

# A Qualitative Examination of Two Year-Olds Interaction With Tablet Based Interactive Technology

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The purpose of this study was to observe children naturally interacting with these touch screen devices. Little direct instruction was given to the children on the use of the devices however an adult did assist when needed. The device was introduced to the children as would be any other educational material such as play-dough, new items in the dramatic play center, or new media in the sensory table. Teachers assisted children when needed, but facilitated and promoted the use of exploratory behavior to learn about and use these devices.

The findings from the collected data for part 1 and part 2 of this study were surprisingly consistent. The themes and trends that were observed in the participant observation single subject case study were also evident in the group setting.

Young children today will not remember a time when there was not an Internet, laptops and pad-based computers. It is a part of their life experience. Many of the adults who teach them, however, grew up when none of this was available. This leads to a generational gap. This is a generation that expects to actively participate in and through their media, hence the decrease in time spent by teens in viewing television and the corresponding increase in time spent on computers, gaming, and the Internet (Beyers, 2009).

The use of a traditional keyboard based devices such as a computer or laptop requires a certain level of physical and motor development to use a keyboard and/or a mouse. Use of keyboard-based devices also requires a level of cognitive development to understand the symbols on the keyboard. Therefore, for a child to make a keyboard based device do what they want to do; they first need to decipher the interface.

The advent of touch screen devices removes this barrier and allows children as young as two years old (perhaps younger) to easily interact with these devices in a

productive manner. Being productive on any device means that the child understands what is asked of them, understands how to interface with the device and understands the action needed to produce a response from the device (Couse & Chen, 2010). Here is an example of a child in the current study aged 2 years 2 months using an Apple iPad:

Mike (2y2m) comes to the iPad, which is turned off Mike approaches the adult:

MIKE: "Michael want shapes game"

Mike has interacted with this game before. He was introduced to the game at 2 years of age, but was not coerced or forced to use the program by an adult. All of his interactions with the device were instigated by his choice. The adult finds the icon and taps it as Mike watches. The game starts.

GAME: "Touch the Circle"

MIKE: "Michael touch the circle!"

GAME: "You touched the circle!" [ap-  
plause]

MIKE: "Michael want a semi-circle"

GAME: "Touch the triangle"

MIKE: "Semi-circle" Mike touches the  
semi-circle

GAME: "That's a semi-circle. Try again!  
Touch the triangle"

MIKE: Mike touches the triangle

GAME: "You found the triangle!" [ap-  
plause]. "You earned a sticker"

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MIKE “Michael want the bus” [selects the bus]

GAME “Put the sticker on the page”

MIKE: “Michael put it right here”

GAME: [applause]

MIKE: [Claps] “YAAAAY”

[Insert Video About here]

This interaction is natural to the toddler. The machine asks for an action (touch) and the child makes a cognitive decision and acts by touching a selection. The child did not have to manipulate a mouse around a screen or decipher a keyboard to enter commands. The child simply interacted in a very natural and developmentally appropriate way with the device. This is the real innovation of these devices. Their interface is intuitive so that little or no instruction is needed for even the youngest children to use them.

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#### Review of Literature

The use of technology in the classroom has been studies and debated for many years. However in the introduction of new classes of devices that use a touch screen interface and the ubiquity of mobile devices such as smart phones and portable gaming platforms, Facebook, Twitter and other social networking media have changed the nature of the debate. Many educators and parents are afraid that these devices are causing a “digital distraction” which is leading to a generation

of children who have trouble focusing on tasks (Richtel 2010).

There are many conflicting studies and beliefs about the benefit of technology in the early childhood classroom. Many feel that technology should be kept to a minimum to enhance other aspects of a child’s development such as outdoor play, social interaction, and cognitive curiosity (Miller, 2005).

Miller (2005) claims that there is no evidence that young children learn these skills better through high technology, and there is abundant evidence that they learn them best through direct interaction with other people. The Alliance for Childhood supports this argument in their publication *Tech Tonic* (2004) in which the following 3 central arguments are made:

Our children face a daunting technological frontier of irreversible changes in human biology and the world’s ecology. They need a radically different kind of technology education to make wise choices in such a future.

Children’s lives are increasingly filled with screen time rather than real time with nature, caring adults, the arts, and hands-on work and play. Yet only real relationships, not virtual ones, will inspire and prepare them to protect the Earth and all that lives on it.

There is scant evidence of long-term benefits—and growing indications of harm—from the high-tech life style and education aggressively promoted by government and business. It is time for concerted citizen action to reclaim childhood for children.

The report also links computer usage to a lack of creativity in later years, obesity, and a lack of outdoor playtime and even to higher rates of terrorism. The report claims to shine a light on a growing problem in our world; namely that there is an overemphasis on technology and computers in education.

Johnson and Christie (2009) found that digital technology holds great promise as an aid to education of children, and it can be appropriate in early childhood education to foster positive play and child development.

They go on to suggest that concerns that computers pull children away from peers or traditional activities appear to be unfounded and that developmentally appropriate software with open-ended content can encourage play, cooperation, and creative problem-solving. They suggest that children need balance between screen play and actual play.

Child engagement with computers and digital toys can be a strong positive complement to other forms of play. Parents and teachers can help assure age- and developmentally-appropriate use of technology by young children. When done right, children's behaviors with computers and digital toys are valuable because they are self-motivated, allow for student input, are challenging and exciting, and lead to learning about the world (Johnson & Christie, 2009 p. 288).

Hirsch and Blanchard (2009) examined many different digital media that could effect the literacy development of children aged 3 to 5. They looked at different media such as television and video games and concluded that the effect of these technologies is as yet unknown. (Lieberman, Fisk, & Biely, 2009) point out that while the impact of playing digital games have been researched with older children and adults the issue have not received as much attention for children ages 3 to 6, even though they are especially vulnerable to media messages, and there are concerns about the value of time spent using screen-based media during the early formative years when physical activity, direct manipulation of objects in the environment, exploratory play, and social interaction are especially important and should be encouraged. They also point out that this is why the American Academy of Pediatrics recommends that young children older than age 2 should spend no more than 1 to 2 hours per day with television and other screen-based media.

#### *Touch-Screen Devices*

Smith (2002) found that technology such as CD-ROM storybooks could offer a ben-

eficial and interactive experience to toddlers. She found that the technology enhanced his imaginative play, initiative to explore, and the development of the understanding and use of abstract symbols. The difficulties reported were related to the use of the device with children this young such as learning how to use the keyboard and mouse and independently opening programs.

However, this study also highlights a problem for researchers on uses of technology in the classroom. Because it was published in 2002, it discusses mostly obsolete the technology of CD-ROM storybooks. New technologies appear so quickly that by the time definitive scholarship can be conducted on the topic, a new technology presents itself. Much is the case with touch-screen devices.

(Couse & Chen, 2010) found that as preschool children developed ease with a tablet-based device using a stylus, their independence with the technology increased, resulting in more experimentation and increased ability to use it to create/represent their thinking. They state that children's engagement with technology does not appear to be a simple function of age, but rather a more complex relationship between technology characteristics and child development.

Chiong & Shuler (2010) studied how new forms of digital media are influencing very young children (4-6) and their families in the United States and how we can deploy smart mobile devices and applications — apps, for short — in particular, to help advance their learning. They found that most children were able to use the device on their own without any trouble. Other children needed a little help, but only at the beginning and they quickly became adept users.

If children were observed to be confused or frustrated, they didn't seem to give up or get bored.

Parents also reported that usability issues generally disappeared after their child played with the device a few times.

The children also demonstrated natural

instincts for using the device. Example - Landscape versus portrait: The study found that most children naturally held the iPod touch in portrait position but then turned it to landscape as necessary to properly view the game. (p. 18)

They also found evidence that children were learning while playing the apps on the mobile device. Using the *Martha Speaks* application developed by PBS KIDS, the study found that 3 year olds made the most gain of any other age group (17%) on vocabulary and word usage. Children did tend to lose interest in apps rather quickly, but the data correlates with adult usage of apps. The researchers suggest that app design could help lengthen the time a child spends on a specific app.

Shuler (2009a, 2009b) suggests that mobile devices have significant potential to be a key ally in supporting learning experiences. While gaming devices such as Nintendo's DSi still command the bulk of attention Apps are unquestionably a new medium for providing educational content to children nationwide, both in terms of their availability and popularity. She suggests that the academic community should pay attention to Apps as an important potential factor in children's mobile learning. Shuler encourages researchers to investigate the implications of the current environment, and recognize "what works" in educating children through Apps. Banister (2010) suggests that teachers are needed to take up the challenge of integrating these devices in their classrooms and researchers are needed to document the impact.

The present study reports the findings of children interacting with Apple iPad devices in two settings. The first setting is a non-structured home environment. The subject was the researchers own child between the ages of 24 months and 30 months. All aspects of the child's interaction with the iPad were observed and occasionally video taped. The second setting was a 2-3 year old classroom setting at a university lab school. Teachers were provided with 5 iPad devices and asked

to use them in whatever way they felt appropriate and to journal about their experience and the children's reactions. The researcher also observed the classroom during the times when iPads were used.

#### Methodology

This research study uses qualitative participant observation to explore how toddlers aged 2 year olds use and interact with touch screen devices. The devices used in this project were first generation Apple iPads running the IOS 3.x for some of the case study observations with Mike. The devices were updated to IOS 4.x in November 2010 before being introduced to the toddler classroom setting. The major difference that impacts this study is the introduction of "folders" into the navigation structure that influenced how the children found the apps that they wanted.

This research study was conducted in two settings with two different types of groups of subjects. Part 1 of this study used a participant observation methodology with the researchers own child between his ages of 24 months and 31 months. This methodology was modeled on Jean Piaget's methodology for studying aspects of child cognitive development by recording intensive observations of his own children (Inhelder & Piaget, 1964; Piaget, 1951; Piaget, 1953; Piaget, 1954; Piaget, Yale, & Media, 1977). This methodology has a number of advantages. It allows for an observation in a naturalistic setting and it allows the researcher to observe spontaneous activity of the subject. The observations for part 1 of this study were made in naturalistic family settings such as the family home, homes of relatives, and other places that the family would regularly visit (e.g. grocery store, restaurant, riding in a car).

Part 2 of this study involved the students in a toddler classroom at a university laboratory school. The participants were 20 children in two classrooms for children between the ages of 2 and 3. The participating children were middle class families and parents were

mostly employees of the university. A pre-observational survey showed that 95% of the children have computers at home (Hsu & Geist in press).

The foreshadowed research questions are:

- How do toddlers, aged 2-3, interact with touch screen devices and how does that interaction compare to traditional computer usage.
- How does autonomous are children using these devices and what degree of adult support is required.
- How does the activity on the computer influence the children's social interaction with other children and adults?
- Are touch screen devices developmentally appropriate for toddlers aged 2-3?

For part 1 of this study, the researcher collected all of the data as a participant, observer and recorder. For part 2 the researcher observed the interactions, but the classroom teachers also observed the interactions and usage of the devices in the classrooms and kept details journals of the observations. The role of all the teachers in the classroom was to be facilitators and to help children solve any problems as they interacted with the iPads, but only when children really needed help. Teachers were also interviewed after the observations to collect their feelings about the iPads in their classroom and the children's interactions with it.

#### *Analysis of the Qualitative Data*

The information gained from informal interviews with the teacher and children, and observational field notes were transcribed and analyzed using a modified analytic induction approach as described by Robinson (1951). This technique involves the following steps: (a) develop a rough definition and explanation of a particular phenomenon in the early stages of research, (b) hold the definition and the explanation up to the data as it is collected, (c) modify the definition and/or explanation

as new cases are encountered which do not fit the definition and explanation as formulated, (d) actively seek cases which may fit into the formulation, and (e) redefine the phenomenon and reformulate the explanation until a universal relationship has been established, using each negative case to call for a redefinition or reformulation (Robinson, 1951).

#### *Findings*

The findings from the collected data for part 1 and part 2 of this study were surprisingly consistent. The themes and trends that were observed in the participant observation single subject case study were also evident in the group setting. The observations and content analysis of the observations and interviews revealed the following three thematic findings.

As early as the age of 2, children easily and naturally interact with the touch screen interface in a way that is different from a traditional computer.

Children's ability to work and explore independently with the device is much greater than with traditional computers. Because the interface is so intuitive, using the device resembles how children play with other developmentally appropriate toys.

The devices enhanced the preschool teachers ability to conduct investigative projects in classrooms with young children in ways that would not be possible without the devices or with traditional computers.

As early as the age of 2, children easily and naturally interact with the touch screen interface in a way that is different from a traditional computer. The teachers in the classrooms needed to provide little instruction for the 2 year old children to begin actively using the iPads in a productive manner.

[The teacher] showed them how to touch their finger to the iPad and slide it to unlock it. Two of the children were able to do so, the other two needed assistance. [The teacher] held their finger with [hers] and slid it across the unlock bar. David said, "I'm typing" as he

had found his way to the keyboard. Lucy also found the keyboard and said, "I'm typing too."

Mike demonstrated in part 1 of the study an early propensity to touch and hold or to touch the screen for too long of a time to cause the iPad to react. However after just a few sessions with the iPad Mike learned to modify his technique to make the iPad respond as he wished. In part 2 of the study, the larger group of children demonstrated a similar problem and rectifying it in a similarly rapid manner. After just a one session of using the iPads, the children began to overcome their natural instinct to touch and hold the buttons and learned the appropriate "tap" required to navigate the device. Once they achieved this, they were able to explore in a way that would not be possible on a traditional computer.

The next day [the teacher] took three more children, one who had prior experience with the iPads. Instantly Josh was able to turn the iPad on by pushing the button and used his finger to slide and unlock. Jonah and Ryan were able to push the button to turn the iPad on with guidance and needed my assistance to slide their finger to unlock it. [The teacher] showed them the button to access the videos and Josh had already touched the button and loaded a video he wanted to watch. Lucy said, "It doesn't work" when she couldn't get her video to open. She was touching the video, but wasn't picking her finger back up to let it load. David and Carter did the same as Lucy and weren't always successful in loading applications on their own. They would both hold their finger to the screen without lifting it back up. [The teacher] showed them how to touch their fingers and let go so the applications would load.

After 2 sessions interacting with the iPads the children were be quickly becoming experts at using the devices. They could adjust the device and navigate to find the applications that they wanted. This gave the children the independence to explore the iPad and the applications that were installed on it such as the video app, the Elmo's Monster

Maker, and an app with pictures and videos of trucks and tractors.

[The] afternoon professional internship took a different small group to work with the iPads. The children were able to turn on the iPads, unlock them, adjust the volume and pick an application. Three out of four of the children went directly to the Elmo monster maker application. The children would use their whole hands to move across the screen.

This mirrored the experience Mike had with part 1 of this study. Mike learned quickly how to navigate the device without much instruction from an adult. Many times his propensity to figure out how to make the iPad do things that he was not directly taught amazed the observers. An example of this is how he learned how to use the Netflix app to watch videos that he was interested in at 2 years 4 months of age.

Through simple observation of others using the app and trial and error exploration, he learned how to navigate the app and, using the picture icons, how to select and start videos. This observation was made when Mike was using the iPad to play another game independently. Mike quit that app and explored the other app icons. He found the Netflix app, opened it and began to explore some pictures of DVD covers. He recognized some familiar characters such as Thomas the Tank Engine, Barney and Bob the Builder. He would tap these pictures and he was rewarded with a video. In subsequent interactions he would experiment with selecting characters he was not familiar with, but that was appealing to him such as Dora the Explorer and Strawberry Shortcake.

This also demonstrated the second finding of this study. Children's ability to work and explore independently with the iPads was much greater than with traditional computers. Because the interface is so intuitive, using the device resembles how children play with other developmentally appropriate toys.

One child freely explored. The children problem solved when using the iPad and when



playing a game that allows children to create their own monsters. The child tapped the monster and the monster laughed. The child tapped repeatedly and says, "He's laughing! I want him [monster] to stop." The child hit the arrow button and the application made a noise. The child jumped up and down. The professional intern asked, "What happens if you hit the purple button?" The child tapped the button and said, "He's dancing! I hit the purple button and he starts dancing to music!" [Later they chose] the monster maker app. They laughed as the monsters danced and sang. One of the children was looking at pictures of trucks and when she wanted another picture knew to swipe her finger across to get another picture. After watching the one child look at the pictures of tractors another child said "I want the tractors."

The interactions with the iPad were very different from those reported in the literature about interactions with traditional computers (Hsu & Geist, *in press*, Ferguson, 2005; D. L. Johnson, Maddux, & Liu, 2000; Vekiri & Chronaki, 2008; Walton-Hadlock, 2008). The interactions with the iPad resemble more the way that children of the same age play with blocks, manipulative or in a sensory table. Students interact and explore the many things that they can do on the devices and the devices respond to their efforts.

Josh at this time had found a Barney video and opened it without assistance. Jonah started moving his iPad around as he noticed the screen would turn with it. As he turned his iPad, he laughed watching the screen turn. [The teacher] started assisting Jonah to find a video to watch and asked "What button do we need to push next?" and Josh responded with "This one" pointing to the play button. Jonah pushed the play button without assistance and the video started playing. Ryan touched his finger to Jonah's iPad and dragged it across the main screen and it switched to a different set of applications.

The final finding was based on the two previous findings. The iPad devices enhanced

the preschool teachers and children ability to conduct investigative projects in classrooms with 2 year olds in ways that would not be possible without the devices or with traditional computers. Part of this was the way the iPad is able to incorporate multimedia presentations that children can easily interact with. The experience of watching the video on the iPad is different from watching as a group on a large screen TV or even on a computer because of the control the children have over the experience.

In Part 1 of the study, Mike would use an app about trucks and tractors that included short videos of the machines in action. Two machines of particular interest were a garbage truck and a large excavator. Mike would watch the same videos repeatedly and would ask questions and comment on the action. Repetition of pleasurable acts and repeating novel tasks is a pattern of interaction that we would expect from toddlers, but it is not the way that these children usually are able to interact with movies and video (Estrella, 2006; Smith, 2002; Tanaka, Cicourel, & Movellan, 2007).

The key here is that the children have active control over the experience and can start, stop and select the videos that they wish to see and experience. Since it is also an individual experience, each child can select different experiences while still sharing their excitement with other children. In part 2 of this study, the children in the classroom became interested in the university marching band because one of their teachers was a former member of the band.

All four [children] were able to push the video button and load the screen. There were marching band videos that the children were instantly interested in. "You can touch your finger to a video you want to watch," [the teacher] told them. Amy was able to load a marching band video to watch. Lucy said, "It doesn't work" when she couldn't get her video to open. She was touching the video, but wasn't picking her finger back up to let it

load . . . While watching the band videos [the teacher] heard comments like “I live there” from David when he saw the word OHIO in the video and “Kelley where’s you?” from Lucy while watching the marching band. The kids remembered that [the teacher] use to be in the marching band. “You’re going upside down!” Lucy said while watching the band dance in the middle of their song. Carter said, “You were playing the drum” when he saw the drum line.

The teachers had incorporated many activities about instruments and bands into the classroom. However for many reasons, it was difficult to have meaningful and sustained interaction with the entire marching band. However, the iPads were able to fill the need by providing many video presentations of the band marching in football games and parades for the children to investigate. These interactions led to questions and activities related to their experiences. The teachers were then able to bring other items and experiences into the classroom because the children could link it to the marching band that they were experiencing on the iPad.

One child found the marching band video with the help of a teacher and started to watch the video. She asked what they were doing. The teacher responded what do you think they are doing? The student said, “Dancing.” Then she pointed to the feather in their hats and asked what it was. [The teacher] noticed that the children had it pretty well figured out that you touch the screen of the iPad to make actions happen.

The teachers reported that the iPads made doing projects with the 2 year olds a much richer experience. Since with children this young, projects need to be very concretely related to their experience, it is vital to have direct interactions with the topic (Foote, 2010; Helm & Beneke, 2003; Jacobson, 2006). The iPad provided the teachers access to a multimedia presentations that were accessible to 2 year olds, promoted independent investigation and group interaction, and kept

the topic relevant to the children’s lives and experiences.

### Conclusions

The AVG Digital Skills study (AVG, 2011) released in October 2010 found that while most small children age 2-3 can’t swim, tie their shoelaces, or make breakfast unaided, they do know how to turn on computers, navigate with a mouse, play a computer game and operate their parents’ smartphones. The study found that a quarter of 2-3 year olds know how to make a call on a mobile phone while 44% can play a computer game. By comparison only 15% can swim unaided and 43% can ride a bike. These are children who will live and grow in a technology-laden society. Trying to limit their access and use of these devices by determining them to be “developmentally inappropriate” is like swimming against the tide.

Instead, educators of young children should be determining ways that devices such as the iPad can be used in classrooms with young children to enhance their educational experience. This does not mean that children should receive all of their experiences electronically. However, these devices, because of their connectivity and intuitive interface can be a meaningful addition to toddler and preschool classrooms.

The teachers, parents and other adults involved with this project were all stunned at the children’s ability and independence with the iPads. Most educators who work with toddlers are aware that the capabilities of 2 year olds are often underestimated. What the iPad offered in this study was a vehicle for the children to demonstrate their abilities to their teachers and their parents. The degree of interactivity and independence with the devices was truly amazing, but only because the iPad was able to support the natural curiosity of the toddlers in the study.

The potential of tablet-based computers in the classroom is still being explored, but more and more schools and classrooms



are finding new and innovative ways to use these tools. Each week new apps explore the boundaries of what is possible with portable touch screen devices. The creative use of these devices with young children can help to unleash the creative and intellectual potential in children as young as age 2. In the future perhaps tablet computers will be a staple of the toddler and preschool classroom just as are books, blocks and imaginative play.

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