardson (2013) and Druin (1996) both see children as
designers when they play. Druin is one of the leading experts in co-designing digital technology with children. One thing her work shows is how children interact with technology in more open-ended ways (Druin, 1996). Open-ended play may rarely be designed for because the need to program digital devices leads to an inherent need to control how the device responds, causing too much definition. However, it doesn’t have to be that way.

This is especially true since the advent of mobile media devices, which provide a range of sensors and the ability to be a part of the open-ended play experience almost anywhere. Mobile media can place itself within the play experience in ways that have not happened before. Mobile media devices are capable of understanding the contextual play cues of the child’s play environment and leveraging them to encourage open-ended play. Physical objects can only offer cue opportunities and are unable to understand them or leverage that information. In the case of open-ended play, new media doesn’t displace old media but adds to the range of options (Goldstein, 2011). The mobility of computing means that digital interactions can now be a larger part of the open-ended play experience. This will continue to be the case, even more so, as devices become smarter and more mobile.

The future of open-ended play will see a mix of the physical and digital interactions. Eisenberg and Eisenberg (Eisenberg & Eisenberg, 1998) view this as a blending of bits and bytes into what they call “middle tech”. They believe that the physical interactions will still remain important even as more things become virtual. “Grown-up design requires us to understand that the ‘magic wand’ twig in our child’s hand is something more powerful and significant than any manmade technology “ (Jones, 2009, p. 103). When it comes to interaction design for open-ended play, it is important to focus on both physical and digital interactions.

**Interaction Design and Open-Ended Play**

Goldstein (2011) believes that new technology will create richer play experiences. While this is true, without responsible design, open-ended play
experiences will not be enhanced by technology. Open-ended play must be understood and actively designed for this to be possible.

Open-ended play is primarily about interaction. As mentioned before, Valk et al. (2012) define open-ended play as play when the meaning of interactions is defined as they are being used. Some of the questions children try to answer when they are engaging in open-ended play are “What can I do?”, “How can I do it?” and “What do I want to do?” (Valk et al., 2012). This shows the child’s need to interact as a part of open-ended play and the need for interaction design to be integrated within the open-ended play experience.

Moggridge is credited as creating the interaction design discipline (Moggridge & Atkinson, 2007). His definition of interaction design is, “The design of the subjective and qualitative aspects of everything that is both digital and interactive, creating designs that are useful, desirable, and accessible” (Moggridge & Atkinson, 2007, p. 659). While Interaction design is generally understood in this way, it does leave out physical interactions and interactions between parts of a system. Open-ended play is not just about digital interactions, but it is also about physical interactions. Most importantly, when a child engages in open-ended play, they are really creating a system.

Kolko’s (2011) definition is more inclusive and is, for this reason, the definition that this thesis subscribes to.

Interaction Design is the creation of a dialogue between a person and a product, system, or service. This dialogue is both physical and emotional in nature and is manifested in the interplay between form, function, and technology as experienced over time. (Kolko, 2011, p. 15)

To Kolko (2011), interaction design does not have to be only software or interface design or even concerned with advanced technology. Kolko (2011) mentions that interaction design is about “shaping behavior” (p.15). This is very much the case for open-ended play. It is indeed a behavior and it cannot be structured for the child, but understanding it can help encourage, allow and shape this behavior. Designing for open-ended play is, at its heart, an interaction design problem.
When it comes to interaction design for open-ended play, there are two clear thought leaders. One is Richardson who worked as a designer for Frog, IBM and M3 Design. She has established herself as an expert on the future of children’s play and what she calls the “superpowers of play” (Richardson, 2013). “The superpowers of play” are how play initiates invention within children causing them to be designers and not players. She is especially concerned with how new technology can foster or diminish these “superpowers” (Richardson, 2013). While Richardson does not necessarily focus on open-ended play, “the superpowers of play” are really the outcome of open-ended play in particular.

The second thought leader is a group from the Department of Industrial Design at Eindhoven University of Technology. This group includes Bekker, Sturm, Eggen and Valk. The collection of their work is centered specifically around interaction design for open-ended play, particularly, the active and social play aspects of it (Bekker, Hopma, et al., 2010; Bekker, Sturm, & Eggen, 2010; Bekker & Sturm, n.d.; Sturm, Bekker, Groenendaal, Wesselink, & Eggen, 2008; Valk et al., 2012, 2013).

Neither Richardson nor the group from Eindhoven describes a process to open-ended play. Richardson identifies a series of play actions in her Periodic Table of Play (http://lauraseargeaneanrichardson.com/). Many of these actions were recorded in this study but they don’t describe the process. Valk et al. (2012) make use of Polaine’s (2010) stages of interactivity in play; invitation, exploration and immersion. However, even though Polaine’s (2010) stages are descriptive of interactivity in play, they do not address the open-ended play process. This thesis describes the open-ended play process discovered in the research in chapter 4.

One result of this thesis is the identification of patterns that describe how children structure open-ended play. Bekker, Sturm et al. (2010) list seven social player interaction patterns with an emphasis on open-ended games. These patterns are single player vs. game, multiple individual players vs. game, cooperative play, player vs. player, unilateral competition, multilateral competition, and team competition (p. 389). They are more descriptive of grouping in open-ended social games than they are of how children structure play. Seitinger and Sylvan (2006) describe open-ended play patterns active play, fantasy play, exploring how things work and game building. These patterns
don’t describe the patterns as much as they describe types or “styles” of play. While Seitinger and Sylvan (2006) mention that children often rotate between these “styles” they don’t address any actual patterns of how this is done. This thesis identifies patterns in how children rotate between the different play actions including all of Seitinger and Sylvan’s (2006) “styles”, except for game building.

Identifying patterns of open-ended play are essential in the development of the interaction design strategies for open-ended play. Design strategies are seen as an approach to solving a problem (Lievesley & Yee, 2006). In this thesis, strategies are not only a flexible approach but a toolset for encouraging open-ended play. Richardson (2010) describes four “secrets” to foster creative children that can be considered strategies and Bekker, Sturm et al. (2010) mention various strategies for designing active and social play. The strategies in this thesis are distinct from their work as it addresses open-ended play as a whole. In many ways, the results of this thesis create a common base that ties the strategies of Richardson and the group from Eindhoven together. This will be discussed further in the discussion section of Chapter 5.

The results in this thesis are unique in that they focus on open-ended play specifically and describe a process children go through when they engage in open-ended play. This thesis will introduce a coding schema for measuring the open-ended play experience based on contextual play cues and play actions. This thesis concludes with four interaction design strategies for open-ended play.

**Summary**

The literature concerning open-ended play shows that open-ended play can help with the psychological, social, emotional and physical wellbeing of a child as well as being perceived as enjoyable by children. It is also the preferred type of play for children. This explains why it is important to design for open-ended play and why the experts are concerned about the decline of open-ended play in the United States. Some experts attribute this to increasing use of digital media by children, although there is no evidence linking the decline of open-ended play or even creativity to this. However, the rapid increase of mobile media use in children and its capabilities present
opportunities to encourage open-ended play that were not previously possible or available. Despite this increase, children continue to interact with physical objects as much as they did before. Therefore, it is important to consider both digital and physical interactions when designing for open-ended play.

Open-ended play is best addressed through interaction design because interactions are the heart of its very nature. The previous research does not show a structured process or defined patterns of open-ended play. These are essential in developing interaction design strategies for open-ended play. Leaders in this field offer some strategies for interaction design for social and active play or play in general. This thesis offers strategies for open-ended play specifically and ties together some of their strategies.
CHAPTER 3. METHODS

Overview

The goal of the research was to identify common patterns in open-ended play to help inform the design process used for open-ended play. This research was therefore focused on how children participate in open-ended play rather than investigating why or what its effects are on children. This goal distinguishes this research from that of the psychology field which has been focused on how play affects a child’s stages of development (Sutton-Smith, 1997). The research in this thesis was based on exploratory studies and aimed at understanding how children ages 5-12 engage in open-ended play and how they use digital devices such as smartphones and tablets in their play experiences. Children in this age range were chosen due to the fact that they are more independent in their decisions compared to toddlers and infants, and they make decisions regarding the ‘play’ by/for themselves. This age range also allowed a broad sense of the open-ended play experience and provided information on how children used mobile media devices because their skill levels are more developed.

Qualitative research methods were chosen to collect data in order to explore the play experience, in general, and open-ended play experience, specifically. These methods were contextual inquiries using ethnographic observation and in-depth ethnographic interviewing (Spradley, 1979) as well as cultural probes. This thesis reports data from the collected video recordings, pictures, field notes of observations, interview responses and cultural probe packages. The recordings of the contextual inquiries and ethnographic interviews were transcribed. A typological analysis including an inductive framework was used to create a coding schema: the data was reduced, thematic categories were created, and conclusions were drawn (Goetz & LeCompte, 1984; Miles & Huberman, 1994).

Contextual inquiry (ethnographic interview and observation) of the children participants was conducted simultaneously while ethnographic interviews were conducted with the participants’ parents, at the family’s residence. There was only one exception in the data where the interview was conducted prior to the observation.
Contextual inquiry and ethnographic interviews were conducted with multiple participants at once, when possible. This allowed for the observation of the play experience between more than one participant at a time. After these ethnographic studies, the researcher explained the contents of the cultural probe packages to the parents and left these packages with the participants to complete over the next two weeks. Not all of the participants participated in all three research methods. The details of this data are provided in the data collection section.

Data Collection

20 children from 12 families were recruited for this study. Of these participants, 9 were female and 11 were male. This is a common number for studies on open-ended play (Bekker, Hopma, et al., 2010; Bekker, Sturm, et al., 2010; Valk et al., 2012). Though the studies for this thesis allowed for children up to the age of 12, the participants were children between the ages of 5 and 11. All of the participants had access to mobile media devices and used it regularly, though that was not a prerequisite for inclusion into these studies. No distinction was made in the areas of race, ethnicity, or income for inclusion into these studies. The pool of participants was drawn from the researcher’s personal contacts and references from those contacts (Biernacki & Waldorf, 1981). They were contacted by email, phone call or word of mouth. Since the goal of this thesis was exploratory rather than proving a hypothesis with generalizable conclusions, the chosen participants were not determined by other sampling techniques. Table 2 illustrates information about the participants in the three studies (parental interview, contextual inquiry, and cultural probes).
Table 2. Participant Information

<table>
<thead>
<tr>
<th>Family</th>
<th>Participant</th>
<th>Gender</th>
<th>Age</th>
<th>Parental Interview</th>
<th>Contextual Inquiry</th>
<th>Cultural Probe</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F1P1</td>
<td>F</td>
<td>6</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>2</td>
<td>F2P1</td>
<td>F</td>
<td>6</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>3</td>
<td>F3P1</td>
<td>M</td>
<td>5</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>F3P2</td>
<td>F</td>
<td>7</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>F3P3</td>
<td>F</td>
<td>9</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>4</td>
<td>F4P1</td>
<td>F</td>
<td>6</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>F4P2</td>
<td>F</td>
<td>9</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>F4P3</td>
<td>F</td>
<td>11</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>5</td>
<td>F5P1</td>
<td>M</td>
<td>6</td>
<td>X</td>
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</tr>
<tr>
<td>6</td>
<td>F6P1</td>
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<tr>
<td>7</td>
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<td>X</td>
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<td>X</td>
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<tr>
<td></td>
<td>F8P2</td>
<td>M</td>
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<td>F9P1</td>
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<td>X</td>
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<tr>
<td></td>
<td>F9P2</td>
<td>M</td>
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<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>10</td>
<td>F10P1</td>
<td>M</td>
<td>5</td>
<td>X</td>
<td>X (separate)</td>
<td>X</td>
</tr>
<tr>
<td>11</td>
<td>F11P1</td>
<td>F</td>
<td>7</td>
<td>X</td>
<td>X</td>
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</tr>
<tr>
<td></td>
<td>F11P2</td>
<td>M</td>
<td>10</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>12</td>
<td>F12P1</td>
<td>M</td>
<td>7</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F12P2</td>
<td>M</td>
<td>9</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The researcher spent anywhere from 45 minutes to an hour and a half at each residence. This amount of time was sufficient to address all of the prepared questions for the ethnographic observations and interviews and allow for extra information that the parents or participants wanted to share. The researcher ended each session with an explanation of the cultural probe. The parents were a part of the study to gain further insight into the overall behaviors and actions of their children’s play habits. Parents of the children were interviewed and were present during contextual inquiry. In many cases, the parents also assisted in the submission and documentation of the cultural probes. The data used in this thesis does not include the parents as “participants”, as the researcher aimed to explore the children’s play experience; however, the interview responses collected from parents are used to supplement and clarify the data.
Each family was given a number between 1-12 and each participant (child within the age range of the study) in the family was given another number: 1 was assigned to the youngest participant, 2 to the next oldest and such. For instance the youngest participant in family 3 is F3P1 (Family 3 Participant 1), the oldest is F3P3, and the only participant in family 2 is F2P1.

**Contextual Inquiries with the Children**

“Contextual Inquiry is a qualitative data-gathering and data-analysis methodology adapted from the fields of psychology, anthropology, and sociology” (Raven & Flanders, 1996, p. 2). It consists of observing and talking with participants in the context of what is being studied (Raven & Flanders, 1996). This method was chosen for this study due to its ethnographic nature that allowed for direct observations of how children play and gather feedback while playing. This method has also been successful in co-designing with children (Druin, 2010). Contextual inquiry is more than just observation and asking the participants questions in context as it opens the possibility of further data collection through participating in the process, providing invaluable insights. For example, in one of these studies, the researcher played “store”, drew a racecar and explored a fort.

During the studies, the child (or children) was asked to play as they normally would in that setting. In general, the first half of the contextual inquiry involved how the child played without mobile media devices. The researcher then asked questions based on the observational context and even participated in the child’s play when possible to gain a better understanding of the play experience. The second half of the contextual inquiry involved how the child used mobile media devices. The researcher asked to observe the child interacting with a mobile media device if that was a part of the child’s normal play routine. During contextual inquiry, the researcher used a tablet to take a total of 119 photos of activities, and interactions in addition to taking field notes and recording over 12 hours of conversation.
Interviews with the Parents

The parents were interviewed during the contextual inquiry to explore further detail of the child's preferences and/or behaviors regarding open-ended play and mobile media use. In-depth ethnographic interviewing is concerned, “with the meaning of actions and events to the people we seek to understand” (Spradley, 1979, p. 5). The goal of ethnographic interviewing, according to Spradley (1979), is to understand the actions and events the same way the people being interviewed understand them. This approach is used to gather data that facilitate logical deductions rather than generalizations. Parents were interviewed only about their children that fell within the age range for the study. This method complimented the contextual inquiries conducted with children because it provided data about the participant’s play habits over a longer period of time when the researcher did not have the opportunity observe them. It also provided insights into the participant’s evolution of play and ongoing patterns. Another important contribution of this data was that it included data on the participants play habits from perspective other than that of the researcher.

An outline of questions developed prior to the study was used as a basis to initiate the conversation and collect consistent data from all the parents (Appendix A). This included questions about demographics, how the participant played without digital media and how they used digital media. Flexibility was allowed in the interviews for further exploration of unforeseen insights. However, questions in the interviews were mostly focused on child’s play habits. The interviews were recorded resulting in 120 pages of transcription for analysis. Abbreviated transcripts, containing only the information used in these studies, are included in Appendix C. Field notes were also taken on the tablet during the interview.

Cultural Probe

Cultural probes are, “specially designed material packages given or sent to the people to support self-reflection and documentation” (Mattelmäki & Battarbee, 2002, p. 266). Cultural probes are usually very flexible and non-specific allowing them to obtain
a broader perspective on the participants' habits, daily activities and preferences. Another advantage to using cultural probes is that they are meant to be as unobtrusive as possible and allow the researcher to gather data from a distance without interrupting the natural sequence of activities (Mattelmäki, 2006). The cultural probes for this study included an activity book with activities for the participants, instructions for the parents, LEGOs, a figurine, a cardboard box, and crayons. The activity book, instructions and list of contents are included in Appendix A. Figure 1 shows a picture of the contents of the cultural probe packages.

![Figure 1. Cultural Probe Contents](image)

These activities were chosen to initiate various types of open-ended play. Each of the activities listed in the package had space for placing pictures, writing and drawing. These activities asked participants (or their parents if they needed help) to record their play with and without mobile media devices. Participants were encouraged to record their own responses and submit digitally when possible. This provided information on how comfortable they were with digital media. Participants were asked to take pictures of their toys or games and screenshots of their mobile media use to provide a baseline of how they played in the traditional and digital sense. The activities in the cultural probes were set up to be more open-ended to allow for a broader range of data. The activities requested from the participants in the cultural probe study can be seen in Table 3.
Laurel, who is a pioneer in developing interactive media for girls, mentioned that girls are predisposed towards narrative play in contrast to boy who enjoy more constructive play (Moggridge & Atkinson, 2007). LEGOs and a figurine were a part of the cultural probe to make sure narrative and constructive play was possible. The LEGOs provided were a random assortment of 70 pieces from a larger LEGO set with a small amount of specialized pieces such as tires, windows or figures. Mostly block pieces were used to allow for a greater range of interpretation with what was created. However participants were allowed to use their own LEGOs if they wanted. The

<table>
<thead>
<tr>
<th>Activity</th>
<th>Reason for choosing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Take a picture of the figure doing something. Describe what they are doing? Why are they doing it?</td>
<td>Gain data on the participant’s play environments.</td>
</tr>
<tr>
<td>Draw the best toy ever! You can use the crayons in the kit or a smartphone or tablet. Take a picture or a screen shot of it. Describe it? What can it do?</td>
<td>Gain insight into internal cues such as preferences.</td>
</tr>
<tr>
<td>Build something with the LEGO and take a picture of it. What is it? How did you decide to make it?</td>
<td>Gain data on construction play.</td>
</tr>
<tr>
<td>What did you do on mobile media today? Did you watch a movie or play a game. Send a screenshot of your favorite part? Describe what you liked about it. (If you do not have access to mobile media, you may skip this activity)</td>
<td>Gain data on how the participant uses mobile media devices.</td>
</tr>
<tr>
<td>What toy/book/game (not on a smartphone or tablet) did you use today? Take a picture of it where you were playing with/or reading it.</td>
<td>Gain data on how the participant plays without mobile media devices.</td>
</tr>
<tr>
<td>Use the figure and one of your toys to create a story. Take five pictures and describe how the story unfolds in each picture.</td>
<td>Gain data on dramatic play.</td>
</tr>
<tr>
<td>Do something fun with the cardboard box. Take a picture of it and describe what it is.</td>
<td>Gain data on imaginative and object play.</td>
</tr>
</tbody>
</table>
participants (except for those in families 3 and 4) were given a choice of either a Marvel Action Hero or Disney Princess as the figurine. This offered the chance to observe the participant’s preference for gender specific toys and see how “well-known” subject matter influenced the child’s play experience. Activities with the figurines were used to understand the play context by asking the participant to take pictures in different places and describe what the figurine is doing or to create a story using the figurine.

Crayons were included in the cultural probe to allow the child the chance to express concepts in a very open and natural way while initiating play and imagination (Hawkins & Stevens, 2002). Drawing offered opportunity to gain data about the participants’ play preferences and influences. For example, one activity asked them to draw the best toy in the world. This helped establish some context for the child’s play.

Another item for the cultural probe was a cardboard box. Families 3 and 4 were asked to procure their own cardboard boxes as a part of the activity packet. There are many popular references to how children play with a cardboard box including many Calvin and Hobbes strips by Watterson and the book “Not a Box” by Portis (Figure 2).


The use of a cardboard box for open-ended play specifically pretend play is also referenced in research concerning play (Meins & Russell, 1997). Cardboard boxes offer a very open and imaginative context for play and was likely to encourage open-ended
play experiences. It was a valuable tool for observing and collecting data concerning how children participated in open-ended play.

The researcher contacted the parents via email a week after they received the cultural probe to answer any questions about the overall study, data collection, and the details of the items in the package. After two weeks, the parents were contacted once again, to collect the cultural probes. In many cases the participants required more than two weeks to complete the cultural probe activities. Data was collected over the course of four months in both digital and physical formats including 157 photos, 32 drawings, 25 writings, and 18 videos.

Data Analysis

Data collected for these studies included recordings, photos, observational notes, writings, drawings and video. The data was analyzed and coded according to actions participants took to structure play and what initiated those actions. These cues and actions were grouped by similarity and formed categories (Goetz & LeCompte, 1984; Miles & Huberman, 1994). The coding schema was developed from these categories and went through several iterations where new categories were added and distinctions were made that broke up other categories. The coding schema was then analyzed for common patterns in open-ended play. The results of the data, including the coding schema, are described in greater detail in the next chapter.
CHAPTER 4. PROCESS AND CODING SCHEMA

This Chapter describes the first set of results from the study. These results are the mapping of the open-ended play process and the development of a coding schema as a means to measure open-ended play experiences and track patterns in open-ended play. The coding schema was developed from the open-ended play process. Both of these results are necessary for the second set of results discussed in chapter 5.

Open-Ended Play Process

One important finding the data demonstrated was the mapping of the open-ended play process. This helped answer part of the first research question: how do children participate in open-ended play? The open-ended play process was discernable through common categories of play recorded from the data and was developed along with the coding schema. Prior research suggested the that the form of children’s play was shaped by internal and external influences (Hendricks, 2011). In a study meant to measure the effects of technology in children’s toys, Bergen measures the actions afforded by the toys (Bergen, 2004). Bergen’s (2004) use of affordances to measure play is effective but falls short for measuring open-ended play because it does not track themes that are a result of internal influences particularly imaginative play. Gibson (1979) created the term “affordance” to describe what the environment provides to an animal. Norman (2013) later uses “affordance” to describe a relationship between the properties of an object and a person. Norman (2013) goes on to describe a “signifier” as a “perceivable indicator that communicates appropriate behavior” (p. 14). A signifier is close to describing the external influences that form play experiences except they are defined as “perceivable” which is not always the case when play is being structured. Therefore this thesis uses the term “contextual play cues” to describe what initiates children to structure play. This is not connected to the terms “contextual cue” or “contextual cueing” which is used in psychology and refers to aiding memory and perception (Mueller, 1980).
Hendricks (2011) mentions that play is shaped or in a sense designed. In open-ended play, the child does the designing. But how is this done? What Bergen’s (2004) study contributes to this one is that play can be measured and understood through the actions taken in play. This is how children structure their play experience. However, this study includes more than just afforded actions because they only serve as a portion of the actions taken in open-ended play. The process of open-ended play contextual play cues initiate play actions is very much like situated action theory. Suchman (2007) describes this as the, “view that every course of action depends in essential ways on its material and social circumstances” (p. 70). Bekker, Sturm et al. (2010) also make this connection and cite situated action theory as influential to their definition of open-ended play.

In the open-ended play process, contextual play cues initiate play actions, which can be either structuring play actions or building/restructuring play actions. Open-ended play starts when a child structures play that was initiated by one or more contextual play cues. The child then continues to draw from contextual play cues to build or restructure the play experience. This cycle has the possibility to continue indefinitely in an iterative manner and is only finished when the child decides to be done or when it is restructured into a completely new play experience. The researcher mapped the open-ended play process (Figure 3) based on the qualitative analysis conducted on the transcriptions, photographs, field notes and videos. Analysis was accomplished by tracking the number and types of contextual play cues and play actions. Play actions were observed in groups and where constantly changing leading to the understanding of open-ended play being more than just structuring but also building and restructuring.
Contextual Play Cues

Contextual play cues in the open-ended play process are the cues children use to initiate structuring and building/restructuring phases of the process. This is similar to how a grain of sand initiates the forming of a pearl. Contextual play cues include both internal and external cues. Internal cues are the cues that are a part of the child such as memories, experiences, feelings or preferences. External cues can be anything in the child’s environment including influences or objects that are external to the child.
Types of contextual play cues defined by the data are affordances, resemblance, space, influence, personal abilities, location, time and internal cues. It is possible that there are a limitless number of contextual play cues and often more than one cue is used at a time to structure the play experience.

**Structuring**

Structuring is the action a child takes in the open-ended play process that was initiated by a contextual play cue. These actions are defined by how the child structures his/her open-play experience. There are many different types of structuring and the lines between two types of structuring actions can, occasionally, blur and mix together. This is to be expected since the open-ended play experience itself is flexible and amorphous. The types of structuring actions defined by the data are constructing, drawing/writing/coloring, crafting, narrating, cooking, singing/dancing, composing music, repurposing, experimenting, exploring and collecting/sorting.

**Building/Restructuring**

Building is the addition of new actions, rules, or scenarios to a current structure. Restructuring occurs when a child changes the current structure of play. Both building and restructuring are initiated by contextual play cues and can include any of the structuring actions. The data also indicates actions specific to the restructuring/building phase of the open-ended play. These are role playing, bargaining, cooperating, competing and rebelling. These actions are distinguished as restructuring and building actions because in the data they only occur in the presence of other structuring actions. Social play, as it includes at least one other person, makes it a building action because there is also always a structuring action in play. It is possible for role play to be a structuring action but there was only one example of this in the data and it was therefore included as a building/Restructuring action.

Building and Restructuring actions are ESSENTIAL to the open-ended play experience. By definition, open-ended play must be able to be restructured or added to
at any time by the child. Building and Restructuring actions are what make open-ended play so dynamic and unique. The data did not indicate any subtractive process in the open-ended play and it appeared to be only a divergent and iterative process. It is possible, however, that a subtractive process is present on a small scale within or as part of the restructuring process.

The following three examples from the data show how the participants structured open-ended play according to this iterative process. For example, one of the participants (F6P1) and his brother were playing with a cardboard box during the contextual inquiry (Figure 4)
initiated play and the participant structured it by crawling in the box that was lying on its side. Building the play experience happened when the participant’s brother grabbed the box handle and tipped the box up with the participant in it. When the participant’s brother joined the play experience, he was immediately in the building stage. It became cooperative social play because the participant was okay with this action.

F7P1 created a game for herself using Hot Wheels and an electric castle toy (Figure 5). This play experience was already developed when it was observed. The data doesn’t show how it originally started, but it does show how open-ended play is restructured and built.

![Figure 5. Car Game](image)

There was a large collection of Hot Wheels neatly lined up in two groups next to a plastic castle with slides. The castle was electric and when you pushed on a button on one of the towers or the flag on the other tower the mote of water spun...
as it played music. The participant showed the researcher that she was in the middle of a game where she slid the Hot Wheels down the slides on the castle while it played music. The cars that landed right side up in the mote of water before the end of two songs were put in one group, “double champions,” and the ones that didn’t get put in another group, “single champions”. “Double champions” had to land right side up before two songs ended. “Single champions” only got one song. Sometimes she slid them down upside-down to see if they would land right side up. If they ran out of songs or landed right side up before a song ended she called it a “result.” She also had cars that she called “granted.” They got extra chances but it was uncertain why. It seemed that these were her favorite cars. One such car, a three-wheeler, she decided to save for later even though it already had an extra chance. (Appendix B)

The castle music served as a contextual play cue that the participant repurposed as a timer. Throughout this play experience, the participant tested whether the Hot Wheels would land right side up after sliding them down the castle slide. The cues for each trial run were the result of the previous run and the slide. This play experience was complex and constantly restructuring. The participant tried sliding the Hot Wheels down the slide differently which built upon the previous structure. When a Hot Wheel landed right side up before the music ran out, the participant placed it with a collection of others that had the same result. When the second Hot Wheels failed to land right side up before the music ran out, the participant set it aside for later.

It should be noted that this is a complex play experience and only part of the contextual play cues and play actions in a small portion of the experience are listed above. This example shows how the play scenario can change given different contextual play cues and actions and can be ongoing.

It is possible for a child to create a rule structure so precise that open-ended play can turn into a defined game and is no longer open-ended play. In this instance, the participant was very close, but she allowed flexibility for the rules and created new ones. The Hot Wheels that she called “granted” are an example of this. They were basically exceptions to the rules.
F1P1 included the researcher in a role play scenario she called “Store.” (Figure 6) “Store” is an example of how an open-ended play experience can keep building. It also shows examples of bargaining.

The researcher started to interview the participant’s Mom and shortly into the interview she started to set up “Store.” She pulled out a toy cash register and an old keyboard and set them on the coffee table. She then pulled out a couple of toy strollers and parked them by the stairs to serve as shopping cars. The participant then pulled out some brooms and a dustpan and placed them in the corner because she thought the “store” needed cleaning supplies. When she finished setting up she handed the researcher some toy money from various games and perhaps from a play set or two and motioned for him to start shopping. The researcher picked up items around the living room and tested the
participant to see what was okay to buy or not. He ventured to pick up the family Kindle that was on the couch to see if he could “buy” it. The participant shrugged to suggest that he could buy the Kindle in the “store.” He tried to buy the brooms and dustpan but the participant shook her head to tell him that those weren’t for sale. After shopping some more in the toy room, the researcher brought his “cart” with all the items in it to the coffee table where the register and keyboard were set up. The participant “scanned” the researcher’s items with the bar code reader on the toy register. After each “scan” she typed on the register and the keyboard before placing the item in a bag. (Appendix B)

There were more contextual play cues and actions to this open-ended play experience than Figure 6 illustrates above, which only further proves the complexity and flexibility of it. In the example above, the participant was constantly building on the earlier structure by repurposing more and more objects for the “Store”. The researcher also built on the structure by incorporating objects that were not originally intended by the participant to be a part of the role play. The participant’s acceptance of the Kindle as a part of the store showed bargaining. Bargaining also happened when the researcher attempted to “buy” the brooms and dustpan. The participant did not allow this but the researcher accepted it and the structuring continued. The toys and books in the toy room were considered to be repurposed because they are now props in the “Store.” There were no set prices at the “Store” so again the researcher and the participant had to bargain for the play to continue.

Coding Schema

One of the results for this study is the development of a coding schema for open-ended play. This coding schema represents categories of contextual play cues, structuring and building/restructuring actions seen in the data. The development of a coding schema for this study was important as it helped identify the key elements of the open-ended play process and facilitate extracting common patterns in this process. In total, 962 total cues and actions are coded and 24 code categories are identified in the
data. On average, each code was observed 40 times. Table 4 shows the open-ended play stages, the codes, in which study they were observed, and their frequency of use by the participants in the studies.

<table>
<thead>
<tr>
<th>Open-Ended Play Stage</th>
<th>Code</th>
<th>Number of Instances Recorded</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Contextual Inquiry</td>
<td>Cultural Probes</td>
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<td>Contextual Play Cues</td>
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<td>Physical Properties</td>
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<td></td>
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<tr>
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<td>7</td>
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<tr>
<td>Resemblance</td>
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<td>11</td>
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<td>Space</td>
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<td>13</td>
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<td>Influences</td>
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<td>4</td>
</tr>
<tr>
<td>Time</td>
<td>6</td>
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</tr>
<tr>
<td>Internal cues</td>
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<td>1</td>
</tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>Creating</td>
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<td></td>
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<td>Constructing</td>
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<td>3</td>
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<tr>
<td>Drawing/Writing/Coloring</td>
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<td>8</td>
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<tr>
<td>Crafting</td>
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<td>4</td>
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<td>Experimenting</td>
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<tr>
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<td>See Structuring</td>
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<tr>
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<tr>
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<td>Competing</td>
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</tr>
<tr>
<td>Rebelling</td>
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</table>
Coding Schema Process

The structure of the coding schema was derived from the data and patterns within it. Examples of open-ended play actions and what allowed or influenced them were grouped accordingly or placed in new categories to create a taxonomy. Every structuring and building/restructuring action has a contextual play cue that influenced that action. The actions were categorized by their type. Coding for the contextual play cues is more difficult because it depends on how they influenced the action. For example, a child could use a pencil to draw or pretend that the pencil is a magic wand. The two actions would be categorized as drawing and creating a narrative. While the pencil was the cue for both actions it is categorized under different cues, affordances for its ability to draw and association for its resemblance to a magic wand. This means that for every open-ended play action in the data, there is at least one code for a play action and at least one for a contextual play cue.

Influence and Internal type contextual play cues are not always apparent through the action and are only coded if the connection can be explicitly made. For instance if in the example above the child mentions that his/her pencil is Harry Potter’s magic wand a second contextual play cue would be added to the coding schema under influence (Harry Potter). Several influence contextual play cues were coded for this study and were often made explicit; internal contextual play cues were not.

The coding schema was built using only open-ended play examples from the data. Any predefined play experiences that were not structured by the child were excluded from the coding schema. For example, a video game is a predefined play experience and is therefore excluded from the coding schema. It is possible for some play actions to be both open-ended and defined. For example, a child may play by cooking or preparing food. This remains an open-ended play experience until the child uses a recipe. In this example, cooking is added to the coding schema only if it is known that the child did not use a recipe.

Multiple instances of the same structuring responses and contextual play cues from different participants were recorded. However, if two participants were involved in
the same instance, such as two brothers playing together, it was recorded only once. If one participant was involved in several instances with the same contextual play cue and structuring response; it was recorded only once. For example, if a participant did several marker drawings it was only recorded once under drawing/writing/coloring. However, if the same participant did a crayon drawing and a marker drawing it would be recorded twice under drawing/writing/coloring because the contextual play cue changed. While this example shows a very small and obvious change of contextual play cue, it is an important distinction to make because it is possible for the participant to choose a more drastic change (such as drawing in the sand) and the full range of possibilities needs to be recorded.

The coding schema does not include examples of contextual play cues or actions that were not present in the data and is therefore not a complete list of all the types of contextual play cues or structuring and building/restructuring activities (if such a thing is possible). For example, prior research describes parallel play as play in the presence of others but not with them (Parten, 1932). Parallel play was not present in the data and was not added to the coding schema. Although, the coding schema is flexible enough to accommodate parallel play as a suggestion type of contextual play cue should it be observed in further research.

Open-ended play is flexible and amorphous. Much of the contextual play cues and play actions in the data fit in several areas of the coding schema at the same time. For instance, all examples of role play are also examples of narrative play and all but one of them are also examples of social play.

All of the contextual play cues and actions from the data were placed within the coding schema structure and marked with the number of instances. This was essential to tracking the number of instances and variety of each contextual play cue and action. Cues were recorded with their associated action and vice versa. This helped track what cues influenced certain types of actions making it easier to track common patterns of Open-ended play. Anytime a contextual play cue or action is mentioned without a specific example, it is coded under the correct category with the participant code and “General”. For example, F1P1’s mom says she participates in crafts but no examples or materials were provided. Contextual play cues cannot be determined for non-specific
examples of actions. A full list of the coded contextual play cues and play actions from this study’s data set can be seen in Appendix D. Figure 7 illustrates a section of a transcript and an example of its corresponding codes.

**Figure 7. Example of coding**

In Figure 7 the highlighted text shows a contextual play cue, structuring action and building action. The cardboard boxes left for recycling were the contextual play cues that initiated F11P2 to construct a house out of them. The building action happened when the participant’s brother and F11P1 (sister) helped build the house. These cues and actions were coded in the schema under the appropriate categories of influence, constructing, and cooperating.

Coding for the data from the interviews and contextual inquiries were combined because all but one family (Family 10) participated in these methods simultaneously. The cultural probe data was coded separately because they were distributed separately and it allowed the opportunity to gain new insights from the data. While it did not add to the coding schema categories, the data gathered through the cultural probe clearly showed how participants used their immediate surroundings in open-ended play. This
influenced the development of the first design strategy for open-ended play, which is discussed in depth in the next chapter.

Special considerations had to be made for coding the cultural probe data. The activities in the cultural probes were not valid as open-ended play because the researcher predefined them. Contextual play cues or play actions were only coded if they were a deviation from or addition to the given activity. For instance, narrative was not coded for the “create a story with the figures” activity because it was a part of the activity and may not be a part of the child’s normal play pattern. However, if the child repurposed objects for the story activity, then the object and the repurposing action was coded.

**Descriptions of the Codes**

This section describes the different contextual play cue and action categories in the coding schema that emerged from the data. The codes will be described in the order of the most to least common under each open-ended play phase (contextual play cues, structuring actions, and building/restructuring actions).

**Contextual Play Cues**

The following codes are contextual play cues, which means that they initiate structuring and building/restructuring actions.

The physical properties of objects are one of the most commonly used contextual play cues, and it includes three codes that are related; affordances, resemblance and space.

*Affordances.* In open-ended play affordances are the features of the materials or objects children interact with when structuring play. This can be surface, shape or function. What is the surface of the object like? Can it be shaped or molded? Does it stretch, break, roll or tear? Affordances are often explored, experimented with, tested or destroyed. For example, the roundness and thinness of coins led F10P1 to experiment with them and see how far they roll.
**Resemblance.** Resemblance is a physical property cue that often leads to repurposing an object. If an object has any resemblance in form or function to something the participant is familiar with, they will incorporate it into their play. The object will then take the role of what the child thinks it looks or works like. The resemblance is often very rough and not defined. One example is F8P1 using a cardboard box as a turtle shell. Even though the box is square and not round, it still had an open side and was large enough for the participant to place on his back and almost fit inside. This resemblance of form cued the participant to use the box as a turtle shell. Resemblance can also be based on a certain function that would lead to the invention of new uses. For example, F1P1 used a keyboard as a cash register when playing store because it had the same interaction of buttons as a cash register. F12P1, on the other hand, blew air into a Ziploc bag and popped it. In doing so, he created a new use for a Ziploc bag based on its resemblance of function to a balloon.

**Space.** Space is the last physical property contextual play cue. It usually leads to narrative and role play. Often this can be an object that creates a space such as a tent, large cardboard box or storage bin. It can also be a space such as a playhouse. It is possible that space is so effective as a narrative and role play contextual play cue because it puts the child at the center of it, creating introspection. Both F6P1 and F12P1 have used a cardboard box as a car. This is considered space because they were both cases where they could sit in the “car”. One can easily see how this leads to the role play of being a driver and indeed it often does.

**Influence.** There are many types of influence described in the fields of psychology, sociology and political science and can be generally considered as means of persuasion (Parsons, 1963). In this study, it refers to anything external to the participant that affects how they structure their play. As mentioned before this is not often connected directly to a play action but is often secondary. Examples placed under influence in the coding schema, range from others such as parents, siblings and peers to media influences and even school subjects. It is important that the inclusion of influences from others does not assume that the resulting structure is social play, though it sometimes can be. It should also be noted that influence is not necessarily verbal but can sometimes be the mere presence of something. For instance, F6P1’s
father was a firefighter and his parents noticed that for a while that influenced the theme of his play.

**Personal Abilities.** Personal abilities are a contextual play cue that is internal to the participant. Personal abilities often contribute to creative structuring such as drawing, singing and building. Examples of personal ability contextual play cues in the data include the ability to somersault, ride, drive, skate and skip. Most often the personal abilities of the child lead them to testing themselves such as seeing how fast can they run or how high can they jump. For example, F8P1 tests his ability to wrestle against his dad.

**Location.** Location is a self-explanatory contextual play cue. It is recorded when the surroundings of the participant has affected how they structure their play. Examples from the data include outdoors, inside a vehicle, at a playground and participating at special events. For Family 9, a wedding offered a certain context with the presence of multiple water glasses and champagne glasses that their children (F9P1 and F9P2) filled with water and played for music. Outside is a common location contextual play cue that allows for actions such as jumping in leaves or throwing snowballs.

**Time.** Time is another self-explanatory contextual play cue observed in children’s interactions with their environments while playing openly. This could be time of day, week, month, year, holidays or special events. The most prominent time distinctions recorded as contextual play cues in the data were the seasons. This is also connected to location and weather. For example, fall offered leaves to jump in for the children in Family 8 and the coming of Halloween reminds F7P1 that it is time to play ninja.

**Internal Cues.** Internal cues are the last contextual play cue category to note. They are what signal the child to participate in a certain play action or behavior and are in this way like the psychological definition of an internal cue (Björkman, 1994). However, in this study they refer strictly to the signaling of a play action from the child his/her self and not used to describe cueing memory. Internal cues can include imagination, emotions, memories, experiences, feelings and preferences. Though it was apparent that they were present through the data, precise examples were rarely
available and therefore very few were recorded. For example, F10P1 will role play school indicating that there is a memory or experience of it but it is not known what the precise memory or experience is. Internal cues often accompany external cues to initiate a play action. In the case of F8P1 repurposing the cardboard box as a turtle shell, both the resemblance of the box to a turtle shell and some memory or experience of a turtle shell were cues for the repurposing action. There were some indications of preferences but very few. Therefore this is only listed as a part of the coding schema and not explored further.

**Structuring Actions**

In open-ended play structuring actions are initiated by contextual play cues and are the first step in building an open-ended play experience. These actions can also be used in the building or restructuring of the play experience.

Creating is the largest form of structuring that contains many categories. The categories of creating defined by the data are constructing, drawing/writing/coloring, crafting, narrating, cooking, singing/dancing, and composing music. There are some similarities and differences that distinguish each of these categories. Creative activities were only added from the data if they were unstructured. For instance, constructing with LEGO®s was only recorded if it was known that directions were not used or were modified by the participant. Out of these categories of creating, the examples exposed by the data were less about what they created and more about what they used to create something. For example, LEGO®s were often mentioned as being what was used to build but what was built was not always present. Because the coding schema is more about the process of open-ended play, what was used to create was more important than what was created.

**Constructing.** Constructing is simply using objects to build with (Miller & Almon, 2009). It is also accomplished in 3D space and can be the result of using objects specifically made for construction such as LEGO®s or objects not intended for construction such as cardboard boxes. It is distinguished from crafting in that it is not for a strictly aesthetic or decorative purpose.
Drawing/Writing/Coloring. Drawing, writing and coloring are grouped together because they often use objects made for that specific purpose and are usually accomplished in a 2D space. Despite using tools such as a pencil, crayon or marker that would define the purpose of drawing, writing, or coloring, the play experience of this type remains open-ended.

Crafting. Crafting is related to drawing, writing and coloring in that it usually uses objects meant specifically for that purpose but tends to be accomplished in a 3D space. Crafting includes sculpting, such as with clay and plaster or creating with materials such as cotton fuzz balls, Popsicle sticks and felt. Some of the latter examples are closely connected to repurposing. However, crafting is separate in the coding schema because it also has an understanding as generally being used for a decorative or aesthetic purpose. This is part of what distinguishes crafting from drawing, writing, coloring and constructing even though in many cases it can be any of those. For example building a birdhouse with Popsicle sticks and hot glue would be crafting while building a firehouse out of LEGOs is not.

Narrating. Narrating is about dramatic play and not writing a story (which is categorized under drawing, coloring and writing though it can also be narrating) (as cited in Else, 2009). Usually this includes scenarios acted out by the children themselves or through toys such as action figures and dolls. Creating a narrative does not necessarily mean that the participant is engaged in role play. On the other hand, role play does always include a narrative, but is categorized separately from creating a narrative because it is usually a part of the building process.

Cooking. Cooking can be considered a play action. As mentioned before cooking is only included in the coding schema when it is certain that the participant was not following a recipe or deviated from one.

Singing/Dancing. Is another form of creating. As with cooking, it is only included in the coding schema if it is certain the participant was creating his/her own song or dance routine. For instance, F1P1 likes to do karaoke. Since songs in karaoke have already been created and it was not know if F1P1 deviated from the songs, this was not coded.
**Composing Music.** The last code that falls under creating is composing music. This is not to be confused with playing music because it has to be the act of creating music for it to be coded as open-ended play.

**Repurposing.** Repurposing happens when a child uses an object for something other than its intended use. This is similar to the actions that are described as object play. However, instead of only physically manipulating an object it can also be about using imagination to redefine what that object is (as cited in Else, 2009). In this way repurposing also leads to symbolic and imaginative play (as cited in Else, 2009). Usually it is a physical property of the object that initiates the child to use it a new way. One example mentioned before was of F8P1 repurposing a box to be a turtle shell. Even toys can be repurposed. For example, F1P1 set out a toy stroller to be a shopping cart when playing “store.” Often a repurposed object becomes the building material for a narrative, such is the case of the “turtle shell.” Repurposing can also be when a child uses an object for its intended use but for purpose of play. F1P1 used brooms as props for her “store.” They were meant to be brooms but they were a part of her role play. The data showed that repurposing was the second most used type of structuring next to creating.

**Experimenting.** The actions taken to test, experiment, and destroy can be very similar and are often difficult to distinguish from each other so they are all grouped under the category of Experimenting. Hughes describes exploratory play to be the accessing of factual information about an object or space (as cited in Else, 2009). Experimenting is the same except that can include the child his/her self. This structuring action is actually often a response to personal abilities because the child wants to test themselves and build certain skills and would therefore also lead to mastery play (as cited in Else, 2009). For example F6P1 jumped from couch to couch testing his ability to jump the gap between them. To this he quite merrily exclaimed, “Daddy, I can hop from couch to couch.” A participant testing their personal abilities can also be risk taking. An example of this from the data is F2P1 somersaulting off of her bed on to a giant beanbag. This category also includes testing or experimenting on different Affordances of objects. F10P1 was doing this when he was rolling coins to see how far they would go.
Exploring. Open-ended play itself is an explorative process. Experimenting is in many ways an exploration of affordances. Exploration warrants its own category in the schema because exploration is not always about testing but about discovery and understanding. There was little data that suggested exploring. This may be due to the use of the participants’ residence for the interview and contextual inquiry. One example from the data that was recorded is F10P1 using Google Earth and weather apps to explore geography.

Collecting/Sorting. Collecting and sorting is closely related to exploring in that it can help with understanding, but instead of discovery it is more about grouping and acquiring. In the data, it was a powerful indicator of preference. For example F2P1 collected glittery and miniature things. According to her these were her favorite toys and she thought miniature things were “cute.”

Building/Restructuring Actions

Building and Restructuring Actions happen after structuring has already occurred. The codes in this section are unique in that they always or almost always occur after the structuring phase. All structuring actions can be a part of the building and restructuring phase but they are not coded twice.

Role Playing. Role play is when a child puts themselves into “‘as if’ or ‘simulated’ actions and circumstances” (Yardley-Matwiejczuk, 1997, p. 1). Though it is possible that role play can also be a structuring action, it is coded under restructuring and building because all but one example in the data was a part of this stage in the open-ended play process. Anything that would be considered imitation is coded under role play. Role play is coded separate from social play even though it generally includes another player. F1P1’s “store” is an example of role play. Her “store” included many props such as a toy stroller, brooms and a keyboard. Each of these items are a building of structuring actions (repurposing) to create a narrative. In the role play of “store”, the participant played the role of cashier while the researcher played the role of a shopper. This example is also an example of social play.
Social play is when a child is playing with at least one other person (Allen & Bekoff, 1994). Since the inclusion of a person has to be structured into play, social play is always a building action. For instance if a child is running they are testing their personal abilities. If the child starts to race another child then they are now testing their personal abilities against the other thus building on the previous structure. F12P1 recounts an example of this when he starts playing a game with his brother (F12P2) that they call “Battle.”

F12P1: So [F12P2] brought down his Lone Ranger locomoto. And then I brought down this vehicle to fight it cause I said, “Hey I don’t want that there so I’ll come and fight you.” Then [F12P2] built another vehicle to fight that, then I build another vehicle to fight that. Starts that. . . . Then the second one, well I forget how it started. I think ah . . . I think [F12P2] just started bombing me. Then I started fighting back. I don’t know why but . . .

Dad: There seems to be a lot of capturing.
F12P1: Yeah. Capturing people, stealing treasure, stealing weapons . .
(Appendix C)

Social play usually undergoes restructuring because the participants co-structure the play experience. For example, F12P1 describes how this happens for “Battle.”

F12P1: Sometimes we have rules that you can’t hurt the royal family cause you have kings and queens, but you can’t attack with your royal family cause then you can just say, “Well you can’t hurt me, so I can just blow up your camp.” And you can’t attack people while you’re on time out. So let’s say I’m on time out but [F12P2] is not so I could just go attack him. That wouldn’t be fair because he couldn’t fight back to me. (Appendix C)

The data suggested four categories of social play; cooperating, bargaining, competing and rebelling.
Cooperating. Cooperating is when two or more children play together towards a common goal (Parten, 1932). One example was observed with Family 6. F6P1 was sitting in the cardboard box that the researcher brought when his brother grabbed the box handle and tipped it up with F6P1 in it. They did this several times and switched places.

Bargaining. Bargaining is when children negotiate rules or situations within their play experience (Miller & Almon, 2009). Bargaining can be a part both cooperation and competition and coded separately for this reason. For example F8P1 and F8P2 participate in bargaining when they play what their parents call the “How Bout” game.

Mom: Right. And these two will get into a game whether it’s their LEGOs, or their cars, or K’nex, or Zoobs, or their stuffed animals and they create this narrative and it’s . . . they’re constantly negotiating what’s going to happen with each other and they’ll disagree about it and then they’ll direct each other, “okay now your guy’s going to do this, and your guy’s going to do that.”

Dad: We used to call it the “how about” game because that’s what we would just hear the whole time, “How about, How about this guy has this laser sword.” Then, “Well, how about this guy has a laser sword shield?” And it just kind of goes back and forth and builds.

Mom: And a lot of it is these explosive noises that go along with it. And so you know the other day [Dad] was saying . . . I don’t remember what you said, but it was something like, “You know, you can’t just blow stuff up in the living room all day.” But the thing is, for me, I know sometimes it seems like we’ve been doing this for hours now can we for once do something else. But I also think it’s okay because it . . . at least it’s creative and they’re learning to negotiate and to interact, you know, work something out between the two of them because they both want the game to continue and even if they have to . . . and sometimes it doesn’t continue because they have to agree but, for the most part in order to keep the game going they will work it out. They will come to an agreement even if it’s an, “Okay fine!” (Appendix C)
The “How Bout” game shows how the participants co-structure the play experience. It also includes both elements of cooperative and competitive play, which further reinforces the need for bargaining to be coded separately.

**Competing.** Competing is when two or more children play against each other (Hughes, Cutting, & Dunn, 2001). Most often this is associated with sports but it is also a part of open-ended play where the participants define their own rules or sometimes don’t even have defined rules. For instance, F8P1 and F8P2 had a dance off during the observation. They each wanted to show off their dance skills and be considered the best, but neither defined rules or were even concerned about how each would be judged the best.

**Rebelling.** Rebelling is considered doing something contrary to what is required by an external party (Gielen & Leeuwen, 2013). It is part of social play because it takes another person to rebel. Rebellion is often thought of as a negative and forceful or even malicious action. It can also be a way of structuring play like testing another person. A good example of this was when the researcher asked F8P2 about his routine.

The researcher started the inquiry with F8P1. He turned out to be difficult to interview at first because he would respond with the opposite of the true answer. He did this for a while despite his parents reprimands. This was a sort of game for him for a while and did not appear to be malicious. (Appendix B)

In this example rebellion is not about anger or maliciousness but in fact was a way that F8P2 played with the researcher. In this context, rebellion is recorded. If rebellion is not an act of play, such as refusal to go to bed, it is not recorded in the coding schema.

**Contextual Play Cue and Play Action Combinations**

There are three different ways that contextual play cues connect with different play actions. 1) A single contextual play cue initiates different play actions. 2) Several contextual play cues initiate the same play action. 3) The same contextual play cue initiates the same play action. These combinations were recorded on both the
individual level and across participants. The different combination possibilities show information about open-ended play; most notably the presence of patterns (Table 5).

| A single contextual play cue initiates different play actions. | Individual: An individual can interpret a cue several ways showing the importance of keeping contextual play cues undefined. | Across Participants: It is to be expected that different individuals interpret cues differently and this knowledge does not add to an understanding of open-ended play. |
| Several contextual play cues initiate the same play actions. | Individual: An individual interpreting different cues may only show individual preference and doesn't add to understanding open-ended play. | Across Participants: When several participants choose the same play action to structure different cues it starts to show the presence of a pattern. |
| The same contextual play cue initiates the same play action. | Individual: When an individual chooses to use the same cue for the same play action it is merely repetition. | Across Participants: When several participants use the same cue to initiate the same play action it shows a strong presence of patterns in open-ended play. |

Table 5. Possible Cue/Action Combinations

Figure 8. One Cue Can be Structured Different Ways
Figure 8 illustrates examples from the data of one contextual play cue being used in several different ways for multiple participants. It is interesting, but perhaps not surprising how different participants interpret the same contextual play cue differently and allow it to structure their play differently. What is perhaps more surprising is that this also happens on the individual participant level. For example, F1P1 restructured play with the same box.

Mom: Yeah. We used to have a giant box for something. They turned that into everything.
Researcher: Do you have any examples?
Mom: Once it was a car, then they flipped it up and it was a house, then it was a dressing room. She does do a lot of dress up play too. Even that tent outside, they flip it on the side and that becomes another dressing room, or a stage or behind a stage and that is where they are before the show. (Appendix D)

It is possible that F1P1 did not even need a separate object or external cue to restructure her play with the cardboard box (though she might use an internal cue to initiate the restructuring). It is also possible for her to build onto the same narrative with the same box such as putting on a fashion show, changing in the “dressing room” and driving her “car” to her “house.”

The fact that one contextual play cue can initiate several play actions on the individual level and across participants is important. It illustrates the flexibility of open-ended play and the need for contextual play cues to be open to interpretation as a means to offer more structuring possibilities. This is a major influence for the first design guideline for open-ended play, which will be discussed in more detail in the next chapter. When a contextual play cue offers several possibilities the child is called to structure the cue on his or her own terms. This is part of what makes open-ended play so engaging for the child and is the mechanism that allows for restructure and building.
Figure 9. Several Cues Can Be Structured the Same Way

Figure 9 Illustrates examples from the data where several contextual play cues lead to the same type of play action across several participants. This is significant because it indicates the presence of patterns to open-ended play. While there is no set path or rule tying certain contextual play cues to play actions, there are some commonalities to the toolkit that children use to structure their play.

This combination is also present on the individual level though it is far less significant because it only indicates a personal pattern. In many cases this pattern can be simply due to personal preferences. For example, F7P1 has a variation of the game she plays mentioned earlier (Figure 5). She uses the sides of a bathtub instead of the toy castle slide. It is likely that her preference for playing with Hot Wheels influences her to respond with the same action for different contextual play cues. While this is less significant on the individual level, the fact that several contextual play cues can lead to the same type of play actions across participants is significant because it shows the emergence of patterns.
Figure 10 illustrates an example from the data of how different participants have used the same contextual play cue to initiate the same play action. This further illustrates the point that there are some commonalities in the way that children structure play and even what contextual play cues they use. This is significant because it also shows that there are patterns to open-ended play and that some of these patterns can be very specific. The same combination on the individual level is simply repeating the same play experience and doesn’t bear any significance to the understanding of open-ended play.

Discussion

Through ethnographic research, these studies identified and mapped the open-ended play process. The open ended-ended play process is iterative and includes using contextual play cues for structuring, building and restructuring of an open-ended play experience. These studies found that contextual play cues initiated the structuring of open-ended play. Once structuring of an open-ended play experience began, contextual play cues initiated the building or restructuring of the play experience. This cycle continued until the child decided to end that specific experience or has changed it into something completely different. This process was flexible and accommodated several contextual play cues and play actions. As part of this thesis, these cues and actions were documented and categorized from the data set to develop a coding schema that can be used in future research of open-ended play.
While there are several models that focus on the stages or process of play, none focus specifically on open-ended play. Partens (1932) stages of social play is one example. Polaine (2010) comes a little closer in defining stages of play for interactivity. This also includes stages of the type of play itself and not as development such as Partens (Polaine, 2010). Poliane’s stages have also been used for design of open-ended play (Valk et al., 2012). The model in this study is different in that it focuses specifically on open-ended play and is not on interactivity strictly in the digital sense as Polianes’s (2010) does. This is important because in these studies, the participants incorporated their surrounding environment into their open-ended play experience. This means that interaction design for open-ended play must look at interactions in both the physical and digital sense.

The discovery of an open-ended play process answers how children participate in open-ended play (research question one). It is the first step in understanding a very complex and variable form of play. With this understanding, it makes it possible to effectively design for open-ended play experiences. On a large scale, the open-ended play process can be used to show how education and new technologies influence open-ended play. On a smaller scale, it can be used to help parents understand and encourage open-ended play for their children.

There was no pre-defined way to evaluate open-ended play prior to this study. The coding schema for open-ended play defined criteria for measuring the open-ended play experience (research question two). It is flexible, allowing for the complexity of open-ended play while still providing structure. This is a significant step for the future research of open-ended play. The categories of contextual play cues and play actions in the coding schema indicated common patterns in open-ended play. This supports the results in the next chapter where, these patterns are identified and strategies for the design of open-ended play are developed. These strategies and patterns are not possible without the solid grounding in the data the coding schema provides.
Limitations

Since this study consists of qualitative research methods and has a small sample set, the results may be difficult to generalize across different races and cultures within and outside of the United States. The participant group is not diverse due to the use of snowball sampling to recruit. All of the participants had roughly the same cultural background and lived in the same city (except Families 3 and 4, who were living in separate cities). All of the participants also had access to mobile media devices. The inclusion of more diverse economic backgrounds and cultures may change the results of the open-ended play process and the resulting coding schema.

There was very little data on time and location cues gathered in this study. This may be due in part to the consistent location of the contextual inquiries. The examples of time contextual play cues in the data are almost always due to location because of how outdoor weather affects the play experience. For example, the fall allows opportunities to play with leaves and the winter offers opportunities to play in the snow. Both are measures of time but they change the outdoors (location). The research was completed in the Midwest during the months of November and December. This can also significantly change observation of open-ended play due to the colder weather.

Little data was collected on exploration. This is likely due to the low amounts of time and location data. Since contextual inquiry took place in a familiar location for the participants, there is little need to explore. The exploring play action does include the exploration of concepts or non-physical spaces. For example, F10P1 uses Google Earth to explore geography and find where relatives are located. There are only few examples of this type of exploration in the data set.

Expanding on the findings and supporting them with a larger and more diverse sample size would address these limitations. This would allow for the results to be more generalizable with participants from different regions and cultural backgrounds. Data can be collected over the course of a year to have a better understanding of time and location contextual play cues. Data from areas where the weather doesn’t change between seasons can be compared to data from areas with different weather or have changing seasons. Contextual inquiry can be done in different areas such as
playgrounds, vehicles or even at special events to see how open-ended play experience varies in these situations.

The defined activities in the cultural probes reduced the amount of data that could be collected. This made them less effective in the amount of data they could produce for this study. The cultural probes were collected prior to the discovery of the open-ended play process and development of the coding schema and therefore could not anticipate the types of data that needed to make them the most effective. While activities for the cultural probes were kept as open as possible they still limited the data that could contribute to the coding schema. Many of the participants also did not want to participate in it because it dictated what types of play activities they should engage in. On the other hand, it proved to be confusing to parents because they expected more structure in the activities.

The cultural probes showed promise in collecting some internal cues and could be reworked to focus on gathering this type of data. It also has great potential to gather data on play in different regions for the scope of the study as well as different areas individual participants play in. Future use of a cultural probe should focus on providing the parents of participants with a play documentation journal that requires pictures and descriptions of play over the course of two weeks. There should be very little interference with the participants’ play except to ask them why they made certain play decisions. This will help provide data on internal cues.

**Summary**

A model of open-ended play and coding schema for analyzing open-ended play were developed from the data in these studies. These contributed a richer understanding of a very complex, flexible and beneficial form of play. Based on this research, it is possible to design means to encourage and support open-ended play for the benefit of children. The next chapter shows patterns of open-ended play discovered from the data through the use of the coding schema and design guidelines based on those patterns.
CHAPTER 5. PATTERNS AND DESIGN STRATEGIES

Common Patterns in Open-Ended Play

The previous chapter indicated patterns in the open-ended play process. This section shows what specific patterns were found in the data set and adds detailed descriptions. Patterns in open-ended play are commonly observed relationships between cues and actions, or among actions. Some cues and actions have more than one common relationship with another action. For example, when a child repurposed an object, he/she often created a narrative including that object (such as a using a stick as a sword and becoming a knight).

In Figure 11 (below) each code is displayed under the corresponding stage of open-ended play. The shaded boxes show general categories that include several different codes. For example, creating (general) includes narrating, constructing, drawing/writing/coloring, singing/dancing, composing music, crafting, and cooking. Each arrow shows the most common patterns where a contextual play cue or play action leads to a specific play action. Experimenting is split into two because there are distinct patterns based on experimenting as a whole and testing self (a specific type of experimenting). The numbers next to each arrow shows how many of the number of instances a contextual play cue or play action led to its connected play action. For example, 19/35 is next to the arrow between space and role playing, meaning that out of 35 space contextual play cues, 19 of them initiated role playing. The remaining instances not documented in Figure 11 initiate various play actions and do not strongly indicate any patterns.
Figure 11. Open-Ended Play Patterns
The analysis led to two groups of patterns that are a part of the open-ended play process. They are structuring patterns and building/restructuring patterns. Both groups are influenced and guided by different types of contextual play cues that are used to initiate open-ended play. However, building/restructuring patterns are also influenced by the type of structuring action that is being built upon or restructured. There are seven structuring patterns and seven building/restructuring patterns identified in the data that include the majority of the contextual play cues and play actions identified in the previous chapter. The common patterns in these two groups will be discussed in the next sections.

**Structuring Patterns**

The research showed that children structure their play experience using contextual play cues in their immediate environment. This means that the best way to guide open-ended play structuring is through contextual play cues, whether it is by suggesting, creating or leveraging current contextual play cues. The most effective cues observed are space, resemblance, affordances and personal abilities due to their role in initiating the most common patterns. They also connect with all of the structuring actions except exploring and collecting/sorting; nine structuring actions in total.

**Space → Role Playing and Narrating (Space Leads to Role Playing and Narrating).** The relationship between a real or imagined space and the participant seemed to cause introspection, which often led to the creation of roles and scenarios. This pattern was very clear in the data and led to the development of the third strategy discussed in the next section. Out of 35 examples of space being used as a contextual play cue, 19 of those led to role playing and 3 led to narrating or storytelling (not role playing). The two are closely related because role playing always includes narrating. This is why narrating is included in this pattern despite separate accounts of narrating (without role play) being relatively low. One of the most common examples of this pattern from the data is the use of a cardboard box as a car. Three of the participants (F1P1, F3P1 and F4P1) created cars out of cardboard boxes that they could sit in and
immediately started narrating by “driving” it. Space is a powerful cue for initiating role play and narration.

**Resemblance → Repurposing.** Participants repurposed an object when its form or function bore even the slightest resemblance to something familiar. This pattern is one of the most common patterns of open-ended play. Out of 37 examples of resemblance, 30 led to repurposing. Mentioned earlier, one of the participants (F8P1) repurposed a cardboard box as a turtle shell. Resemblance often initiates repurposing as an action.

**Affordances → Experimenting and Creating (General).** Affordances within an object or interface cued participants to experiment how it works or what it does. This exploration often led to creative, sensory, and mastery play. Out of 50 examples of Affordances, 16 initiated experimenting and 21 initiated creating. Affordances invite experimenting when they are new or a child is trying to use it for something else. For example, F7P1 experimented with Siri on her iPad by asking questions to see how Siri would respond. Affordances commonly lead to experimenting and creating actions.

**Personal Abilities → Testing Self and Creating (General).** Participants would often test their own abilities though locomotor (active) and creative play. Out of 31 examples of personal abilities, 29 led to testing self and 2 led to creating. Risk taking is also considered a form of testing self. F2P1 participated in this pattern when she showed the researcher that she could somersault off of her bed onto a beanbag chair. This was both risk taking and a demonstration of her personal abilities. Despite having only a couple of examples, personal abilities initiating creating is included as a common pattern because it represents the remainder of the examples of personal abilities as a whole. This did not happen with any of the other patterns and is significant for that reason. F8P2, F8P2, and F1P1 enjoy dancing as an ability that they express creatively instead of testing themselves by it. It is easy to see how this can be the case for other creative actions such as drawing and crafting but there was often not enough data to isolate personal abilities from other contextual play cues driving these actions. Personal abilities leading to testing self and creating are significant patterns that encourage active and creative play.
Building/Restructuring Patterns

Building and Restructuring patterns are also initiated by contextual play cues. However, unlike structuring patterns, they are also guided by previous structuring actions. Just like there are patterns to what contextual play cues often lead to certain structuring actions, there are also patterns to what play actions often lead to other play actions.

**Repurposing → Narrating and Constructing.** Repurposing is the most common structuring action in open-ended play. Children are remarkably innovative in how they use objects to structure their play. They will often use repurposing as a tool to create scenarios or for constructing. Out of 101 examples of repurposing, 59 initiated narrating and 19 initiated constructing. When Repurposing initiates narrating the child is engaging in dramatic and construction play. For example, F5P1 started narrating by imagining a stick as a sword. Children participate in creative play when they repurpose objects for construction. F8P1 did this when he constructed a person out of boxes. Repurposing commonly leads to narrating and constructing.

**Experimenting → Constructing.** In various occasions, after experimenting with an object, a participant would decide to construct a structure with the object. This represents hands on learning (mastery play) and construction play. Out of 20 examples of experimenting, 6 of them led to constructing. Though 6 is a relatively low number, it still represents a pattern that demonstrates a progression of play after experimenting. It is also possible that all constructing goes through a stage of experimenting as a means to understand the materials or their relations to other parts of the construction. This is difficult to prove though as it simply can be an internal process. However it was documented that F8P1 experimented with combinations of LEGO and would change it if, “it didn’t look good.” This shows experimentation leading to construction as a restructuring action even with a material the participant is very familiar with.

**Constructing → Narrating and Cooperating.** Often a participant won’t stop at constructing but continue to create scenarios from what was constructed. Constructing also leads to cooperating because it provides a common goal for social play. Out of 44 examples of constructing, 11 of them led to narrating and 9 of them led to cooperating.
Constructing encourages more constructing by definition and most of the 44 examples of constructing in the data show this. While constructing leads to narrating and cooperating far less, they are patterns of play that progress past constructing and are significant for this reason. It is not uncommon for whatever is being constructed to also be a part of a scenario. When F8P1 constructed a person out of boxes, he was also creating a narrative surrounding the box person. Constructing can also be a cooperative action such as when the children in Family 11 built a fort together. Constructing leads to narrating and cooperating.

**Testing self → Competing.** After a child tests and demonstrates their own abilities, it is natural to want to test them against another person. This is how testing self often leads to competing. As with the pattern of personal abilities initiating testing self, this pattern is usually large-motor and rough-and-tumble play. By its nature, it is also social play. Out of 29 examples of testing self, 6 initiated competing actions. While this is low, every example of competing was initiated by testing self (6/6). This makes it a significant pattern. It might also show up stronger if more examples of competing were documented. One of the most common examples of testing self leading to competition is wrestling, which was recorded for 5 of the participants. In the case of wrestling, participants are testing themselves against another person. This shows how testing self leads to competition.

**Role Playing → Social Play (General).** Role play encourages social play because the role a child plays is often accompanied by supporting roles. For example, F1P1 played the role of a store clerk in her “store” while the researcher played a shopper. Imagine if there was no shopper or no store clerk. Each roles enhanced the other. Out of the 28 examples of role play, 27 of them led to social play. This suggests that role play encourages social play.

**Connection of Patterns to Strategies**

These patterns of cues and their relationships to actions were observed during the studies. It is very likely that there are more patterns within open-ended play other than the ones reported in this thesis. Another important finding is that these patterns
further progressed open-ended play through several actions. They are also significant because they include 12 of the 15 subcategories of play listed in Table 1. This means that designing for open-ended play with an understanding of these patterns, can carry with it all of the benefits of each of these types of play. The next section describes proposed strategies for designing for open-ended play. The patterns mentioned in this section are the basis for the development of the design strategies.

**Interaction Design Strategies for Open-Ended Play**

The open-ended play process outlined in the previous chapter and the examples coded from the data show common patterns and connections between certain contextual play cues and play actions or among play actions. The following design strategies were developed based on the patterns in open-ended play.

1. Encompass
2. Provide
3. Immerse
4. Challenge

They are easy to remember with the acronym EPIC. These strategies are a means to help designers design and evaluate concepts for open-ended play. They are developed to accommodate the widest range of open-ended play actions and patterns possible. The strategies include all of the open-ended play patterns documented in this study when all four strategies are used. In the following section, each strategy will be presented with suggestions and examples of how to use it. These suggestions are only meant to help describe the strategy and are by no means are the only ways to incorporate the strategies into a design.

The focus of these strategies is on interaction design for open-ended play. Each strategy is applied to the design of both physical and digital interactions. Digital devices are becoming more and more a part of children’s environment. They will be absorbed as a contextual play cue and thrown into the open-ended play experience. “It's likely
that today's kids who are 'digital natives' -- meaning they've grown up with technology front and center in their life -- will make fewer distinctions between physical and digital toys, and see them equally” (Richardson, 2014, n.p.). When designing for open-ended play, ignoring digital interactions will only limit possibilities for open-ended play. The same is true of ignoring physical interactions. When only digital interactions are present, it is extremely difficult to design for open-ended play because they often exclude the possibility to build or restructure the play experience. This is essential to open-ended play. Therefore each strategy takes both of these types of interactions into account.

There are many ways each strategy can be incorporated into a design. Each strategy is defined by an inclusive and exclusive aspect. The inclusive aspect is what should be done and is intentionally vague to keep the possibilities open. The exclusive aspect is specific about what cannot be done and defines limits for that strategy. Both aspects of each strategy must be followed to engage it.

An open-ended play experience can still be encouraged even when ignoring some of the strategies. However, it cannot be encouraged or designed for if rules are predefined or the possibility to build or restructure play is absent. This goes against the very definition of open-ended play. “Do not define rules” is the exclusive aspect of fourth design strategy. While it is possible to ignore this strategy, this aspect of it cannot be ignored. Ignoring any of the strategies limits the open-ended play experience being designed for by blocking the patterns and actions that strategy encourages.

At the end of each section detailing a strategy there is a strategy sheet. Each strategy sheet includes what the strategy is, what types of open-ended play it encourages, a description of how to use it and examples from the research. There are also three examples of current products that use the strategy; one physical interaction example, one digital interaction example and one example that incorporates both physical and digital interactions. The strategy sheets serve as a quick reference guide to each strategy and can be used as a design resource.
Encompass: Integrate Surroundings, Do Not Close the System

Encompassing is about integrating the child’s surroundings into the open-ended play experience. This can be accomplished by designing physical interactions that include common household objects or digital interactions that use sensors as the interface. F3P3 used a paperclip, two different chairs, a stuffed animal and the figure from the cultural probe to create a narrative. Her surroundings, specifically the two chairs, were used as the setting for her narrative. It is therefore important to keep in mind that when designing for open-ended play, whatever the output is will be a part of a system the child creates. It also opens up the play experience to the building and restructuring phase because it is possible to include other play patterns and actions. This perhaps makes it the single most important strategy for designing for open-ended play.
Figure 12. Patterns of Open-Ended Play Encouraged by Encompass
Table 6. Types of Open-Ended Play Encouraged by Encompass

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<th>Open-Ended Play</th>
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<th>Play with the Arts</th>
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<td>Construction Play</td>
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<td>Imaginative Play</td>
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<td>Dramatic Play</td>
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<td>Object Play</td>
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<td>Locomotor Play</td>
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<td>Rough-and-Tumble Play</td>
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<td>Rebellious Play</td>
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Physical interactions can include common household objects and use low tech materials (such as paper, wood and stone) that are readily available to accomplish this strategy (Eisenberg & Eisenberg, 1998). Examples from the research include chairs, cushions, blankets, boxes, paper and cardboard tubes. Toobalink (Figure 12), by Metre
Ideas and Design, is a toy system that successfully uses this strategy by creating a system that includes cardboard tubes for constructing (http://www.toobalink.com). Toobalink encourages open-ended play by allowing the user to incorporate their surroundings to define their play experience.

Figure 13. Toobalink (http://inventorspot.com/files/images/toobalink_parts.img_assist_custom.jpg) and (http://www.scientificsonline.com/media/catalog/product/cache/2/image/9df78eab33525d08d6e5fb8d27136e95/3/1/3153201d.jpg)

It is also possible to include common household objects and low-tech material with digital interactions. Eisenberg and Eisenberg call this mixing “middle tech” and it is a powerful way to encourage open-ended play with digital media (Eisenberg & Eisenberg, 1998). To do this the digital interactions must consider the device as one of several contextual play cues to the open-ended play experience and not a completely closed off system. Drawnimal (Figure 17) takes steps in doing this by encouraging the child to draw part of what is on the screen (http://www.yatatoy.com). This is a small step towards less reliance on the screen because it does not confine the whole play experience to the device.

Using more interface possibilities for digital devices besides graphical user interfaces (GUIs) is a way to incorporate surroundings. Mobile media devices especially rely heavily on GUIs and touch screen technology, which tends to have very defined interactions. These devices also usually have many sensors that are used to automate certain responses but are not used for interfacing. For instance an accelerometer is often used simply to read the orientation or position of the device and is rarely used to interface with it. However, in IOS 7, Apple’s mobile operating system, shaking the device gives the user access to the “undo” menu. (https://developer.apple.
Even though this is still a very defined interaction it does use motion as means to interact with the device.

Using sensors to interface with a digital device is one way to incorporate surroundings. This can bring the physical world closer to the digital world allowing the interactions to extend beyond the device. Helicopter Taxi (Figure 13) is an app from Toca Boca that uses the device’s camera to make the surroundings into a background/platform for the game (http://tocaboca.com/game/helicopter-taxi). This is known as augmented reality. According to The New Media Consortium, “Augmented reality refers to the layering of information over a view or representation of the normal world, offering users the ability to access place-based information in ways that are compellingly intuitive” (The horizon report 2011, 2011, p. 5). Augmented reality is only one way to incorporate surroundings. Bluebrain (Figure 20) also does this by using location sensors (http://bluebrainmusic.blogspot.com). However, it is accomplished, digital interactions must extend beyond the device for it to incorporate surroundings.

![Figure 14. Helicopter Taxi (http://media.tocaboca.com/2011/06/characters_and_helicopter.png) and (http://tocaboca.com/game/helicopter-taxi/)](image)

Encompassing is about how to incorporate a design into the child’s context. This is the only strategy of the four that specifically encourages the building and restructuring phase of open-ended play and is the most important for that reason. The patterns that this strategy encourages are experimenting leading to constructing and repurposing leading to constructing and narrating. It will also lead to social play when combined with the third and fourth strategies. Even if the design is its own system, such as LEGO, in
open-ended play, a child will still incorporate other objects and contextual play cues from his/her environment to be a part of that system. When designing for open-ended play, the end product is really only a part of a system that the child will ultimately create. Therefore it is important to allow for and leverage the contextual play cues that are a part of the child's surroundings.
Encompass
This encourages building and restructuring play.

Example
Emma was playing with her action figure in the living room. To her it was no longer the living room, but the wild west where under the coffee table was the bank and behind the couch was the outlaw hideout.

How?
This can be accomplished by designing physical interactions that include common household objects or digital interactions that use sensors as the interface.

Types of Play Encouraged
- Construction Play
- Exploratory Play
- Social Play (When combined with Immerse and Challenge)

Physical Interaction
- Toobalink
  By Metre Ideas and Design
  Toobalink is a toy system that successfully uses this strategy by creating a system that includes cardboard tubes for constructing.
  http://www.toobalink.com

- littleBits
  By littleBits Electronics
  LittleBits is a system of tiny circuits that connect to each other through magnets and encourages the use of house hold items and LEGOs.
  http://littlebits.cc

- Helicopter Taxi
  By Toca Boca
  Helicopter Taxi uses augmented reality to include the environment into the app.
  http://tocaboca.com

Provide: Design Ambiguous Interactions and Forms, Do Not Define Use or Subject

Provide possibilities for open-ended play by designing ambiguous interactions and forms. This can be accomplished by refraining from defining the use or purpose of an interaction or the subject matter of a form. This strategy creates several possibilities for structuring. In the case of open-ended play, the more action possibilities that can be perceived by the child the more open the play experience will be. This was demonstrated in the data by the different ways the participants used the handle cut out on the box in the cultural probes. Even though the handle is intended as a means to carry the box, it was instead used as a way to tip and shuffle the box or look through it (Figure 8). The interactions for the handle were ambiguous because they afforded several possibilities and therefore resulted in different structuring actions. The same thing could be said of the form of the cardboard box. It was ambiguous enough for F8P1 to repurpose it as a turtle shell. Ambiguous interactions and form are part of what create possibilities for open-ended play.
Figure 16. Patterns of Open-Ended Play Encouraged by Provide
## Table 7. Types of Open-Ended Play Encouraged by Provide

<table>
<thead>
<tr>
<th>Open-Ended Play</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Creative play</strong></td>
<td>Play with the Arts</td>
</tr>
<tr>
<td></td>
<td>Construction Play</td>
</tr>
<tr>
<td></td>
<td>Dramatic Play</td>
</tr>
<tr>
<td><strong>Imaginative Play</strong></td>
<td>Role Play</td>
</tr>
<tr>
<td><strong>Object Play</strong></td>
<td>Symbolic Play</td>
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<tr>
<td></td>
<td>Mastery Play</td>
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<tr>
<td></td>
<td>Sensory Play</td>
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<tr>
<td></td>
<td>Risk-taking play</td>
</tr>
<tr>
<td></td>
<td>Small-motor Play</td>
</tr>
<tr>
<td><strong>Locomotor Play</strong></td>
<td>Large-motor play</td>
</tr>
<tr>
<td></td>
<td>Rough-and-Tumble Play</td>
</tr>
<tr>
<td><strong>Social Play</strong></td>
<td>Rules-based Play</td>
</tr>
<tr>
<td></td>
<td>Cooperative Play</td>
</tr>
<tr>
<td></td>
<td>Competitive Play</td>
</tr>
<tr>
<td></td>
<td>Rebellious Play</td>
</tr>
</tbody>
</table>

An ambiguous form is one that does not represent something else or is abstract. This is what drives resemblance and allows the child to determine what the form will represent or how to interact with it. While it is possible for a child to ignore the intended
subject matter of objects to repurpose them, resemblance is more commonly used with ambiguous, abstract or simple forms.

Designing ambiguous physical forms is as simple as making something abstract or so simple that it isn’t connected to a specific use or subject matter, such as a stick. In this case, it is a matter of less design. Another way is to create an object where the form can be changed (such as clay) or system that can be assembled in a variety of ways. LEGOs are an example of the latter. LEGO (Figure 15) is a toy system of plastic parts that can be assembled in a variety of ways. While some LEGO parts are becoming more specialized (Such as Batman LEGO) the base bricks are very simple shapes that allow them to be combined in a variety of different ways to represent different things (http://www.lego.com). In many cases, ambiguous forms lead to a variety of interaction possibilities. This can be observed within the LEGO system itself, where the more specialized parts offer more interaction possibilities than the base bricks. This further illustrates the connection between Interactions and forms.


This seems to be counterintuitive when designing for interactions for digital platforms, but there are at least two possible ways this can be accomplished. (1) The first is to use low resolution or ambiguous graphics and shapes. Minecraft (Figure 16) is an excellent example of using this strategy. Minecraft is an open world game created out of blocks that can be repurposed to create structures within the game (https://minecraft.net). The use of lower resolution graphics allows for the self-
populating open world’s AI. It also allows for the repurposing of the blocks within the virtual environment.

Figure 18. Minecraft (http://www.oyunhocam.com/wp-content/uploads/2014/05/minecraft.png) and (http://bombapps.com/cool-minecraft-picture-gallery)

(2) The second strategy is to purposely leave out information so that the user fills it in their self. Drawnimal (Figure 17) is a mobile media device app that uses this strategy as a means to teach the alphabet. In Drawnimal the user places the device on paper and is given instructions to draw around the device completing an animal that is animated on the screen (http://www.yatatoy.com). Drawnimal does not encourage open-ended play because provides directions on how to draw the rest of the animal. However, it is possible for the user to deviate from the instructions by embellishing the drawing. This allows the user the opportunity to imagine what is not on the screen and create an open-ended play experience.

Figure 19. Drawinimal (http://static1.actualidadipad.com/wp-content/uploads/2014/03/Drawnimal.jpg) and (http://changinglinesblog.files.wordpress.com/2013/04/lion.jpg)
An ambiguous interaction doesn’t serve a clear purpose and can be interpreted or acted upon in several ways. Gaver, Beaver, and Benford (2003) see it as means to “encourage close personal engagement with systems” (p.233). “Allowing this ambiguity to be reflected in design has several advantages. Most importantly, it allows designers to engage users with issues without constraining how they respond” (Gaver et al., 2003, p. 233). Instead of communicating an appropriate behavior such as Norman’s (2013) signifiers do an ambiguous interaction leaves that to interpretation. Ambiguous interactions drive the flexibility and open-ness of contextual play cues.

The idea of creating an ambiguous interaction is counterintuitive in interaction design (Gaver et al., 2003). Generally, the designer tries to be as clear as possible how to use an artifact and what the results will be when it is interacted with in certain way. Physical interactions tend to be more open to interpretation than digital interactions. For example, the handle of a coffee mug can be perceived as a means to hold it, but it can also be used to look through. On the other hand, clicking on a “next” button on a webpage will go to the next webpage and does not afford any other interactions. Digital interactions tend to be very defined. This is possibly part of the reason open-ended play is not designed for as often on digital devices and also possibly one of the reasons why the participants did not use digital devices for open-ended play as often. Defined or highly structured interactions do not let the child structure their own experience. Despite this, it is important that ambiguous interactions are consistent so that the child is able to reliably structure their own play experience. It is just as important to create ambiguous interactions in digital media as it is in physical objects when encouraging open-ended play.

Designing ambiguous physical interactions is in a way creating signifiers that can be interpreted in several different ways or affordances that allow several different interactions. The example of the coffee cup handle is a signifier that can be interpreted in several different ways. LEGO’s are also an example of ambiguous physical interactions because each piece can interact with the others in several ways. This makes the LEGO system flexible and allows it to create open-ended play experiences.

Designing ambiguous digital interactions is more difficult because digital interactions are often clearly defined. However, Minecraft accomplishes this by creating
several interaction possibilities with the blocks in the game. Another way to accomplish this is to break the reliance on a graphical user interface by using sensors. Sensors can be used to create several interaction possibilities with the device itself. This is perhaps the best way to design ambiguous digital interactions because it also offers possibilities to use the first design strategy.

Providing possibilities is the next most important strategy. It is based on the most common structuring patterns, which are initiated by resemblances and affordances and encourages the structuring actions of repurposing, creating and experimenting. In the research, affordances were the most common contextual play cues that children would use to initiate a play action. Those structuring actions were usually experimenting and creating. In many cases open-ended play experiences started with these patterns. When children perceive different affordances to structure their play, they are answering the questions, “What can I do with this?” and, “How does it work?” This usually happens naturally when there is less definition and the contextual play cue is more ambiguous than it is defined. Many times the form affords certain interactions. This strategy considers interactions and forms together because they are often inseparable for this reason. Designing ambiguous interactions and forms can create several play action possibilities. This strategy encourages creative play, exploratory play, and symbolic play.
Provide

This creates possibilities and allows the child to design their own experience.

<table>
<thead>
<tr>
<th>Example</th>
<th>How?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emma used a keyboard as a cash register when she played “Store.” Although a keyboard has a very specific use, Emma associated the function of the keys to the keys of a cash register and repurposed the keyboard as such.</td>
<td>This can be accomplished by leaving affordances to be interpreted and adding as many interaction points as possible.</td>
</tr>
</tbody>
</table>

Types of Play Encouraged

- Creative Play
- Exploratory Play
- Symbolic Play

Physical Interaction

- LEGO
  - By The LEGO Group
  - LEGO is a toy system of plastic parts that can be assembled in a variety of ways. This leaves interactions open and encourages building.
  - http://www.lego.com

- Sifteo Cubes
  - By Sifteo
  - Sifteo Cubes are a platform of devices that are used for tactile and digital games. The simple form and near field communication creates open interactions.
  - https://www.sifteo.com

- Minecraft
  - By Notch Development
  - Minecraft is an open world game created out of blocks that can be repurposed to create. The low resolution graphics and blocks keep interactions open.
  - https://minecraft.net

Figure 20. Provide Strategy Sheet (http://shop.legoeducation.com/Resources/Files/product-images/Demo%20images%20(ST)/9384_Prod_02.JPG), (http://image.knewone.com/photos/2445a148349463ceae3e9e39a5da146a.png!small) and (http://www.oyunhocam.com/wp-content/uploads/2014/05/minecraft.png)
Immerse: Create an Environment, Do Not Define Context or Scenario.

Immersing the child in the open-ended play experience is about creating an environment. This can be accomplished by defining a space physically or through sensors and feedback from a digital device. Context or scenario cannot be defined when using this strategy. An environment triggers the creation of a scenario that is a part of narrative and role play actions. Spaces that are larger than the participant were the most used space contextual play cue and overwhelmingly led to role play. The best example of this is a cardboard box. In the research, cardboard boxes were used as houses, cars, spaceships or caves. All of these examples where a part of the participants’ narrative or role play actions.
Figure 21. Patterns of Open-Ended Play Encouraged by Immerse
An environment can be created physically by defining a space. This can be as simple as drawing a large square in sidewalk chalk or as complex as soft play environments. Soft play environments (Figure 19) are an assortment of soft shapes and mats that can be arranged into different environments.

<table>
<thead>
<tr>
<th>Open-Ended Play</th>
<th>Creative play</th>
<th>Imaginative Play</th>
<th>Object Play</th>
<th>Exploratory Play</th>
<th>Locomotor Play</th>
<th>Social Play</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Play with the Arts</td>
<td>Dramatic Play</td>
<td>Symbolic Play</td>
<td>Mastery Play</td>
<td>Sensory Play</td>
<td>Risk-taking play</td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td>Rebellious Play</td>
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</tbody>
</table>
The size of soft play environments allows them to define a space and create an environment. They do not define a context or scenario because the shapes are not representational and can be arranged.

Creating an environment digitally is not as simple as it is physically. One way to do this digitally is through use of sound and sensors. For instance, it is possible for a tablet to start making a dripping sound when the light sensor senses less light. This could suggest an environment that could be a cave or rain on a cloudy day. Bluebrain (Figure 20) is a Washington D.C. based artist duo that creates location aware music albums (http://bluebrainmusic.blogspot.com). These albums are set up as an app that reads your location within a certain area such as the National Mall in Washington D.C. and changes the music to describe or even enhance the listener’s surroundings. While this isn’t an example of open-ended play it does show how sound can help create an environment.
Virtual environments are commonly used in videogames. However, they cannot offer an open-ended play experience because they are too defined and run on devices that do not immerse the user. It is possible to create an environment using augmented reality, virtual reality or even projectors. However, these media must not define context or scenario and must be readily available to children to create an open-ended play experience.

Immersion is based on the open-ended play patterns where space encourages narrating and role play. Role play often leads to cooperative social play and this strategy will encourage this pattern indirectly. When children are placed in a defined space, it causes them to focus on themselves in relation to the space. This causes some introspection. One can imagine the child asking his/her self, “Who am I?” or “Who do I want to be?” The contextual play cue of space often leads to role play because of its relationship to the child, especially if the space is larger than the child. There might be a threshold where a space is too much larger than a child and they no longer acknowledge that relationship. Either way role play can be encouraged by creating an environment. It is important not to define what a space is, but rather define the space and let the child decide what it is. An environment can also be created by offering cues that suggest it. The more possibilities for that environment the more open-ended the play experience will be. Creating an environment is about immersing the child in an experience. This is important because it encourages dramatic play, role play and cooperative social play.
**Immerse**

This encourages the creation of scenarios and narratives.

**Example**
Ethan used a box to create a car. The inside of the box allowed him to sit in it and imagine that he is driving the car. Space is what triggered his role play as a racecar driver.

**How?**
This can be accomplished by physically defining a space or through sensors and feedback from a digital device.

---

**Types of Play Encouraged**

- [Dramatic Play](http://www.specialneedstoys.com)
- [Role Play](http://www.moff.mobi)
- [Cooperative Play](http://bluebrainmusic.blogspot.com) (When combined with Encompass)

---

**Soft Play Environments**
By (Various)

Soft play environments are systems of large soft shapes that can be arranged to create a play environment.

[Link](http://www.specialneedstoys.com)

**Moff**
By Moff

Moff is a wearable smart toy that creates an environment through sounds that it plays when moved.

[Link](http://www.moff.mobi)

**National Mall**
By Bluebrain

National Mall is a music album that uses location to create an environment with the music.

[Link](http://bluebrainmusic.blogspot.com)

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Challenge: Present Challenges, Do Not Define Rules

Presenting challenges is a part of creating a rule based game but it is also important for open-ended play. However, this can be more difficult than for game design because it must be done without defining rules. Two ways to accomplish this are to create difficult interactions and to measure or record actions. Presenting challenges is a way to encourage children to use their personal abilities to test themselves or create. These patterns are important because they are connected to a sense of pride and accomplishment. For example, the gap between two couches was enough to present a challenge to F6P1. He tested his abilities by jumping from one couch to the other and exclaiming, “Daddy, I can hop from couch to couch!” He clearly wanted his accomplishment to be known. Locomotor and creative play are encouraged by incorporating this strategy into designs.
Figure 25. Patterns of Open-Ended Play Encouraged by Challenge
Objects present challenges through the physical interactions they create. Even something as simple as a ball presents the challenges of how far can it be thrown, bounced or caught. One way to present challenges in physical media is to create difficult interactions. A Yo-yo (Figure 22) presents difficult interactions that require skill
to work and perform tricks. It is possible to present challenges in physical media by measuring and recording but it often needs to be accompanied by set of rules making it unsuitable for open-ended play. For example, a target can measure accuracy and record the result. However this measurement is usually based on rules such as a consistent distance from the target and tool used for shooting. This makes creating difficult interactions, a more suitable way to present challenges in physical media.

![Figure 26. Yo Yos](http://museum.nationalyoyo.org/files/2013/10/2013USN-1A-Champion-YoYo-Gentry-Stein-1024x941.jpg) and (http://sonoma.towns.pressdemocrat.com/files/2013/03/1yoyo.jpg)

It is better to present challenges in digital media by measuring and recording actions. This is something that digital devices can do on a level that physical objects cannot. Think of measuring and recording time, distance, motion or even sound. Digital media also offers the opportunity to not only present the challenge but to also scale the challenge and create goals. Doing this presents challenges for a child, but it also allows them to see how their skills have developed which can give the child a sense of accomplishment. Mobile media devices in particular are very capable of this because of the sensors they include. NikeFuel (Figure 23), by Nike, is an example of presenting challenges through measuring outcomes and tracking changes (https://secure-nikeplus.nike.com/plus/what_is_fuel/). NikeFuel is software that measures physical activity through devices such as a watch, wristband or smartphone.
The results are displayed online or thorough an app and can be used to set goals or compete against others. This has become common in digital media but it is not often present in play without rules. Measuring and recording is one way to present challenges with digital media, however they must be presented without rules to encourage open-ended play.

Presenting challenges is about allowing the child to test and express their personal abilities. The personal abilities of the child are an important contextual play cue that often primes them to testing these abilities or creating. These patterns happen any time a child tries to see how fast he/she can run, how high he/she can jump or how well he/she can draw. This is often the response to the question, “What can I do?” and is usually attached to a sense of pride and accomplishment. This strategy is also likely to encourage competitive social play initiated by testing self, though it encourages this pattern indirectly. While the designer has no control over what the abilities of the child are, it is possible to design for these patterns by presenting challenges. This is important because it encourages locomotor play, mastery play, creative play and competitive social play.
Figure 28. Challenge Strategy Sheet (http://museum.nationalyoyo.org/files/2013/10/2013USN-1A-Champion-YoYo-Gentry-Stein-1024x941.jpg), (http://www.pushstartcreative.com/blog/wp-content/uploads/2013/08/PS_Gaming_Outdoors_Loop_02.jpg) and (https://lh5.ggpht.com/CMOzbZbtRJT1ZvNwtoSanBstknLHfiy3yA7v6dStlf9BLvE5y7OhuDQpLx1oOFpBA=h900)
Strategy Combinations and Emphasis

Each strategy was created from a series of common patterns observed in open-ended play and it is expected that following these strategies will support those patterns. Since open-ended play is not just one pattern but a combination of patterns, the same is valid for the strategies as well. By combining these strategies, it is possible for the designer to encourage richer and more complex open-ended play experiences.

It is possible to design for an open-ended play experience with just one of these strategies. For example, an action figure can incorporate the child's surroundings (although it doesn’t encourage it) such as it did for F3P3 therefore satisfying the first strategy (Encompass). However, since the action figure defines the subject matter, it severely limits the narratives the child might create with it. This might be part of the reason children lose interest with such toys after a short period of time. It is important to follow as many of these strategies as possible when designing for open-ended play because it allows for more contextual play cues and actions for structuring play.

Each of the interaction design strategies for open-ended play are important for different reasons and some are more effective for encouraging certain types of play. There are cases where it may not be possible for a designer to follow all of these strategies or the designer may want to focus on certain types of open-ended play as a part of a brand strategy. For example, if the designer of the action figure in the example above knows that the subject matter will limit narrating possibilities, he/she can use the third strategy (Immerse) to provide more. If a designer needed to create a concept for a brand that encourages active competitive play, he/she might want to focus more on presenting challenges (fourth strategy). If the brand was focused on imaginative social play instead, the designer should combine the second and third strategies.

Understanding the differences of the strategies and what types of open-ended play they enable can help the designer deal with constraints and follow brand strategy when designing for open-ended play.

Immersing (third strategy) and challenging (fourth strategy) only indirectly encourage social play. None of the strategies directly engage patterns that encourage social-play. This is because the patterns that encourage social play are reliant on
another person as a very specific contextual play cue. Incorporating surroundings (first strategy) should allow for the inclusion of another player but it does not engage the patterns of actions that lead to social play. Therefore to directly encourage social play the first strategy should be combined with the third or fourth strategy. Overall it is best to include as many of the strategies as possible.

**Discussion**

The data from this study indicates patterns in how children used contextual play cues to structure open-ended play. It also shows patterns in how children restructured and built off previous play actions. These patterns fall under the categories of structuring patterns and building/restructuring patterns.

The major research question this study set out to answer is “how do you design for open-ended play, especially with digital media?” The four strategies for interaction design for open-ended play are the answer to this research question. They are EPIC 1) Encompass 2) Provide 3) Immerse and 4) Challenge. These strategies were developed from the patterns indicated by the data from the studies and are meant as a guide for the design and evaluation of products, services and systems that encourage open-ended play. Each of these strategies are summarized in a strategy sheet. The strategy sheets are a resource for designers to use as a quick reference when designing for open-ended play.

Richardson (2010) describes four “Secrets” to foster creative children in an article for Fast Company that are very much design strategies for play. Two of these “secrets”, flexible tools and open environments, are parallel to the second and third design strategies in this study. This makes sense because designing for open-ended play has the same goals as Richardson in that it puts children in the creative role and they become designers of their play experience.

This study concludes that less definition in objects (second strategy) can create more possibilities for open-ended play and that space is a powerful contextual play cue in encouraging imaginative play (third strategy). Mcloyd (1983) finds that structure (definition) actually encourages some types of pretend play (imaginary play). However,
Mcloyd (1983) uses two different scenarios to test this theory. One scenario uses less structure but does not include a space contextual play cue and the other uses more structure and does use the space contextual play cue. Mcloyd (1983) was not tracking the space contextual play cue and it is possible that it was the larger cause of encouraging pretend play and not structure.

Bergen (2001) on the other hand finds a negligible difference between talking toys and the same toys without an electronic talking feature. This may seem contradictory to this study’s findings because this shows that more definition doesn’t change the outcome of play. However, both of the toys in the study already had defined subject matter, which doesn’t address the effectiveness of the second strategy. Bergen did find that the difference was negligible because it was a short time before the children became board of the talking feature and created their own dialog. In fact Bergen (2001) goes on to mention that the inclusion of other players created the most diverse play dialogs with the toys thus confirming the first strategy’s effectiveness.

Seitenger and Sylvan (2006) found that simpler designs were more effective in creating more play activities. Bekker, Sturm et al. (2010) also conclude this but mention that too many possibilities can be overwhelming and perhaps hamper the number of play activities. They go on to say that abstract shapes should be balanced by clear interaction possibilities.

Design for open-ended play is difficult because the child is in control of the play experience and not the designer. This is especially difficult when it comes to the design of digital interactions because they are constricted by the interface allowed by the device they are on. Mobile media devices offer more and more ways to interface, opening up new possibilities for open-ended play on digital platforms. Unfortunately play on digital platforms remains too defined to effectively contribute to open-ended play experiences. The interaction design strategies for open-ended play are important because they provide ways to design for open-ended play without defining it. They can be applied to the design of physical and digital interactions, which will be important for the future of design for open-ended play as digital interactions become more complex and tangible or in a sense more like physical interactions.
Applying Strategies

The following section provides an example concept of an app that encourages open-ended play and how it was created using the interaction design strategies. An app was chosen as an example because it is very difficult to design for to encourage open-ended play and there are no known apps that satisfy all four strategies. The strategies can also be used as criteria to evaluate concepts and competitive products.

**Ideation.** The ideation phase for an open-ended play app started with concept generation focused around new ways to use sensors in a mobile media device. This was a way to incorporate the first and most important strategy (Encompass) into the design and was viewed as a solid starting point. All of the concepts incorporated the other three strategies while keeping this one in mind (Figure 25).
Evaluation. Each concept was evaluated according to how many strategies it used. According to this evaluation none of them incorporated all four strategies. However, it was possible to combine several of them into one app concept (Table 6).

| Refined Concept. | The refined concept is a combination of several of the initial concepts. Together they satisfy all four of the design strategies for open-ended play. This app is focused on allowing the user to add and combine different roles. Three roles are presented but there are the possibilities for many roles. These roles are based on the research data.

The pirate role (Figure 26) puts the user in the role of sailing a ship. It shows the open sea as a backdrop for role play and encourages users to physically create their own pirate ship. A mobile device is used to “move” the ship. The accelerometer and location of a mobile device are used to pan the horizon for landmarks and essentially steer, while blowing into the microphone moves the ship in that direction. These

Table 10. Concept Evaluation

<table>
<thead>
<tr>
<th>X-Ray</th>
<th>Airplane</th>
<th>Playtime Background</th>
<th>AR Building</th>
<th>iPchyderm</th>
<th>Lantern</th>
<th>Drawbridge</th>
<th>AR Builder 2</th>
<th>Aircraft Carrier</th>
<th>Draw/Animate</th>
<th>Treasure Hunter</th>
<th>Pirate</th>
<th>Insect Pinboard</th>
<th>Driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
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<td>X</td>
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landmarks are only suggestions such as islands, other ships or sea monsters. They are kept open to allow the user to imagine what happens when they are encountered. With an additional player, one user can steer the ship while the other moves it.

Figure 30. Pirate Role

The driver role (Figure 27) puts the user in the seat of a car. The louder the user makes noise, the faster the car goes. The mobile media device shows scenery passing by and a speedometer to show how fast the user is going. The user can race against other players and see their car on the road. There are purposely no goals or end time when racing and was included in the concept as an open form of competition.
The explorer role (Figure 28) uses the mobile media device as an interactive map that can be created during the open-ended play experience. The interactive map encourages the user to imagine what is discovered while exploring by shading out parts of the map. These parts of the map are revealed as the user adds paths, instructions, drawings and descriptions. It is also possible for the user to add pictures and interactions that can be revealed depending on location. The interactive map can create an environment by adding sounds depending on the descriptions added on the map or make it hard to see the map in low light. The map that the user creates can be saved, continued or shared. When the map is shared with another player, that person must follow the map and can receive cues based on location and pictures.
All three of these roles incorporate surroundings in different ways through the use of sensors to interface with the device. In the pirate role, the location, accelerometer and microphone are used to steer the ship. The microphone determines speed in the driver role. The explorer role uses the light sensor, location and camera to include the surroundings of the user. These are ways this concept uses the first strategy.

The roles have a general theme but are kept vague to allow them to be combined and allow the user to repurpose them and imagine their own roles (Figure 29). The roles satisfy the second strategy by showing part of the role and only allowing certain interactions. This encourages the user to imagine the rest of the role and create
different role combinations that allow different interactions. This encourages the building and restructuring phase of open-ended play.

The third interaction design strategy was incorporated into the app in the explorer role. The explorer role can create an environment through location and the light sensor. For example, the device turns off the screen and adds dripping sounds to create a cave environment when the light sensor receives no light. This can also be tied to location and descriptions set by the user to initiate these interactions at the appropriate time.

The driver and explorer roles present challenges in different ways. The driver measures sound and presents it with a faster speed. This leads to a more competitive experience. The explorer role can save and share the map to record and present a challenge in a more cooperative experience. Both of these roles use the third strategy.

Several iterations are usually completed before a final concept is made. This concept only went through one iteration of refinement but it still illustrates how the strategies can be used in the design process. The strategies can be used as criteria for evaluating the concept as outlined above (Table 6). They can also be used to evaluate other products. The chart below (Table 7) shows an evaluation of the current product examples in this section including the devices that mix physical and digital interactions from the strategy sheets. Each strategy represents criteria and measures the
effectiveness of the product in promoting open-ended play, though not all of the examples are designed for open-ended play. The more strategies a given product follows, the more actions and patterns are available with that product and the more open-ended that play experience is likely to be.

Table 11. Competitive Product Analysis

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<tr>
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<th>Physical</th>
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<tr>
<td>LEGO</td>
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Benefits of Designing for Open-Ended Play

Not all designers of play are looking to create open-ended play experiences, but there are several benefits to consider by at least making a product, system or service for a play experience more open-ended. As mentioned earlier these strategies can be used to encourage a certain type of play that may be a part of a brand. For example, a brand that is about encouraging active play should employ the third strategy. Even when open-ended play is not necessary for a product, system or service, a broader range of play can enhance it. Encouraging a broader range of play can in turn encourage longer engagement time which brings more brand equity (Bekker, Hopma, et al., 2010).

Incorporating the child’s surroundings (first strategy) into a design adds value without adding cost by expanding it into a system. It does this by leveraging objects outside of what is initially designed and including it into that play system. LittleBits, by littleBits Electronics (http://littlebits.cc), is a system of tiny circuits that connect to each
other through magnets. LittleBits (Figure 30) are a great example of a system designed to encourage the use of contextual play cues outside of that system.


A recent inclusion into the littleBits system is a piece that allows LEGO s to be connected to littleBits. By doing this littleBits adds the value of LEGO s to its system without having to spend time, money and resources to develop its own building system. It also creates a specific focus and value to their product. This shows that design for open-ended play or at least more open play experiences can add value to a product, system or service.

**Limitations**

Four patterns observed in the studies were not included as part of the strategies due to their lack of recorded instances. Most of these patterns are inherent to the nature of one or more of the actions that are a part of it. For example, bargaining is often a part of cooperating and competing and both are encourage through bargaining. Also mentioned before, narrating is always a part of role play and it is very possible that all role play is encouraged by narrating. Rebellion is connected to competition in that it is a way of testing self against another person and is very likely encourage by testing self. There was also some indication that personal abilities encourage collecting/sorting.
A second limitation is that there were no clear patterns linked to location, time, influence and internal cues or exploring and collecting/sorting actions. They are therefore not a part of these strategies. Location, time, exploring and collecting/sorting are not addressed because there is not enough data to support a solid pattern from of these cues. There was a lot of data collected on influence but no direct connections could be made to any other action.

It seems likely that there is a pattern between influence and internal cues. For example a child may watch a Batman cartoon (media type of influence) and develop a preference (internal cue) for Batman, which in turn may lead the child structuring role play where he/she is Batman. This would be a unique pattern because it connects two contextual play cues. This may also explain why there is no direct connection between influence and any other action. There are a few exceptions where influences causes structuring actions directly such as when music influences dancing but these cases appear to be isolated and very specific. This connection may also be linked to exposure. “Tools of the Mind” makes sure that there is exposure for richer pretend play. This seems to validate the influence and internal cue connection. More research could be done to connect this study to how tools of the mind works (Bodrova & Leong, 2001). It is also possible that a more definitive pattern may emerge between influence and internal cues with more data.

It also seems likely that there could be a pattern between location and exploration. For instance, unfamiliar locations may encourage exploration. It would make sense that this pattern would not show up in the data because interviews and contextual inquiry were in familiar places. As mentioned in chapter 4, conducting more research in areas different areas may yield more data on location contextual play cues and show a pattern between them and exploration.

It is possible that there is a pattern between personal abilities (such as the ability to acquire and recognize) and collecting and sorting. This is also limited by the low amount of data gathered on collecting and sorting.

The design strategies were based off the patterns discovered in the data and are therefore limited to that data. In the presence of more data and new patterns, more strategies might emerge.
Summary

Common patterns in open-ended play were discovered based on the results from the previous chapter. These patterns show that there are ways to encourage open-ended play while still allowing children to structure their own play experience. Four interaction design strategies were developed to leverage these patterns in open-ended play. These strategies are a means for designers to design and evaluate products, services and systems for open-ended play.
CHAPTER 6. CONCLUSION

Contributions

Open-ended play is a very dynamic and ever-changing type of play. In open-ended play, the child is in control of his/her own play experience and this leads to the development of self-regulation and contributes to the wellbeing of the child (Diamond, 2012; Self-regulation you and your foster child, n.d.). This thesis identified several other types of play that are a part of open-ended play experiences which further illustrates the importance of this type of play.

Despite these benefits, open-ended play has been in decline in the United States over the past few decades (Chudacoff, 2011; Miller & Almon, 2009). The decline of open-ended play threatens the wellbeing of children and can have negative effects leading into adulthood (Moffitt et al., 2013). Design can be used as a means to solve this problem. However, open-ended play is constantly restructured and the child is in control of the experience making it difficult to design for.

This thesis mapped the entire open-ended play process supported with the data collected from twenty participants. A coding schema was developed to measure the range and frequency of contextual play cues and the actions they initiated in open-ended play. Patterns in open-ended play were then identified and tracked. This provided a clear picture of how children participate in open-ended play. Finally this understanding led to the development of four interaction design strategies for open-ended play.

These strategies are a means for designers to encourage open-ended play in the development of products, services and systems for children, which will result in contributing to their wellbeing. They can also be used by educators in creating curricula, to help the development of self-regulation in young children. Finally, parents can use these strategies as a means to encourage and participate in their child’s open-ended play experiences.
Future Research

Assessing the Efficacy of Interaction Design Strategies for Open-Ended Play

The strategies developed in this thesis are based solely on patterns of open-ended play recorded in the data. A next step for these strategies would be to assess them in a controlled environment, with practicing and student designers. This would validate how successful they are in designing for open-ended play and the most common play actions that result from each strategy or combination. Measuring and comparing the length of engagement children experience might determine how much more engagement each strategy or combination produces. Case studies of designs and curriculum-based instructions on these strategies can also help determine their outcomes.

Investigating the Relationship Between Open-Ended Play and the Iterative Design Process

The open-ended play process closely resembles many iterative design processes. The connection between play and creative thinking is not a new subject. Brown (2008) from IDEO, a global design consultancy, talked on the subject of play and creativity in his TED talk, “Tales of Creativity and Play.” The similarities between the open-ended play process and iterative design process could change this discussion. Further research on the connection between the two may be beneficial to gaining insights into creative and innovative thinking and how to foster it in children or adults.

Exploring the Impact of Open-Ended Play on Affordance Theory

Open-ended play has some basis in affordances. Affordances seem to be how contextual play cues initiate play actions in open-ended play. The exception to this is pretend-play or make-believe play. In pretend play, the child seems to be receiving cues from both the environment and experience. Open-ended play seems to involve a
deeper mix of affordances that not only include interactions with environment but also imagined interactions that are assigned by the child. Even if an object does not afford an action, a child can, in essence, force that affordance through imagination. For instance, the figures supplied in the cultural probes did not afford moving limbs. However participants often created scenarios where their limbs would move such as waving or talking. Further research into how a child creates affordances with objects in open-ended play may add to the development and understanding of affordance theory.
APPENDIX A. RESEARCH MATERIALS

Interview Questions

(Questions for the interview will explore these three main areas, but are not limited to these specific questions and may change depending on what information is given during the interview.)

Demographic information and general questions

What are the ages of your child(ren)?
What is a routine daily life with the child(ren) like? Do you have a schedule of things to do, things to learn, etc.?
What are the kinds of games you engage in with the child(ren)?
How do you decide on what kinds of games you choose/purchase for your child(ren)?

Concerning Play without Mobile Media

What does your child(ren) spend the most time playing with? How?
Are there any discernable patterns or common themes in your child(ren)’s play?
What kind of creative activities does your child(ren) pursue?
What does your child(ren) play with that isn’t originally “intended” to be played with? (for example a cardboard box can be used as a house for a doll)
Describe some things that your child(ren) has/have done with a cardboard box.

Concerning Use of Mobile Media

What does your child(ren) spend the most time doing on mobile media?
How does your child(ren) play with or use mobile media in a way that it is not “intended” to be used? (for example I use my phone screen to light my way in the dark sometimes)
Do you restrict your child(ren)’s use of mobile media? Why or why not?
Do you or your child(ren) find DIY projects of activities on the Internet?
Does your child(ren) ever multitask while using mobile media? (for example they could watch Netflix on a tablet while playing with LEGO$s$) What combinations of tasks do they do?

**Cultural Probe Content and Instructions**

Contents

Figure
LEGO$s$
Crayons
Paper
Cardboard Box

Activities

The following activities must be done within the next two weeks. They can be done in any order or combination. It should only take about a half hour each day. Your child(ren) can do more than what is listed here and even come up with their own activities.

To record the activities you or your child(ren) will need a digital camera and the ability to email the results of the researcher. In some cases it might be easier to voice record information instead of writing it. This can be easily done with most tablets or smartphones. Please email any digital submissions to [omit] when completed.

If you do not have access to these devices or prefer to use non-electronic media, the PI will make the appropriate adjustments to your package. Please email the researcher at [omit] or call at [omit] to arrange for the submissions to be picked up.
Thank you for your time. Please let the researcher know what activities your child(ren) do not want to do and why. This is still usable information for the study. If you have any questions feel free to contact the researcher at [omit]

Day 1

1. Take a picture of the figure doing something. Describe what they are doing? Why are they doing it?
2. Draw the best toy ever! You can use the crayons in the kit or a smartphone or tablet. Take a picture or a screen shot of it. Describe it? What can it do?

Write or record your descriptions and email them with your pictures to [omit].

Day 2

1. Take a picture of the figure doing something. Describe what they are doing? Why are they doing it?
2. Build something with the LEGO®s and take a picture of it. What is it? How did you decide to make it?

Write or record your descriptions and email them with your pictures to [omit].

Day 3

1. Take a picture of the figure doing something. Describe what they are doing? Why are they doing it?
2. What did you do on mobile media today? Did you watch a movie or play a game. Send a screenshot of your favorite part? Describe what you liked about it. (If you do not have access to mobile media, you may skip this activity)

Write or record your descriptions and email them with your pictures to [omit].

Day 4

1. Take a picture of the figure doing something. Describe what they are doing? Why are they doing it?
2. What toy/book/game (not on a smartphone or tablet) did you use today? Take a picture of it where you were playing with/or reading it.

Write or record your descriptions and email them with your pictures to [omit].

Day 5

1. Use the figure and one of your toys to create a story. Take five pictures and describe how the story unfolds in each picture.

Day 6

1. Do something fun with the cardboard box. Take a picture of it and describe what it is.

Activity Book

All text for in the activity book is the same as the instructions above.
The activities must be done within the next two weeks. They can be done in any order or combination. It should only take about a half hour each day. You can do more than what is listed here and even come up with your own activities.

Please email any digital submissions to when completed.

Please email the researcher at or call at to arrange for the submissions to be picked up.

Figure 35. Activity Book Front and Back Cover
Draw the best toy ever! You can use the crayons in the kit or a smartphone or tablet. Take a picture or a screen shot of it. Describe it? What can it do?
Take a picture of the figure doing something. Describe what they are doing?
Why are they doing it?
What did you do on mobile media today? Did you watch a movie or play a game.
Send a screenshot of your favorite part? Describe what you liked about it. (If you
do not have access to mobile media, you may skip this activity)
What toy/book/game (not on a smartphone or tablet) did you use today? Take a picture of it where you were playing with/or reading it.

Do something fun with the cardboard box. Take a picture of it and describe what it is.
Use the figure and one of your toys to create a story. Take five pictures and describe how the story unfolds in each picture.

Figure 44. Activity Book p.9 and p.10
APPENDIX B. OBSERVATION NOTES

Family 1

F1P1 is a six year old girl that lives with both parents. She has a newborn baby brother. Her mom runs a daycare so she is used to playing and sharing with other children. She is pretty shy and doesn’t say much during the contextual inquiry.

She shows the researcher the toy room that they have and points out Mr. Potato Head as her favorite toy. Her mom seems surprised by this and mentions that she likes to draw on the easel more than anything. The toy room has several toys and various books and play sets, including a small table and chairs and a large dollhouse.

The researcher begins to interview her mom and shortly into the interview she starts to set up how she plays “store.” She pulls out a toy cash register and an old keyboard and sets them on the coffee table. She then pulls out a couple of toy strollers and parks them by the stairs to serve as shopping cars.

While she is doing that, the researcher interviews her mom some more and take a look at some of the board games they play.

F1P1 pulls out some brooms and a dust pan and places them in the corner because the store needs cleaning supplies. When she is done setting up she hands the researcher some toy money from various games and perhaps from a play set or two and motions for the researcher to start with a cart to go shopping.

The researcher starts picking up items around the living room and testing to see what is okay to buy or not. The researcher picks up a DVD and even venture to pick up the family Kindle that is on the couch to see if that was acceptable to play with. F1P1 shrugs to suggest that the researcher can buy the
Kindle in the “Store.” The researcher tries to buy the brooms and dustpan but F1P1 shakes her head to tell the researcher that those aren't for sale.

Mom then directs the researcher to the toy room, which is a part of the “Store.” The researcher picks out various toys and books. The researcher asks F1P1 what books are the best to get and she picks out a couple for me. After this it is time for the researcher to check out.

The researcher brings his “cart” with all the items the researcher picked up around to the coffee table where the register and keyboard are set up. F1P1 begins to scan my items with the bar code reader on the toy register. After each scan she types on the register and the keyboard before placing the item in a bag. She does this for each item and motions for my money. The researcher is not sure how much to give her, so the researcher tries to see if a plastic quarter is enough. It isn't so the researcher pays with the rest of the paper money that the researcher has. F1P1 accepts the money even for the Kindle and the researcher goes back to the stairs to pretend the researcher is leaving the “Store.”

At this point the researcher and participant are done playing store and the researcher ask to see what F1P1 uses the Kindle for. She starts playing various games on the Kindle and seems to be very engaged by not responding to her mom or the researcher too much. He mom mentions that this is not normal and that she just loaded a new game on the Kindle and that is why she is so engaged at the moment. Every once and a while F1P1 interjects on what her favorite games are and switches between a few games that she is playing.

After this the researcher introduces the activity packet and explains the contents. She chooses the Disney princess over the Marvel action hero for the packet.
Family 2

F2P1 is a six-year-old girl that lives with her mother and younger brother and sister. The contextual inquiry started when the researcher asked her what her favorite toys were. She went upstairs and brought down some fake jewels. Collecting glittery and miniature things was a theme for her. She also played two lines of a song on an upright piano in the corner of the living room.

F2P1, her mother and the researcher went upstairs to see her room. She showed the researcher more of her collection, which included a small tea set, small gourd, jewelry and ornaments. The room is shared with her two siblings. In the corner of the room were several beanbags that were larger than her. She showed the researcher what they like to do with the beanbags. She climbed the foot of her bed and did a somersault into the beanbags.

Not far from the beanbags, a tent was set up. In the middle of the tent was a tea set. F2P1 pointed out that one of the teacups was broken. F2P1 showed the researcher all the clothes and costumes that they had in a chest in the other corner of the room. She mentioned that they would often play “dress up.”

Just out side of their room by the stairwell was the toy room. In the toy room was blocks, a large window bench stacked full of stuffed animals, Barbies, a rack of movies and shelving with plastic bins full of craft stuff. After showing the researcher that her favorite stuffed animals were two small stuffed monkeys, the researcher and participant went downstairs to see what she used the iPad for.

When the researcher and participant got downstairs, her brother and sister were watching a TV show from PBS Kids on the family iPad. She took the iPad out of her brother’s hands and he immediately started crying. After her mother scolded her and calmed down her brother she showed the researcher her favorite apps on the iPad. They included various games and a drawing app. Her mother wanted her to show the researcher the Dot game because she liked the minimal interface to it.

We played tic-tac-toe on the iPad for a while and the researcher and participant drew a horse together on the drawing app. Mom set up a movie (Anastasia) for the family on the computer on the floor in the corner of the living room. The researcher
introduced the cultural probe and F2P1 picked the Disney princess over the Marvel action hero.

Her mother wanted the researcher to see Toca Hair Salon on the iPad before the researcher left. F2P1 showed the researcher how to color hair, cut it and grow it back again on that app. After that the researcher concluded the observation.

**Family 5**

This family consists of a mother, father and two boys. F5P1 is the oldest boy as six years old. His younger brother is four.

The researcher was invited down to the basement for the contextual inquiry. In one corner there was a train track playset and in another corner there was a drumset with puzzle mats underneath it. There are also two couches in the room and that is all. F5P1 and his brother were playing with LEGO's that were separated into plastic bins by the color of the pieces. Their mom admits that they have to put them away that way due to her “type A personality.”

For most of the inquiry F5P1 builds LEGO's with his brother. F5P1 would often stand up while talking and answering questions. After a while F5P1 shows us a firehouse that he made out of LEGO's. He mentions that he thought to make it because he found a piece that said “fire” on it and decided to make a firehouse. Part way into the inquiry F5P1 finds a football and starts playing catch with his brother till his parents tell them to stop. F5P1’s brother gets on the drums and plays for a little bit, till his parents tell him to stop. They continue to build with LEGO's after this.

The researcher then decides to observe F5P1 playing with a mobile media device. His mom goes up stairs to get the family iPad. When she brings it down F5P1 starts to play a game on the iPad. After a short while the researcher introduces the activity packet. During that introduction F5P1 and his brother rap “Ice, Ice, Baby” for the researcher then the researcher and participant have a discussion about Minecraft. The researcher continues to introduce the packet. F5P1 chose the Marvel action hero over the Disney princess. After that the researcher concludes the contextual inquiry.
Family 6

This family consists of two parents and 3 boys. F6P1 is the oldest of the three at age 5. The youngest is an infant.

The observation began in the living room. There were two couches and an entertainment center. To the right of the entertainment center was a Christmas tree and by the tree was plastic storage bins with toys. At first glance most of those toys were Little People. There were various other toys in plastic storage bins.

The researcher told F5P1 that he could play while the researcher and participant do the interview. He immediately started playing with some Angry Birds plush toys. Angry Birds turns out to be the subject of much of his play. F5P1 shows the researcher an Angry Birds Catapult toy that he launches his plush Angry Birds out of. He also had some plastic Angry Birds that were a part of the set that the catapult came with. After a little while, F5P1’s brother opens up a Sticky Hand and immediately throws it up at the ceiling. Dad gets it down for him and he throws it up on the ceiling again. F5P1 joins in doing this also with his own sticky hand. This appeared to be more testing the properties of the Sticky Hands than testing Dad though it was doing that too.

Later F5P1 shows the researcher the cards that come along with the Angry Birds set. They show how to build certain structures and which birds you get to use to knock them down. He said that he doesn’t follow that one but follows the more open cards that just tell you what blocks to use and how many. Dad mentions an Angry Birds book that F6P1 made. He finds it and lays it out in sequence for the researcher because it is on separate pieces of paper. He then describes the story for me.

When the researcher and participant start talking about boxes, F6P1 immediately tries to get into the toy box. His Dad tells him not to do that because there are toys in it. The researcher suggests that he can play with the box the researcher brought for the cultural probe. It is big enough for him to fit in. The box is lying on its side and F6P1 immediately crawls into the box and peeks out of it. His brother grabs the handle that is on the top and tips the box upright with F6P1 in it. They start laughing and do this a couple more times before F6P1’s brother asks for someone to do it for him.
After talking about what others things that get used as toys that aren’t supposed to be toys, F6P1 shows the researcher how he turns a counter height chair into a gunship by tipping it over and sitting in it with the legs pointing forward. Mom starts to close the box on F6P1’s brother and pretends that she is going to ship him off to their Grandmother. F6P1 asks if she would ship him off and it is clear that he wants to play also. Dad brings up a box that looks like a car and shows it to me. He had made it for the boys. F6P1 starts jumping from couch to couch until his Dad scolds him for it.

Dad then goes and gets an Angry Bird costume that he made for F6P1 out of a cardboard box. After that F6P1 finds his Angry Birds Telepods and shows the researcher how you play with them on the family iPad. He shows the researcher this for a while and is very focused on playing Angry Birds while the researcher interviews his parents. His Mom suggests he shows the researcher Monkey Splat on the Family Nook, so he does. The researcher then introduces the activity packet. Before the researcher leave, F6P1 shows the researcher a pamphlet of different Angry Birds products that he laminated.

**Family 7**

This family consists of a mother, father and F7P1 who is a 9-year-old girl. The mother was not present for the interview.

F7P1 started the observation by playing Minecraft on her Mom’s iPad. She is very distracted during the observation while she is playing on the iPad. Her Dad and the researcher repeat a lot of questions that she doesn’t seem to hear. She played on the iPad in a chair in the corner of the kitchen where she slowly started to sink lower into the chair.

After talking for a while about what F7P1 likes to do on the iPad she mentions that she likes Paper by 53 app. This is a drawing app that is free but you have to buy different digital brushes etc. She shows the researcher some of her favorite brushes and how she likes to draw and color in the app. She goes back to playing Minecraft but stops when she agrees to show the researcher some of her clay models. She climbs the stairs by taking 5, 4, 3, 2, and 1 stairs with each successive step.
She shows the researcher her models of food and planets made out of clay. The researcher and participant talk a little while about the toys that she plays with. F7P1 took the researcher up to her toy room. In her toy room there were many toys. There was a telescope box in the corner. Most notably was a large collection of Hot Wheels neatly lined up in two groups next to a plastic castle with slides. The castle is electric and when you push on a button on one of the towers or the flag on the other tower the mote of water spins and it plays music. She showed the researcher that she was in the middle of a game where she slides the Hot Wheels down the slides on the castle while it plays music. The cars that land right-side-up in the mote of water before the end of two songs get put in one group and the ones who don’t get put in another group. Sometimes she slides them down upside-down to see if they will land right-side-up. She also has cars that she calls “granted.” They get extra chances but it is uncertain why. It seems that these are her favorite cars. One such car, a three-wheeler, she decides to save for later even though it already had an extra chance.

She also showed the researcher how she plays with some giant vinyl coated foam shapes. She usually just likes to jump on them but she also assembles them to make a water scene with a speedboat. After that the researcher and participant head downstairs and the researcher introduces the activity packet. She starts playing with Siri on the iPad to see how she would respond. When the researcher shows her the box, she immediately starts playing with it. The first thing that she does is stand in it and grab the handles, and then starts to scoot across the tile floor by shifting her weight. The researcher concluded the observation after this.

Family 8

This family consists of a Father and Mother and two boys within the age range for the study. F8P1 is 8 years old and F8P2 is 9 years old.

The researcher started the inquiry with F8P1. He turned out to be difficult to interview at first because he would respond with the opposite of the true answer. He did this for a while despite his parents reprimands. This was a sort of game for him for a while and did not appear to be malicious. F8P2 on the other hand was very cooperative.
which was pretty much his behavior for the entire inquiry. We initially talked and the boys did not play but only interviewed. F8P1 had a hard time sitting still and was always in motion.

After talking a little about what kinds of things they play with that are not originally intended to be toys, F8P2 brings down a stick that he calls his “staff.” They also show the researcher a plane launcher that they use as a toy gun. We talked a little about mobile media and F8P2 shows the researcher his iPhone that was one of his parents that was handed down to him. They also have a family iPad that the boys play with.

Mom reminds them that they love to dance so they start up some music on the radio and have a dance party. They try different moves like the moonwalk and some breakdancing. They also have a dance off to see who can moonwalk better or do other moves better or longer or faster. While the boys dance I interviewed their parents about their use of mobile media.

After the dance party the researcher and participant go to the TV room where the boys show the researcher Skylanders on their Wii. On the way there, the researcher noticed a couple of constructions out of K’Nex. They were a sword and nun chucks. The boys and their father tell the researcher about all of the weapons they make out of toys and objects. The boys have a little trouble getting Skylanders started. They show the researcher both a competition and cooperative mode. Once they start playing they are very focused on the game. The researcher continues to interview their parents while they play.

Before the researcher closed the contextual inquiry, the researcher introduced the activity packets to the boys. They immediately started to play with the boxes. F8P1 claimed a smaller box and put it on his back and crawled on the floor pretending to be a turtle. He exclaimed, “These boxes are better than the researcher thought they would be, thanks!”

Family 9

Family 9 consists of a mother, father and three boys. Two within the age range for this study. F9P1 is 7 years old and F9P2 is 9 years old.
I start the inquiry in the living room of Family 9's home. On the way in, the researcher passed a room with LEGO's covering the floor. In the living room there is even more LEGO's and several toys places close to the TV and entertainment center.

The researcher starts talking with F9P1 and he shows the researcher his toy sword, which he holds by the hand guard and plays with it like a gun. He also shows the researcher several other ways he plays with it. His Mom mentions his favorite game. He shows the researcher this and runs toward one of the living room recliners and somersaults into it while holding his sword as a gun and pretends to shoot after the somersault.

The researcher and participant talk for a little bit and F9P2 shows the researcher some elaborate LEGO scenes that he and his brothers build as well as a tank that he built out of LEGO's. The researcher and participant continue to talk about their use of mobile media and the boys chip in here and there while they are playing. F9P2 comes down and shows the researcher a submarine he built out of LEGO's. He though of it after doing a paper on the Hunley submarine.

We continue to talk about screen time and restrictions as well as what other types of games they play. After talking about video games they start arguing about what is the best way to play a shooting video game. F9P2 went upstairs to grab an owl he made out of a box, tape, paper towel tubes and Hot Wheels. The Hot Wheels were no longer attached but were originally the feet.

The parents mention that F9P1 like to create more narratives and they show the researcher pictures of a castle set up that he created with knights all around the castle and extra blocks to support the walls. The parents mention that F9P2 would play with stuffed animals a lot. He seemed embarrassed by this and did not want to show the researcher the food containers he made from cracker boxes for his stuffed animals. The youngest brother ran upstairs to bring them down and show me. F9P2 then started to show the researcher how he would feed his stuffed animals and have to pump their stomach by pressing down on their bellies.

We then look at how they use mobile media. F9P2 had a tablet of his own that he recently broke by dropping it and F9P1 had his own tablet also. The researcher watched them play games with them. Games on the tablets were a social event for
F9P2 who was watching his youngest brother play Subway Surf and offering advice. After a little while their Mom was able to find a picture of “Bob” which was a person that F9P2 created out of cardboard boxes and paper towel tubes.

After they show the researcher what games they play on their tablets the researcher introduce the activity packets. F9P1 immediately gets into the box and closes the flaps. His dad then starts carrying him around in the box and even takes him outside to load him into the van before the researcher leave.

Family 10

Family 10 consists of a mother, father, F10P1 and his younger sister. The researcher met with the mother first for the interview then later returned to do observation with the participant.

The researcher started the observation with F10P1 while he was playing with LEGOs downstairs in a family/playroom. He was finding LEGOs to build a racecar. The researcher and child build with LEGOs for a little while and the researcher ask him about “Shape Blocks”. He shows me that there are patterns where you can arrange these flat wooden tiles into pictograms and the researcher play with these a bit while he tells me about them.

The researcher asked F10P1 about drawings and if he could show me some recent drawings. He took me upstairs to the refrigerator and showed me his drawings attached to the door by magnets. He colored a turkey and Christmas tree with presents underneath it. He then shows me a craft kit that he gets sent to him called Kiwi Crate.

F10P1 wanted to draw a racecar. The researcher and F10P1 sat down with his sister and drew racecars with markers for a half an hour. During the process he was giving us ideas for what should be on the racecar and what colors it should be. He would even come up with names for our cars. He chose a black 17 for his number and added a blue streak of lightning. He called his racecar Red-Blue Storm and mine Rain.

After drawing the researcher and F10P1 went back downstairs and he showed me Angry Birds on his iPhone. The researcher asks to see what else he uses his phone for and he ignores me to continue playing Angry Birds Space. When the
researcher started to show him what the researcher brought for the activity packet he stopped playing. He was especially excited about the crayons and the LEGO®s. His sister started drawing with the crayons on his packet immediately. He immediately goes downstairs to add the LEGO®s from the packet to his LEGO®s and build something.

F10P1’s building is interrupted when his mom shows him a project he started the day before. It is some construction paper glued together and he called it his “World.” It looks a bit like a landscape with a yellow circle for a sun. He decides he want’s to finish it right away. He uses more paper and a glue stick to add a road to the world. The researcher helps him with this before the researcher concludes the observation.

Family 11

This family consists of a Father, Mother and 5 children. The youngest two are in the age range for this study. F11P1 is a 7-year-old girl and her brother, F11P2, is 10 years old.

The researcher started this observation with most of the family gathered around the dining room table sharing pizza that they had just made. F11P1 was watching Dinosaur Train on PBS Kids in the adjacent open living room. F11P2 was at the table eating pizza.

The researcher started by asking F11P2 questions and would occasionally try to ask F11P1 some questions, but she was either shy or not interested in participating. Very often her parents would ask the same question to get a response. They mentioned that she was up late the night before and might be more defiant because of it. She would refuse to participate at times, but seemed to be playing at it and not upset. The researcher joked with her about taking a picture of her American Girl Doll, which she declined to let the researcher see.

The researcher and family start by talking about the participants’ use of mobile media. The children in the family, except for F11P1, had recently received Kindles for Christmas. After interviewing for a while, F11P2 showed the researcher a house he made with his next oldest brother. F11P1 chips in and says she helped too but her brothers disagreed.
F11P2 and F11P1 then took the researcher downstairs to see the fort they had built. It encompasses almost all of the family room downstairs and is made up of furniture, blankets, cord and cushions. The researcher and family all climb in. There were cushions everywhere and the ceiling hung low. They mention that they made it a week earlier when they had their Kindles taken away.

The researcher and family went back upstairs and continued to talk at the dinner table about what the children make out of objects that are not supposed to be toys. The researcher introduces the activity packet before the researcher leave.

**Family 12**

Family 12 consists of a father, a mother and two boys. Both of the boys are within the age range. F12P1 is 7 years old and F12P2 is 9 years old. F12P2 was not present for the observation and interview.

The researcher and participant start in the living room, where there were games and toys in various places. There are several LEGO models amongst them. F12P1 starts by showing the researcher his latest LEGO creation, which he calls a “circus plane.” It looks like a plane with a helicopter propeller on the back fin. While the researcher explains the activity packet to the father, F12P1 starts to play with a remote control bumper car.

The researcher and the father talk a little about the boys’ routines and what games the family plays together. F12P1 starts piecing together a card game called Sleeping Queens that the family plays. He shows the researcher the rules and the cards then explains the rules to the game.

F12P1 describes a game he plays with F12P2 called “Battle” which is usually played with LEGO. I was confused at what a “mini fig” was so F12P2 holds up a LEGO figurine and tells the researcher that is a “mini fig.” He then shows the researcher a LEGO police van and how many ways there are to escape out of it. He then sets up a scenario where a LEGO 4x4 with a hook on the back of it pulls the bars off the police van and the convict escapes.
F12P1 then talks a little about what he is reading and shows the researcher a book called You Can Count on Monsters. He also showed the researcher an electronic globe that has a stylus. When the stylus is placed on any of the countries, the globe tells you what country it is and can give you examples of the language and national songs. While Dad goes to get the family iPad, F12P1 shows the researcher the three-season porch, which looks like it serves as a toy room. It is full of various toys, most of them LEGOs. This was where one of their “Battles” had occurred.

When Dad comes down with the iPad, F12P1 shows the researcher Clumsy Ninja. The researcher talks with his Dad for a little while about screen time restrictions. The researcher and participant talk a little about crafts and F12P1 shows the researcher a necklace that F12P2 made for him. They then show the researcher the “Box Room” in the basement where they keep a bunch of boxes for shipping. All the boxes are collapsed and piled up in the room. F12P1 immediately starts to climb on the stack of boxes and then starts to wedge himself under the layers of boxes.

After the researcher and participant go back upstairs, F12P1 and the researcher play a bumper car tournament. This was done with remote control bumper cars. These cars had buttons on the side of them that would eject the figurine of the driver when hit. When the researcher and participant are done playing, Dad shows the researcher F12P2’s pinewood derby car and a cardboard castle that can be set up, played in and color on. Dad also shows the researcher a box with cardboard circles pinned onto the bottom. This was a mine cart that F12P1 had made with his Dad.

The researcher then helps F12P1 peel the wrappers off of crayons so that he can melt them together and make shapes and new crayons out of them. F12P1 also appeared to enjoy just the process of reshaping the crayons. He was not concerned with what colors went together or what shape to make them, but seemed excited about melting them together.

The researcher and participant talked about what things the boys use as toys that aren’t meant to be used as toys and F12P1 brings out a Ziploc bag. He blows air into it and sits on it to make it pop. The researcher and participant continue to talk while peeling crayons and F12P1 brings out a picture that he made with crayons. It looked
like a quilt with many different color squares. After this the researcher concluded the observation.
APPENDIX C. TRANSCRIPTS

Family 1

F1P1 is a six-year-old girl that lives with both parents. She has a newborn baby brother.

Mom: Honestly there really isn’t one thing that she is just like, "I love this toy and I would constantly play with that." She does use the easel quite a bit.

…

Mom: She will play with the cash register quite a bit. Makes her own little store, keyboard and cash register.

F1P1: I play with the keyboard.

Mom: You do play with the keyboard a lot.

Researcher: The keyboard on the . . .

Mom: Like an old computer keyboard.

Researcher: What do you do with the keyboard?

Mom: Store, so you have to buy stuff, and she pushes buttons and we will have paper here, and they doodle and . . .

Researcher: Does she make a store?

Mom: we have books or you have to take the shopping cart and buy random junk out here and buy it.

Researcher: How do people buy stuff at your store? [F1P1]?

…

Mom: Christmas we do a big gift. And then just a bunch of little stuff she wants or stuff she needs or . . . I don’t know. She always picks out junk, and I hate the junk cause it gets played with once and then she will never touch it again, so we try to avoid some of that sort of thing. I think last year Santa brought DS and the year before a dollhouse, then drums, usually it is one giant thing she wants. Right now she is in-between ages which is tough. Or we already have it. Maybe she is thinking she will get a Kindle. . .

.nope, we already have one.
Mom: Yup. I mean there is still some toys she wants, it's just she'll never play with them or she'll play with them once and . . .
Researcher: One and done
Mom: Yup.

Mom: For her birthday she wanted tools. Like her own real toolset. ‘Cause she wanted to build stuff with [Dad] so we got her a toolset and her and [Dad] built a tent with a wooden frame and then . . .
Researcher: That's pretty awesome.
Mom: Yeah, it was really random. She wanted tools, pink ones. They didn't have any pink tools, they had purple so she got purple.

Mom: She likes to play outside.
Researcher: Yeah, what does she do outside?
Mom: Swings, swing a lot. What else? Plays in the leaves now. Rides the bike. What else do you do? Your scooter, you haven't played with your Jeep much.
F1P1: It's dead

Mom: This or school.
Researcher: She makes school?
Mom: Uh huh. This is the classroom, the marker board. She uses the little pointer stick and uses the posters on the wall and points to random stuff. It's more imagination play than sit down and play with toys. She's not that into Barbies, dolls. Or house even. When the kids are all here, they have one giant house and their roles. It's a lot more imaginary.

Researcher: You know the whole title is about open-ended play, but it is really about imaginary play, which is kind of the same thing.
Mom: Kids don't do that as much anymore.
Mom: Like with the box, it would just be a box. She will sit and play in the box.
Researcher: Hey, that is something though. It is interesting to see if the box becomes something… or is it still a box and just a space at that point?
Mom: When you have little kids, never get them toys, just give them a box and they will be the happiest. One Christmas my aunt or my cousin- she was probably one, she got all these cool toys for Christmas and she wanted nothing to do with them. She wanted a water bottle and a paper plate and she sat and played with that all day. She didn't care about the toys but the water bottle was a toy. Doctor, that is another imaginary . . . or Vet even.
...
Researcher: You can't go to the store and not buy cleaning stuff. When you play vet, F1P1, who do you check up on? The dog?
Mom: If we play vet with [the dog] we are going to the E.R. to see a doctor. You usually, What do you do when you play vet? Who's the animal?
F1P1: Stuffed animal.
Mom: Or another kid will play the part. Okay, you ready?
...
Mom: She puts on dance shows and music recitals. She gets out her karaoke machine.
F1P1: It's in my room.
Mom: You'll sing on it. What else? What else do you like to play with?
...
Researcher: Alright is the store open, do I get to go shopping? What do I have to do first? Get a cart?
Mom: She has to get money.
Researcher: Oh, money too. This is the money, okay. Alright. What if I decide I'm going to buy the whole store?
[the researcher takes a stroller around the room and goes "shopping."]
Researcher: Monster's University. Okay.
Mom: I think he needs a broom, don't you?
F1P1: Uh uh, these are my things.
Researcher: Oh those aren't for sale, Okay.
Mom: And you get to go into the toy room.
Researcher: Oh really? 'Cause I was going to buy this Kindle. I don't know if I have enough money for the Kindle. Okay so anything in here. Oh look at this car, this is awesome! That will go really good with my Barbie. And books. What's the best book to get? That's the best book? Biscuit and Little Pup. That one too? Am I going to have enough money for this one too? Yeah. Pete the Cat, Rockin' in my School Shoes. This looks awesome! Let's see here. Do I need anything else? I like markers too, so I'm going to have to get two markers. Alright, now where do I go? Do I have to go checkout around by [the dog]? What is this . . . oh this is for signing. There is even a bag. You've done this before.
[the researcher checks out with F1P1]
Mom: As kids we used to, we had our own play house with a kitchenette and we would go raid the cupboards for anything we could find and we would just make stuff.
Researcher: Like food stuff?
Mom: We would take flour and water and spices and it stunk so bad, then we added pinecones and random . . .
...
Researcher: Alright, what do I do with this? Oh I have to pay.
Mom: How much?
Researcher: I got five. That should cover everything right? Even for the Kindle? Is this a $25 coin?
Mom: Is that a $25 coin or is it a quarter?
F1P1: Quarter.
Researcher: Oh, did I forget . . . Oh I didn't pay with card. I did it all with cash. So I just take this and go? I'll just sling it around my shoulder.
Mom: Uh Oh, you forgot your car.
Researcher: Oh no, I did forget the car you're right.
...
Mom: Yeah. We used to have a giant box for something. They turned that into everything.
Researcher: Do you have any examples?
Mom: Once it was a car, then they flipped it up and it was a house, then it was a dressing room. She does do a lot of dress up play too. Even that tent outside, they flip it on the side and that becomes another dressing room, or a stage or behind a stage and that is where they are before the show.

... 
Researcher: Does she ever multitask while playing on this? Like watch a movie, play and watch? Any other things, listen to music and dress up?
Mom: Every now and then she will but she is usually off doing something else right away.
Researcher: So, It sounds like she treats it a lot like a toy in a way. It's low commitment and then she goes around. That's interesting because a lot of people are really afraid, it's like they can only have so much screen time and worried about it being addicting and sometimes it's just not the case.
Mom: We don't really have a restriction when it comes to that thing.
Dad: She gets bored with it and puts it down, which I think is okay.
Researcher: Right, Just like any other toy or anything. That's interesting.
Mom: I don't know if that's because she doesn't have restrictions with it.

... 
Researcher: So is there any patterns, she move around a lot from toy to toy, game to game, but is there any themes or anything you notice or what draws her away from the media more than anything?
Mom: She gets bored.
Researcher: She gets bored, yeah? I get it, yeah, it's just like any other toy.
Mom: Or something's on TV that she wants to watch or she wants to go . . .
Researcher: Do you restrict movies or TV time at all?
Mom: We let her watch a while at night. Like on the weekends we are not around much, we always seem to be doing something. She has a TV in her room. Well, did till she got that taken away. She was naughty. But I think we have that on at night before bed and I don't think she would watch it because it was super low and you couldn't hear it. I think it was more of the nightlight type thing. She is more used to having a night light on in her room. So no she sleeps with her nightlight . . . her lamp on.
Mom: She switches between that, the iPad and the tablet. Each one has a bunch of different games on them.

Researcher: So she doesn't just switch between the toys, she also switches between the devices?

Researcher: [F1P1], do you like to play games the most or watch Netflix? What do you do the most?

F1P1: Games

Researcher: What type of activity or game she does keeps her busiest the longest before she switches?

Dad: Coloring

Mom: She'll color for awhile

Dad: But she'll switch between marker board. . .

Mom: She'll go from coloring on marker boards, to coloring books, to the marker board

Researcher: So she'll switch between coloring but she'll stay in coloring mode for a while.

Mom: Yeah. There are a couple of little craft type things. She'll get the feathers out or the pipe cleaners or the little balls.

Family 2

F2P1 is a six-year-old girl and is the eldest of the 3. She has a sister and a brother. They live with their mother.

Researcher: [F2P1], do you have any favorite toys or anything you play with?

F2P1: Upstairs.

Researcher: Upstairs?

F2P1: Yeah, I like these LEGOs.

Researcher: You like those LEGOs? Those are you favorite LEGOs?

F2P1: Yeah,
Researcher: What do you do with them?
F2P1: Just play and build with them.
Researcher: You play and build with them? Do you have more or just those?
There's a bunny in the closet but I dropped it and I don't know where it is.
Researcher: Oh no, that's the problem with LEGO's they can go disappearing. What's your favorite toy?
F2P1: Well upstairs I have some glittery stuff on my table
Researcher: Can you go get it?
F2P1: There's a lot of it I'll get a little bit of it.
...
Researcher: Oh those kind of glittery things. Those are your favorite toys?
F2P1: Most of them.
Researcher: Most of them? What do you do with them?
F2P1s: Well you just...
...
F2P1: ... and these are for building stuff these are sticks and green stuff and I wrap the green stuff around the stick and I make this. A sword like this.
Researcher: You make it a sword? Do you sword fight?
F2P1: Yeah just for fun and I have stickers. And I make this...
Researcher: Is it another sword?
F2P1: I don't think so. I don't know. Are there any games on here?
...
F2P1: Not that much. Usually I like to just sit at the piano and play my songs.
Researcher: You play your songs that the piano? Can you show me?
F2P1? I don't know a song to dance to but I know two lines together but just two lines I don't know the rest.
[F2P1 plays a song]
..
Mom: She normally likes to sit there and watercolor and draw with sharpie color sharpie markers. That's how she uses her free time to the point where I almost always have a jar of watercolor for her to do just whenever she wants to. We don't have TV so that's not a default activity, we have DVDs but.

Researcher: . . .but it's kind of in the corner so you don't turn it on too much?

Mom: Yeah it's not the main attraction.

Researcher: So water coloring huh? Do you have any watercolors?

F2P1: Yeah.

... 

F2P1: this is paint for fingernails. I got it for a prize. If you put them on in this way it will stick to your fingers. This is where the heart stone was.

Researcher: okay.

F2P1: From farmers market, the man gave this to us for free. It's like the court [gourd] or something.

Researcher: can you eat it?

F2P1: what?

Researcher: can you eat it?

F2P1: it's kind of like . . . it's kind of like a little pumpkin.

Researcher: ...and is that a kaleidoscope?

F2P1: Yeah.

Researcher: my mom loved kaleidoscopes.

F2P1: ...and my mom gave me this I have a pink butterfly, but I don't know what it is.

Mom: this is sort of their . . . their space.

Researcher: look at this tent thing. This is awesome too.

F2P1: this is our home. This is like a rainbow bow because it came off a hair tie. My grandma gave me this necklace.

Researcher: See you have a lot of neat jewelry, huh?

F2P1: She gave us her jewelry.

Mom: She was known in her school for liking miniature things. Really tiny things like the tiny LEGO things. And so we find these things at tag sales and all kinds of places and
she kind of hoards them and plays with them and sticks them in little bags and does all kinds of pockets and stuff.

F2P1: . . .beads and jewels.

Mom: Beads have been an extension of that interest in my opinion.

Researcher: They're all sparkly… you like sparkly things?

F2P1: Yeah like look at this shiny and sparkly.

Researcher: shiny and sparkly. Do you play it? Does it run around?

F2P1: No. It just is a pony statute.

Researcher: It's just there for the sparkles huh?

F2P1: It was an ornament and it took the string off.

Researcher: Are you going to put it on the Christmas tree?

F2P1: No, but I have a snowflake that my Nutcracker dance last year my friend gave it to me and it is so sparkly and glittery and it’s an ornament and one little part came off. This is a little thing you can put juice in. This is juice I mean water juice. I am supposed to have a tea kettle. . . oh, there is. You can do that. And here it’s the top of the box.

…

Researcher: what’s this?

F2P1: it’s a beanbag.

Researcher: What?!

F2P1: We jump from my bed and I’ll show you. You do this.

Researcher: Okay.

F2P1: I can do a somersault.

Researcher: You can do a somersault? Is this normal?

F2P1: Yeah.

Researcher: Okay, I’m just making sure I’m not encouraging them, 'cause I really want to see this.

Mom: I don't think it's what you're thinking.

Researcher: Okay.

[F2P1 jumps from bed onto beanbag]

…
Researcher: So you do a tea party you said?
F2P1: Yeah we did but . . .
Researcher: Who goes to the tea party?
F2P1: Me. . . I don’t know. These are my dress up clothes.
Researcher: Oh dress up clothes. You do dress up a lot?
F2P1: I was a ballerina and my costume was . . . my sister’s costume was . . . Let me see what [sister’s] costume was . . . this dress. She was a princess. And my brother was a super hero and I was a ballerina. We dressed with turtlenecks and tights because it was so cold. This is my dresser.

Mom: When she’s trying to avoid something that’s in our schedule she will draw, or watercolor, or paint.
Researcher: Does that usually hold her attention?
Mom: Yeah to the point where I have to kind of you know say “hello.”

Researcher: Do you ever play with the blocks?
F2P1: When we were little we did.
Researcher: What about cardboard boxes?
F2P1: Cardboard?
Researcher: Yeah.
Mom: Remember when we made a slide out of the cardboard boxes and you guys slid down the stairs on top of the boxes?
Researcher: Classic.
F2P1: I don’t remember.

Researcher: What are your favorite stuffed animals?
F2P1: My favorite are these two.
Researcher: the monkeys?
F2P1: Yeah and like this. I have a lot of favorites. Tiny ones too.
Researcher: so why do you like the miniature ones?
F2P1: Very cute. And look, [brother] bought this and left it around the house and left it
and I found it and I want it.

... 

Mom: Umm. . . What else do you play? So here’s our arts and crafts supplies and junk it hasn’t been organized for a while. Most of arts and supplies are downstairs now.

...

F2P1: Yeah and last time when we parked our cars there, we used to bike around.

Mom: Right, it was a common garage. We were the first tenants in the building until other people moved in it was like a private gymnasium.

Researcher: That’s awesome.

F2P1: And we could, we could, we could run around and play with their scooters and bikes.

...

Mom: We have a shed now where we park our bikes. So what do you do in the front yard [F2P1]?

F2P1: We climb on the tree and play around, play tag, play Red Light Green Light and we play What Time is it Mr. Fox and all kinds of games.

Researcher: What Time is it Mr. Fox?

F2P1: Uh huh.

Researcher: What’s that? I’ve never heard of that one before.

F2P1: Well we have four people over here and we say “What time is it Mr. Fox?” and they put their hand up this way, and they put up their fingers and shout it out, and do that much steps, and then, and you get close enough they turn around and say “Midnight” and whoever he catches gets to be the fox.

Researcher: That sounds like fun.

F2P1: It’s one of my favorites. We go down the driveway.

...

Researcher: Is there anything you kids play with that isn’t normally intended to be a toy? Kind of like the cardboard box again?

[some interruptions and background conversation]

Mom: I’m sure something will come to mind but I can’t think of anything off hand. Like second use toys or such things. Kitchen utensils.
Researcher: Kitchen utensils?
Mom: Yeah. . . I never expected art supplies . . .

[more interruptions from brother, F2P1 and I continue to play tic-tac-toe]

Mom: String and rope. They will play with yarn for hours, tie things and . . .

[F2P1 and I continue to play tic-tac-toe]

Mom: Maybe sponges too are another dual use. I’m thinking of what they bring in the bathtub. You know cups and stuff, but also sponges.

Researcher: That’s interesting. I didn’t think of the bathtub as much.

...

Researcher: That’s actually very nice. Glitter Draw! Uh oh, more sparkly stuff, and drawing. That’s got to be amazing.

F2P1: Do you know what I should make? Do you know how to make a horse?

Researcher: A horse? No, just the tail.

F2P1: I know how to make the tail.

Researcher: You know how to make the tail? Well if you do the head . . . you know how to make the head? No? Alright you do the tail and I’ll see if I can do the head.

F2P1: Okay.

Researcher: Should we do it this way?

F2P1: Yeah.

Researcher: Okay.

F2P1: What color?

Researcher: That’s entirely up to you.

F2P1: I think we can make it like . . . like that?

Mom: Plastic bags. If I give them plastic bags they will flip. The tell you not to use those. Preschool and above I’ve done it. Where they find them around or whatever and they use them as their sacks.

Researcher: It looks more like a rat. So what did they do with the plastic bags?

Mom: they put trinkets and stuff in them and hold them around, or their toys.

Researcher: Ah, okay.

Mom: . . . just their treasures.

...
Researcher: Have they used this in a way that like is not normal for it. Like we use our phones all the time to see around at night.

Mom: Oh, interesting!

Researcher: I was wondering do they, have they used in any other way that is . . .

Mom: You know they use it sort of as a stuffed animal comfort toy. With like a picture of me or family will be brought to bed and put under the pillow kind of thing. So that’s happened. But as an object, they haven’t used it as a plate or tray or anything that I can think of. Let’s see, what else? They’ve used it as a radio, as a TV… Well, in our family it’s kind of a reward gadget. It’s not freely available to them. It’s a babysitter and many respects to cause I don’t, I’m wary of too much screen time and their babysitter used to until I mentioned it, have the TV on all the time. Not TV, but DVDs running all the time because some would be napping and some wouldn’t and she thought that it would keep the others calm which she was right about, but given that I limit it pretty severely, I did not like that so she cut back on it.

Researcher: So why do you limit it?

Mom: What do I limit it to?

Researcher: No, well, yeah that too, but why and what to?

Mom: I’m afraid it will promote passive, stationary, sedentary behavior. But I read an article that if you’re interacting with it then that won’t be the outcome. But I’d just rather have them outside or being active and even social. Even if they’re fighting it’s better than if they’re zoned out on that thing. You know? I don’t want it to be an ADD thing you know?

…

F2P1: We can use this as our treasure box!

…

Researcher: Take a picture of Sleeping Beauty. You take a picture of her doing something. What is she doing?

F2P1: Holding her dress down like this. She’s going to the prince.

Researcher: The place?

F2P1: The prince. In her best posture.

…
Mom: Yes. Eat. To eat and snack and drink and... and it's usually they are playing they do it... like when she's at a dance lesson and they're not they play with it. Or when we’re going somewhere, traveling.

Researcher: Right, Right, that's kind of the babysitting.

Mom: It's very much that way.

... 

Mom: Oh, scarves! Like my winter scarves, they'll put them on their head and put a hat on them and they'll pretend they are Rapunzel. All three of them. Yeah they were just doing that last night. And it sounds obvious, but they'll take a stuffed animal or shoe or slipper or cushion and the girls will put them under their shirts and pretend that they are pregnant, and [brother] too actually.

[more conversation about brother]

Mom: Yeah so this is what she'll do, she'll like... it'll drag around behind her, now she's twirling it around. Right, and then they'll pretend they are Rapunzel.

...

Family 5

This family consists of a mother, father and two boys. F5P1 is the oldest boy as six years old. His younger brother is four.

Starting from the question of what a regular school day schedule is like.

Mom: Really? Well now they have that new Infinity too. We don't have that. We played Skylanders yesterday. They wrestle a lot with... 
Dad: We play cops and robbers, we play soccer outside, we drive remote control trucks down at the river and we fly kites and go to the park and ride bikes and drive scooters... 

Mom: Yeah. They are actually...they don't like to be inside if they don't have to. They're not the kids that will sit and watch TV. I would love it if you would sometimes but you would much rather not.
Dad: [F5P1] is learning how to weld and make breastplates and [brother] has made swords.

F5P1: I have a metal sword upstairs in my room.

…

Mom: They both actually like craft stuff too.

Dad: Oh, totally!

Mom: More so than I would’ve thought actually. Like drawing, and coloring and hot glue gun ...oh my gosh.

…

Dad: Cooking- and [brother] likes doing experiments.

Brother: Yeah. I just did an experiment with daddy and we made a volcano.

F5P1: Remember when grandma was here and we made a volcano out of paper? How was it not sogging up?

…

Reseacher. . . making is kind of a big theme for them?

Mom: I would say that for sure. They’re doers and shakers for sure.

Brother: Fighters!

Mom: Pretend fighting.

F5P1: Not pretend fighting.

Mom: What do you mean not pretend fighting? Better be pretend fighting.

F5P1: I can beat him.

Mom: Beat [brother]?

F5P1: Yeah.

Mom: You’re bigger than him.

F5P1: It’s easy. I just have to pick him by his face and throw him on the ground.

…

Mom: We have a craft container and I like to make things out of paper and they like to paint and they like to . . . what do you guys, boys?

[brother interrupts and needs to get pieces for LEGO's up in his room]

Mom: [F5P1] would you like to make with crafts? What do you like to do?

F5P1: Ah . . . experiments.
Mom: Experiments? Would you like to make? If you got out the craft box what would you make? You and dad made a cage. Out of plastic.
F5P1: Oh yeah! I have it but my hermit crab died.
Mom: I know. But they made a hermit crab cage
F5P1: I had to make it for school.
Mom: he passed. What else do you like to make?
Dad: Taking those popsicle sticks and gluing them together making structures. [F5P1] will go to Walmart and get a pack of those fuzzy little balls from Walmart and make little creatures out of them.
F5P1: No. Fuse beads.
Dad: Fuse beads. He loves those.
Mom: He loves the craft isle at Walmart.
Dad: Those beads that you iron and melt together.
Researcher: right. I remember those.
Mom: Clay.
Dad: Paper airplanes.
Mom: Yeah. That was last week. Paper airplanes.
Researcher: I used to know some really good ones. When I was in school and was the fastest one. Ever.
Mom: One morning we woke up and there was like forty on the floor.
...
Researcher: Okay I have to see that.
Mom: What did you make?
F5P1: Ah . . . a firehouse. It says fire on it.
Researcher: What made you think of making a firehouse?
F5P1: I started using red and I found the fire so I made a firehouse.
Mom: Perfect.
...
Dad: I would say I guide them on most things. It’s. . . to me it’s really important to know that you can do whatever you want like if you think of an idea you can make it. So I think
that’s where I probably guide them to make crafty stuff or we’ll go out to the garage. [F5P1] will say like the other day, “Let’s make a snow plow for a remote control truck.” We welded one to the truck. So I think that, I like it so I enjoy it vicariously and I think how good for them that we don’t have to buy it we can make it or think outside the box.

Mom: I think that kids nowadays like characters on TV and her boys never really got into that kind of . . .

Researcher: That’s a really good insight.

F5P1: I got into Halo. I only got a LEGO thing of Halo.

…

Dad: [F5P1] likes to rock climb.

Mom: They like to do a lot of outside stuff. I think we do. You know? So I think it’s natural that they do too.

Dad: As far as limitations go, just the obvious ones. You know? Games that are too violent, we don’t allow that.

…

Dad: Anything. Even when they pretend box.

Researcher: Do they use props- like things around the household that are not normally toys or . . . they just kind of pull into their pretend play?

Dad: I would say not much. I see what you’re saying but . . . well I guess we, they use sticks to represent swords but that . . . What are some things that we play with that you pretend is something else.

F5P1: We make guns out of our hands when we play cops and robbers.

Researcher: So you make the guns. You make noises when you do that too?

Mom: You got to make the noises.

Researcher: So what happens when you are the robber?

F5P1: We die

Researcher: You die?

F5P1: We get put into jail.

Researcher: Oh yeah. Where is the jail?

F5P1: Playhouse.

Researcher: Playhouse? So the playhouse is always the jail?
Brother: No we go on top of the Playhouse and then we go down and he tries to get us and we run and he gets us when we’re not up and that means he wins.
F5P1: He takes us to jail.
Researcher: That’s awesome. And then you always get out of jail? How do you get out of jail?
F5P1: Ah . . . there’s a door.
Mom: You just walk out? Smart.
Researcher: Is your dad watching me do it or do you have to sneak out?
F5P1: I have to sneak. Otherwise he hears me.
Researcher: Ah . . . That’s awesome.
F5P1: Like when we’re playing cops and robbers [dad] “I’m going to get a sandwich.” And then he actually goes and gets the sandwich.
Researcher: Does your dad get hungry a lot when you’re in jail?
...
Researcher: So [F5P1] do you ever play with the cardboard box?
F5P1: Yeah.
Researcher: What do you do with it?
F5P1: my dad pushes me around it.
Researcher: Awesome. They gone down the stairs with it yet?
Dad: No.
Mom: No but they heard that.
Researcher: I was going to say, is that dangerous to suggest?
F5P1: There’s this big plastic thing . . . wait, no! My . . . the mattress on my bed, I sat on it and I rolled downstairs with it.
Mom: When? Are you dreaming?
Dad: I used to do that at the college.
Researcher: They learn so quick these days.
Mom: I know! Starting early.
...
Researcher: Alright so [F5P1] do you have your iPad or something?
F5P1: Yeah. We have our own phone too.
Researcher: You have your own phone too?
Brother: Yeah we share it.
Researcher: Alright can you find your phone and your tablet that you play with normally?
Mom: Do you know where they are?
F5P1: No
Brother: We can’t text or call.
Mom: I’ll find it.
Brother: Me too. It’s up on the bed.
Dad: Yeah so [mom] got a new phone And so she gave the boys her phone and it doesn’t have cellular but, so we set it up so he can practice typing and texting to grandma and grandpa [mom] and I.

... 
Researcher: So you guys are clearly not afraid to let your kids use devices at all.
Mom: No, but we monitor what they use.
Researcher: Do you?
Mom: Oh yeah. We are always with them when they’re using them. And they have their own
F5P1: Nuh uh! You’re not at grandma and grandpa’s.
Mom: Or when they are at grandma or grandpa’s. They have their own folders with their games in them. So . . . he’ll download games.
Researcher: So do you restrict their screen time at all?
Dad: We don’t really have to. If it doesn’t get too long, yes.
Mom: But I would say they don’t play more than a half hour.
Dad: Sometimes it could be a little longer.
Mom: That’s the same way with TV. Sometimes I wish they would sit and watch longer and do something like that just because we . . . when daddy and I need to get dinner ready . . .
F5P1: I used to watch TV a lot.
Mom: I don’t think you ever did that much TV.
Researcher: Yeah, that’s interesting. Well I’m seeing that a lot, you know.
Mom: It’s a good problem to have.
Researcher: When it’s not restricted I’m seeing a lot that they usually switch through it just like any other toy. You know?
Mom: Yeah. I would say that’s true. Would you?
Dad: Oh yeah. For sure. I would say that’s pretty normal psychology. When you say you can’t play with guns because we think it’s . . . it just makes them . . .
Mom: . . . want to play with them.
Dad: Or makes it a bigger deal than it is.
Researcher: Yeah. No Kidding? So do your kids ever do the craft stuff . . . find craft stuff on the Internet?
Mom: But we looked at Pinterest a little bit.
Researcher: Ah . . .
Dad: We help them.
Mom: They don’t really search.
Dad: No.
Mom: They don’t know how to search.
Dad: And we don’t let them search. [F5P1] might say, “I want to make this.” And so we’ll say, “Hey, let’s look for ideas.” But we do it together.
Mom: Yeah I don’t know.
F5P1: Mostly we look at ideas for paper airplanes.
Dad: Exactly. That’s too risky to allow them to do that on their own.

…
Researcher: Do they ever multitask while they’re doing it? So . . . maybe they watch Netflix and play LEGOs or listen to music and play LEGOs.
Mom: They are pretty focused
Dad: Yeah. I would agree with that.
Researcher: So it’s really focused for that half an hour and then it’s move on and it’s focus on something else?
Mom: Right. Yes.

…
Mom: What would you think of to do with the box [F5P1]? Like first thing that comes to your head?
F5P1: I don’t know. I would cut it.
Mom: Cut it? And what would you make with it?
F5P1: I don’t know.
Mom: Like a habitat for an animal? That’s what you have done before.
F5P1: Not with cardboard.
Mom: really?
F5P1: No.

Family 6

This family consists of two parents and 3 boys. F6P1 is the oldest of the three at age 5. The youngest is an infant.

Mom: He likes to build. Every time we go there there’s always something. They have these little play sticks that are kind of like Lincoln logs but are plastic they have always grooves on them and they have like the direction sheet and they can make different things with them.
…
Mom: yeah. He usually draws Angry Birds every single day.
Dad: that’s what he does when he gets there.
Mom: it was like one day when he drew a tree and everybody was like it was a big deal because he chose not to draw an angry bird.
…
F6P1: there are different sizes of Angry Birds; large, small and medium.
Researcher: large, small and medium. Wait, which ones the small one?
F6P1: These.
Researcher: Nice.
Dad: Show him the catapult.
F6P1: what? You mean him?
Dad: no show him the catapult that you launch him.
Researcher: oh yeah. How good is that with the big ones? Does it work with the big ones?
Dad: they fall off.
F6P1: see?
Researcher: that makes it kind of hard.
F6P1: yeah but we can put him on. See? Sometimes he falls.

... 
Researcher: is that what he spends the most time playing?
Dad: yeah.
F6P1: Angry Birds.
Dad: you play blocks to don't you?
F6P1s: yeah.
Dad: [brother] plays with blocks?
Researcher: What do you make with the blocks?
F6P1: sometimes I make buildings with cars with obstacles. And sometimes I make in elevator.
Researcher: for cars? What cars, like Hot Wheels?
F6P1: yeah.

... 
Dad: Yeah. They were really into Little People there for a while.
Researcher: Little People? What is that?
Dad: [F6P1] Go find a Little People.
F6P1: where?
Dad: I don’t know. Where is the Little People?
F6P1: Let me find one of them. They are kinda boring.
Dad: It might be underneath.
F6P1: I know.
Researcher: They are kind of boring huh?
Dad: Those are little people.
Researcher: why are they boring?
F6P1: because they don’t come with much stuff.
Researcher: They didn’t come with much stuff huh?
Brother: Yeah we lost all the other ones.
F6P1: we only have one.
Dad: you didn’t lose them. You have a bus for them you have a boat for them. Here’s one. You have a Jeep kind of thing.
Researcher: so the Angry Birds comes with more stuff? Is that what you like Angry Birds, or do you like Angry Birds for another reason?
F6P1: well I like it because then we get to destroy the pigs.
Researcher: You get to destroy the pigs. That is fun. Poppin Piggies.
...
Dad: yeah. He likes to build things. You like to make things and draw things?
F6P1: yeah.
Dad: do you like to break things?
F6P1: No. I like to build things.
...
Dad: . . .you know like this one you use two of the birds to lunch at it.
F6P1: and then it tells you how many times he wants the bird and which bird to use.
Like that one you can do redbird, yellowbird and blackbird.
Researcher: That’s cool. So have you gone through all the cards? Have you made all of those?
F6P1: I don’t really make all of those, I just . . .
Dad: You just build.
F6P1: I just build my own structures but this is kind of like we get to do our own. We get to build a structure with this much plastic.
Researcher: Ah. That’s cool. Do you follow those cards?
F6P1: I follow these. It’s called we get to build our own structure of that much blocks.
Researcher: and use exactly what’s on the card? Or do you just build your own thing?
F6P1: yup. What’s on the card and build something.
Researcher: okay.
...
Researcher: Can you launch the big ones in that? That looks like it might hold the big ones.
F6P1: they can.
Researcher: home or are they too heavy to go far enough?
F6P1: I put them in . . .they don’t really go very far.

... 
Dad: he likes to draw. [F6P1] Do you know where your book is?
F6P1: You mean my coloring book?
Dad: no the one you wrote. Your Angry Birds book that you drew.
Researcher: you did an Angry Birds book? Oh, I’ve got to see that. That would be awesome!
F6P1: This one.
Dad: you have it? Well no, the one that you may with all your drawings.
F6P1: Oh yeah. I have . . . is it the smaller one? I have it.
Dad: You have it over there?
F6P1: yeah. I have it here.
Dad: all your sheets? You know the sheets you made in your little notebook? No not that one. Yeah you know that when you drew with the racecars?
F6P1: what?
Dad: the one with the racecars? Two Angry Birds and the racecars? Do you know where that is?
F6P1: Will I know where one of my stories is.
Researcher: you made a story?
F6P1: yes. About an angry bird going on a mission.
Researcher: That’s awesome! Did you do it for school or did you do it for the fun of it?
F6P1: just for fun.
Researcher: just for fun? Oh that’s really cool!
Dad: why don’t you go show him?
Researcher: I got to see it. Can I take pictures?
F6P1: here’s one.
Dad: we haven’t stapled it together yet.
F6P1: daddy helped me make the car.
Researcher: Awesome. It’s the Angry Birds in the car.
F6P1: Yeah.

[we set them up the pages with the drawings in order for me to take a picture]
Researcher: Now you have to tell me the angry bird story.
F6P1: Um . . . an angry bird is driving a car and then he saw something and he got out his car and he saw this . . .
Dad: What is that?
F6P1: it’s a turbo with gears then they’re trying to restore a pet dragon back to the world it’s kind of like . . . and he’s scared.
Dad: That’s the Bird that was driving the car?
F6P1: what?
That: is that the bird that was driving the car?
F6P1: Ah . . . Yeah.
Dad: same bird.
F6P1: and then he saw that and then he won’t have to go find gems to . . . to get the dragon back to the . . . the pet dragon back to the world and then he got back in this car and then he saw that most of his mission time is gone and then he got some . . . went to that tree to get some more gems. Then he went back to get some . . . then got the white and . . . dragon. And then he went back . . . he went home with the dragon.
Researcher: Awesome! Angry Birds and Dragons.
Dad: Dragonvale. You like Dragonvale also, don’t you?
Mom: Playsticks.
Dad: Playsticks. Those things are awesome.
F6P1: I can build something really good with the Playsticks.
Researcher: Oh those are awesome! That’s the next level of Lincoln logs. It really is.
Mom: Yeah they come in different lengths like Lincoln logs do.
Dad: Different lengths and different colors. But you can link them anywhere in there. They have just kind of a scalloped shape.
F6P1: We can build whatever we want. And it has an idea book.
Dad: You like to build stuff with those don’t you?
Dad: You like playing with boxes don’t you?
F6P1: Yeah.
Mom: They all like to get inside of things. You know [F6P1] will get in the stripy thing here from time to time.
Dad: Stripped box. No, no [F6P1] don’t get in that. There is toys in that right now.
F6P1: it won’t hurt me.
Researcher: You can get this box if you want. So what or other things they have done with the box or other things they have played with that isn’t normally a toy?
Dad: Tents and clothes basket.
Researcher: Clothes baskets, that’s the second time I’ve heard that today.
[F6P1 and his brother take turns climbing into the box and tipping each other over in it. The brother is using the handle cut into the box to pull it over.]
Dad: Chutes. They make tunnels with them.
Researcher: So it’s just as he said pretty much anything they can climb in.

F6P1: I usually like to play with my highchair.
Dad: Oh yeah your chairs.
Researcher: Yeah how do you play with that?
[F6P1 tips the chair over and sits with the legs pointing in front of him and pretends they are guns.]
F6P1: I just do this and then I drive it like pretend and go PEW PEWWW PEW.
Researcher: So are the legs the guns? It’s his own Tie fighter. He needs cardboard wings on the side of that thing.

Mom: Cars . . . [Dad] used to be a firefighter so they like to do firefighter kinda stuff.
Researcher: Ah. Okay. So they trim boxes into firefighter . . . or ambulance or . . .
Dad: no they haven’t done that with boxes.
Mom: they haven’t done that in a while.
[Some conversation with boys while they play with the box. Dad brings in a box that is made to look like a car]
Researcher: Another box. What is that?
F6P1: It's a car.

... 
F6P1: Daddy. I can hop from couch to couch.
Dad: It's been well used. [F6P1] you're not supposed to do that.

... 
Researcher: So who made that one?
F6P1: Daddy.
Researcher: Did you help?
F6P1: Yeah. A little.
Researcher: That is perfect!
F6P1: I can put my whole body in it.
Researcher: Oh my goodness.

[Conversation about the Angry Birds box costume]
Researcher: So does [F6P1] use the phone or iPad or anything in any way that it's not intended for like we pull out her phone and use it for light when we are stumbling around in the dark.
Mom: As a flashlight. That's about it.

... 
Researcher: So do you guys restrict how much time do you get with their devices? I
Mom: We try to. We don't really have a set time limit but . . . No [F6P1] you can't jump up there. We don't really have a certain time limit or anything like that.

... 
Researcher: They get on the Internet that often?
Mom: We don't really use the Internet outside of apps and stuff like Netflix and the little apps and stuff that we have.
Researcher: That's about it huh?

... 
Researcher: Do they ever multitask while playing on the templates or anything like maybe they watch Netflix and play with the Angry Birds toys or something?
Mom: Yeah they usually do that while they're watching TV.
Researcher: what do they usually do all the watching TV?
Mom: Play Angry Birds. . . we let them in front of the TV sometimes . . .play blocks. …
Researcher: Do they get the technology taken away if they’re naughty?
Mom: Yes.
Dad: [F6P1] do you get the iPad taken away?
F6P1: Yes. Sometimes but not most.

**Family 7**

This family consists of a mother, father and F7P1 who is a 9-year-old girl. The mother was not present for the interview.

Researcher: Is math your favorite?
F7P1: No science.
Researcher: That is fun.
F7P1: Space!
…
F7P1: Depends on the day. Some days I have LEGO club, some days I don’t. Monday is LEGO club day.
Researcher: LEGO club?
F7P1: Yeah.
Researcher: What's that?
F7P1: It’s a club where you do things with LEGOs.
Researcher: Sounds like the best club ever.
…
F7P1: Oh here it is. 53 Paper.
Researcher: Oh 53 is amazing. They just came out with a new pencil.
…
Dad: We play . . . depends on the weather. Right now sledding hasn’t started yet. Soccer football things already ended. The neighbor kids are there across the street. Usually
they’re running around back and forth and then we ride bikes over to the playground nearby.

…

Dad: Inside we play with dogs or the cat that’s a big thing. We used to play restaurant. We haven’t done that for a while.
F7P1: Yeah that’s in the bathtub.
Dad: Or in the playroom.

Researcher: How do you play restaurant?

Dad: Are you going to tell him or should I tell him?
F7P1: I can’t recall because we haven’t played in a long time.
Dad: That’s true. Once you got really into reading that stopped. Restaurant is where you have teacups and plates and stuff like that. Fake food, you tell what’s in the menu, one person orders and you serve it up and bathwater is cheap and it’s always really good. And pour it back in and the bathwater is also off water right? You wash all the dishes. What else? Every once in a while if we get a good box. We haven’t done that in a while. A box house like in the blue room there. And then that becomes the TV watching house after a while.

Researcher: With the box.

Dad: Yup. But we haven’t done that for a while because we haven’t had a good box. We also . . . what else do we do?

Researcher: The TV watching house? What’s that?

Dad: It’s . . .

F7P1: It’s a house to watch TV in.

Researcher: You have to stay in the box? Do you make the box a house?
F7P1: It just sits there and get it in it and watch.

Dad: Clay… we do clay sometimes. Clay trees, rockets and space. Everything in space right now.

Researcher: What makes a good box? What’s the best box?

F7P1: Big box. Like your box.

Researcher: Big box?
Dad: Or bigger.
Researcher: Why does it make that . . .
Dad: She’s got to be completely inside.

...  
Researcher: Do you usually like to play with friends or be doing those activities with friends?
F7P1: Yeah sort of.
Researcher: Yeah sort of? What would you say she spends the most time doing?
Dad: Doing?
Researcher: If she’s not playing with the tablet what’s . . . usually one of those activities or...  
Dad: It’s usually with kids because she’s the only kid so if the neighborhood kids are here then there’s something going on with them. And actually from early on we had a thing where we weren’t going to have all the screen stuff going on in our house. So her grandpa got an iPad for over there, actually no, got her a DS. And that has to stay at their house. She does sleep over. The Asian grandparent thing, they feel like where they came from it would be to grandparents job to raise the grandkids almost entirely. So the American compromise is that she doesn’t sleep over twice a week.  
Researcher: That’s interesting. I didn’t know that.  
[conversation about parenting]
Dad: I think the DS gave way to the iPad.
F7P1: Sometimes I still play the DS.
Dad: Sometimes yeah that’s true. But it’s not a DS 3-D or whatever the latest thing is.
Researcher: But it still lives over there?
Dad: Yeah. It still is over there. So this is [Mom]’s iPad. And so [Mom]’s iPad is not really available. She uses it to work. It’s not usually lying around here so there’s actually occasional iPad time at home and occasional computer, PBS Kids, you know online thing. And some TV, but we sort of have informal restraints on the screen time.  
Researcher: So why is that? What makes you do that? And you say it’s informal. How do you decide? Is it may too much right now or . . .  
Dad: Well early on you could see a correlation between a whole lot of computer time, or TV time, or DS at that time I think and just some of the behavior things. They would just
kind of tune out and not really be involved in what was happening. And we kind of heard that but we didn’t pay attention and then when we started seeing we started really pulling back a bit. Then it became a half hour a day was the limit for a while and now it’s not so much, now it’s as long as we balance it with some more time with other stuff then it’s okay. So it’s not strictly a half an hour day. Total screen time is more than that. But then there are these times when she will kind of, sometime she’ll do it two night sleep over there, or for some reason or another she watches a whole lot of TV one day. Sometimes there’s that sort of, I don’t know, tune out thing that happens. And then we restrict it for a while. Some to go through peaks and valleys and after you restrict it for a while she goes back to being herself. So it’s a must like she wants to run around outside but doesn’t feel like she can if she can get on the screen and do something.

... Researcher: So when the tune out happens, is it less of an awareness of what’s going on basically around . . .
Dad: Yeah it’s partly that and partly sort of rebellious against anything else, like time to eat, or go wash your hands. Got to practice piano before bedtime. That kind of stuff.
F7P1: I need some more iron.
Dad: It kind of turns into little weird bad behaviors.
[conversation about the F7P1 finding diamonds in Minecraft]
Researcher: What would make you more comfortable with screen time?
Dad: I think it’s just, I don’t know. I think it’s a couple of things, you know. A predictable way to find games that were age-appropriate or activities or whatever it is. Because unfortunately grandpa sometimes download things that are not always age-appropriate and so she ends up doing all these other things you’ll only find out at the end of the weekend. So . . . because he doesn’t pay attention to those things. And the other thing is . . . well like on some of her school stuff now they have these . . . they have to do some online homework. Some of those she actually likes those. Some of the time, she gets to do iPad at home it’s because [Mom] found some educational game like State Capitols when she was doing the capitals in second grade. There’s a state capital game that worked really well and she really learned it. So that was helpful. If it’s all educational stuff in that’s not enough for her, but if it could somehow be not so addictive. I mean if
there was a game that was age-appropriate and didn't become so addictive. I don’t know if that’s even possible but . . . it’s got to be balanced with all the other things going on in life.

F7P1: I have six diamonds.

Dad: Communicate and dogs and school. It tends to always try to take precedence over all those other things if you let it go too far.

Researcher: So that’s interesting.

Dad: Of course the parents are always on the guard instant and some way. And the kids have a certain amount of that because it’s a part of the world; it’s a part of their generation.

Researcher: Right. And right now you’re hitting on the very reason I’m doing this project. But Yeah, no it’s true technology has to be learned, but how do you learn it without having that “tune out” as you say.

Dad: Yeah. How do you get moderation in some way?

…

Researcher: So [F7P1] what kind of games do you play with your friends? Like the neighbors across the street?

F7P1: I play . . . I play . . .

Dad: See it’s this kind of thing.

Researcher: You play . . .

F7P1: What’s it called? I play tag and race down the hill.

Dad: Yeah that was fun.

Researcher: You guys ever pretend play?

F7P1: Sometimes.

Researcher: What kind of things do you pretend?

F7P1: Once we pretended that we were . . . well one day we were playing a game called dolphins and that’s a game where you . . . there is one or more people and there’s one dolphin. The people try to get the dolphin out of the pile. So . . . yeah.

Researcher: So is the dolphin hard to get?

F7P1: Sometimes because it’s [friend]

Researcher: Do you see any patterns or common themes in [F7P1]’s play?
Dad: I think in . . . She’s gradually over the last two years become really interested in this whole ninja thing is kinda making its way through this age group. And they’re all ninjas at Halloween and some of them were ninjas last year too at Halloween. So that’s a big deal. Superheroes I think her big thing for that age group but not so much in her group of friends. I don’t know why. She’s really anti-princess stuff. She’s always been that way.

F7P1: So true.

Dad: Yeah even before you knew what princess was your anti . . . Let’s see. Hot wheels is pretty big. I think through a lot of the games she’s picking up a lot of the violent ideas about guns and about swords and stuff like that. It kind of fits in with the ninja thing sometimes and sometimes it kind of fits in with the cowboy thing.

Researcher: Okay.

Dad: The ninja thing peaks about every October when the costume thing starts going. To have this thing at their school where they have Trunk-or-treat and they’re all running around the parking lot after dark with the big campfire in the middle I’m going to their teachers trunks of their cars and a trick-or-treat out of their cars. So they have a game or activity and then they get treats. So than the ninjas are all running around in the shadows doing a lot of stuff. And it kind of tapers off during the winter.

Researcher: Does that get replaced with anything else? You mentioned something about Cowboys.

Dad: The cowboy thing is a summer thing it seems like. It would seem to be that way this year especially. The wintertime is mostly sleds and snowballs, and build snow men. Ice-skating. She likes ice-skating a lot. Try to go ice-skating even through the summer except the summer the ice rink here was closed for maintenance.

…

F7P1: Of course I draw.

Researcher: Play with clay?

Dad: Do you want to bring down your clay models?

…
Dad: Well sometimes I can’t tell. See that’s the pattern. There’s a request and then, “Well I just have to finish this game.” And of course the games never really end. There is no actual endpoint. “I just have to finish.”

F7P1: Daddy sometimes there is most of the time.

Dad: I don’t see that normally. In Clash of Clans there is no end in sight.

F7P1: Well, duh.

Dad: See? You say that, “As soon as I finish this game.”

F7P1: Yeah well that’s because I have something to do.

Researcher: So does she play with anything that isn’t normally a toy? Like a box. Not really a toy but something that becomes a toy?

Dad: Sticks. They’re stacks of sticks right out on the porch here. There’re sticks all around the house. We are going to be finding sticks for the next hundred years.

F7P1: Daddy, you won’t be alive for the next hundred years.

Dad: Well as many of those as I am. I think it started just as you know kids play with sticks when she was two. That it was sticks stay on the ground. Then it became sticks stay outside. And then she found Harry Potter and read as many books as we’d allow and then . . . and she and all her friends really got into Harry Potter about a year ago. So then they are all wands. And there around everywhere and there are all kinds of games that go with the wands.

Researcher: What are some of the Harry Potter wand games?

F7P1: Wand games? What are you talking about?

Researcher: Yeah. With the sticks? What do you do when you play Harry Potter?

F7P1: Will wave our sticks around and say the spells basically.

Researcher: What’s a spell? Do you remember one?

F7P1: Yeah I remember two of them. Actually three. Wingardium Leviosa, that makes things fly or I mean float. Advara Kadavra. Advara or Advera, whichever. That’s the killing curse.

Researcher: That’s one of the bad curses. The Mystery of Magic would have you for that one.

F7P1: Ministry not mystery. So there’s my pool.
Dad: Very Nice. She had to teach me all the spells and I had to follow her directions. It was an outside game according to her because they did that at recess a lot.

...  
F7P1: This is a tree, this is a thing of salsa, this is a burrito or tortilla whatever you want, space, a cookie or a pizza.  
Dad: That's like all of space.  
Researcher: Or a flying saucer.  
Dad: What's that yellow white things in space?  
F7P1: that’s a comment I already told you.  

...  
Dad: They started getting these, you know, trucks and spaceships like specific models which most LEGO is now is specific. It’s not like the big pile of stuff. And so they have over many months to build all these LEGO things and they are all sitting out on the table. But it’s something that. . . I don’t know all kids do this or if it’s just the way they’ve done it. So they started doing that and we didn’t do much here because there was all this LEGO over there. They don’t come to the LEGO of their own thinking they followed the directions only and then they make the railroad station or whatever.  
F7P1: That’s not the same with me daddy sometimes I make it different.  
Dad: Yeah, You’ve made a few small ones without, but not . . .  
F7P1: But Daddy sometimes and make them my own way.  
Dad: You Do?  
F7P1: Yeah.  

...  
Dad: What’s odd is actually that Hot Wheels more open-ended now. Like when we were kids LEGO were extremely open-ended and Hot Wheels was moderately open-ended. And now it’s kind of inverted, go look at her playroom is like the floor is carpeted in Hot Wheels. When [friend] and [friend] come over they do things with Hot Wheels. And when she is in the bath she’s doing things with Hot Wheels.  
F7P1: Not always.  
Dad: . . . cause race nicely around the tub as the water is draining. And then she’s figured out which one . . . she has these trial races where she’ll have 18 cars in the one
that gets first place is the one that can scream around the bathtub and that flip upside-down. And that one stays in first place and they drop off after that. Always not racing down the track games. So it's the open-ended stuff has just taken a different channel even though they do have some track things occasionally they don't use the track as much.

…

Dad: [F7P1] Can you think of anything? Do you ever use the iPad or [Mom]'s phone for something other than a game.
F7P1: Yeah, I use [Mom]'s phone for a flashlight.
Dad: You do?
F7P1: Yeah. In the Sahara Desert.

…

Researcher: [F7P1] do you ever do anything while you’re on the iPad, you ever listened to music and play with LEGOs or watch TV and play on the iPad? Do you do like two things at once when you’re on that?
F7P1: Yeah.
Researcher: What do you do?
F7P1: Ds and iPad. I mean DS and TV.
Researcher: What do you like to watch on TV?

…

F7P1: This is what I sometimes do. This is what I’m doing currently so I’m taking . . . these cars failed to land like this on here while it’s moving.
Researcher: Aha. Okay.
F7P1: So they start up here, push this or push down the flag on the other side. The flag moves this one around and then I send them down and . . .
Researcher: Scoop them up.
F7P1: Yup. He’s on.
Researcher: So he’s on if he lands face up.
F7P1: Yup.
Researcher: And then these are the two groups.
F7P1: So those are the double champions and these are just the single champions. I’m going to narrow it down to one. Sometimes I try sending them like this.

Researcher: Oh yeah, to see if they flip over the right way?
F7P1: Chance one gone. They get two chances. And he makes it.
Researcher: He makes it. That’s pretty awesome.
F7P1: Those are the double champions and they get two chances. Some of them are granted.
Researcher: So what counts as a chance?
F7P1: A chance.
Researcher: Yeah.
F7P1: Is one song.
Researcher: Oh okay. So they have to land face up before the song ends.
F7P1: Yeah. And they get two songs. [indistinguishable]. Result!
Researcher: Whew! That was a short song. He lucked out.
F7P1: This is a “granted” one so I doubt he’ll make it.
Researcher: Yeah, that’s kind of tough, but it’s cool looking.
F7P1: It’s a three-wheeler. It landed on its side.
Researcher: Nope, so this is his windshield? It just breaks off?
F7P1: I can do that one later. [she sets the three-wheeler aside]

…

Researcher: Do you do anything with these? What do you do with those?
F7P1: I don’t have [indistinguishable] normally I’ll line them up this one in the middle and these two on the sides and I’ll just jump on them. And sometimes this is the speedboat that’s the water and that’s the harbor.
Researcher: Sometimes it’s a speedboat, water and a harbor. That’s cool. Those look like fun

[The researcher introduces the activity packet. They talk a short bit about her climbing the wall. At one point F7P1 starts playing with Siri on the iPad to see what she says. This started when the researcher showed her how to take a screen shot. She activated Siri and would giggle at what she said. In the beginning Siri was only responding to the ongoing conversation then she started to ask Siri questions.]
F7P1: Let’s see what it says.
Researcher: Hold on I got to take a picture of this too.
F7P1: Hi there. What is your name?
Siri: Siri. Pleased to meet you.
F7P1: You are crazy.
Siri: I’m doing my best.
Dad: What was that . . . you had a funny question for her one time? The kind of stumped her. I forgot what that was. You remember what it was?
F7P1: No.
Dad: Just a little while ago.
Siri: I’m not sure what you said there.
F7P1: I just laughed.
Siri: I don’t know what that means. If you’d like I can search the web for ‘I just laughed’.
Researcher: It breaks down after a while.
Dad: Yeah.
F7P1: No thank you.

**Family 8**

This family consists of a Father and Mother and two boys within the age range for the study. F8P1 is 8 years old and F8P2 is 9 years old.

Dad: Okay we’re starting from when you wake up.
F8P2: Oh okay so we wake up . . .
Mom: That’s a good idea.
F8P2: Get dressed . . .
F8P1: We change our clothes. Back into her pajamas, get out robes on. We don’t brush our teeth, we eat candy . . .
F8P2: [F8P1]
...
Researcher: What kind of games do you guys play with your parents?
F8P2: Usually with our parents we play board games. And sometimes new wrestle with our Poppy.
F8P1: Oh yeah.
F8P2: Sometimes we wrestle with Dad.
F8P1: And we always win. I once put him in a headlock and he tried to trap me and I kicked him in the head.
F8P2: Yeah.
F8P1: So I put him in a headlock with my feet and he started to capture me so I kicked him in the head.
Researcher: Oh no.
F8P2: That was funny.
Dad: Hilarious.
F8P1: And he actually thought it was a pretty good move.
Dad: It was a pretty good move.
Researcher: Yeah the flip to the fore head is usually the finishing move in wrestling.
F8P1: I wouldn't actually kick you.
Researcher: Do you guys have like any requirements for what kind of toys they can have?
F8P1: Yes.
F8P2: LEGO . . .
Dad: Ah . . . I don't know if requirements are . . .
Mom: I've been pretty anti-toy gun.
F8P2: Toy gun?
Dad: Yes, but they still creeping or they make their own out of LEGO or airplane launchers is you just saw.
Mom: Or toast.
Dad: Or toast. Ash . .
F8P1: Or we make our own pancakes.
Dad: You know. I guess we don’t. I don’t know that we have any real hard . . . it's more like we know it when we see it.
...
Researcher: Do they have any of those devices?
Mom: Well, [F8P2] has a phone that is one of our old ones that he has games on.
F8P2: He thought his phone was dirty so if you wanted to wash it in water and so his phone kind of . . .
F8P1: Can I get a new phone tomorrow?
Mom: And so, yeah so he has some games on there that he plays with but it’s not every day.
Dad: We don’t have a like PlayStation or whatever the little handheld videogames are other than the phone and an iPad.
...
Researcher: What do you like to play with the most?
F8P2: Friends.
Dad: He’s trying to get real answers from you, so while you’re lying there think of the toys you play with.
F8P2: Well LEGO’s. I like building. Things that you can build and play with like LEGO’s or like the sword that he made Zoobs.
Dad: You know what Zoobs are [Researcher]?
Researcher: Yeah.
...
F8P2: Yeah. We also play with kitty.
Researcher: Yeah that’s another thing they can play with something that’s not a toy. Do you guys know of anything that like is not considered a toy but gets played with a lot?
Dad: Sticks. They might have sticks inside right now. Did you guys bring sticks in from outside?
F8P2: Yes.
F8P1: Yes.
Dad: Uh huh. They’re not supposed to do that.
F8P1: Should I show my staff?
Dad: Yeah. Yeah go get it.
Researcher: You got a staff?
F8P1: Yeah,
F8P2: it’s a stick that he calls a staff.
Researcher: That’s almost universal; sticks and cardboard boxes.
Dad: Yeah.

…
Researcher: Ah. I was going to say you like building I’m surprised you’re not building with the cardboard box all the time.
Dad: [F8P1] recently cut one up and was making something.
F8P2: Yeah he was making, he was trying to make a person.
Dad: But he was grounded then.
F8P2: Yeah.
Dad: It’s like his fallback.
F8P2: I’ve never been grounded. Why have I never been grounded?
F8P1: Because you never kicked all hole in the wall like I have.
F8P2: Yeah that’s true.
Researcher: So that’s the walking stick?
Dad: It’s a staff.
F8P2: One day he got really mad because I didn’t let him wear one of my shirts and he’s been kicking the wall a lot so he kicked a hole in the wall.
Researcher: Yup. That’ll do it every time.
F8P2: We still have a hole.
Researcher: You made a box person? You made a person of a box?
F8P2: Remember?
F8P1: Yeah.
F8P2: When you were grounded.
Researcher: What made you think of making a person?
F8P1: I broke it.
F8P2: What! Why did you break it?
Researcher: Does the great thing about a box if you can’t hurt its feelings.
F8P1: Because it doesn’t have a head.
Researcher: So you didn’t get to finishing the head yet, huh?
Dad: [F8P1], [Researcher] is talking to you.
Researcher: You didn’t get to finishing the head then, huh?
F8P1: Well I got the head and neck done. I was working on the shoulders. I got the shoulders done and then I tried to [indistinguishable]
F8P2: I made a four-armed guy.
Dad: [F8P1] how did you decide you wanted to build a person out of a box?
F8P1: Will there’s a book called Cardboard, building magical cardboard, and cardboard comes to life.
F8P2: Is it like a show?
[Mom excuses herself]
Researcher: you said that Cardboard was a comic book?
F8P1: Yes.
Dad: It’s a comic book? Hm.
F8P1: I like comics and chapter books.
Researcher: Is that we spend a lot of time doing? Reading?
F8P1: Reading and writing are two of my most favorite favorite favorite activities in school. And math I love math, and science.
Researcher: Is there anything left? Social studies?
F8P2: Oh, we draw! We like to draw.
...
F8P2: Yeah. Some of the more Photoshopped. We have a lot of pictures of our house.
Dad: Photoshopped?
F8P2: Yeah like these.
Researcher: Yeah? You guys did those?
F8P1: That looks like Minecraft.
Researcher: It does. I love these on the wall these are awesome.
F8P2: I mean this when I was really young. I think that was kind of funny. That one [F8P1] made that one.
Researcher: what about this one?
F8P2: I made that one. I made that one in Photoshop.
Researcher: So that's a Photoshop one huh? So do you play in Photoshop a lot? [F8P1] do you draw things in Photoshop too?
F8P1: No.
F8P2: No, he doesn't know how to use Photoshop yet because he never really wants to do it. But I make a lot of things in Photoshop.
F8P1: I want to do it but you always take the chance. I mean I never think of doing but you always do it.
Dad: I can teach you next time. We have another computer that you can use.
...
Dad: What do you guys do when you're outside?
F8P2: Well, we are going to ski this year.
Dad: Yeah. That's once every two years. He's talking about every day. What do you . . . when you go outside what do you do?
Researcher: or in the fall. Like If you make piles of leaves and things.
F8P2: yeah recently we made a big pile and sort of jumping in it. But we did that last fall and it was way more fun.
Dad: This fall it was kind of wet.
Mom: I know something you do for fun.
F8P2: What?
Mom: Dance party.
F8P2: Oh yeah.
Mom: Make up dances.
Researcher: Make up dances? No way.
F8P1: Hey, you want to see the moonwalk or the coffee grinder?
Researcher: You know how to do the moonwalk?
F8P1: Yeah, obviously. Do you want to see?
Dad: I don't think we're going to do a dance party right now.
Researcher: Oh, can we? This is perfect because it's also the observation.
Dad: Okay.
Researcher: No Please. I want to see a dance party.
Dad: Okay. See it.
Mom: You might need to move.
Researcher: I might need to move? Just get ready?
F8P2: But wait Dad, I don’t have Daft Punk on here . . .
Researcher: Oh, you’ve got the Daft Punk too. You guys got good taste. You guys are totally swag.
F8P1: Have you ever seen Despicable Me?
Researcher: I have in bits and pieces.

F8P1: Oh Dad. You know Photo Booth? We like to do Photo Booth. It’s been fun.
Researcher: What do you guys do with Photo Booth?
F8P2: Umm . . . well, we just make faces on it to see how weird we look.
F8P1: And on the extra one it looks like we had white hair.
Researcher: Oh Really. Does it like reverse the colors?
F8P2: No. It’s like black-and-white.
Researcher: Let me see. Can you do it with that?
F8P2: I don’t have it on here.
Researcher: Oh. Okay.
Dad: I know that for video games they also play Skylander.
F8P2: Oh yeah.
F8P1: Can we do that? Because we practice music all the time.
Dad: Can we do it right now are you asking me?
F8P2: Can show him?
Researcher: Yeah please do. So you are to show me how Skylanders actually work? Because I have not seen that yet. I’ve gotten to see the telepods, but I haven’t gotten to see Skylanders yet. Wait. Wait. Before you show me someone has got to tell me what that is.
F8P1: Nunchucks.
Researcher: And another sword. Okay. I never knew you could make Nunchucks out of K’nex. I’ve got to see that. That’s amazing. It’s like their arsenal of weapons. I have to lay these out.
Dad: Yeah the other day they, Yeah, he has the whole set weapons. Will you show him your weapons?
Researcher: Yes.
F8P1: But I lost my scythe.
Dad: He has a scythe.
Researcher: What? I've got to take a picture of your weapons.
Dad: What is scythe from? Is it LEGO?
F8P1: Yeah, Ninjago.
Researcher: Ah, Ninjago. That’s awesome.

... 
Researcher: So do you guys restrict screen time at all, or use of phones or tablets?
Dad: Yes we do.
F8P2: Usually we have to practice music before we do stuff like that.
F8P1: [Researcher], you’re a good man.
Dad: I would say that we try. And I think one of the other tablets has an ad for setting up a screen time limiter.

... 
Dad: They get too sucked in and then the parent doesn't want to have to be on the clock and be the one that’s always saying, “Okay now is the time to turn it off. Turn it off. Turn it off.” Whereas this thing just . . . kid sees the countdown and you can set it for an hour and there's a countdown and I think it just stops them.
Researcher: So is that the reason why you would try to limit screen time or is there another reason?
Dad: Is that the reason? Is what the reason?
Researcher: Like you know having to pace it? . . .or is there . . . basically why do you want to limit screen time?
Dad: Umm . . . I don’t know. I just want them to do other things.
[more description of Skylanders by Dad. They put figurines on a “portal” and the characters show up on the screen. They can then battle each other or do a coop game.]
Researcher: So you mentioned that you want them to do other things, like what other things? As a parent you want to see your kids do.

Dad: Yeah, well play outside. I like to play outside. I liked when they’re building and creating things. LEGO.

Researcher: So that’s really interesting. I want to go in that direction and have a more creative experience because you don’t have that with media as much. Like what do you think are the benefits of that creation . . . creative time?

Dad: What do I think the benefits are of creating? I don’t know I guess I just . . . it’s so personal. I think creativity is virtuous. I guess I think it’s also kind of training for kids to become someday producers of things instead of just consumers’ things.

Researcher: That’s the best answer. I don’t know if I can even answer that question yet and I’ve been studying it. That’s maybe the best answer I’ve heard in a while. I kept having this debate my head. And you see that happening with media like this they get sucked into it. And you’re right they become consumers and I thought what happens when we get down the road and everyone’s just consuming. Who’s making?

Dad: Right, Yeah. That’s kind of what America is doing.

Researcher: Yeah that’s a great quote.

Dad: I do think that I am sort of just old-fashioned. I mean I think there are digital ways of being creative producers. So I try to teach that in Photoshop. He is kind of me in that it’s challenging. There is always some little thing he gets hung up on and so I teach him a tool that’s very difficult. I don’t know, it’s a master tool and there’s always something like he clicked on the wrong tool or hit the shift key, something happened that . . . I don’t know I think a little of it’s kind of old-fashioned and a little bit is I want them to do creative things.

…

Mom: And also one of [F8P2]’s conferences with the teacher was in kindergarten and [F8P1] was with us. And we were sitting at the table with her and the two of them were over playing and just kind of doing the thing that they do which is . . . you would have to probably secretly videotape. If they are conscious that you’re watching, it’s not the same level. They just create these games since they were little. They started with their
fingers. And it would make these spider fingers fighters, is what they call that. We have some videos of that actually.

Dad: The finger fighters?

Mom: Fingers fighters... but you know it’s just kind of evolved from there. But during the conference she said, “I don’t have kids that play like this much anymore, because everyone so locked into ‘the thing’.”

Researcher: The thing?

Mom: Leading the play rather than just . . .

…

Mom: Right. And these two will get into a game whether it’s their LEGOs, or their cars, or K’nex, or Zoobs, or their stuffed animals and they create this narrative and it’s . . . they’re constantly negotiating what’s going to happen with each other and They’ll disagree about it and then they’ll direct each other, “okay now your guys going to do this, and your guy’s going to do that.”

Dad: We used to call it the “how about” game because that’s what we would just hear the whole time, “How about, How about this guy has this laser sword.” Then, “Well, how about this guy has a laser sword shield?” And it just kind of goes back and forth and builds.

Mom: And a lot of it is these explosive noises that go along with it. And so you know the other day [Dad] was saying . . . I don’t remember what you said, but it was something like, “You know, you can’t just blow stuff up in the living room all day.” But the thing is, for me, I know sometimes it seems like we’ve been doing this for hours now can we for once do something else. But I also think it’s okay because it . . . at least it’s creative and they’re learning to negotiate and to interact, you know, work something out between the two of them because they both want the game to continue and even if they have to . . . and sometimes it doesn’t continue because they have to agree but, for the most part in order to keep the game going they will work it out. They will come to an agreement even if it’s an, “Okay fine!”

Researcher: So does this type of gameplay always happen with the two of them, or do they participate in it one on one?
Mom: Usually they’re together but sometimes they’ll just be alone . . . [F8P2] more so, I think, than [F8P1] will just . . . by himself have the game going. And [F8P1] seems to when he’s alone will draw.

... Researcher: Do you ever see them if they’re using the media, do they ever multitask like maybe they listen to music while they play with LEGOos or watch Netflix on this while they play with LEGOos?
Dad: I don’t think so. I think they’re usually pretty focused on that. Even with both of them and one of them is playing.

... F8P2: Like draw the toy?
Researcher: yup.
F8P2: Well I like to draw LEGO sets ‘cause well. . . some of the LEGO sets that I don’t have that I like, I have a LEGO book that has some of the sets that I like.
Researcher: Awesome. That can be a part of it.

**Family 9**

Family 9 consists of a mother, father and three boys. Two within the age range for this study. F9P1 is 7 years old and F9P2 is 9 years old.

F9P1: This is what I mostly use it for.
Researcher: The sword that becomes a gun. How old are you [F9P1]?
F9P1: Seven.
Researcher: Seven?
F9P1: Yup. It can also be this . . . this . . . this . . .and . . .
Researcher: . . . and the flying sword. How old is [F9P2]?

... Researcher: Did you build that?
F9P1: Yeah. It’s called the drone game.
Researcher: The drone game? You guys all play that?
F9P2: I don’t.
F9P1: Yeah.
F9P2: My tank can trample your base.
Mom: They’ve been doing elaborate LEGO games.
Researcher: Yeah you guys have some awesome LEGO s going on. So the tank is your favorite LEGO s?
F9P2: Yeah.
Researcher: When did you get that?
F9P2: I built it.
Mom: It’s his own design.
Researcher: It’s your own design? That’s amazing!
F9P2: I built it about three days ago.
Researcher: That’s way cool.
Mom: He’s going to move to Denmark and work for LEGO, and I’m going to go visit him.
Researcher: Yeah. Right?
F9P2: Maybe. You better be nice to me.
Researcher: That’s awesome.
F9P2: You’ll have to buy me a LEGO set there.
Mom: You’re the one working for LEGO. You get all your sets free or something.
Researcher: Is it safe to say that LEGO s are your favorite toy ever?
F9P2: Not counting the . . .
Mom: Yes I think LEGO s are probably your favorite toy ever.
F9P2: The tablet is actually my favorite toy ever.
Mom: You’re LEGO is your toy that you mother does not restrict.
...

Mom: What do you do when you come home?
Dad: Somersaults.
F9P2: Play with my LEGO s.
F9P1: somersaults.
Mom: [F9P1] why don’t you answer the question first? You like to do your somersaults yeah . . .
F9P2: I play LEGO.
...
Mom: They get an hour or less of TV today. How many days a week is mommy usually let you play video games?
F9P2: Every day.
Mom: They used to play the Wii three days a week. But now [Dad] lets them do tablets for half an hour every other night or so. Otherwise there is a playing by themselves or playing with friends. I would say [F9P2]'s day after school is LEGOs, playing with friends, but that’s usually LEGOs too, and the same amount of TV or video stuff as [F9P1]. [F9P2] probably reads at least an hour a day too.
Researcher: So their time on their tablets, does that come as the same time? Can they play on the Wii or do that or are they separate?
Mom: Yeah. It’s either/or.
Researcher: So that’s a total screen time type limitation.
...
Researcher: So you guys restrict how much time they have on that. Why do you restrict that?
Dad: Probably so they can get a wider range of activities. Not just sitting around all day but . . . I mean there’s kind of a funny story from last night again from the wedding is ah . . . want their cousins about [F9P1]'s age, a little older and he had and iPad. So during the dinner he sat there and played the iPad and didn’t talk to anybody.
Mom: He wasn’t even in the room though. He was in the hallway.
Dad: He was playing there for a while.
Mom: And then know each other. They’ve gone camping together and played with each other but he didn’t even talk to anybody, that I know of. He just disappeared out to that hallway.
F9P2: I didn’t even see him.
Mom: Well, and then the unfortunate thing is they were spending the night and we weren’t so he might of gotten to use the pool later too. So it wasn’t like he was video
gaming the entire night, but yeah I know. Yeah I knew that would make you scowl at me.

Researcher: So it sounds like the interaction is really important especially when you’re at events like that?

Mom: From my standpoint there’s a million reasons why I don’t want them gaming all the time. Depending on who you read their maybe increased violence and something like that, like the thing if they’re involved in violent games and that. Sometimes I see the behavior deteriorating if they don’t wait too much media interaction during the day. They get wilder when it’s turned off.

Researcher: So it’s interesting, I’ve been hearing that a whole lot and it’s strange because it’s like you said it depends on what kind of actual research it is. For just about every parent has said it changes the behavior a little bit after a while. So can you describe that a little bit like what happens? There a little more wilder?

Mom: If you were here long enough to watch and episode of something, within 10 seconds of the TV being turned off it would be, at least two of them will be at each other’s throats.

F9P2: [F9P1] and [youngest brother]

Mom: Not that they aren’t already.

Dad: [F9P1] No! It could be worse. I don’t totally agree with what [Mom] says though . . . I don’t think . . .

Mom: But you agree that it’s healthy for them to have a variety of activities.

Dad: I don’t think they act any different when the TV goes off. It’s usually mostly just immediately returning to their previous activities. Fighting.

F9P2: It’s sort of a time out. We do the exact same thing after the timeout.

Mom: But we both agree they need a wider range of activities. We want to encourage them to be outside. We both agree we want them to be outside we want them to be physically active and you know. Being with friends- not just standing side-by-side playing the same video game together but inventing their own games.

Researcher: Interesting. Speaking of inventing your own games, what kind of games do you guys invent?

Mom: Tell him what you did at the table last night at the wedding.
F9P1: We were doing science stuff. We were poured water in other cups and stuff.

Mom: They had all the water glasses and champagne glasses and stuff and they were making a concert with the music. You know how you can rub your finger around a thin rimmed glass? And then they poor little more water in and a little more water out to see how it changed. They had quite the little experiment going.

Dad: In general it seems like you guys mostly do the single or group LEGO activities, like [F9P2] and one of the neighbor kids. Do you have wars or kinda just . . .

Mom: There for a while you and [Brother] were doing a lot of Batman stuff. They made this huge LEGO base and did all of these different Batman scenarios on it.

F9P2: Oh. We can show him that.

... 

Mom: [Dad] taught him some of the basics of chess, and she’s been enjoying that lately. Of course I can’t play that. Nobody ever taught me how to play. You’ll have to teach me how to play [F9P1].

Dad: Wrestling too. You know, physical activity.

Researcher: Yet it doesn’t have to be a board game necessarily.

... 

Researcher: Ah, Non-video game was for now I’ll come back to videogame wise. That’s awesome! That submarine.

F9P2: I wrote a book about it at school so I built one.

Mom: This is another one that’s his own design. Models after the Hunley Submarine.

Researcher: Torpedo.

Mom: I mean, non-media toys I guess we obviously allow swords and pretend guns and what not.

Dad: A lot of them.

F9P1: Pretend swords not real swords.

Mom: [F9P1] even has a little S.W.A.T. police set that came with a costume or whatever. I mean, they use their imaginations when they play with it. We don’t tend to let them point the guns at each other but otherwise it’s okay if they play war type games or bad guys versus good guys type games. As far as media, you know Wii games and such. I think all of ours are rated “E” for everybody.
Mom: They like playing that elaborate bank robber or whatever game.
Researcher: Oh, What’s that?
Mom: They made that up so it a five year old, [Youngest brother] who is almost five, and [F9P1] who is seven. They played this elaborate bank robber game that they made up and all the stuff that gets stolen, which is whatever toys, gets put in their hideout, which is up in the bedroom. So the bedroom is filled with stuff.
Researcher: So that’s like robbers, Banks and robbers, police and robbers? What do you call it?
Mom: [F9P1] what is that game that you play with [Younger brother] and [Friend] lately? Bank Robber game or what do you call it?
F9P1: Oh I wear a mask and am [indistinguishable]
Mom: But does it have a name? Did you get the game and name? No? Just the Robber game.
Researcher: Just the Robber game.
F9P1: Then when I walk upstairs. . .
Researcher: Are there any discernible patterns or common themes in your children’s play that you can think of right away?

... 
Researcher: What kind of creative activities do you do? LEGOss is definitely one of them right?
Mom: LEGOss is definitely one of them. You haven’t done it so much recently but you used to make all kinds of robots and owls and other interesting things out of empty boxes and empty oatmeal containers too. So he built stuff out of materials other than just LEGOss.
F9P2: I like LEGOss better because it doesn’t waste tape.
Mom: You don’t do it so much at home, but [F9P2] really really likes art. He’s successful with the art he’s done at school.
F9P2: I’m the gymnastics boy.
Researcher: So when you make things with empty boxes, what kind of things are they and you use tape and boxes, what else do use?
Mom: Your owl’s feet were Hot Wheels cars. Is he still put together?
F9P2: yeah but not the feet.
Mom: Where is he?
F9P2: in my room
Researcher: Yeah that would be great. That sounds awesome.
Mom: And [F9P1] more with the games he makes up. He doesn’t need to start with a board game he can start with some mismatched group of toys and if he’s got a friend or two that can make up an elaborate game that has different rules.
Researcher: So it has rules. Is a competitive type or is it making up some sort of story or . . .
Dad: More stories.
Mom: I would say more stories. Because even their bank robber game has the two younger boys . . . [F9P1] are the two younger boys the good guys and you’re the bad guy . . .
F9P1: Yes.
Mom: Or do you take turns? So [F9P1]’s the bad guy and pretends not to see them. And is like, “Oh where can they be? I cannot see them anywhere?” So here’s his owl minus the Hot Wheels feet.

Dad: [F9P1] you were just doing the castle.
Mom: Oh the [Younger brother]’s fold out castle? If you need a picture of a fold out castle, I can email you one.
Researcher: That would be awesome.
Mom: There’s the castle itself but [F9P1] had it all set up. If you want to ask another question this will take me a couple minutes scrolling through to find them all.
[Side conversation about the pictures]
Mom: Every single window that Castle has a specific guy in it, guarding it and doing something and the guys were from more than one set and the horses were down there in the mews you know. Some cool stuff. Have you heard of the Magic Tree House series?
Researcher: Yes.
Mom: He’s been reading those also and they have nonfiction guides each Magic Tree House book. So one of them was castles and knights and he’s three quarters of the way through that one. He really got interested in the castle; he’s got a cannon in there, all sorts of stuff.
Researcher: So what were you doing with all of those?
Mom: Oh, and he set up all the blocks along the outside perimeter to keep it safe.
Researcher: What made you think of that [F9P1]?
F9P1: Well . . . when I, I just wanted to invent a game so I invented this game. First it started out like this and then I thought more of a real castle so I built some stuff onto it then became like it’s a real castle and there was this bad guy that was a Robin Hood guy. He had a sword and a bow and arrow. He was the bad guy, and they would never let him in and no matter how hard he tried he couldn’t get over the gate.
Researcher: So you had to protect against the Robin Hood bad guy.
F9P1: His place was a tree he didn’t normally go . . .

Mom: The other thing that was turned into a toy yesterday with all the hanging around at the wedding. So I had a dress on that had a kind of a link and chain belt. The end of the belt came down about you a far and had a little coin thing on the end of it. And what did you do with it?
F9P1: I kept on saying, “Come on Doggy.”
Mom: Oh yeah, I was the dog kept trying to pull me along. [F9P2] and [Younger brother] kept twirling it around and making a game out of that. But who knew my clothing was going to be turned into a toy yesterday.

Mom: [F9P2] you’ve built Bob. I wonder where that scrapbook page is?
F9P2: You threw him away.
Mom: Well I know, but that’s why said, “I wonder where that scrapbook page is?”
F9P1: Bob? Who’s Bob?
Mom: Tell [Researcher] who Bob is.
F9P2: A big cardboard thing I made.
Mom: But what was it? A man. Taller than . . . almost as tall as Daddy. Do you remember what year you built it? I might be able to find a picture of that too. Or do you have anything else up in your room that you built that you can show? Go show him the fish picks box.

F9P2: No.

Mom: No?

Younger brother: I will.

Researcher: What about you [F9P1], did you do anything with cardboard boxes?

Mom: We haven’t mentioned that. He really loves the stuffed animals, even at 10. He’ll play games with the stuffed animals.

Researcher: I totally did. My stuffed animals rocked.

F9P2: [Dog] likes stuffed animals.

Mom: [Dog] likes stuffed animals. [Dog] is too old to play games with them but they all love to pet her.

F9P2: This is for my bunnies, Colorful, Butterscotch. . .

Researcher: Fish Picks?

Mom: That’s to feed the stuffed penguin.

Researcher: That’s awesome. Can I take a picture of it [F9P2]? Is that alright?

F9P2: uh huh.

Mom: FYI If it makes any difference for your study, he probably made that when he was six. So that’s nothing to recent we can’t throw it away.

Researcher: Yeah that’s cool though.

Mom: basically we can’t throw anything away.

[Side conversation about F9P2’s stuffed animal names]

Researcher: Oh my goodness there’s more. Do they all feed the penguins?

Younger brother: No.

Researcher: What do these other ones do?

F9P2: This feeds the rabbit. I have to pump their stomachs.

Mom: Well here you go. Imaginative play right here.

...
Mom: We used to just use paper flashcards for his math practice, but I know [Dad] has done some tablet stuff with him. Yeah, here we go, here’s the . . . But yeah, [F9P2] will actually go to [Dad’s] website where he’s scanned some our LEGO instructions but will also go to other websites and places when [F9P2] decides, “I want to build such and such set. Mommy can I use the tablet just for demonstration.” So it’s not like he’s on . . . he’s not spending three hours gaming. It’s just the still picture so he can build is LEGOs.

Researcher: So you’re okay with a little extra screen time if they’re doing something outside of that. . .

Mom: Yeah it’s still picture type stuff.

Researcher: Interesting.

Mom: [F9P2] has made basically little stuffed animals of wool. Felting is what it’s called.

F9P2: No I haven’t. . . Oh yeah, mice.

Mom: Yeah you did. Way back when. The mice and we made the hedgehog together and I made the penguins by myself. But all that just came from someone teaching us how to do it and then I bought a book. He’s done craft stuff.

Mom: But especially [F9P2] and [Youngest brother], since they sit next to each other in the van. They’ll interact and look at each other’s tablets a lot. And [F9P2] will give advice, wanted or not, to the other two about their games.

F9P2: Not normally. That’s with the Wii.

Researcher: So it’s almost a social event?

Mom: [F9P2] will give a sports commentary of you to both [Dad] and I about what’s he’s doing too.

F9P2: Only in the army.

Mom: Especially with the Great Little War Game, because it’s got so much strategy. Like, “I just moved my sniper.” It’s almost like listening to ESPN. “I just moved my sniper.” And “Oh no, now they’ve got another sniper.” And . . .

F9P2: No I never said that.

Mom: “Now they just bought another tank.”
F9P2: No.
Dad: Yeah you do that all the time.
Mom: I’m not saying exactly what you say but that’s the type of . . .
F9P2: Only told one of my tanks are blown up or when one of their tanks are blown up or when I’ve bought an anti-tank guy.
Dad: There’s a lot of running commentary.

... 
Mom: [F9P1] can show you the best hotel ever right now.
Researcher: The best hotel ever.
Mom: This is what amused him in a church service a couple of weeks ago.
Researcher: Okay hold on. I’m got to see this.
Mom: [F9P1] Hotel and Indoor pool.
Researcher: Can I take a picture of it?
Mom: Hold it up here with your thumbs so that you not covering up any of the words.
You want to be able to see the parking ramp in the gas station too. And the 700 windows.
Researcher: Alright so tell me, what’s in the [F9P1] Hotel? What makes it so great?
F9P1: well there’s a bunch of . . .there’s three beds, four beds in each room.
Researcher: Wow. One for each person in the family almost.
Mom: I like that idea . . .well I’m willing to share with you but it be nice if the boys didn’t have to share.
Researcher: Is that it? Just a lot of beds? It’s got a pool.
Mom: Tell him about the pool.
F9P1: There’s a hot tub that’s this big.
Researcher: That big:
F9P1: There’s a pool that’s that big.
Researcher: You can’t do much swimming you can just step your feet in.
Mom: I think he means in size of a hotel, not that.
Researcher: Oh, Okay. So the hot tub is the size of a couple of rooms then? The pool is the size of the whole floor? Awesome!
Mom: That would be an awesome big pool wouldn’t it?
Family 10

Family 10 interview consists of a Mother, Father, F10P1 and his younger sister. F10P1 is 5 years old. I met with the mother first for the interview then later returned to do observation with the F10P1.

Mom: He’s usually building something or drawing. He loves to draw. Drawing’s his big thing. And so it’s one of the things he uses on his Leap Pad. He likes to do drawing parts.
Researcher: So that’s maybe when he likes to do the most? With and without digital media?
Mom: Yes. With and without he likes to draw and he likes to watch YouTube videos of, gosh, trains, people cooking. Yet he learned about Spiderman actually by watching a guy make a Spiderman cake, and then he wanted to make one. And it’s just, every now and then he comes up with this idea to bake and it’s like,”You were watching YouTube.”
Researcher: So he likes to cook too?
Mom: Yes. He likes part of any of the cooking that we do especially baking. We usually do pancakes once a weekend.
Researcher: Does he look up any other do-it-yourself type projects or anything?
Mom: LEGO’s. He likes to watch how they build LEGO’s. He’ll watch 30 minute long videos on how to build these houses and kitchens or something and then he’ll go and he’ll build it. And so that’s the hard part that night when he watches this then he wants to go build right away and it’s just you have to interrupt him. But he’ll remember the next day and it’s like, “you can remember to do that but you can’t remember to pick up your toys.”
Researcher: Yeah.
Mom: Building LEGO’s to create a story. He’ll get into that.
Researcher: Yeah.

…
Mom: [F10P1] [and spells it] he'll also watch videos that have songs. He'll watch them over and over again until he learns the song. That's how he learned the planets. There was this planet song that the group that does a bunch of educational videos, and five little monkeys is the current one that I now I’ve memorized.

Researcher: And he does all of this on YouTube?
Mom: Yes. Yeah that’s another reason he only does that night is because we can monitor. Let’s see, what was he watching last night? Let’s take a look at his history. These things where they make these little miniature erasers and stuff like that. I don’t know if it’s in Japan or Korea, like they make these erasers of small things of food and then do it piece by piece.

…

Researcher: So it sounds like you restrict their use of electronics.
Mom: Will we don’t like him to just sit and play with it. [Sister] likes to more than [F10P1] does. She’s more the game player though she likes to play games and stuff.
Researcher: So [F10P1] doesn't like to play the video games on them?
Mom: We've tried getting him to . . . because me and my husband like to play video games, we can get them to play on the Wii or even some other kid ones. But he does like the one with monkeys again. I can show you on here. He loves trains and so there’s a train game that he liked that I can show you on here, but he’s played it so many times I think he’s gotten bored of it. Oh and they also like to do the practice . . . I can show you some of the apps. There is spelling that gets used a lot. Right here, this one. This one he likes to practice his writing on. You have to follow it.

…

Researcher: You mentioned that you don’t usually want them to be on too long. Is there a reason why?
Mom: Actually I like them to be active also. I like them playing and you know getting the sense of touch for things, and interacting with each other and other kids. Plus when he comes home he has his down time but usually He chooses to draw or build LEGO during that time and then we try to be active or go outside and in the evening when we're trying to just kind of wind down, you know physically and then the brain can work on the games and stuff then.
Researcher: So you use it as a wind down. That's interesting.

Mom: On the weekends they might pick them up more during the day, like I said doing downtime but [F10P1] is a very active kid he doesn’t like to sit down and he’s not one to sit and watch a movie lots of times for very long to watch little tidbits but be doing something else he’s always got to be doing something else as well.

…

Mom: Once he gets home usually get a snack and then I want to drop something usually it’s something that he learned about in school or something he did with friends. It’s like he’s got something in his head he needs to get up and so he’ll draw for little while and then. Then he’ll want to either go outside, especially when it was nicer, to go outside for a little bit I will come down here and he and [Sister] will usually play something together. Lately it’s been Angry Birds because he likes to build with big blocks and make is on angry bird things that he can throw at them and try to knock them down. Or LEGO’s or build a train track. We’ve got a lot of Thomas trains. That was his thing for since he was two until recently. But then he’ll usually . . . after that we’ll have dinner, but usually after dinner he’ll go back and draw something again. He loves to draw. Sometimes so hope all the dinner is at something kind of easy. He’ll set the table. And then I’ll come down. It could be anything. They could do dress-up or they’ll play a game or. . . I’m trying to think.

…

Mom: Sometimes he knows the words and sometimes he just puts them together to guess. He’s learned a few words working with his grandma on it. And he also likes to play with the Google Earth.

Researcher: Oh Yeah.

…

Researcher: Right. What kind of games do you and your husband play with [F10P1]?

Mom: Well we’ll do Angry Birds. We’ll build the stuff with him. He likes Mousetrap. We’ll play Mousetrap. He likes Pictionary and he likes to do puzzles. But I don’t know he’s not a real big board game player. He likes hide-and-seek. Or do dress-up, baking, monsters or superheroes. We’re always the monsters. The memory game, he’ll play the memory game with [Sister] and I. just where you flip them over and they have to flip over the tiles
or cards. You know, to try to make the match. She likes to watch us play some video games; we don't play video games a whole lot. Every now and then [Dad] will put something in. He'll like to watch it and move the stick around but we let him actually play some of the games I think he just gets frustrated because he doesn't have the dexterity yet. So he doesn't have a whole lot of interest in those. He likes to play school. She likes to be the teacher and have us be the students. We've tried a few board games with them and he hasn't shown a whole lot of interesting that. Oh, he'll play Cooties because he likes to build the bug.

…

Researcher: Are there any discernible patterns or common themes in your child’s play? So To your name mentioned he really likes building and active things, so anything along those lines or like is he really into the Marvel action heroes or, well trains is one of them. Mom: Trains. He loves trains anything. Lately he’s been really into Batman and Spiderman. He’s really latched onto those two, or making up his own, he likes to make the little centerpieces and dressed in his pajamas that are solid colors, you know lightning man, or fast man, so he likes to make his own and make his own costumes. Lately Angry Birds. He’s really been into Angry Birds lately. And he’s been showing interest in space and the planets. He likes to read about those and he’ll even watch . . . we got the Universe series. He likes to watch those and learn about the planets out in space. He doesn’t want to go in space he’s made that very clear. He doesn’t want to go in space because he’s heard you can’t breathe in space but he likes to learn about it.

…

Mom: When he picks up books at the library they’re always different. They’re always about kids. Kids doing things. He doesn’t usually pick out books about trains or Angry Birds or animals. It’s usually about a kid doing something. Which I’m glad he, you know, has different interests because he can be a little obsessive about things sometimes. Researcher: That’s interesting. That’s good insight. I never thought about asking anyone about books that they read. That really gives a good look into it. What kind of things does [F10P1] play with that isn’t originally intended to be played with? Like a cardboard box which is a part of the packet by the way?
Mom: Yeah, I mean cardboard boxes he’ll turn into houses or caves. The love to make tents out the pillows and the couches upstairs. We got the big ottomans and the coaches are really deep, so they like to build forts and houses out of those. He’ll get some of the pots and pans from upstairs and bring them down here and cook with them, play kitchen. Coins. He likes to play with coins.

Researcher: Really? What does he do with coins?

Mom: Ah, treasure. Sometimes and other times he likes to just roll them to see how far they’ll go. Even though they have their own capes, they’ll make capes of blankets or towels and folded clothes. He’ll build with anything, he likes to stack up and build the presents upstairs. Or He’ll actually dump stuff out of bins and boxes and build those up sometimes. That’s usually when I’m like, “Okay let’s find the blocks.”

Researcher: Yeah that can get messy after a while.

Mom: Yeah anything you can think to build list, he usually just likes building with things. When he was a toddler used to like to go into our bathroom and pull out all shampoo and lotion and any bottle he could find and take them out into the living room and just line them up. I don’t know why he’d do that. But any bottle he can find, he would line them up by size. He’ll take anything arts and crafts, he’ll try to glue things down. He’ll try to turn different toys, for different things he finds, don’t try to turn it into anything you can create a picture with. Like cookie cutters or just toys. Sometimes he’ll use toys like they’re not supposed to just create something or picture that he’s got in his head.

…

Researcher: There’s a lot of fun creative things in there. So kind of the same question but related specifically with the technology, have you ever do anything with his iPhone or Leap pad, that generally isn’t intended to be done with it.

Mom: He likes to practice his writing and spelling, especially his name, and he always does it on my phone, and so he texts people just his name or odd words. I’ll get a phone call, “Your son’s got your iPhone again.” But he likes to practice his spelling on the text program.

Researcher: Another example is you know, we’ve all have done it where we use our screen to see around in the dark.
Mom: Right, Like.

Researcher: Has he ever tried to build with it? Use it as a block?

Mom: Yeah. Yes he has. He’s trying building them up before. He'll turned on, he found the flashlight program, he turned it on and made it a window one time.

Researcher: No, that’s awesome.

Mom: He likes to FaceTime and he would have me take videos of him singing or dancing and likes to see himself with pictures and stuff, especially he likes to see what the pictures turn out like. Music. He’ll find videos on YouTube that has the music that he likes, and held to set it down, and she knows how to turn on the Airport upstairs speakers, and so turned on up there and he’ll dance to it. But he won’t play music from the music file; he goes to YouTube and finds the videos that have the music that he likes. He’s going to Google maps, and instead of using it to find a place he’ll use it to look around the world. Same thing with the weather program. He’ll use it to just look around see where places are, because we had family over the place and friends. He likes to see where they’re at. He’s called my parents for a couple of times other than that he doesn’t really use the phone app.

…

Contextual Inquiry

Researcher: What are these?

F10P1: Those are shape blocks.

Researcher: Shape blocks? What do you do with them?

F10P1: You can do anything you want to build.

[I play with shape blocks for a bit and the F10P1 shows me how to make things with shape blocks. They have pads that show designs that you can build from.]

Researcher: do you always follow those patterns or do you make some of your own stuff?

F10P1: I make some of my own stuff.

Researcher: What kind of stuff?

F10P1: Like trees or bunnies.
... 
Researcher: Both of them? Nice. What's your favorite toy? 
F10P1: actually drawing. 
Researcher: drawing? 
F10P1: Uh huh. 
Researcher: Can you show me some new drawings? 
F10P1: Yeah. I like to draw with washable markers and crayons. 
...

Mom: Why did you put that up there? What was that for? 
F10P1: That's for the art rocket. 
Researcher: The art rocket? What's and art rocket? 
F10P1: it's from the green boxes. 
Researcher: The green boxes? 
F10P1: Yeah, like this. 
Researcher: What. What's this? 
Mom: Kiwi Crate. It's a company that sends monthly crafts that you can subscribe to. 
We then draw racecars for a little bit.] 
Mom: he's been drawing since he was about two years old. We used to actually have him, when he could talk for us very well, we used actually have them drawn it out so that we would be able to explain to us through his pictures, so he's always loved to draw.

**Family 11**

This family consists of a Father, Mother and 5 children. The youngest two are in the age range for this study. F11P1 is a 7-year-old girl and her brother, F11P2, is 10 years old.

Dad: What do you think you going to do when you go to [Friend]'s today? 
F11P2: LEGO's 
...


F11P2: Your dad tells me... you the one that listens to the audiobooks to the pillow? That's awesome. Do you do something with your Kindle that isn't normally meant to use that way?

[Side conversation]
Researcher: They use it as a flashlight to see around at night?
F11P2: Well yeah. To see my light. Like when I go to the bathroom at night. I just get under a pillow, click the button and see where it lights. It's really helpful. And then when I wake up I can play video games all night till I wake up, or by that time.

... 
Researcher: Nice. I've got to see how that works on those. [Dad] you restrict how often they can get on their devices?
Dad: Uh huh.
F11P2: Yes. Meanie.
Dad: It's a constant battle. Unfortunately it ends up getting used as a disciplinary tactic. If you don't do this, this and this it gets taken away. It's always like a bartering...it gets very frustrating.
Researcher: That's very common.
Dad: It's the thing that works and...
Researcher: That's very common. Why do you limit the screen time?
F11P2: Like an hour a day.
Dad: Why?
Researcher: Yeah, Why and how. Is it by time or is it by feel?
Dad: It's by time and we limit it because they would probably be on a continuously from the time they get home to the time they to go to bed and I think... We both.

[Side conversation with the older brother about whether that is a bad thing or not.]
Sister18: Why don't you limit my screen time Dad?
Dad: Because you don't abuse it. I haven't seen any behavior you that says I need to.
Researcher: Do you have a set amount of time or is it just kind of by feel, if you feel they've been on too long.
Dad: It's probably around an hour a day or less.
F11P2: I do two hours because I do one hour of chess each day.
Dad: That's the thing. If you're doing chess then we're a little more lenient, or if they're listening to audiobooks reading. We would let them use it more if they were actually reading a book.

…
Researcher: Do you do anything . . .You multitask what you doing it, like do you listen to an audiobook will you play . . .
F11P2: Yes, I listen to audiobooks while we're cleaning.
Researcher: Oh, while you're cleaning, you do that. I do that with my wife all the time too. She got me into audiobooks.
Dad: They also listen to audiobooks and play video games at the same time.
F11P2: Yeah!
Brother13: that's what happens when you get good. You can do it subconsciously.
Researcher: So you'll play videogames, you clean, what else do you do while you're . . .
F11P2: Play with LEGO. I do.

…
Researcher: That's pretty awesome. What do you . . . do you ever get to play with your brothers Kindles?
Brother13: She used to.
Researcher: You used to? What did you used to play when you got your brothers' Kindles? Before they locked you out?

…
Researcher: What games did you get [F11P1].
F11P1: Not telling.
Researcher: Well if you don't tell, than I'm just going to assume that your brothers right. I'm going to assume that they're just putting words . . .

…
Researcher: Do you want to be a doctor when you grow up [F11P1].
F11P1: What?
Dad: Do you want to be a doctor?
F11P1: Kind of.
Researcher: Kind of.
Dad: You can if you want. You know, the Kindles were kind of . . . It was the idea was that they would use them for reading books and the other stuff, but it seems a lot of the other stuff has kind of overshadowed the book reading.
F11P2: Reading is boring.
Researcher: They’re listening to books while they’re doing everything else, it sounds like.
Dad: Right. The audiobooks of been a lot more popular than the reading ones.
F11P2: That’s because you can’t multitask while reading.
Dad: We actually had a hard time finding good books for them to read.
F11P2: We’re picky.
Dad: And then it is very expensive. You can check some stuff out from library but that somewhat limited.

F11P2: I come home and then have a snack. I don’t know what, but usually just something. That my mom takes away my Kindle after school, so I have to clean to get it back. Then when I get back I do my hour.

Researcher: Do you do anything other than watch TV? Do you have any toys to play with?
F11P1: I read, I play with my friends, I play with my American Girl doll.
Researcher: What do you read?
F11P1: Percy Jackson and the Lightning Thief.
Researcher: What was that?
Brother13: Percy Jackson.
Researcher: Oh, Percy Jackson and the Lightning Thief.

Dad: I’ve noticed that since we got the Kindles he tends to stay in his room more. And I think it’s because . . . So he has his kindle when he goes to bed to listen to the book, so when he wakes up, he’s got it, so he doesn’t come up here, and I think . . .
F11P2: I don’t do that.
Dad: Yeah you do.
F11P2: Not in the morning, I might watch a video, like . . .
Brother13: Oh yeah, we watch YouTube a lot.
Dad: So you’re in your room more often, and you kinda hole yourself up because you think that we aren’t going to notice you playing and take it away from you.
F11P2: Oh, really.
Dad: Uh huh. Am I wrong? That’s a pattern of noticed is that come and he’ll just kind of disappear to his room. We’re like, “Where’s [F11P2]. Oh I bet he’s down in his room.” And then she does the same thing sometimes but it’s the TV in our bedroom. “Where’s [F11P1]” and we will walk in and there she is sitting on the bed watching TV.
...
Dad: She’s at the age where she likes the set up very typical little tea parties, she makes. Like sets her doll stuff out in a very organized fashion. I don’t know, sets up a store, so a lot if the play is in organizing it . . .
Researcher: Scenario . . .
Dad: Yeah, putting little labels on it and making it look neat.
Researcher: [F11P1] when’s the last time you made a store?
F11P1: What?
Dad: When you organized all your stuff into a store? What did you make when you had all your stuff over by the fireplace? What was that?
F11P2: It was a house.
F11P1: It was a house for my American Girl doll.
Dad: Oh, It was a house for your American Girl doll.
F11P1: That was the bedroom. That was the school.
Dad: Oh, There was a bedroom and a school.
...
F11P2: We built that house.
Researcher: What house?
Dad: Go show [Researcher] your fort.
F11P2: No our house. Where’s our house?
Researcher: I’ve got to see the fort too.
F11P2: Where's the cardboard house?
Dad: Okay show him the cardboard house.
Researcher: I definitely want to see both of those.

[They find the house]
Dad: This was pretty cool. They came up with this on their own.
Researcher: That's awesome. What made you make a house?
F11P2: We just went outside and found cardboard. See the door opens and the garage opens, well it should open.
Dad: We decided that we were going to start recycling again. So the thing is her parents have the recycling bin down at their house, it's the really big one, so we kind of aggregate everything up here, and we take it down, except nobody ever takes it down so we ended up with all of this crap laying around and I was fussing about it one day and then they decided to make this little … I like the fire place.
F11P2: You should take a picture of the . . .
Dad: Then the top comes off and you can look in.
Researcher: Look inside. Yeah. You guys even carpeted the house. So who was this? This was you and . . .
F11P2: [Brother13]
F11P1: And Me.
Researcher: You helped too?
...
Researcher: Was this you and [Participant13] too?
F11P2: Yeah.
Researcher: That's awesome. So what do you got in here? It's the place to play Kindle or what?
F11P2: Yeah, hideout so they can't find you.
F11P1: and you have to kind of go through here.
Researcher: Oh my gosh. This is awesome!
F11P1: Yay, you don't have to take a picture of my American Girl doll.
Researcher: Oh I will, you just wait [F11P1]
F11P2: It's so small.
Researcher: Well it's not a fort if it is giant right? This is pretty comfy. I can't believe you guys have a fort. This is classic!

Researcher: So what made you guys decide to make a fort?

F11P2: Cause one day, like a Saturday, we had nothing to do, cause our Mom and Dad took our Kindles away and our computers.

Researcher: So you wanted of me to fort if you didn’t get your kindles taken away?

F11P2: No it’s just, we didn’t know what to do and [Participant13] was like, “Let’s build a fort.”

Researcher: [F11P1] did you help out with the fort?

F11P1: Yeah.

F11P2: No, she didn’t. She didn’t do anything really.

Researcher: You came in and enjoyed it, right?

F11P2: No I did like 49% ahhh 35%, [Brother13] did like 65%.

Researcher: That is sweet! That’s got to be the biggest fort. I don’t think I’ve made a fort that big.

F11P2: We were going to connect the string up the stairs and make it go up the stairs.

Researcher: Wow. That would have been really awesome.

F11P2: We don’t have enough blankets. We used every blanket in the house.

Dad: That was a pretty cool project.

[Side conversation.]

Dad: They ran string all over and then suspended blankets. They made a web of string.

Yeah, it’s really cool. They’ve had a couple of sleepovers in there, had some friends over and they slept in there. That you really creative stuff they are, either so bored that they can’t come up with anything else, or these have been taken away, or these things are really, These devices really hamper this kind of play, they really do because. This compared to what he’s looking at right now. You know. Look at the game he’s playing compared to this cardboard box. It’s really hard to compete.

F11P2: You got a problem with my games?

Dad: No, but these things are addictive, no doubt about it. We’ve seen really bad behavior from the kids when we take them away from them. Like really lashing out, sort of violent temper tantrums when we take it away from them . . .
F11P2: That’s not true.
Dad: Basically have to rip it out.
Researcher: It’s weird. It’s almost 50/50. I hear the two ends of the extreme.
Dad: I think a lot depends on the kid’s personality, but these kids really . . . [Brother13] isn’t quite as bad. [F11P2] has a hard time relinquishing. You know you have to say, “Okay, one more minute. Okay 30 seconds.” I mean, he will go right down to the one second and then some. Then he gets really ticked when you take it away from him. Then we had this thing for a while that is really super annoying. “Oh, I just need to finish this level.”
F11P2: That was [Brother13]

... 
Researcher: Hey [F11P1], do you make anything? What do you make creatively? Do you draw or anything like that?
F11P1: I make clothes.
Researcher: You what?
F11P1: I make clothes for my American Girl dolls.
Researcher: You made clothes for your American Girl dolls?
F11P1: Yeah, I made a swimsuit.
Researcher: What!
F11P1: That’s the top of it.
Researcher: You made that?
F11P1: Yeah.
Dad: How’d you make that?
Dad: You made it out of a sock?
F11P1: [Friend] helped me.
Dad: Nice.
F11P1: See, there.
Researcher: It’s a tube top. Look out.
F11P1: There’s another part to it.

...
Researcher: So [Dad] is there anything that [F11P2] or [F11P1] use as a toy that isn’t originally meant to be used as a toy? the box is a good example, or the blankets for . . .

Dad: What are some of the other things that you guys have used to play with that . . .

F11P1: Cloth.

Brother15: Probably nothing, you never buy us toys.

Researcher: You made that swimsuit out of a socks right.

F11P1: Yup.

Dad: What are some other stuff you guys have used for toys?

F11P1: We made earmuffs, we made . . .

F11P2: We made a lot of cardboard things

Researcher: Cardboard is awesome. What have you have done with a cardboard box?

Other than making the house?

Brother15: Probably nothing.

F11P2: Like making shape when we make cookies.

Researcher: Out of cardboard?

Dad: Didn’t you guys make swords?

F11P2: Oh yeah, No, that was the [Family].

Dad: Didn’t you guys make a marble run one time out of tubes?

F11P2: Yeah.

F11P1: Oh those things? We still have those tubes.

Dad: [F11P1] does a lot of stuff outside too with junk.

F11P2: She gets dirt, makes dirt pies and makes the whole . . .

Dad: She likes to make food out of mud.

F11P2: She likes to make the down. . .

Dad: Yeah it is a mess, She uses kind of like . . .

Brother15: It needs to be power washed.

Dad: I know it does, but she likes to use yogurt containers, when you get Chiclet style gum that’s in those plastic trays, she would use those to make little mud cookies.

Researcher: That’s awesome.

F11P1: No. Ice cubes.

Dad: Ice cubes. Whatever.
Researcher: Mud cubes.
Dad: So she uses all that stuff creatively.

…

Researcher: Has [F11P1] ever made anything out of a cardboard box?
Brother15: She helped with this.
Dad: She made a little crib for her American Girl doll.

**Family 12**

Family 12 consists of a father, a mother and two boys. Both of the boys are within the age range. F12P1 is 7 years old and F12P2 is 9 years old. F12P2 was not present for the observation and interview.

[The researcher introduces the project and describes what will happen. F12P1 starts by describing his latest LEGO creation]

F12P1: Basically it’s supposed to be a circus plane so this helps it go in circles. And then . . . it’s supposed to be a circus plane so this helps it go in circles even though it’s not a helicopter. Here a propeller thing that goes up and down to help him get in and then he sits down.

…

Researcher: Do you guys play any other games that maybe aren’t board or card games?
Dad: He and [F12P2] play Battle a lot.
Researcher: Battle? What’s that?
F12P1: It’s basically like we sometimes have LEGO guy battles but we build tons of vehicles and mini figs and build some weapons and then try to fight with the vehicles.
Dad: You want to show him the porch?
F12P1: Yeah, one second. Sometimes what I do, I add these castle sets where the dragons are the enemies and the lions are the good guys. Sometimes they set up jousting tournaments like this.
[We discuss LEGO for a while]

Researcher: So you guys play Battle with LEGO?
F12P1: Yup.

Researcher: You gotta show me how you play Battle.
F12P1: Sometimes we have rules that you can’t hurt the royal family cause you have kings and queens, but you can’t attack with your royal family cause then you can just say, “Well you can’t hurt me, so I can just blow up your camp.” And you can’t attack people while you’re on time out. So let’s say I’m on time out but [F12P2] is not so I could just go attack him. That wouldn’t be fair because he couldn’t fight back to me.

Researcher: So how do they get on time out?
F12P1: If we’re doing something that we need to have them away from. Like not attack while we’re doing it then we just say, “time out.”

Dad: Like going to the bathroom.
F12P1: Uh huh. Maybe we’ll build something like a treasure trove and we need to not have . . . I can show you my police truck.

Researcher: Who showed you guys how to play Battle?
F12P1: We just made it up.

Researcher: You just made it up?
F12P1: Yeah, we had about 3 Battles so far. The first one started really weirdly. It all started with this guy that pretended he had a broken leg in the hospital then one day he started getting up and fighting against people and he had this giant laser cannon. Then I started building those and we started fighting.

Dad: It seems like one . . . when you say you’ve had three Battles, it sounds like one can take a couple of days right?
F12P1: Yeah.

Researcher: So how do you know when a battle is done?
F12P1: We just do it when somebody gets beaten or we just go back to our camp. The second one started because . . . it didn’t start with something that was even LEGO.

Researcher: Oh really?
F12P1: [Indistinguishable] trains. So [F12P2] brought down his Lone Ranger locomotive. And then I brought down this vehicle to fight it cause I said, “Hey I don’t want that there
so I'll come and fight you." Then [F12P2] built another vehicle to fight that, then I build another vehicle to fight that. Starts that. Then the second one, well I forget how it started. I think ah . . . I think [F12P2] just started bombing me. Then I started fighting back. I don't know why but . . .

Dad: There seems to be a lot of capturing.

F12P1: Yeah. Capturing people, stealing treasure, stealing weapons . . .

Dad: [F12P2] was bragging the one day about how he had how many mini figs?

F12P1: Yeah he had his mini figs in his army he had 166 mini figs.

Researcher: Mini fig? What's a mini fig?

F12P1: It's like one of these guys. [F12P1 holds up a LEGO figure].

Researcher: Wow!

F12P1: And I have 44 compared to him.

Researcher: Is it always done with LEGOs or do you guys play with other things other than LEGOs too.

F12P1: Sometimes we do it without LEGOs. I can show you this if you want.

Researcher: Yeah.

F12P1: Here's a guy named Chase McCane who can drive this truck.

Researcher: Chase McCane?


Researcher: That's what you named him? How did you think of that name?

F12P1: Well I didn't really think of it. I just made it up in a magazine.

Dad: I've noticed that you seem to name yours but [F12P2] doesn't name his.

F12P1: He used to name his. He has just a thief that we don't know where he came from but he is supposed to be in the jail. Now here's another thief. Whoever built this jail, if it was a policeman, man they were not very smart. They build 6 escape routes. [While showing me a LEGO police van]

Researcher: Oh, my goodness.

F12P1: Exactly. Here's one, the door. Two, the windows, that's three now. Four, the cabinets. There's cabinets in here that they can jump out of. Now five, the trap door in the room. Six, they can go through the cabinets and get the key and then unlock the door. Now seven, they can just go through the cabinets and jump out the window.
Researcher: You really thought of this.
F12P1: I didn't but who ever thought of this, if it was a policeman in real life, boy they were not very smart.
Researcher: Not a very good policeman huh? Too many ways out. Have you built your own jail cell?
F12P1: No this is my only one. And here is another thief that comes along to rescue the other one. [This LEGO person is on a 4x4 with a hook on a chain hanging of the back] Hooks onto . . . I can show you on the side . . . supposed to hook it onto the thing [bars] and yank it out.
Researcher: Hold on. Do it again. Let me get a picture of you.
F12P1: Yeah, I need to do it again.
Researcher: I feel like I've seen that in a movie somewhere.
Dad: I wonder if you pulled it more towards the sofa. Like pulled the window this way instead of more slantways. You'll get more force.
[F12P1 tries to pull off the jail window with the hook and finally succeeds.]
...
Researcher: That's pretty cool. So tell me about the screen time limitations. What limitations are there?
Dad: I think it is to be more strict.
F12P1: It used to be an hour before that we can have one at all we just sit down and watch my movie. We had a movie we can watch every day.
Dad: We used to watch a lot of what's in the Bible. Have you seen that? Do you want to show him one?
Researcher: I think I might.
Dad: It's made by the guy that made Veggie Tales.
Researcher: Oh those are awesome.
Dad: So these are really good. And there was this whole phase where we watched the guy was turning himself into a genie and going into different work settings. Remember that? It's like . . .
F12P1: Mr. Rogers?
Spend some time trying to think of the name then F12P1 starts to show me an electronic globe that interacts with a pen to tell you about each country.

Researcher: So there’s less screen time restrictions now.
Dad: I think that they keep themselves busy. There is still rewards, like you get iPad time if you . . . with workbooks. We have a pile of workbooks. Although they don’t tend to do them much. If they do 10 minutes workbooks than they get iPad time.

…

Researcher: I used to have a jail out here but I destroyed it somehow. Oh yes, here’s one guy. I captured him, [F12P2] captured him from the last war but he doesn’t know that I go snooping around the jail cells after the war.

Researcher: So this is where you guys do the war?
F12P1: Yeah. That’s where [F12P2] has his old camp from last war but he doesn’t know that I’ve been snooping around in his jail cells.

Researcher: Ah. So did he not call a timeout so you were able to snoop around?
F12P1: no he didn’t. Last war when we quit it, he wasn’t on timeout.

Researcher: So that means you get a snooper around while he is at play practice?
F12P1: Yup.

Researcher: That’s pretty awesome.

…

Researcher: So why do you guys limit screen time?
Dad: You said why?

Researcher: Yes.
Dad: Because I think that it’s . . . I’m trying to think without being too caustic. No I think human interaction is so much more valuable especially at this age. So I think that there’s not really . . .

Researcher: So you think that there’s a gap in what you would want him to learn?
Dad: Not necessarily that I’m worried about anything. I just am thinking that learning how to interact with other people is the hardest thing that people have to learn. You know a lot of adults don’t get it. You get good at whatever you practice so I want them to practice that.
[F12P1 continues to show me Clumsy Ninja. We talk a little more about building interaction and how video games affect children]

Dad: Well so sometimes kids are a little grumpy when they have to stop playing the video games and I feel that part of it is that is because in a game you have complete control and you it responds immediately. Neither of which is true in real life.

Researcher: Yeah that makes a lot of sense.

Dad: If you read literature and find support for that, that would be great.

…

Dad: And so for them . . . for some of them videogames are a way to relax.

Researcher: Especially for him who’s already kinda had that human interaction all day and is kinda worn out from it.

Dad: Yeah. I’m trying to think. We try not to do videogames just before bed because we are worried it will keep them hyped up a little bit. We go back and for the between video’s and screen time. They like to watch Phineas and Ferb.

Researcher: Yeah that’s been really big lately.

Dad: And ah I think what is useful is to watch a little bit and have a little time to laugh about it and talk about it after it’s over. Even just 10 minutes. Say, “Wasn’t that funny when this happened?”

…

Researcher: So what kind of creative things do you do [F12P1]? Do you like making stuff? Crafts? What about your necklace?

F12P1: [F12P2] made that for me.

Researcher: Made that for you. That’s awesome.

…

Dad: It used to be a floor to ceiling castle.

F12P1: Yeah, it was supposed to be a gold mine but we didn’t finish it. We didn’t need brown or grey paper on it. We were going to make paper dynamite to chuck out but that didn’t work.

Researcher: So is this here specifically for the kids to use or is it recycling.

F12P1: It’s just storage.
Dad: It’s box storage but every once in a while they’ll grab something and make something.

[Conversation about remodeling]
Dad: You had an Alligator going for a little while that was really cool.
F12P1: Oh yeah. I destroyed that. I never finished it.
Researcher: Out of a box huh?
[Dad shows me around a little bit and shows the other rooms]
Dad: You had a box that you put wheels on the side of. Like paper wheels. We have photos of that I think. It’s sort of a phase from a year ago.
Researcher: Does [F12P2] do anything crafty or creative or make anything out of boxes?
F12P1: Not really, we once made cardboard cars but then I don’t know what happened.
Dad: Yeah we were shoving you around in it upstairs. It was like you were riding in it.
F12P1: I did have a boat that I built once. Now all of these boxes were not flattened once and there were land mines everywhere.
Researcher: Landmines?
F12P1: Well basically holes in the ground.
Researcher: So you would climb on it and it would sink.
F12P1: *Voomfl*
Researcher: So was that fun?
F12P1: Yeah.
Researcher: Was that part of the reason you climbed on them?
F12P1: Kinda. That way, but if you lift it up, I can burrow down here. [Said as F12P1 starts to wedge himself under a pile of flattened boxes.]
Dad: Burrow.
F12P1: You should not be able to see the ground.
Dad: Yeah it was really up to here at one time.
F12P1: Now you see me now you don’t.
...
Dad: So Yeah [F12P1] really like the boxes and the craft stuff. [F12P1]’s really interested in decorating for parties.
F12P1: Yes I am.
Researcher: Decorating for parties. Really?
F12P1: Yeah, once I had a party up in my room without warning.
Researcher: Oh Okay.
F12P1: Oh here’s the LEGO tow truck I know.
Researcher: Who’d you invite to the party?
F12P1: My babysitter.
Researcher: That’s awesome.
F12P1: How about this? That’s pretty cool.
Researcher: When you make a party in your room what’s in the party?
F12P1: Basically apples.
Researcher: Apples?
F12P1: and games.
Researcher: Apples and games?
F12P1: Yup.
Researcher: So apples are the party food?
F12P1: Yup, and my friend Mr. Bunny Business. [Showing me a stuffed rabbit].
Researcher: and Mr. Bunny Business. Is that what his name is? You know what, I think I still have a bunny from when I three. That was a long time ago now.
F12P1: I still have a tiger from before I was born.
Dad: So what did you do to decorate your room? Do you remember?
F12P1: No, I think for Christmas I put up some old tinsel and I put up some red, white and green streamers.
Dad: They were going all over the place. I remember them crossing in the middle of the room.
Researcher: Wow.
F12P1: Yeah, once I had . . . and I also had these bows in there that I still have and Christmas lights.
Dad: We told them they can decorate the room however they like as long as they use blue tape on the walls. Painter’s tape, instead of nails.
Researcher: Yeah so it doesn’t pull out.
F12P1: Yeah we had brand new Christmas lights that burned out after one day. It was bad. But luckily we have some new ones!

... 
Dad: [F12P1] here is one of your little carts. We also do stuff; he’s really interested in taking apart old electronics.
Researcher: Who is? [F12P1]
Dad: Yeah, we gave him this inkjet printer that no longer worked so he took out these . . . so there’s that.

... 
Dad: So what was this? This what your mine cart wasn’t it?
F12P1: Yeah, that was for my gold mine.
Dad: This was the mine cart [Dad shows the researcher a box with cardboard wheels pinned to it]. So he would actually sit in it and get pulled around. And the wheels you know don’t hold him or anything but they are wheels. He told me to put them on.
Researcher: I’ll take a picture of that.
Dad: But this is tiny compared to the scale and I think we must have pictures of them. We thought they were cool at the time. I mean if you think they are useful, I’ll try to look them up. But definitely, something of this sort of five to six years old, not seven. I feel like it is, it sort of ended . . .
Researcher: It really change from then?
Dad: Yeah.
Researcher: and that was the playing with the boxes?
Dad: Yeah, boxes and all that. It used to be that when the babysitters were here . . . the babysitters helped you with the boxes too right?
F12P1: Yeah.
Dad: and they would be like, “What do you want to do today.” And he would say, “Let’s make this thing,” and they would make something dramatic and cool and it would be here when I got home.
Researcher: but the castle is still fun?
Dad: Yeah, you still looking forward to that castle?
F12P1: Yeah. You want to help me put some crayons in here?
F12P1: You take off the wrappers and put the wrappers in here, and have the crayon without the wrappers in here.

Researcher: and is that how you do . . .

F12P1: Then you microwave it for 5 minutes if you have a big load and probably three if you have a little. I will try three first.

Researcher: And then what do you do with them?

F12P1: And then we probably just make ordinary crayons with them.

Dad: Pour them into molds. Heat it and pour it into molds.

[Dad talks about how hot it gets]

Dad: [F12P1] has been interested in cooking and helping cooking, so this is his personal spice mix.

F12P1: I call it the mystery spice.

Researcher: The mystery spice? Can I take picture of the mystery spice?

F12P1: Yeah it has cumin, cinnamon, chili powder and sugar in it.

Dad: It’s not bad.

F12P1: You can put it in black bean soup, tacos and it tastes pretty good.

[I take a picture of the spice]

Dad: What’s your favorite recipe to make?

F12P1: Sweet potato soufflé. It’s good. It has cinnamon, brown sugar, milk, butter, sweet potatoes, marshmallows . . .

Dad: So I think in terms of creative things, that’s become more of an option as responsibility and dexterity grows.

... 

F12P1: Sometimes maybe, let me think . . .

Dad: Have we used egg cartons for anything?

F12P1: Yeah. I once made a turtle out of egg cartons.

Researcher: A turtle out of egg cartons. That’s awesome.

Dad: Or what else . . .

F12P1: I tried to make something but grandpa wouldn’t let me. I tried to burn a giant milk carton and take it out of the fire in its shape.
Dad: Oh in a new shape? Oh yeah, He probably wouldn't let you.
[Short conversation about grandpa]
Dad: He’ll use Ziploc bags for a fair amount of things.
Researcher: What would he do with a Ziploc bag?
F12P1: One thing that I normally do is I make a Ziploc bag to hold . . .
Dad: Oh yeah you really like balloons too.
F12P1: Yeah I love balloons. I’m great at blowing them up. I’m awful at tying them, but I’m great at popping them too.
Researcher: What’s the most fun part, blowing them up or popping them?
F12P1: I think blowing them up and blowing them up the second time is most fun.
Dad: Yeah you seem to enjoy blowing them up and having the air escape into somebody’s face. That’s what I’ve noticed.
Researcher: Homemade whoopee cushion. [F12P1 shows the researcher a Ziploc bag full of air]
F12P1: It’s a balloon now.
Researcher: Yeah. It’s like those packaging plastic bubbles that they ship out with Amazon now.
[F12P1 sits on the Ziploc bag to pop it.]
Researcher: Oh Man! Did it blow out the bottom?
F12P1: uh huh. Sometimes they do. Sometimes they make a hole on a side, sometimes they make a hole on this side.
Dad: We didn’t tell him about when [Previous Babysitter] would come to babysit, they played a lot with . . . what was it? Chase or Cops and Robbers?
F12P1: Cops and Robbers, or Castle.
Dad: Castle, Yeah. You played Castle a lot.
Researcher: So tell me about Castle. What was Castle like?
F12P1: Well I was normally the king and the tallest person was always the bad guy, and [F12P2] was always the knight.
Researcher: [F12P2] was always the knight huh? So you all played that?
F12P1: Yeah. They always set up traps for me but I always escape because they were always made of pillows and cushions.
Researcher: Wait [F12P2] and the bad guy?
F12P1: No the bad guy trapped me but it was funny because the traps are made of pillows and blankets so they are so easy to escape. Once they tried taking apart the couch and making a big jail out of it but then [F12P2] took his Styrofoam sword and stuck through it.
Researcher: So what was your castle?
F12P1: Well our castle was in here, we had a big blanket down here and that was basically my hiding place.
Researcher: That was your hiding place?
...
F12P1: Yeah . . . well not on Youtube, normally I just have a book of projects that I can make out of projects.
Researcher: Oh, okay. Where is that book do you have it?
F12P1: No I don’t have it with me right now and I don’t know where it is either.
Researcher: It disappeared a while ago huh?
Dad: I know there is some book called Super Dad Weekend or something and it has projects you can do with your kids.
F12P1: There is one in . . . that’s a puppet theater in there. It shows a kid and there’s a puppet of himself and a puppet of his dad and the dad is watching and the kid says to the dad puppet, “May I please have my allowance payment raised?” and the dad is like, “Sure!” and the Dad is staring at it like "uh". . .
Researcher: So when you get TV time or you play with the iPad, do you ever do something else while you’re watching TV or playing with the iPad?
F12P1: No.
Researcher: You ever play with the LEGOos while you watch TV or . . .
F12P1: Not really.
Researcher: So you’re usually pretty focused?
F12P1: Normally when we watch TV we watch it together, but [F12P2] doesn't like Mario Kart so he doesn’t play it.
Dad: [F12P2] does the multitasking thing and Mommy does a lot.
[Short discussion about Mommy and introduction of the activity packet]
Dad: It makes me realize I’m hoping we do have pictures of all the cool things they create. At one point they had a really nice television set going where they would be the actors on TV and come in and do advertising for us.

Researcher: And the box was the TV?

Dad: Yeah, just a box with a hole in it for the screen.

Researcher: That’s amazing.

Dad: We got a video of that. It’s funny, [F12P2] wanted to make much longer presentations. We were like, “No it’s done now.”
## APPENDIX D. CODING SCHEMA WITH DATA

Table 12. Coding Schema with Data

<table>
<thead>
<tr>
<th>Open-Ended Play Stage</th>
<th>Code</th>
<th>Coded Cue or Action</th>
<th>Contextual Inquiry</th>
<th>Cultural Probes</th>
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Table 12. Coding Schema with Data (Continued)

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|                       |      | Internet                                         |                    |                 |
|                       |      | Search for ideas                                 | 1                  |                 |
|                       |      | Weather app                                       | 1                  |                 |
|                       |      | Google maps                                       | 1                  |                 |
|                       |      | Youtube                                          |                    |                 |
|                       |      | Trains                                            | 1                  |                 |
|                       |      | How to . . .                                      | 1                  |                 |
|                       |      | Cooking                                           | 1                  |                 |
|                       |      | Books                                             |                    |                 |
|                       |      | Cardboard Book                                    | 1                  |                 |
|                       |      | Books about kids doing things                    | 1                  |                 |
|                       |      | Super Dad Weekend (project book)                  | 1                  |                 |
|                       |      | Magic Tree House                                  | 1                  |                 |
|                       |      | Boxes left for recycling                          | 2                  |                 |
|                       |      | Siri                                              | 1                  |                 |
|                       |      | Toys (American Girl doll)                         | 1                  |                 |

Number of Instances Recorded

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Table 12. Coding Schema with Data (Continued)

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Toys

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| Toy electric castle as timer | 1 |
| F10P1 General                 | 1 |
| Game money as role play money| 1 |
| Hot Wheels as owl's feet     | 1 |
| Stuffed animal as patient    | 1 |
| Toy sword as gun             | 1 |
| Castle as Hot Wheel track    | 1 |
| Plane launcher as gun        | 1 |
Table 12. Coding Schema with Data (Continued)

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Table 12. Coding Schema with Data (Continued)

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Table 12. Coding Schema with Data (Continued)

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Table 12. Coding Schema with Data (Continued)

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REFERENCES


Diamond, A., Barnett, W. S., Thomas, J., & Munro, S. (2009). Focus and planning skills can be improved before a child enters school. S (pp. 1–2). Cabridge.


Richardson, L. S. (2013). *The superpowers of play: Our future favors the flexible*.


