Policy Brief

Envisioning a Digital Age Architecture

For Early Education

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Introduction

The digital age brings a profusion of new challenges and opportunities for the field of early education. The vast majority of children—including those in disadvantaged households—are growing up hearing, seeing, and interacting with digital media and communications technologies of all kinds every day.[1]

Educators now have once-unimaginable opportunities for collaborating with each other, exploring new content for their lessons, and employing new tools for measuring children's progress. But in early education, policies that affect

Adding to Reforms Already Underway, Birth Through Third Grade

Many people hear "early education" and think preschool, but the field is broader than that, stretching across the developmental span of early childhood, from birth through age 8. To build a strong early education system, New America and a host of research, advocacy, and philanthropic organizations have called for policies that give children access to a continuum of aligned and high-quality learning environments.[2] That continuum, often called P-3 or PreK-3rd, should start at birth with strong parental supports and nurturing environments, continue through children's experiences in childcare settings and preschool classrooms, and extend through kindergarten and the early grades of elementary school.

A digital age architecture should work in tandem with reforms promoting the birth-through-third-grade continuum. Those include: incentives to coordinate and share resources among publicly funded programs (including home visiting, child care, Head Start, state-funded pre-K, and public schools); opportunities to elevate the workforce and help teachers provide rich language and exploratory experiences for children; alignment efforts, via standards, instruction and assessments, that enable children to build on their learning seamlessly from one grade to the next; observation tools that call attention to the quality of teacher-child interactions; systems for identifying individual children's needs and tracking their progress; and more.

the quality of children's learning settings do not reflect this new reality. They should.

The daily lives of children and their families' routines are now shaped by what they watch and when, and how they interact with TV, digital tablets, smart phones, and social networks.[3] Yet parents and educators hear a tangle of messages from different sources advising them on how children should interact with digital media. Some experts focus on time limits citing the potential for negative impacts on children's physical activity and social skills and recommending no screen media for children before 24 months of age.[4] Others emphasize that educators have a responsibility to help children become "multiliterate," knowing how to use media to read texts and visual materials, conduct searches, and filter information.[5]

Survey data from at least three studies over the past year show that parents and teachers feel positively about the role that digital media could play in helping children learn,[6] but their responses also reveal problems. One is a lack of preparation and professional development for teachers.[7] Another is that parents are not using, or cannot find, educational guides for choosing games and apps.[8] Recent reports show spotty access to high-speed Internet in PreK-3rd classrooms; some teachers who have no access to tablets in schools are relying on their own personal devices to show children new materials.[9]

With child poverty on the rise and achievement gaps widening between children from high-income and low-income families,[10] will these problems exacerbate those divides?[11] Or could policies be changed to promote more opportunities for the disadvantaged and improve outcomes for all children no matter what their family circumstances? The hope behind that latter question is what led to this policy brief.

Shifting Away from Technology as Babysitter

Until recently, many educators and policymakers who focus on young children have been reluctant to use video, interactive media, and digital tools in preschool settings. Teacher survey data show faster adoption of technologies in the K-3 grades than in preschool—a separation likely stemming from a lack of age-appropriate preschool materials in the pre-tablet days, but also created by resource scarcity in preschools and child care centers that lack stable funding.[12] Some of the aversion also stems from understandable fear of harm to children when screen media are used inappropriately. A 2009 survey, for example, showed that child care providers who

care for children in their homes relied heavily on TV, using it two to three hours per day for infants and preschoolers.[13] Some longitudinal studies and scientific experiments have shown a link between toddlers regularly experiencing or "watching" adult-oriented TV (such as primetime sitcoms, "reality shows," or dramas not designed to be understood by young children), and negative results for language development and "executive functioning," such as children's ability to focus on a task.[14]

> " At least three factors need to be taken into account: the content on the screen, the context of use, and the age and characteristics of each individual child.

Research has also shown, however, that young children can benefit from various forms of screen media, when those media, including TV shows, are designed to be understood by them or used mindfully by the parents, teachers, and other caregivers around them.[15] Studies point to at least three factors that need to be taken into account: the content on the screen, the context of use, and the age and characteristics of each individual child. Positive findings come from experimental and longitudinal studies of programs such as Sesame Street, Barney & Friends, Between the Lions, Blue's Clues, The Adventures of SuperWHY, and others.[16] Less understood is how much children can learn via interactive media and e-books. A few recent experiments, however, show the potential for children to learn when interacting with screen media or participating actively with what they see on the screen.[17] Recently researchers have opened new lines of research on the potential benefits of "joint engagement with media" or co-viewing—those moments when parents and teachers watch or play games with children and talk about images they see on screen, introducing new words, and exploring subject matter together.[18] Other areas of interest among early childhood researchers include the use of technology to support personalized or adaptive learning, as well as the ability of digital cameras and audio-recording applications to help young children create their own stories and build narrative skills.[19]

In 2012, the National Association for the Education of Young Children and the Fred Rogers Center for Early Learning and Children's Media at Saint Vincent College released a position statement on technology that heralded a new era.[20] The statement was designed to prevent misuse of technology, declaring that "passive use" should not replace "active play, engagement with other children, and interactions with adults."[21] It also stated that interactive media

could promote learning when "used intentionally by early childhood educators, within the framework of developmentally appropriate practice to support learning goals for individual children."[22] Here was a clear sign of the field of early education putting the onus on itself: professional educators were recognizing their responsibilities for helping children develop essential social and intellectual skills for the 21st century. They wanted to enable children to see themselves as budding writers, thinkers, analysts, scientists, and creators confident in using the tools at their fingertips.

Modernizing and Rebuilding

Buildings change with the arrival of new technologies (plate glass, indoor plumbing, electric lighting), not to mention new dynamics in family life (less formality, for example, brought down the walls between kitchens and dining rooms). Today's educational institutions are in throes of similar construction and remodeling, and early education is no exception. Findings from developmental science have led to greater understanding of how children's learning environments can shape their growth; higher expectations for children's cognitive and social development; and higher standards for educators and caregivers. Yet funding continues to be uneven as policymakers try to recover from the years directly after the Great Recession, when some funding was either flat or in decline.[23] Financial challenges accompanied by the massive task of preparing and raising the skill levels of the workforce make it tempting to avoid talk of any kind of reforms, let alone imagine a space for new technologies.

That would be a mistake. In addition to addressing concerns of inequality and digital divides, educators and policymakers should seize the chance to bend the technology marketplace toward the needs of educators and families, enabling new connections to resources, new materials for use in the classroom, new tools of communication, and new partnerships for cost-savings, not to mention collaboration and creativity. As states and communities create new systems by connecting once-siloed programs and raising standards, they should recognize that they are building for the digital age.

Below we propose five essential actions for designing a new system that can reap the benefits and withstand the challenges of new technologies:

- Aim high
- Boost the workforce
- Tap hidden assets
- Connect to information and each other
- Investigate

We also ask questions to trigger new dialogue on what needs to be done to build this house of our dreams, a system that gives all children the opportunity to thrive in an era marked by intense technological and societal change.

Aim High

Policies should set high expectations for the use of technologies with children in classrooms, in other community settings and at home.

In addition to decades of research on what children need for optimal physical, social, and cognitive growth, studies show that the quality of their interactions with parents, caregivers, and teachers—in particular, their back-and-forth conversations—has a direct impact on how much children learn.[24] When technology is used, whether e-books shared at storytime or classrooms receiving video phone calls from pen pals, it too can promote back-and-forth conversations. **How should technology and learning policies be updated to promote adult-to-child interactions?**

Children also need opportunities for physical exploration and tactile experiences. Unfortunately, today's discussions about technology create artificial standoffs between viewing digital media and exploring the world outside. Yet with older technology—books—educators have had little trouble integrating two-dimensional and three-dimensional learning into their lesson plans. And today, book-like experiences can happen via screen media, whether via e-books on plants and animals, videos of field trips, or slide shows of "before

and after" tower building. Some of those media experiences could be oriented to promote hands-on and gross-motor learning by demonstrating field science, artisanship, athleticism, dance, music and more. **Do today's standards for technology integration in the classroom—if they exist at all—encourage exploration and hands-on learning?**

Most experts on educational technology urge that technology should be integrated into curricula and lesson plans, not isolated as "technology time." To do that, early educators emphasize the importance of being selective and intentional.[25] Well-chosen games, apps, or e-books enable them to augment and invigorate their lessons in ways that spark new conversations and tap into children's curiosity. New on-screen games can provide teachers individualized data on children's progress and provide a record to share with next year's teachers. But some teachers report being wary of using those kinds of technologies because doing so may contribute to the "screen time" frowned upon by the raters in many states' Quality Rating and Improvement Systems (QRIS),[26] especially given that those ratings are increasingly used to determine public funding of child care and pre-K. **Could quality-measurement tools and licensing standards be updated to focus on how and whether teachers use screen media to promote learning instead of on the amount of time spent with devices?**

Boost the Workforce
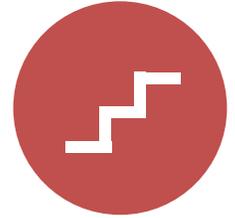
Studies published in the past few years highlight why it is a mistake to assume that children will learn more when decision makers merely invest in hardware and software.

The 2012 book *Giving Our Children a Fighting Chance* describes the challenge poignantly. Through careful observation over 10 years, researchers Susan Neuman and Donna Celano followed an early literacy experiment involving two libraries in Philadelphia, and discovered that new books and computers—while welcome, especially in the low-income neighborhood—were not enough to spur the kind of individual guidance and back-and-forth interactions that young children need to become strong readers.[27] In 2013, a study for the U.S. Department of Education by the Education Development Center and SRI International showed that simply giving teachers electronic white boards, mobile computers, and high-speed internet access did not make a difference in outcomes for preschool children learning mathematics.[28]

These examples, and an increasingly settled knowledge base about what good teaching entails, highlight the risk of ignoring human capital—the need to invest in the adults working with children. It is not enough to prepare teachers for the digital age by simply instructing them on the practical ins and outs of how to use a device, app, or "learning platform." (These kinds of tutorials are not difficult to deliver and should be expected with any technology installation and roll-out anyway.) In a recent survey by the LEAD Commission, a bipartisan group designed to support the U.S. Department of Education and Federal Communications Commission, 82 percent of teachers said they are not receiving the necessary training to use technology to its fullest potential in the classroom.[29] Attention should be paid instead to helping teachers integrate technology into their curricula, a point underscored by the Obama Administration in its 2014 budget and proposed ConnectEDucator Initiative. Even more critical is providing prospective and current teachers a solid grounding in the latest developmental science and ensuring they are mentored through practical experiences in real settings with young children. With that grounding in place, prospective teachers should be required to apply their knowledge of pedagogy and child development to answer questions about how to appropriately use new tools. **Are today's teacher preparation programs and professional-development programs up to the challenge?**

Robust professional development was a key recommendation by the Digital Age Teacher Preparation Council convened in 2011 by the Joan Ganz Cooney Center at Sesame Workshop in conjunction with the Stanford Educational Leadership Institute. That council's landmark report, *Take a Giant Step: A Blueprint for Teaching Young Children in a Digital Age*, laid out five goals to achieve by 2020 that consider various ways to integrate technology tools in curriculum, assessment, and instruction and consider technology in determining standards for good programs.[30] **What do digital-age standards look like when applied to accreditation, professional development, and teacher preparation?**

Another consideration: Equipping the workforce to answer questions from parents. Families today are buzzing with questions about which apps to download and whether a child should be allowed to watch a particular video. To address this, we should tap into the expertise of media literacy specialists and children's librarians to develop skills for what we and others in the field have started to call "media mentorship."[31] This approach involves training individuals to help families, including young children, use new tools to become creators while also being selective and thinking critically about what games they play or shows they watch. **How can technology integration and media mentorship become more tightly woven into coursework, student teaching assignments, and residencies?**

Tap Hidden Assets

Since the dawn of the Web, resources like books, teacher guides, and educational videos have been freed from the binds of physical location.

Yet the 20th-century structures designed to hold those physical assets are still standing, and the walls built around them (both figuratively and literally) are difficult to break through. Libraries and public television stations, for example, are two institutions that offer treasure troves of materials that early educators may not even know exist. Health clinics and pediatricians offices are also siloed, with few links to resources in early education and vice versa.

Several new reports and initiatives show a desire to overcome these barriers. One is *Growing Young Minds*, a report from the Institute for Museum and Library Services in partnership with the Campaign for Grade-Level Reading. The report calls on policymakers to encourage more collaboration between libraries and early childhood education and, among other recommendations, "link new digital technologies to learning."[32] The *Take a Giant Step* report recommends "the expanded use of public media as cost-effective assets for teachers,"[33] and PBS has opened websites to provide online resources and courses for educators.[34] The Office of Head Start has promoted regulations to encourage better cooperation between children's librarians, early literacy specialists, and early educators.[35] Reach Out and Read, an initiative that enlists pediatricians to promote parents' reading with young children, now has a presence in all 50 states.[36] **How should we align policies affecting libraries, public media and health care providers to enable more sharing of resources, expertise and ideas?**

Also typically untapped are the creators of games and media for children. Private entities (for-profit and nonprofit) are obviously very busy in this arena: Thousands of apps for young children are already present in app stores such as iTunes and Google Play.[37] Yet developers, it appears, tinker away with little input from early childhood professionals or researchers who study child development. Parents and educators face a "digital wild west."[38] In 2012, the Fred Rogers Center for Early Learning and Children's Media at Saint Vincent College took steps to address this divide and published its "Framework for Quality" which describes attributes of media that prompt young children's learning and engagement.[39] A small number of companies—nonprofits such as Sesame Workshop and PBS, for example—do have robust research teams and experts in child development.* But in most cases, media developers rarely connect with the world of educators and child development experts. **How do we forge better connections between researchers, educators, and creators of high-quality children's media?**

* Full Disclosure: The Early Education Initiative at New America is engaged in research projects with the Joan Ganz Cooney Center at Sesame Workshop.
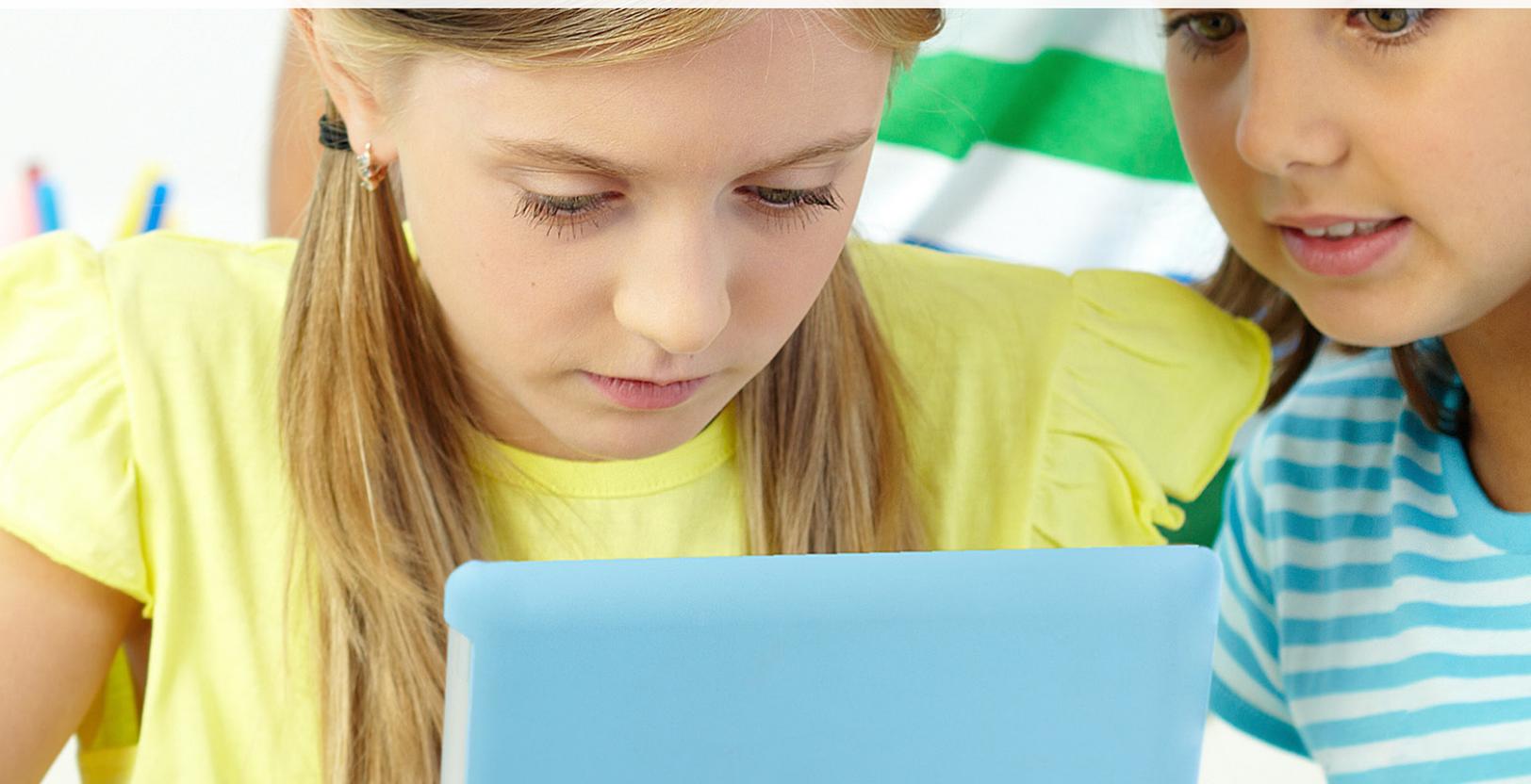
Connect to Information and Each Other

Given how much the Internet has become part of everyday life, policymakers may assume that everyone has computers and is online. Indeed, national surveys show that the majority of families have access to the Internet and the vast majority of adults have smartphones.[40]

That does not mean, however, that teachers or students are always able to connect. Recent reports show that in some cases, the Internet is only available in a limited number of classrooms. One report from the U.S. Department of Education's Ready to Learn study found that only 29 percent of pre-K programs had Internet connections that children could use to access games and other multimedia.[41] Moving into kindergarten and beyond, 72 percent of primary and secondary schools do not have the Internet infrastructure they need now, let alone what they will need in the future.[42] And for educators lacking access in the classroom, it is unknown whether they have connectivity at home to take advantage of the vast resources available online.

> " The 21st century requires greater connection between educators to learn from each other and share resources.

To address this lack of connectivity, the FCC is taking steps to update the E-rate program that subsidizes telecommunications services for public schools and libraries, refocusing funds to prioritize Internet service.[43] In public comments to the FCC last fall, New America recommended, among many other measures, greater flexibility for schools providing early childhood education, including the ability to connect classrooms used for pre-kindergarten and Head Start.[44] **What policies and legislation need to be updated to ensure teachers and learners have Internet connectivity?**

To compensate for a lack of high-speed broadband infrastructure, some districts have relied on 3G/4G/LTE mobile networks to connect to the Internet and online resources. Pilot initiatives within the E-rate program have also allowed applicants to use funds for mobile service plans. But while smart phones and other technologies that connect to mobile networks have been widely adopted, the fees that telecommunications companies charge when customers exceed their monthly data limits can be prohibitively expensive.[45] Those limits may not allow educators, parents, and students to make use of video tutorials and other educational materials. **Should public dollars be invested in mobile service plans or more robust broadband infrastructure?**

The complexities of education in the 21st century require greater connection between educators to learn from each other and share resources. Locally, the emergence of professional learning communities (PLCs) in schools over the past decade have enabled better information sharing among PreK-3rd teachers, literacy specialists in libraries and public schools, social workers in home-visiting programs, and professionals working in child care programs.[46] These PLCs have traditionally met face-to-face, but increasingly rely upon online databases to find, share, and connect others to high-quality resources. At the state level, several departments of education have begun to develop repositories for educator resources,[47] and are thinking through how to best evaluate the quality of materials available.[48] These types of efforts may help break down silos between not just educators, but also the myriad programs and providers of early childhood education. Yet it is unclear whether PreK-3rd teachers are even able to fully access those resources. **Which policies would establish a high bar for quality and effective sharing of resources?**

Finally, for both families and educators to truly benefit from the opportunities of the digital age, access to connectivity must extend beyond learning settings into the community at large. Recognizing the need for community-wide coordination and planning for broadband infrastructure, the Institute of Museum and Library Services released a report detailing a framework for community action for building and supporting digital communities.[49] Many school districts have taken on an active role connecting families at home; the Mooresville Graded School District in North Carolina worked with a local Internet provider to secure free home connectivity for families of students that qualified for free or reduced price lunch.[50] **What role should institutions such as schools and libraries play in extending connectivity beyond their walls and into the community?**

Investigate
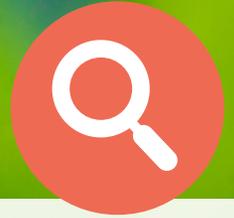
Incorporating technology and media into early education is, by its very nature, an experiment. It raises questions of what works and what does not, and what conditions led to success or failure.

Yet too often, new materials or new techniques are introduced without forethought on how to gather data and evaluate success. School district leaders and early learning administrators may feel pressure to make purchases without enough information on the products' effectiveness, nor do they have models for gathering and analyzing information over time to evaluate those purchases. Leaders need research informed through sound scientific investigation, using controlled experimental trials, longitudinal studies, and data gathering on technology in educational settings and at home. **How can policy encourage more evaluation and scientific study of digital-age interventions and technology implementation?**

Federal agencies such as the U.S. Department of Education and the National Science Foundation do run a few grant programs that encourage research on early education and technology, such as the Ready to Learn program and the Next Generation Preschool Math and Science projects. Analysts should examine how funding levels for those programs compare to other education and applied research programs, and consider whether other grant programs also encourage the study of technology use in early childhood. Universities and their faculty are often the recipients of federal funding, but they also depend on grants from private philanthropies and corporations. **Which policies will ensure that research on technology in early education is conducted independent of vested interests?**

Conclusion

The young children of today will soon grow into the middle-schoolers of the next decade, the high school graduates of the late 2020s, and the citizens and workforce of the future.

By paying attention to the way today's young children use technologies and media, and by tailoring policies to ensure that educators are prepared to help them, policymakers can promote environments that give learners every chance to succeed.

This brief lays out the beginnings of a new architecture for 21st-century policymaking. We hope it will spark dialogue across the field about what it will take to remodel early education for the digital age: aiming high, boosting the workforce, tapping forgotten assets, connecting people to each other and to information, and investigating what works.

Notes

1   Zero to Eight: Children's Media Use in America 2013, (San Francisco: Common Sense Media) http://www.commonsensemedia.org/research/zero-to-eight-childrens-media-use-in-america-2013.

2   See p. 18 of Lisa Guernsey, Laura Bornfreund, Clare McCann and Conor Williams, Subprime Learning: Early Education in America since the Great Recession (Washington, DC: New America Foundation, 2014) for a discussion of the current birth-through-third-grade policy focus.

3   Aviva Lucas Gutnik, Michael Robb, Lori Takeuchi, and Jennifer Kotler, "Always Connected: The New Digital Media Habits of Young Children," (New York: Joan Ganz Cooney Center at Sesame Workshop, 2011) http://www.joanganzcooneycenter.org/publication/always-connected-the-new-digital-media-habits-of-young-children/; Lori Takeuchi and Reed Stevens, "The New Co-Viewing: Designing for Learning Through Joint Media Engagement," (New York: Joan Ganz Cooney Center, 2011) http://www.joanganzcooneycenter.org/wp-content/uploads/2011/12/jgc_coviewing_desktop.pdf;

4   "Children, Adolescents, and the Media," Council on Communications and Media, American Academy of Pediatrics (Elk Grove Village, IL: AAP, 2013) http://pediatrics.aappublications.org/content/early/2013/10/24/peds.2013-2656; Diane E. Levin, Beyond Remote-Controlled Childhood: Teaching Young Children in the Media Age, (Washington, DC: National Association for Education of Young Children, 2013) https://www.naeyc.org/store/Beyond-Remote-Controlled-Childhood.

5   Borsheim, C. , Merrit, K and Reed, D, 2008 "Beyond Technology for Technology's Sake: Advancing Multiliteracies in the Twenty-First Century" The Clearinghouse: A Journal of Educational Strategies, Issues and Ideas 82 (2): 87-90; Renee R. Hobbs and David Cooper Moore, Discovering Media Literacy: Teaching Digital Media and Popular Culture in Elementary School (Thousand Oaks, CA: Corwin Press, 2013); Also see the Common Core State Standards "anchor standards for reading" CCSS.ELA-LITERACY.CCRA.R.7, which calls for student to "integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words."

6   Victoria Rideout, "Learning at Home: Families' Educational Media Use in America," (New York: Joan Ganz Cooney Center, January 2014) http://www.joanganzcooneycenter.org/publication/learning-at-home/ ; Parenting in the Age of Digital Technology, Center on Media and Human Development, Northwestern University (Evanston, IL: June 2013) http://vjrconsulting.com/storage/PARENTING_IN_THE_AGE_OF_DIGITAL_TECHNOLOGY.pdf; Ellen Wartella, C. Blackwell, Alexis Lauricella and Michael Robb Technology in the Lives of Teachers: Survey of Early Childcare Providers. Report for the Fred Rogers Center. (Evanston, IL: Northwestern University, Summer 2013) http://www.fredrogerscenter.org/media/resources/FINAL-Fred_Rogers_Center_2013_Tech_Survey_Report.pdf; Study of Preschool Parent and Caregiver Use of Technology and PBS KIDS Transmedia Resources, A Report to the CPB-PBS Ready to Learn Initiative (New York: EDC and San Francisco: SRI International, 2012) http://cct.edc.org/sites/cct.edc.org/files/publications/Parent%20Caregiver%20Body%20Feb%2013.pdf

7   See p. 12 of Technology in the Lives of Teachers: Survey of Early Childcare Providers. Also see Fran Simon, Karen Nemeth, and Dale McManis, "Technology in ECE Classrooms: Results of a New Survey and Implications for the Field," Child Care Information Exchange 35: 5, No. 213 (September/October 2013).

8   According to survey data on p. 37 of Parenting in the Age of Digital Technology, only 13 percent of parents use website reviews, only 5 percent read newspaper or magazine reviews, 34 percent rely on friends' recommendations, and 25 percent rely on what children find themselves. According to p. 27 of the Learning at Home study, 55 percent of parents said they wish they had more guidance on what was educational.

9   See page 4 of Shelley Pasnik and Carlin Llorente, Year One Context Studies: A Report to the Ready to Learn Initiative (New York: Education Development Center, 2011) http://cct.edc.org/sites/cct.edc.org/files/rtl/study-11-context-full.pdf

10   See page 6 of Subprime Learning.

11   Susan B. Neuman and Donna C. Celano, Giving Our Children a Fighting Chance: Poverty, Literacy, and the Development of Information Capital (New York: Teachers College Press, 2012).

12   For more on the instability and spottiness of funding for pre-kindergarten, see Lisa Guernsey and Alex Holt, Counting Kids and Tracking Funds in Pre-K and Kindergarten (Washington, DC: New America Foundation, 2012).

13   Dimitri A. Christakis and Michelle M. Garrison, "Preschool-Aged Children's Television Viewing in Child Care Settings," Pediatrics 124: 6 (December 1, 2009) 1627 -1632. http://pediatrics.aappublications.org/content/124/6/1627.full. It should be noted that this survey did not make any attempt to determine whether the content on the screen was educational or designed for young children. But as the authors report, "at the levels of viewing reported here, even educational television has limitations. Previous studies of the benefits of high-quality television evaluated exposures of <1 hour."

14   Rachel Barr, Alexis Lauricella, Elizabeth Zack, and Sandra L. Calvert, "Infant and Early Childhood Exposure to Adult-Directed and Child-Directed Television Programming: Relations with Cognitive Skills at Age Four," Merrill-Palmer Quarterly 56:1 (2010); Rachel Barr, Catherine Danziger, Marisa Hilliard, Carolyn Andolina and Jenifer Ruskis, "Amount, content and context of infant media exposure: a parental questionnaire and diary analysis," International Journal of Early Years Education, 18: 2 (2010) 117; Angeline S. Lillard and Jennifer Peterson, "The Immediate Impact of Different Types of Television on Young Children's Executive Functioning," Pediatrics 128: e000 (October 2011); Dimitri A. Christakis, Michelle M. Garrison, Todd Herrenkohl, Kevin Haggerty, Frederick P. Rivara, Chuan Zhou, and Kimberly Liekweg, "Modifying Media Content for Preschool Children: A Randomized Controlled Trial," Pediatrics 2013;131 431-438

15   For compilations of the research on intentional use of media designed for children, see Michael Robb, "Research Summary, New America Foundation Roundtable, October 15, 2013," draft for the Alliance for Early Learning in a Digital Age, March 2014.

16   John C. Wright, Aletha C. Huston, Kimberlee C. Murphy, Michelle St. Peters, Marites Piton, Ronda Scantlin, and Jennifer Kotler, "The Relations of Early Television Viewing to School Readiness and Vocabulary of Children from Low-Income Families: The Early Window Project," Child Development 72:5 (2011); Many more peer-reviewed studies are described in Lisa Guernsey, Screen Time: How Electronic Media—From Baby Videos to Educational Software—Affects Your Young Child (New York: Basic Books, 2012).

17   Sarah Roseberry, Kathy Hirsh-Pasek, and Roberta M. Golinkoff, "Skype Me! Socially Contingent Interactions Help Toddlers Learn Language," Child Development (forthcoming); Alexis Lauricell, Tiffany Pempek, Rachel Barr, and Sandra Calvert, "Contingent computer interactions for young children's object retrieval success." Journal of Applied Developmental Psychology, 31 (2010): 362-369; Georgene Troseth, Megan Saylor, and A.H. Archer, "Young children's use of video as socially relevant information," Child Development 77 (2006) 786-799.

18   Takeuchi and Stevens, "The New Co-Viewing."

19   See the May 2012 issue of Young Children published by the National Association for the Education of Young Children and devoted to technology and young children.

20   National Association for the Education of Young Children and the Fred Rogers Center for Early Learning and Children's Media and Saint Vincent College, 2012. "Technology and Interactive Media as Tools in Early Childhood Programs Serving Children from Birth through Age 8," (Washington, DC: NAEYC and Latrobe, PA: Fred Rogers Center, 2012). Available at http://www.naeyc.org/content/technology-and-young-children.

21   NAEYC statement, p. 4

22   Ibid, p. 5

23   Guernsey et al, Subprime Learning, pages 3-6.

24   Mashburn, A.J., Pianta, R., Hamre, B.K., Downer, J.T., Barbarin, O., Bryant, D., Burchinal, M., Clifford, R., Early, D., Howes, C. "Measures of Classroom Quality in Pre-Kindergarten and Children's Development of Academic, Language and Social Skills," Child Development 79 (2008) 732-749.

25   Madhavi Parikh, "Technology and Young Children: New Tools and Strategies for Teachers and Leaders," Young Children (May 2012).

26 Some states employ monitors who use observation tools and checklists when visiting child care and pre-K programs to determine if they are meeting standards of quality, and some of those tools, such as the Early Childhood Environmental Rating Scale, require monitors to record the amount of time that children spend with screen media such as televisions or video screens.

27 Neuman and Celano, 2012.

28 Shelley Pasnik and Carlin Llorente, Preschool Teachers Can Use a PBS KIDS Transmedia Curriculum Supplement to Support Young Children's Mathematics Learning: Results of a Randomized Controlled Trial, Summative Evaluation of the CPB-PBS Ready to Learn Initiative, (Waltham, MA, and Menlo Park, CA: 2013).

29 "Paving a Path Forward for Digital Learning in the United States," LEAD Commission, (September 2013) http://leadcommission.org/sites/default/files/LEADComm_PavingPath_Report_091013a_highres%281%29.pdf

30 Brigid Barron, Gabrielle Cayton-Hodges, Laura Bofferding, Carol Copple, Linda Darling-Hammond, and Michael H. Levine, Take a Giant Step: A Blueprint for Teaching Young Children in a Digital Age (New York: Joan Ganz Cooney Center, 2011).

31 Lisa Guernsey, Presentation on Screen Media and Young Children, TEDx MidAtlantic, October 2012; Also see "Mobile Media, Early Literacy & Digital Storytelling," a presentation by Cen Campbell of LittleeLit.com and Betsy Diamant-Cohen for Mother Goose on the Loose. http://www.slideshare.net/CenCampbell/il-betsy-cen13

32 See page 5 of Growing Young Minds, Institute for Museum and Library Services, 2013 http://www.imls.gov/assets/1/AssetManager/GrowingYoungMinds_ExecSum.pdf

33 Barron et al, Take a Giant Step, page 41.

34 See PBS TeacherLine at http://www.pbs.org/teacherline/ and PBS Parents at http://www.pbs.org/parents/.

35 "Head Start, Child Care, and Public Libraries: Partnerships to Support Young Children and Their Families," ACF-IM-HS-12-04," Federal Register, May 9, 2012; See also page 3 of Lisa Guernsey, Technology in Early Education: Building Platforms for Connections and Content that Strengthen Families and Promote Success in School, an issue in the series The Progress of Education Reform (Denver: Education Commission of the States, 2012).

36 See the Reach Out and Read website at http://www.reachoutandread.org/about-us/

37 Carly Shuler, iLearn II: An Analysis of the Education Category in Apple's App Store (New York: Joan Ganz Cooney Center, 2012).

38 See Lisa Guernsey and Michael Levine, Pioneering Literacy in the Digital Wild West: Empowering Parents and Educators, (Washington, DC: Campaign for Grade-Level Reading, 2012).

39 "A Framework for Quality in Digital Media for Young Children: Considerations for Parents, Educators, and Media Creators," Fred Rogers Center for Early Learning and Children's Media at Saint Vincent College, 2012, at http://www.fredrogerscenter.org/media/resources/Framework_Statement_2-April_2012-Full_Doc+Exec_Summary.pdf

40 Data from page 34 of Victoria Rideout, Parenting in the Age of Digital Technology: A National Survey (Evanston, IL: Northwestern University, June 2013) shows that 85 percent of parents have a computer at home with high-speed Internet access, http://vjrconsulting.com/storage/PARENTING_IN_THE_AGE_OF_DIGITAL_TECHNOLOGY.pdf; Aaron Smith, "Smartphone Ownership – 2013 Update," Pew Research Center, June 2013.

41 Pasnik and Llorente, Year One Context Studies, page 4.

42 EducationSuperHighway. "The Connectivity Gap." http://www.educationsuperhighway.org/the-connectivity-gap.html

43 Sean Cavanagh. "Shift E-Rate Dollars to 'Must-Have' Technologies, FCC Chairman Says." Education Week. http://blogs.edweek.org/edweek/DigitalEducation/2014/03/shift_e-rate_dollars_to_%27must-have%27_technologies_FCC_official%20says.html

44 Lindsey Tepe. "E-rate Modernization: Promoting Connectivity for 21st Century Learning Environments," EdCentral, September 23, 2013. http://www.edcentral.org/e-rate-modernization-promoting-connectivity-for-21st-century-learning-environments/

45 Hibah Hussain, Danielle Kehl, Benjamin Lennett, and Patrick Lucey. Capping the Nation's Broadband Future? Dwindling competition is fueling the rise of increasingly costly and restrictive Internet usage caps. (Washington, DC: New America Foundation, 2012); see also, Benjamin Lennett and Danielle Kehl, "Data Caps Could Limit Online Learning's Bright Future," the Chronicle of Higher Education, March 4, 2013. https://chronicle.com/article/Caps-on-Data-Use-Dim-Online/137653/

46 Ed Week Spotlight on Professional Learning Communities, November 10, 2010, http://www.edweek.org/ew/marketplace/products/spotlight-professional-learning-communities.html

47 See, for example, New York State Education Department's EngageNY, which provides educational materials, including curricular modules and units, for P-12 ELA and mathematics that are aligned to state standards. http://www.engageny.org/common-core-curriculum

48 Open Education Resources (OER) Rubrics and State Support. Achieve Inc. http://www.achieve.org/files/OEROverview072613FINAL.pdf

49 Building Digital Communities: A Framework for Action. Institute of Museum and Library Services. http://www.imls.gov/assets/1/AssetManager/BuildingDigitalCommunities_Framework.pdf

50 See http://www.edcentral.org/mooresville-nc-connected-schools-supported-connected-communities/