Research-Based Technology Recommendations For Early Childhood Education

Sheila Connelly, Dowayne Davis, Hafiz Saleem

Sunday, April 3 2016

New Jersey City University

Professor, Dr. Christopher Shamburg

EDTC 807: Implementation and Evaluation of Curriculum

Curricula in Early Education

Young children, in particular, many low-income and minority children, are not getting enough cognitive, motor, self-control, health and social skill development at home nor in schools. Students tend to benefit more from programs that focus on essential competencies and agree to be evaluated on how well students acquire them. (Ornstein, 2015 p. 159) The need for developing essential competencies in young children is the basis of Ornstein's argument for various standard curricula in early education, including children under the age of six.

Early Childhood Technology Objectives

The objective of this document is to define technology recommendations that foster the development of digitally literate educators and parents who are grounded in child development theory with knowledge, skills, and framework to select and use technology tools and interactive media that suit the ages and developmental levels of young children. Therefore, this document presents six research-based recommendations that are essential to developing the necessary technology skills young children require during early childhood education and beyond.

Recommendation #1: Basic technology operations, concepts and skills

The National Association for the Education of Young Children (NAEYC) suggests that young children need opportunities to develop the early "technology-handling" skills associated with early digital literacy that are similar to "book-handling" skills associated with early literacy development. (NAEYC & FRC, 2012) Additionally, new Common Core Standards across the United States require incorporation of various technology skills in core subjects such as Mathematics and Literacy. (Achieve, 2012) Therefore, early childhood programs should devise

curricula that develop students' sound understanding of technology operations, concepts and demonstration of technology skills. (ISTE, 2007; Donohue, 2003)

NAEYC broadly defines technology to include knowledge and use of tools or machines, not simply computers. Technology can include things such as tape recorders, cameras, video, as well as simple gears, wheels, and levers. At various grade levels, technology can be used by teachers or children and include the use of technology in dramatic play (NAEYC, 2015 p. 19). Examples of technology operations, concepts and skills for implementation in kindergarten through second grade are below.

Example 1: *Formal implementation of technology skills in grade K*

A Kindergarten teacher that looks to develop the technology operations, concepts and skills for students at the Kindergarten level may focus on students' basic knowledge of peripheral devices, knowledge of input and output devices, demonstrating use of devices such as the keyboard, mouse, monitor and CPU. The teacher could focus on essential questions such as, how do you turn on the computer, how do you turn on the monitor, can you describe the power symbol, can you identify an input device and an output device? (Guarino & Daetwyler, 2012) The teacher can assess students' understanding and mastery of these topics by carrying observation tests in which the students carry out specific tasks based on the teacher's direction. (Assessment Techniques, 2016) For example, the teacher could ask the class or an individual student to double-click, drag a window, turn on the computer, identify the keyboard or identify an input device.

Example 2: *Formal implementation of technology skills in grade 1*

A 1st grade teacher that aims to develop the technology operations, concepts and skills for 1st grade students should expand on the basic technology skills learning in kindergarten, with more advanced higher-order essential questions and assessments. (Guarino & Daetwyler, 2012; McKay, 1956) For example, the teacher could ask essential questions such as, what is the difference between turn on the monitor and the CPU, what are the step in printing a document, what are ways to effective use a mouse and keyboard or how do we navigate to the Internet? (Guarino & Daetwyler, 2012) The teacher can assess students' understanding and mastery of these topics by administering a written test with multiple questions and verbal response.

Example 3: *Formal implementation of technology skills in grade 2*

Technology operations, concepts and skills at the 2nd grade level expand on learning at prior grade levels. A the 2nd grade level will teacher should begin to introduce; advance keyboard functions, with special characters; variety of digital tools such as, word processors, digital applications, and web-based applications that support collaboration with others. (Guarino & Daetwyler, 2012) Additionally, the essential questions should include, can students locate letters and special characters using proper hand placement, what are the step to create a new document or presentation, and how do parts of the computer work together? Teachers should use pre and post-tests to assess student master. These assessments should include a mixture or multiple choice and open-ended questions to challenge the students.

Recommendation #2: Promote appropriate screen time in and out of school

According to the Center of Disease Control and Prevention (CDC), childhood obesity has more than doubled over the last thirty years and creates a number of long-term health risks over

time. (Ogden, Carroll, Kit & Elegal, 2014) To combat this detrimental trend, particularly in young children, the CDC, American Academy of Pediatrics, and technology standards call for children to be active daily and to spend less time in sedentary pursuits, such as watching television and videos and playing video and computer games, collectively known as screen time. (Anderson, 2008 & NAEYC & FRC, 2012) Given the plethora of digital devices with increased access and use by young children, it is recommended that early education programs promote appropriate screen time both inside and outside the classroom based on national guidelines. (NAEYC & FRC, 2012 p. 11)

Example 1: *Promoting appropriate screen time in school*

According to the NAEYC, balancing screen time for young children from birth to adolescents is a team-effort between the home and school. (NAEYC & FRC, 2012 p. 11) In a formal K-12 instructional setting, in particular grade K-2, teachers can play a major role in promoting and setting appropriate behavior related to students' screen time. (Shifrin, Brown, Hill, Jana & Flinn, 2015) The American Academy for Pediatrics and American Heart Association recommend zero hour of daily screen time for children under age two and no more than two hours for children older than two. (Lifsey, 2016) Given these current guidelines, teachers should build lesson plans that incorporate a combination of demonstration, group work, and actual screen time to limit the active time students spend in front of the screen. Additionally, teachers can use teaching moments during formal lessons to reinforce proper and safe uses of digital media. (Shifrin et al., 2015)

Example 2: *Promoting appropriate screen time out of school*

Students' screen time extends beyond the walls of the classroom to their home through casual media consumption during daily activities. (Lifsey, 2016) Therefore, parents and guardians play a significant role in further promoting appropriate screen time. Outside of the classroom, young children are presented with various informal opportunities to access and use technology in their homes. (Shifrin et al., 2015) Given these informal education opportunities, parents can promote appropriate screen time by, carrying out physical activities with young children, scheduling screen time in advance, using everyday activities like walking the dog as a physical activity, avoiding using screen time as rewards, creating media-free zones in rooms like the bedroom, planning alternatives to screen time activities and setting daily limits. (Willenberg, 2006; Shifrin et al., 2015)

Recommendation #3: Technology use should be developmentally appropriate.

The use of technology with young children should correspond to developmental milestones corresponding to a child's age and personal development. (NAEYC & FRC, 2012) Knowledge of developmental milestones can be applied when considering how and when to use technology in formal and informal learning settings. (NAEYC, 2009)

Example 1: *Pre-School Technology Curriculum Corresponds to Developmental Milestones*

Computer Explorers is a company that provides technology education to young children in settings ranging from day care centers to preschools to kindergartens and elementary schools. They have mapped developmental milestones to their Computer Explorers activities in their document, Ages & Stages in Action! (Computer Explorers, 2014) The state of New Jersey has aligned their preschool standards, including technology, with the HighScope Preschool Developmental Indicators. (NJDOE, 2012)

Example 2: *Early Childhood Educational Technology Evaluation Toolkit*

The one-page document, the Early Childhood Educational Technology Evaluation Toolkit, published by Hatch Early Learning and included in the 2012 article, Finding the Education in Educational Technology with Early Learners by Lilla Dale McManis and Susan B. Gunnewig is a tool for educators to use when evaluating technology to bring into an early childhood classroom. (McManis & Gunnewig, 2012) If one adds the word apps to software, a document is developed that can be used by teachers for current evaluations.

Recommendation #4: Interactions with technology should encourage creativity and be fun.

Play is important for children, in and out of the classroom. Just as children use their imagination when they play with toys, the technology that they use should promote creativity in new and innovative ways. (Epstein, 2013; NAEYC & FRC, 2012)

Example 1: *ScratchJr*

ScratchJr enables children ages five to seven to create interactive stories using computer programming that can feature their own artwork, photographs and voices. There are ScratchJr versions that work on iPads and Android tablets. The Lifelong Kindergarten group at the MIT Media Lab, who created Scratch Jr's older sibling, Scratch, collaborated with the Development Technologies Research Group at Tufts and the Playful Invention Company to create ScratchJr (ScratchJr, 2016) A goal in the development of ScratchJr was to allow young children to create digitally. (Flannery et al., 2013)

Example 2: *Osmo*

Osmo uses a mirror placed over an iPad's camera that enables the child and the iPad to interact with objects placed in front of it such as a Tangram puzzle. Since the puzzle is on the table and the iPad is on a stand, it provides an opportunity for children to play together to solve the puzzle. (Raths, 2015) In addition to the Tangram puzzle, Osmo also has a word game similar to hangman, a physics game, Newton, a mathematical game, Numbers, and drawing game, Masterpiece. (Osmo, 2016)

Example 3: *Chromville*

Chromville uses augmented reality to make a child's 2D drawing come to life in 3D. There are versions of Chromville for Android tablets, iPhones and iPads. There are apps for drawing, science and water. (Chromville, 2016) It is another example of using technology to allow a child to be creative.

Recommendation #5: Promote digital literacy through knowledge acquisition, using computerized training of working memory (Klingberg, 2005)

According to Michael Booker, the author of *'A Roof without Walls: Benjamin Bloom's Taxonomy and the Misdirection of American Education'* (Booker, 2008) and Sam Wineburg and Jack Schneider, the authors of 'Was Bloom's Taxonomy Pointed in the Wrong Direction?' (Wineburg et. al, 2009) , Acquisition of knowledge was relegated to a lowly position in Bloom's learning hierarchy in schools, which resulted in students being ill prepared to develop the so-called 'higher-order' skills. This recommendation is being made on the calls for revisions to Bloom's Taxonomy, in order to help students gain and retain knowledge through memorization and recall of facts and information using tools of technology in early education.

Example 1 *(Formal in-class setting):*

Using game-based interactive technology tool, like Kahoot (Kahoot.it), teachers can teach and reinforce new vocabulary words, transfer facts and information, and introduce simple concepts in early education. Using the same tool, teachers can assess the retention scale of such knowledge and information passed in a lively competitive environment (Hussein, 2015).

Example 2 *(Informal at-home setting):*

Internet-connected Smart TVs are now available in approximately 56% of American households (Leichtman Research Group, 2015). This has resulted in exponential development of accessible apps (apps that are interactive and could be played by multiple players, families together). An example of such accessible app is Scrabble Blitz for SMART TV, which could be played by an entire family at once using their cell phones or tablets (Lieberman, 2006). This app meets the three affordance criteria suggested by Carr (2000) and Kafai (2006) for such apps, namely Transparency (immediate results), Challenge (difficulty), and Accessibility (parent-child collaboration) (Saracho et. al., 2007).

Recommendation #6: Promote affective and social skills using technology

According to NAEYC position statement on the use of Technology and Interactive Media in Early Childhood Programs, "When used appropriately, technology and media can enhance children's cognitive and social abilities." Ample research points to that effect (NAEYC, 2012). Peter Slovak and Geraldine Fitzpatrick (2015) also reviewed a vast amount of literature on Social and Emotional Skills Learning (SEL). They point out to the potential of mutual cooperation between Human-Computer Interaction (HCI) and SEL. Thus, it is recommended to promote the

use of technology in enhancing social skills, such as, self-awareness (mindfulness), self-management, relationship skills, and communication skills.

Example 1 *(Grades K-2—Formal setting): Teaching Mindfulness to Children (Jones et. al., 2015)*

The literature on the effectiveness of teaching mindfulness to children is growing (Thompson et. al., 2008), (Hooker et. al., 2008). A 15-minute mindfulness training using binary aural music in the background everyday can help improve executive functions of attention, self-awareness, and self-control (Napoli et. al., 2005). "Mindfulness is associated with emotion regulation across a number of studies. Mindfulness creates changes in the brain that correspond to less reactivity, and better ability to engage in tasks even when emotions are activated." (Roemer et. al., 2015)

Example 2 *(At-home Informal setting): Unplugging Technology to Teach Self Control*

In this example, parents and children agree on a technology-free Sabbath once a week by unplugging technology, in order to practice self-control, an executive function of the brain and an important social skill. The movement for a National Day of Unplugging does exist. (http://www.sabbathmanifesto.org/unplug/).

References

Achieve. (2012). *Understanding the skills in common core standards*. ().Achieve, Inc. Retrieved from http://www.achieve.org/files/Understanding-Skills-CCSS.pdf

Anderson, S. E., Economos, C. D., & Must, A. (2008). Active play and screen time in US children aged 4 to 11 years in relation to sociodemographic and weight status characteristics: A nationally representative cross-sectional analysis.*BMC Public Health, 8*(1), 1.

Assessment techniques and tools for documentation. (2016). ().Government of Newfoundland and Labrador. Retrieved fromhttp://www.ed.gov.nl.ca/edu/k12/curriculum/guides/completely_kinder/8.%20Section%204%20Assessment%20FINAL.pdf

Chromville. (2016). Chromville. Retrieved April 2, 2016, from https://chromville.com/apps/

Computer Explorers. (2014). *Ages and stages in action.* Retrieved on April 2, 2016 from http://computerexplorers.com/PreschoolAgesStagesinAction.pdf

Donohue, C. (2003). Technology in early childhood education. *Child Care Information Exchange, 154*, 17-22. Retrieved from https://www.ccie.com/library/5015417.pdf

Epstein, A.S. (2013) Using technology appropriately in the preschool classroom. *Extensions. 28*(1), 1-12. Retrieved on April 2, 2016 from http://www.highscope.org/file/NewsandInformation/Extensions/ExtVol28No1_highres.pdf

Flannery, L. P., Silverman, B., Kazakoff, E. R., Bers, M. U., Bontá, P., & Resnick, M. (2013, June). Designing ScratchJr: Support for early childhood learning through computer programming. *Proceedings of the 12th International Conference on Interaction Design*

and Children (pp. 1-10). ACM. Retrieved on April 2, 2016 from http://ase.tufts.edu/DevTech/publications/scratchjr_idc_2013.pdf

FoDoR, I. E., & Hooker, K. E. (2008). Teaching mindfulness to children.*Gestalt Review*, *12*(1), 75-91.

Guarino, S., & Daetwyler, P. (2012). *Trinity area school district template for curriculum mapping, 2012-2013* Retrieved from http://www.trinitypride.org/files/1045670/1st%20Grade%20Computers.pdf

ISTE. (2007). *ISTE standards students.* ().International Society for Technology in Education. Retrieved from https://www.iste.org/docs/pdfs/20-14_ISTE_Standards-S_PDF.pdf

Jones, D. E., Greenberg, M., & Crowley, M. (2015). Early social-Emotional functioning and public health: the relationship between kindergarten social competence and future wellness. *American journal of public health*, *105*(11), 2283-2290.

Klingberg, T. (2005-02-01). Computerized Training of Working Memory in Children with ADHD-A Randomized, Controlled Trial. Journal of the American Academy of Child and Adolescent Psychiatry, 44(2)

Lieberman, D. A. (2006). What can we learn from playing interactive games. *Playing video games: Motives, responses, and consequences*, 379-397.

Lifsey, S. (2016). Digital childhood: Realistic screen time limits for children tuesday, January 19, 2016. Retrieved from http://altarum.org/health-policy-blog/digital-childhood-realistic-screen-time-limits-for-children

McKay. (1956). Taxonomy of educational objectives. vol. 1: Cognitive domain. *New York: McKay,* , 20-24. Retrieved from Taxonomy of educational objectives. Vol. 1: Cognitive domain

McManis, L.D., Gunnewig, S.B. (2012). Finding the Education in Educational Technology with Early Learners. *Young Children. 67* (3). 14-24. Retrieved on April 2, 2016 from http://www.naeyc.org/yc/article/finding-education-in-educational-technology

NAEYC. (2015). *Early childhood program standards and accreditation criteria & guidance for assessment, national association for the education of young children. updated April 1, 2015.* ().National Association for the Education of Young Children. Retrieved from http://www.naeyc.org/files/academy/file/AllCriteriaDocument.pdf

Napoli, M., Krech, P. R., & Holley, L. C. (2005). Mindfulness training for elementary school students: The attention academy. *Journal of Applied School Psychology*, *21*(1), 99-125.

National Association for the Education of Young Children (NAEYC). (2009). *Developmentally appropriate practice in early childhood programs serving children from birth through age 8* [Position Statement] Retrieved on March 30, 2016 from http://www.naeyc.org/files/naeyc/PS_technology_WEB.pdf

National Association for the Education of Young Children (NAEYC) and the Fred Rogers Center (FRC) for Early Learning and Children's Media at Saint Vincent College. (2012). *Technology and interactive media as tools in early childhood Programs serving children from birth through age 8.* [Position Statement] Retrieved on March 30, 2016 from http://www.naeyc.org/files/naeyc/PS_technology_WEB.pdf

New Jersey Department of Education (NJDOE). (2010) *Alignment of the New Jersey preschool peaching and learning standards of quality With HighScope's preschool key developmental indicators.* Retrieved on April 2, 2016 from http://www.state.nj.us/education/ece/curriculum/desc/NJKDIs_HighScope.pdf

Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2014). Prevalence of childhood and adult obesity in the United States, 2011-2012. *Jama, 311*(8), 806-814.

Osmo. (2016). Playosmo.com. Retrieved April 2, 2016, from https://www.playosmo.com/en/

Radich, J. (2013). Technology and interactive media as tools in early childhood programs serving children from birth through age 8. *Every Child*,*19*(4), 18

Raths, D. (2015). 5 Ways to Extend Tablets Beyond the Screen. *T H E Journal, 42*(3), 24-26.

Roemer, L., Williston, S. K., & Rollins, L. G. (2015). Mindfulness and emotion regulation. *Current Opinion in Psychology*, *3*, 52-57.

Saracho, O. N., & Spodek, B. (2007). Contemporary Perspectives on Science and Technology in Early Childhood Education. Contemporary Perspectives in Early Childhood Education. Information Age.

ScratchJr - About. (2016). Scratchjr.org. Retrieved April 2, 2016, from http://www.scratchjr.org/about.html

Shifrin, D., Brown, A., Hill, D., Jana, L., & Flinn, S. K. (2015). Growing up digital: Media research symposium. *American Academy of Pediatrics, 1*, 2015.

Slovák, P., & Fitzpatrick, G. (2015). Teaching and developing social and emotional skills with technology. *ACM Transactions on Computer-Human Interaction (TOCHI)*, *22*(4), 19.

Thompson, M., & Gauntlett-Gilbert, J. (2008). Mindfulness with children and adolescents: Effective clinical application. *Clinical child psychology and psychiatry*, *13*(3), 395-407.

Willenberg, B. (2006). Children's activity pyramid. *University of Missouri Cooperative,* Retrieved from http://www.mdpedi.com/wp-content/uploads/2015/04/eKids1.pdf