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"The Computer is Broke!" Could Technology Be Affecting Fine Motor Development in Tech Savvy Pre-School Children or Could It Be Something Else?

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ABSTRACT

Technology has permeated society such that the youngest members of society, children from birth to age 5, utilize touch screens at an early age. This case study analysis initially hypothesized the use of technology at an early age impacted fine motor development. After close inspection, investigators identified how pedagogic practices and state standards additionally affect the future of a young child's fine motor skill development.

It was Meet the Teacher Night at my school. Excited children and anxious parents entered the room I had so carefully prepared. Since the room would be busy with children, siblings and caregivers investigating the play areas, the computers were powered off, but all other areas, such as art, blocks, music, manipulatives, writing and reading remained available. As one family stepped into my classroom, I noticed a precocious four-year-old holding tight to his caregivers' hand. His eyes wandering around the room taking in all the sights and sounds intended to engage and motivate him. This continued until he spied the computer station. Quickly he went over to the monitor and touched the screen, swiping it as if to assist an image to reappear. Immediately, the expression on his face changed from a smile to a disturbing puzzled look. "The computer is broke, he replied." On another day, a four-year-old's behavior reading a book raised concerned for me. As the child studied the illustrations and pondered the story, I noticed an interesting reaction when it was time to turn the page. Instead of turning the page by pinching it between their fingers, the child batted the page as if to move the screen. Quickly, I realized the child was confused. I responded by explaining how screens are different from books but pondered about how technology has impacted our youngest learners.

Technology

As these scenarios illustrate, our youngest technology users, toddlers and preschoolers, have held, observed, or manipulated technology at an early age in comparison to children who are older. Generation Z, now in their teens, utilized the same technology the younger generation, including the preschoolers in this scenario, observe daily: Cell phones and touch screens (Tulgan & Rainmaker Thinking, 2013). In response to the daily observations and accessibility to cell phones and touch screens among our youngest technology users, Common Sense Media (Rideout, 2013) conducted a study on media use in the United States in the years prior to 2013 for children zero to age eight. Not surprisingly, technology usage has increased for this age group. According to this survey (Rideout, 2013); the most common devise for children to have access is a smartphone. Mobile media ownership increased from 2011 to 2013 with smart-phones expanding in ownership from 41% to 63% and tablet ownership soaring from 8% to 40% during the two-year span (Rideout, 2013 p. 21).Technology usage by children has increased exponentially in the last two years. Toddlers and infants manipulate mobile devises with 10% viewing mobile screens in 2011 and increasing to 38% in 2013 (Rideout, 2013 p. 23). Of the zero to eight year olds whose usage was surveyed, usage includes both educational games and sites for enjoyment with 43% using educational games and 42% using sites for pleasure (Rideout, 2013, p. 22). Use of traditional screens (desk tops, lap tops), has decreased by 30 minutes a day (Rideout, 2013, p. 10). Television screens continue to prevail as the most dominant form of technology usage, but now young children have more options: DVR, streamed and on-demand programs with additional access available on mobile media devices.

The Common Sense Media Survey (Rideout, 2013, p. 29) identified that mobile media devises are used across income levels with 46% of low income families (those earning less than $30,000 a year) having access to the internet. Smart phone access for low income families increased from 27% to 51% while tablet access grew from 2% to 20% (Rideout, 2013, p. 29). However, higher income families continue to have greater access to high-speed internet and utilize more mobile devise applications than lower income families. Further, higher income families utilize more content related to education than their lower income counterparts.

Fine Motor Development

The second area that framed this study involves the fine motor development of young children. Psychologists and child development specialists divide the physical domain into two sub areas: fine and gross motor development. Contemporary research on fine motor development supports the implementation of age appropriate materials to enhance and encourage maturation of finger dexterity, wrist stability, pincer grasp, palmer grasp and hand arches (Bredekamp, 2014; Copple & Bredekamp, 2009). Historically, Maria Montessori (1965) advocates using practical life materials to develop fine motor skills. As young children use practical life materials such as pouring water in a glass, sweeping the floor or buttoning a shirt, the muscles in the hand, wrist and fingers become stronger thus developing the child's fine motor ability.

However, current research in fine motor development has identified additional reasons to encourage fine motor development in young children, asserting a link between fine motor development and subsequent academic achievement (Cameron et al., 2012; Dinehart & Manfra, 2013; Grissmer, Grimm, Aiyer, Murrah, & Steele, 2010). Grissmer et al. (2010) investigated

connections between motor development and academic achievement longitudinally from fall of kindergarten until spring of fifth grade. This study expanded on a study by Duncan et al. (2007) that identified how early math skills and attention correlated with later achievement in math and reading. Grissmer et al. focused on three of the six data areas collected by Duncan et al. and added tests to assess gross and fine motor skills more intently. Gross motor skills lacked a connection to academic achievement, but fine motor skills were found to enhance cognitive skills later in the elementary years. According to their analysis, emphasis in the younger grades should be shifting from focusing on development of math and science concepts to instead concentrating on foundational skills such as fine motor development and attention.

Additionally, Cameron et al. (2012) studied the connection of fine motor development to academic achievement. Using a sample of 213 middle socio-economic status, three and four-year-olds, Cameron et al. assessed executive function and fine motor skills using six different assessments. One significant finding resulted when fine motor development, specifically the ability to copy designs, correlated with increases in comprehension and decoding while reading during the kindergarten year. "Children who enter kindergarten having already learned to copy forms and write letters can deploy their attention to learning more complex literacy skills such as reading words and sentences" (Cameron et al., p. 1240). The authors stated that the results do not establish causality and some children may attain advanced literacy skills through alternative methods.

Along with both Cameron et al. (2012) and Grissmer et al. (2010), Dinehart and Manfra (2013) also studied the relationship between fine motor development and academic achievement. This study focused on the motor skills of economically diverse children from preschool to second grade who were primarily of Hispanic origin. Specifically, the researchers studied manipulation of objects and writing to determine how these skills could predict achievement in later grades through a fine motor assessment and grade analysis. Data revealed a positive relationship between fine motor skills of preschoolers and math or science achievement in second grade. Further, a more significant relationship occurred between completing a writing task and overall academic achievement.

Purpose

In summary, these three studies illustrate the significance of fine motor skills in the preschool years to forecast achievement in math and reading in subsequent grades. However, to develop fine motor skills, which vary greatly among prekindergarten children, early childhood curriculums and the home environment should include ample opportunities for development of movements in the hand and wrist. Specifically, opportunities to foster finger dexterity, wrist stability, pincer grasp, palmer grasp, and hand arches. It is important to note that the home and school environments increasingly utilize technology. Therefore, the questions that framed this study included: How much technology is present and utilized in the homes of prekindergarten children? What were the fine motor abilities of the children and finally, what implications occur for Pre K classes?

Sample and Setting

The sample for this research consisted of eight families who consented to participate in the study along with their children: four female children and four male children. All children

were between the ages of 4 and 5-years-old except one child who was 3. Three of the children had been in the program for two years. Racial demographics consisted of two Latino/Hispanic, five White /Caucasian and one designated other. Two children receive speech service but there were no other identified special needs. A unique characteristic of this sample involves the education of the home caregivers. At least one family member of the 3 and 4-year-old preschoolers are employed as teachers within the school district. The classroom in the study serves as a preschool option for teachers employed in the district; therefore, the educational background of the families surveyed consisted of three with a Master Degree and five with a Bachelor Degree.

The setting for this study occurred in the southwestern area of the United States of America in one large school district serving over 100,000 students. The Pre K class utilizes the High Scope (2015) Curriculum with the teacher trained to use the program. This curriculum incorporates numerous opportunities for children to participate in child-initiated activities. Instruction occurs primarily in small groups with assessments involving the High Scope assessment instrument: COR Advantage.

Methodology

This mixed-method study was analyzed using three different methods to triangulate the findings from the research. The Technology Survey completed by families included closed ended questions that were placed in an online survey with the consent form. Analysis was completed through the survey software using percentages for analyzing each individual question. Additionally, qualitative methods involved collecting and analyzing observations taken from the HighScope COR Assessment instrument, and anecdotal notes taken by the teacher during the year about the children's choices during everyday occurrences in the classroom. The data from the children's' fine motor usage was analyzed using analytic induction (Lincoln & Guba, 1985) to determine categories. The resulting categories included fine motor development, gross motor development, writing utensils used, name writing, literacy skills, play stage, drawing stage and centers the child participated within. Data that did not fit into the categories was re-analyzed and new categories were opened.

Finally, both sets of data were analyzed using constant comparison (Lincoln & Guba, 1985). Constant comparison concurrently compares the data to determine relationships. Through these comparisons, new categories and relationships emerged.

Data Collection

Data collection involved understanding the ownership and usage of technology along with identifying the fine motor development of the children whose families consented. Families who consented, responded to an online survey about technology usage, ownership and fine motor development by answering a series of questions about technology usage at home (both desk top and touch screens), as well as, insight into any fine motor activities occurring at home. Questions involved yes or no responses about the technology ownership, usage and fine motor development.

To further augment the data, additional data was collected about the fine motor development occurring in the classroom. High Scope classrooms incorporate the COR

Advantage Assessment which identifies skill achievement in an authentic and natural setting rather than administering a test. The instrument measures "Approaches to Learning, Social and Emotional Development, Physical Development and Health, Language, Literacy and Communication, Mathematics, Creative Arts, Science and Technology, Social Studies, and English Language Learners" (High Scope, 2015, pg.1).

Along with using the assessment records of the COR Advantage, the teacher documented anecdotal records throughout the year. These records included notes about the children's fine motor skills, gross motor skills and technology activity in the areas chosen during the day. The teacher also analyzed any drawings or writing the children might have completed during the year and included them within the anecdotal records.

Results of the Technology Survey

The survey questioned caregivers about the technology ownership and technology usage of their children. Table 1 describes the technology ownership and usage of the sample surveyed.

Table 1

Technology Ownership and Usage

Technology Ownership and Usage	Percent
Owns iPad / Tablets	87.5%
Owns E Reader	37.5%
Owns Lap Top Computer	87.5%
Owns Desk Top Computer	62.5%
Owns Cell Phone	87.5%
I Pad Usage	87.5%
E Reader Usage	42.9%
Lap Top and Desk Top Computer Usage	37.5%
Mouse Usage	37.5%
App Usage on a Touch Screen	87.5%
E Reader Usage on a Touch Screen	25%
Less than one hour using a Touch Screen	62.5%
1-2 hours using a Touch Screen	25%
2-3 hours using a Touch Screen	12%

Data Analysis

The data from the survey aligned with research by Rideout (2013) regarding the ownership of electronic media. According to Rideout (p. 21), 63% of the families surveyed own smart phones and 40% identified having tablets. Additionally, the survey indicated usage from the families surveyed remained high for all electronic devices except e books. Therefore, the

high ownership and usage of electronic technology, would classify the children of these families as Digital Natives (Prensky, 2001).

In addition to the survey data, results from the COR Assessment and Anecdotal Observations were analyzed across domains of development as well as the child's skill in name writing, demonstrated drawing stages and favorite centers. The data was initially analyzed for categories across the eight participants to verify the fine motor development.

One area of analysis was the fine motor development which specifically reviewed how the children were holding a writing utensil. This analysis revealed that a fist grip appeared in four of the eight children while three of the eight held the marker with a pronated grip and one grip was very close to a tripod grip. All but one child preferred markers over writing utensils that require more finger strength. Of the four-year-olds who held markers with a fist grip, all three were unable to write their name and uninterested in using writing utensils. Of the three with a pronated grip, two were unable to write their complete name.

Further, the drawing stages were analyzed to understand the development of finger dexterity and strength. Four of the children exhibited organized or controlled scribbling, while two of the children in the pre-schematic stage drew more detailed illustrations. While drawing stages reflect the cognitive development of the child, drawings that involve more details, require more strength in the fingers and increased finger dexterity.

To understand how activities in the classroom may or may not be encouraging finger dexterity, the centers chosen, types of play, vocabulary, and gross motor skills were analyzed. Play stages, vocabulary and gross motor skills were also analyzed, but fewer trends were evident from the limited data. Interestingly, five of the eight enjoyed playing in block center which, even though an excellent activity for developing spatial skills provided fewer opportunities for fine motor skill development than other areas of the classroom.

Further understanding about the fine motor activities of the classroom involved observations about materials and activities present in the Pre K classroom. Within the frame of the High Scope (2015) Curriculum (Schweinhart & Weikart, 1988), children choose an area or plan an activity to complete. Later, after finishing the planned activity, children share or review the activity completed. The classroom where the study was conducted included areas of interest for the children: Building, Art, Sand and Water Exploration, Play Dough, Writing, Dramatic Play, Math Manipulatives, Fine Motor Activities, Blocks, Music and Outdoor Activities. Of these areas available to the children, eight areas, Math, Building, Art, Play-dough, Fine Motor Manipulatives, Writing, Dramatic Play and Sand and Water Experiences, develop finger dexterity, palmer grasp, pincer grip and wrist rotation through manipulative such as connecting blocks, painting at easels, threading cards, small animals, buttoning clothes, writing notes and building structures. However, the type of fine motor development enhanced by the manipulatives and materials depended on the area or activity of the classroom chosen each day by the child.

To augment the knowledge about materials within the Pre K classroom and to understand the impact on children who might require additional fine motor development the following year, the Kindergarten classrooms at this school were observed. Specifically, materials in each of the seven Kindergarten classrooms were observed to determine the types of materials utilized within the kinder classrooms. The available manipulatives aligned with academic nature of the standards required for kindergarten children, such as math manipulatives, letters for spelling along with activities for writing letters and developing sounds. Materials most frequently identified within the seven classrooms included unifix cubes, counting bears, and pattern blocks in five out of seven rooms with all the rooms including pencils, markers, scissors, glue and

paper. An area of each room included an easel for painting and a kitchen for dramatic play. Only four of the seven rooms incorporated building materials such as waffle blocks, bristle blocks or Legos.

Discussion

Fine motor development of three and four-year old children varies. According to Copple and Bredekamp (2009), development of finger dexterity and the pencil grip may not occur even with multiple fine motor opportunities. Within this classroom, Pre K children were given choices about the type of activity of which they were interested. Areas of the room included activities such as play-dough, easel painting, linking manipulatives and writing utensils on a daily basis; however, availability does not assure usage.

Additionally, drawing stages also vary among three and four-year old children. According to the Lowenfield's Stages of Artistic Development (1947), the Scribble Stage characterizes children ages 2-4 and the Pre-schematic Stage occurs at age 4-7. Herbert Read (1966) concurred with Lowenfield that the scribbling stage materialized from ages 2-4. However at age 4, lines transpired in their drawings and from 5-6 descriptive symbolism emerged. Rhoda Kellogg (1970) determined after her investigations that scribbling continues from age 2 to age 5. Each researcher, Lowenfield (1947), Mead (1966), and Kellogg (1970), provide developmental knowledge, however the drawing stages in this study were analyzed with Lowenfield's stages. Primarily, the drawings analyzed in this study aligned with Lowenfield's scribbling stage. Fine motor development varies with individual children; however, despite the observation that these children fell within developmental norms for drawing, it is important to look at state standards for preschool and kindergarten, as three of the children in this study will be attending kindergarten in the fall.

Policies of state education agencies often dictate the pedagogic practices, beliefs and emphasis occurring in the classroom. In this study, standards or guidelines of the state education agency contradict the developmental guidelines previously discussed. Specifically, according to the state guidelines, by the end of the year, four-year-olds should be writing letters to make words, writing their name correctly and conveying thoughts through writing such as in a list or label (State Education Agency, 2015a).

Moreover, the specificity of these standards (State Education Agency, 2015a), dictate precise fine motor skills to be attained. By the end of the prekindergarten year, four-year-olds should develop control of writing utensils such as using a "conventional grasp (with fingers instead of fist)" (p. 119). Further, the child illustrates control of eye-hand activities through activities such as drawing. According to the standards, children should "draw recognizable pictures and shapes" (p. 119) along with manipulating puzzles, buttons or beads. However, the data in this study reported that many of the four year olds failed to meet this standard and the subsequent skills related to writing.

Of the eight children included in this study, two of them wrote their first name and one child wrote letters in their name. Similarly, only one child of the eight demonstrated a more conventional pencil grip. In the skill described as drawing a discernible picture or shape, two of the eight demonstrated success. These findings were concerning considering the mandated Pre K standards and the research supporting the link between fine motor development and academic skills, as previously discussed. After viewing the manipulatives available in the Kindergarten classrooms, it appeared fewer opportunities will be available to children who require ongoing

support for their fine motor skills to fully develop the degree of finger dexterity, wrist rotation, palmer grasp necessary for them to meet the grade-level standards.

According to the standards (State Education Agency, 2015b, p. 5), kindergarten children will be assessed on writing short poems, forming capital and lower case letters and spelling consonant-vowel-consonant words. Taken together, this data reveals an increase in expectations with a simultaneous decrease in support. According to Copple and Bredekamp (2009), children struggling with fine motor ability and also required to complete tasks involving meticulous fine motor skills may become exasperated and disheartened about engaging in more formal writing activities.

Frustrations such as these have led researchers to investigate the excessively academic nature of kindergarten today. Bassok, Latham, and Rorem (2016) compared kindergarten classrooms from 1998 to 2010 surveying teachers on the changes occurring. Teachers in 2010 believe academics starts before children enter kindergarten. Therefore, less time focused on discovery activities such as dramatic play, water or sand play and instead allotted to reading and mathematics through direct instruction techniques involving children completing worksheets. The increased academic time required in kindergarten has the potential to affect the excitement for learning normally occurring in the early years; especially, affecting children who require more opportunities for development of foundational skills such as fine motor development.

Summary

This study aimed to understand how the increased use of technology by Pre K children could be affecting their fine motor development. The families and children were identified as digital natives owning and using multiple forms of technology. The children's fine motor skills were analyzed according to developmental frameworks and appeared to be on track if the children continued to interact and manipulate items to build finger dexterity and small muscle control. However, concerns began to emerge as state standards were compared to developmental frameworks.

When the developmental frameworks were compared to the state standards for this sample, a lack of continuity and consistency was observed within the larger educational system (Jozwiak, Cahill, & Theilheimer, 2016). Existing developmental frameworks provided for the fine motor skills to occur across a range of ages, valuing the individual development of each child. However, the state standards for this particular study necessitated specific skills to be achieved within a particular timeframe that was inconsistent with the developmental frameworks. Further, since three participants of the sample will progress to kindergarten the next year, kindergarten standards were analyzed. Looking across early education systems, as the children progress to kindergarten, they face a more academic program where writing requires precise control of a writing utensil to produce letters, words and sentences. For children who enter a kindergarten classroom without the skills to write effectively, they will face increased challenges: Challenges that become increasingly concerning when the link between fine motor development and academic achievement is considered.

However, limitations to this study exist. The small sample size lacks generalizability to a larger group of similar age children. Further a causal relationship could not be determined. Despite these, the study did shed light on implications for teaching young children who are Digital Natives (Prensky, 2001).

One implication would be increasing the availability of fine motor activities for young children during the Pre K years. Creative options need to be available to motivate and engage young children in developing the muscles related to fine motor skills. These could include encouraging children to use a mouse or stylus to control the computer or screen rather than using their fingers directly on the screen. Families should be educated about the importance of developing fine motor skills in their children and the balance that must occur between technology usage and other forms of play.

Another implication would be to advocate for more flexibility within state standards on when children are required to master fine motor skills. When young children are forced to complete detailed writing activities without the maturity of fine motor skills or the interest in the writing process, frustrations will occur. According to Almon, Carlsson-Paige, and McLaughlin (2015), the pressures of the Common Core on Kindergarten classes has increased the amount of writing; resulting, in children from playful Pre K programs becoming labeled as behind during the first months of their Kindergarten year.

However, technology permeates the interests and thoughts of young children and holds potential for both positive and negative outcomes. The developmental progression of children's skills requires an understanding of individual needs and skill attainment. The question of whether technology and fine motor skills are related remains debatable, as does the question of if there should there be less emphasis on fine motors skills when we know these skills are developing during the formative years? Research (Cameron et al., 2012; Dinehart & Manfra, 2013; Grissmer et al., 2010) illustrates the significance of fine motor development upon academics. This impact is intensified by inappropriate standards, including the kindergarten standards reflected in the Common Core (Almon et al., 2015), as well as, a decrease in play and creative learning in the early years (Almon & Miller, 2011).While this article stimulates reflection on the relationship between them, additional questions emerge about whether the lack of fine motor skills relates not to increased technology usage but instead to less emphasis on play? Or, does the increased emphasis on academic standards in Pre K and Kindergarten affect the lack of opportunities for developing fine motor control? Another possible question involves whether children and families choose electronic toys with less emphasis on fine motor development rather than playing with manipulatives that support development. As technology expands to involve more time in the lives of young children, these and other questions require further exploration in the literature.

References

Almon, J., Carlsson-Paige, N., & McLaughlin, G. B. (2015). *Reading instruction in kindergarten: Little to gain and much to lose*. Retrieved from Alliance for Childhood website:http://www.allianceforchildhood.org/sites/allianceforchildhood.org/files/file/Reading_Instruction_in_Kindergarten.pdf

Almon, J., & Miller, E. (2011). *The crisis in early education: A research-based case for more play and less pressure*. Retrieved from Alliance for Childhood website: http://www.allianceforchildhood.org/sites/allianceforchildhood.org/files/file/crisis_in_ly_eared.pdf

Bassok, D., Latham, S., & Rorem, A. (2016). Is kindergarten the new first grade? *AERA Open, 1*(4), 1-31. doi: 10.1177/2332858415616358

Bredekamp, S. (2014). *Effective practices in early childhood education: Building a foundation* (2nd ed.) Boston, MA: Pearson.

Cameron, C., Brock, L., Murrah, W., Bell, L., Worzalla, S., Grissmer, D., & Morrison, F. (2012). Fine motor skills and executive function both contribute to kindergarten achievement. *Child Development, 83*(4), 1229-1244.

Copple, C., & Bredekamp, S. (2009). *Developmentally appropriate practice in early childhood programs* (3rd ed.). Washington, DC: National Association for the Education of Young Children.

Dinehart, L., & Manfra, L. (2013). Associations between low-income children's fine motor skills in preschool and academic performance in second grade. *Early Education and Development, 24*(2), 138-161. doi: 10.1080/10409289.2011.636729

Duncan, G., Dowsett, C., Claessens, A., Magnuson, K., Huston, A., Klevanov, P., … Japel, C. (2007). School readiness and later achievement. *Developmental Psychology*. *43*(6), 1428-1446.

Grissmer, D., Grimm, K., Aiyer, A., Murrah, W., & Steele, J. (2010). Fine motor skills and early comprehension of the world: Two new school readiness indicators. *Developmental Psychology, 46*(5), 1008-1017.

High Scope. (2015). *COR Advantage Overview* [Online product summary]. Retrieved from http://coradvantage.org/overview/

Jozwiak, M., Cahill, B., & Theilheimer, R. (2016). *Continuity in children's worlds: Choices and consequences of early childhood settings.* New York, NY: Teachers College Press.

Kellogg, R. (1970). *Analyzing children's art.* Palo Alto, CA: Mayfield.

Lincoln, Y., & Guba, E. (1985). *Naturalistic inquiry*. Newbury Park, CA: Sage.

Lowenfield, V. (1947). *Creative and mental growth*. New York, NY: Macmillian.

Montessori, M. (1965). *Dr. Montessori's own handbook*. New York, NY: Schocken Books.

Prensky, M. (2001). Digital natives, digital immigrants. *On the Horizon* (MCB University Press) Retrieved from http://www.marcprensky.com/writing/Prensky%20%20 Digital%20 Natives%20Digital%20Immigrants%20-%20Part1.pdf

Read, H. (1966). *Education through art.* New York, NY: Random House.

Rideout, V. (2013). *Zero to eight: Children's media use in America 2013* (Common Sense Media Report).Retrieved from Common Sense website: https://www.commonsensemedia.org/ research/zero-to-eight-childrens-media-use-in-america-2013

Schweinhart, L. J., & Weikart, D. P. (1988). Education for young children living in poverty: Child-initiated learning or teacher-directed instruction? *Elementary School Journal, 89* (2), 212– 225. doi: 10.1086/461574

State Education Agency. (2015a). *Revised prekindergarten guidelines*. Retrieved from http://tea.texas.gov/index2.aspx?id=2147495508

State Education Agency. (2015b). *Texas Essential Knowledge and Skills by grade level: Kindergarten*. Retrieved from http://tea.texas.gov/index2.aspx?id=6148

Tulgan, B., & Rainmaker Thinking Inc. (2013). *Meet generation Z: The second generation within the giant "Millennial" cohort* (White Paper). Retrieved from Rainmaker Thinking website: http://rainmakerthinking.com/assets/uploads/2013/10/Gen-Z-Whitepaper.pdf