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Using Early Childhood Education to Bridge the Digital Divide

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Technology literacy plays an important role in a child’s ability to succeed in school and later life.

Yet, despite rapid growth in society’s use of digital technology, many children in low-income families in the United States are not able to access and use technology in the same ways as their more-advantaged peers. This means they have fewer opportunities to learn, explore, and communicate digitally, and fewer chances to develop the workforce skills they will need to succeed in later life. Early childhood education can play a valuable role in ensuring that low-income children can access technology and learn how to use it. This Perspective frames a discussion on these subjects by exploring the role of early childhood education in bridging the digital divide.
Early childhood education (ECE) is a well-established step in the education pathway for young children. As of 2012, approximately 80 percent of 4-year-olds received regular care from someone other than their parents, and three-quarters of these children attended a public or private preschool center.¹ A substantial portion of a young child's time is spent in ECE. Preschool programs generally last 3–6 hours, and family child-care providers often care for children all day long. The potential for ECE providers to play an important role in a child's development can, therefore, be significant.

ECE provides an important opportunity to address disparities in skills and abilities among children.² On average, children who come from disadvantaged families have lower levels of academic achievement than their more-advantaged peers.³ These achievement gaps can appear as early as 18 months of age and persist to later ages.⁴ High-quality ECE experiences have been shown to substantially reduce gaps in math and reading skills as well as motivation and socialization.⁵ Children who participate in ECE perform better in kindergarten and attain higher levels of achievement throughout their K–12 schooling. The effects of ECE are particularly strong for children from low-income families.⁶ ECE is also related to increased high school graduation rates, higher employment and income levels, and lower rates of crime.⁷
Recognizing the importance of ECE, federal and state governments have invested substantially in its public provision. Funding for the Head Start program, which provides educational, health, nutritional, and other social services, was nearly $8 billion in 2012. Several states have developed universal prekindergarten programs to ensure that all students have access to high-quality ECE. Public investments have led to significant growth in State Preschool Program attendance, which doubled from just 14 percent of 4-year-olds in 2002 to 28 percent in 2012. State Preschool and Head Start—the two largest publicly funded programs—accounted for 41 percent of 4-year-olds enrolled in preschool in 2012.

We know that ECE can provide valuable opportunities to address disparities in foundational skills, and we know that a majority of children receive some form of ECE. So the question is, can ECE also address disparities in other areas? Over the past two decades, the integration of information and communication technology (ICT) into educational settings has raised concerns that disadvantaged students are behind peers in information and communication technology access and use. The disparity in access to and use of technology is commonly referred to as the digital divide. This Perspective discusses ECE’s potential to address this digital divide. We also discuss ICT’s potential to address early disparities in academic achievement and “soft skills,” such as motivation and socialization.
For a growing number of Americans, ICT has become a “general-purpose technology”—one that, like the railroad and electric power in their eras, is indispensable to daily life. Computers, other computer-based devices (such as smartphones), and the Internet play an important role in many aspects of life, including education, work, social interaction, and civic participation. Some believe that ICT may even have the power to alter preexisting economic and social structures. However, history shows that it usually takes time for general-purpose technologies to work their way through a social structure, and, during that time, gaps in access can grow and create social divides. Bridging these divides sometimes requires that the government and civil society step in.

The use of ICT in the workplace is on the rise. By 2003, more than 56 percent of employed Americans were already reporting computer in the workplace, and 40 percent were reporting Internet use as well. A 2008 study showed that those with higher-paying jobs, including managers and professionals, are particularly likely to use computers in the workplace, and that those who...
report using technology in the workplace earn 14–27 percent more than those who do not. Projections in the U.S. labor market indicate that much of the country’s future job growth will be concentrated in areas that require use of ICT on the job.

ICT is increasingly being integrated into education, both to prepare students for the workplace and to enhance the learning environment. As early as 2003, more than 80 percent of K–12 students reported using a computer in school; in 2009, 74 percent of elementary school teachers and 69 percent of secondary school teachers reported using a computer “sometimes” or “often” in classroom instruction. College-age students use computers at high rates, with 83 percent of first-year college students reporting in 2012 that they used a computer “quite a bit” or “very much” in academic work. A growing body of research shows a positive relationship between the use of computers at home or in school and academic achievement.

The ability to use ICT effectively for education and work requires technology literacy, or the ability to use computer-based devices, software, and networks. Just as basic text literacy opens the door to a world of information and provides opportunities for learning, technology literacy grants access to the digital world and all of the learning opportunities it affords. According to the International Society for Technology in Education’s National Educational Technology Standards, technology literacy includes both the basic knowledge and skills needed to use ICT and the more-advanced ability to use ICT “to analyze, learn, and explore.” Early childhood education plays a critical role in building basic text literacy, and it may be able to do the same for technology literacy.

In 2009, 74 percent of elementary school teachers reported using a computer “sometimes” or “often” in instruction.
Without technology literacy upon entry into kindergarten, students may begin to fall behind in the classroom, as standards for K–12 education in the United States place considerable importance on ICT. The Common Core State Standards—an initiative that aims to bring diverse state and local curricula into alignment with each other—mentions technology more than 100 times in 66 pages of national standards for English and language arts. Standards for both basic and advanced technology literacy are included. For instance, the standards state that sixth-grade students should be able to “use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.” In addition to the integration of technology into Common Core State Standards, a number of states set separate standards for technology use and technology literacy.

Given the growing role that ICT is playing in education and the workplace, it is important to ensure that all Americans can access computers and the Internet and learn to use them effectively. However, a digital divide has long existed, with income and education being strongly tied to computer access and use. We next discuss the digital divide and the possibility of addressing it through the integration of ICT into early childhood education settings.
The Digital Divide in Access Is Narrowing, But Other Divides Persist

Americans’ access to computers and the Internet has increased dramatically since the late 1990s. However, low-income families continue to lag behind when it comes to gaining access to ICT. A 2011 Census Bureau survey found that 86 percent of households with annual incomes of $100,000 or more had at least one computer and Internet access in the home, compared with just 50 percent of households with incomes below $25,000.

The good news is that the divide in access to devices is substantially narrower among younger generations. A 2012 Nielsen study looking at differences in smartphone ownership between those earning less than $30,000 and those earning more than $75,000 found a gap of 50 percentage points among those ages 30 and above. But the gap among those ages 18–29 was only 13 percentage points. This trend suggests that the gap in ownership of sophisticated, Internet-connected devices is likely to narrow.

During the past few decades, schools have played a critical role in narrowing the digital divide in access to ICT. By 2009, access at school was nearly universal: 93 percent of teachers reported the daily presence of at least one computer with Internet access.
in their classrooms. The ratio of students to computers in the classroom was reported to be 5.3 to 1.²⁴

Providing universal access to ICT in schools is a priority for the federal and state governments. According to one consulting firm, annual federal and state spending on computers and other ICT in schools was $334 million in 2012, up 150 percent from 2010.²⁵ The American Reinvestment and Recovery Act of 2009 allocated more than $7 billion to ensure nationwide access to high-speed Internet for libraries, schools, community centers, and other settings. A number of cities offer free broadband Internet service.²⁶ Such corporations as Microsoft, Target, and Google have donated significant numbers of free computers and interactive whiteboards to schools.²⁷ As the popularity of tablets has increased, several school districts have announced plans to make these devices widely available.²⁸

The advantage of greater access to ICT in schools, however, is limited by disparities in access at home. The divide in access is apparent across a range of devices (Figure 1). Evidence suggests that low-income families own fewer devices, and these devices tend to be older and less portable.²⁹ In addition, a 2011 government report shows that high-speed Internet connections are less prevalent in low-income neighborhoods and rural areas.³⁰

The above discussion suggests that access for disadvantaged populations through school-based policy and public initiatives has succeeded in partly offsetting the gaps that persist in home access. As access to ICT among disadvantaged populations has improved, the focus has shifted to how ICT is used. By use, we mean both basic technology literacy, such as turning on the device and accessing the Internet, and advanced abilities to “learn, analyze, and explore.” Some describe the digital divide in ICT use as an “opportunity gap” or a “participation gap,” in which low-income individuals are not able to take advantage of the opportunities ICT provides.³¹ Disparities in advanced technology literacy skills by income and family characteristics result in differences in the way technology is used, and different types of use may lead to greater or lesser benefits from technology.

A number of studies illustrate a digital divide in ICT use. For example, studies show that, in many cases, disadvantaged youth use the Internet more often than their more-advantaged peers.³² However, such individuals largely use ICT for entertainment and social networking.³³ Lower-income households are also less likely than higher-income households to use ICT for educational purposes. For example, one study reports that 35 percent of lower-income parents have downloaded educational applications for their child, whereas 75 percent of higher-income parents have done so.³⁴ In addition, studies from 2010 show that teachers at schools in wealthier areas are more likely to use computers in innovative ways and to support development of higher-order reasoning skills.³⁵ Children from poorer areas, however, are more likely to be taught to use computers for drill and practice.
Evidence of disparities in access to and use of ICT suggests that the approach to addressing the digital divide must be double-pronged. It is important to continue to support access to devices in schools and households in lower-income areas, and to ensure that the devices are complemented with access to adequate bandwidth and appropriate software. Yet efforts must also focus on ensuring that social resources are put in place to help children develop the knowledge, skills, and abilities necessary to reap the full benefits of technology as a tool for learning and growth.

**Figure 1. In 2012, the digital divide at home was apparent across a range of devices**

![Chart showing the digital divide at home across different devices by annual household income](chart.png)

**Annual household income**
- Less than $30,000
- $30,000–$49,999
- $50,000–$74,999
- $75,000 or more

Evidence indicates that the digital divide in access to ICT begins at very early ages. In families earning less than $25,000 annually, fewer than 30 percent of children under the age of five were using a computer at home in 2012. In families earning $75,000 or more, the rate of use among young children was 66 percent. The integration of computer-based technology in the early childhood classroom has the potential to address the digital divide in both access and use. Children without access in the home can start to build familiarity with technology, and its effective use can be modeled and guided by educators.

While common in K–12 and postsecondary education settings, ICT has played a relatively small role in ECE settings. In a search of preschool education standards in 23 states, we found that six states made no mention of computers or technology. Only two states supplied detailed standards for what is ex-
Various studies show ICT’s potential to improve basic skills in such academic areas as mathematics, reading, and science, and provide a “print rich” environment that offers a range of opportunities for language development. Other studies show a strong positive relationship between computer use and intelligence, creativity, and self esteem. Children actually engage in a wide range of social interactions with peers and teachers when they are working with computers, suggesting that ICT can play an important role in socio-emotional development. Finally, ICT use among young children has been shown to improve motor skills through the use of a mouse and engagement in motor skills–focused activities.

Although the body of evidence on ICT and early skill development is growing, it is important to note that the evidence is not always positive. For example, a 2002 study indicates that there is no relationship between computer use and skill development.
or academic achievement. Another study finds no relationship between computer use and visual or gross motor–skill development. A meta-analysis conducted by the U.S. Department of Education concluded that evidence of the effects of K–12 education technology is very weak, with few rigorous controlled studies that enabled computing-effect sizes. Additional research is needed to better understand how ICT can be integrated into ECE to ensure that positive benefits are realized.

Additionally, although ICT may help students develop new skills in technology literacy and provide additional learning opportunities in math and reading, there are also concerns about skills that will be neglected. For example, the sedentary activity associated with computer use raises concerns about such gross motor skills as running and jumping. Critics also argue that an important aspect of ECE is play with concrete materials that can be manipulated. These activities may not translate well to ICT. With regard to socio-emotional development, some studies indicate that individual use of computers, rather than collaborative play, is more prevalent in ECE settings. It is important to explore the role of ICT in expanding learning opportunities, but it is also important to understand the ways in which increased integration of ICT may lead to diminished opportunities for skill development in other areas.

Indeed, not everyone agrees that digital technology use should be encouraged among young children; it has been a subject of considerable debate. Due to concerns about the mental and physical side effects of “screen time,” the American Academy of Pediatrics (AAP) has recommended that children under the age of two should have no screen time and that screen time for children of all ages should be limited to two hours a day. Although early AAP statements did not distinguish between different types of screen time, the most recent policy statement specifies that these limitations should be placed on “entertainment screen time.” A series of studies over the past ten years have found that many ECE providers are hesitant to integrate technology into care settings. According to a 2013 article in Time, only half of parents feel that ICT should play a larger role in education.

However, in recent years, consensus has grown around support of some technology use among children ages 3–5. The expanding use of technology in K–12 education makes it more important for students to enter the classroom with some familiarity with technology. The discussion has evolved from “Should computers be used in ECE?” to “How might computers be used effectively?” Along with other organizations, the National Association for the Education of Young Children (NAEYC) has acknowledged that technology use among preschool-aged children is inevitable, and it argues that how technology is used is critical to determining whether its benefits can be realized. In this vision of the role for technology, computer-based devices are viewed as another set of important tools for communication and learning: Used properly, they can be useful for education and work; used improperly, they can deliver a number of potentially negative side effects.
Technology literacy may afford new opportunities to develop three foundational skills

**Motor skills**
The development of fine motor skills is a critical aspect of ECE, as young children must develop these skills (such as holding a pencil and manipulating basic materials) in order to later engage in basic educational activities throughout their time in school. Computer use requires a different set of motor skills, so technology exposure can help ensure that young children develop these additional skills. For example, the hand-eye coordination required to use a mouse is very different from the hand-eye coordination required for drawing or writing, and the use of touch screens may offer additional opportunities. The NAEYC identifies “use of a mouse” as one way of developing fine motor skills among young children. Others argue that computer-based technology can improve motor skills through increased motivation and focus on activities, such as drawing.

**Socio-emotional skills**
Socialization and the development of emotional skills are key goals of ECE. Early childhood classroom activities include games and other pursuits that require students to work together and make decisions—activities that help them develop socio-emotional skills. Software designed to lead young children through storytelling or to structure decisionmaking processes may further nurture their socio-emotional development. However, because computer use is often a solitary task, there is concern that too much computer time may diminish social interaction. Although studies have demonstrated that software can engage students in collaborative play, not all early childhood software is designed for this purpose.

**Cognitive skills**
Improved academic achievement through developing abilities in reading, writing, and mathematics has long been viewed as one of the primary purposes of ECE. The introduction of computers into regular ECE instruction may grant access to software that could be used to engage students in developing these abilities. As software has evolved from the early point-and-click software to student-led software that encourages children to represent ideas through several media, the potential for cognitive growth through computer-based devices has grown. There may also be a role for computers in delivering instruction in literacy and mathematics.
Supporters of technology in ECE argue that issues associated with implementation largely drive the mixed evidence on technology and skill growth. Certainly, the range of potential positive effects on the development and learning of young children will not be realized simply by placing Internet-connected devices in ECE settings. We identify five key supports that are required to ensure the successful adoption and use of ICT as a tool for ECE (Figure 2).

High-quality Internet connectivity, developmentally appropriate software, and smart and portable devices are helpful in supporting educational technology efforts. However, policymakers should avoid assuming that these are sufficient for the successful integration of technology into education. In practice, these supports may not even be necessary, since much may be achieved with older computers and older software that sit on a desktop with a large enough screen to be shared among children. And, even if the most up-to-date software-device-connection combination is present, it may not be usable if there is no one to guide the child. The key point is that the real value is derived from the presence of a high-quality knowledge facilitator.

A facilitator can be a teacher, parent, older sibling, or any individual who can work with children to actively explore the computer, model effective behaviors, and steer children toward appropriate technology use. Studies have shown that a well-trained facilitator is one of the most important determinants of whether technology use will result in skill growth. As ICT is integrated into ECE settings, teachers will play the important role of knowledge facilitators in the classroom. However, in 2010, more than one-quarter of K–12 schools reported that teachers are not sufficiently trained to successfully integrate ICT into the classroom, and training deficiencies are likely to be even greater among ECE providers. This raises concerns about the ability of ECE teachers to act as effective knowledge facilitators without receiving additional training.

Figure 2 also shows that support at home can play a critical role in facilitating skill growth among young children. ECE
classroom time is limited, and engagement with ICT in the home can help build skills through practice. Studies show that building parental skills and encouraging parental involvement in ECE can be an effective means of improving student achievement, and a number of early programs specifically aim to get parents involved or build parental skills. However, limited access to ICT in low-income homes, combined with family members’ limited knowledge about educational computer use, may present obstacles to effective home support. In addition to acting as knowledge facilitators in the classroom, if properly trained, ECE teachers may be able to support parents and siblings in their role as facilitators in the home.

It is important to note that ECE providers are a diverse group working in diverse settings. These include state preschools, Head Start centers and other center-based care, and family child care. According to a 2012 report, approximately 57 percent of children age four are in center-based care, 21 percent are in family child-care settings, and 22 percent do not receive any type of formal ECE. The goals for ICT integration may be different for different types of providers, and effective implementation may also look quite different in these various settings. The five key supports we identify are likely to play somewhat different roles in different settings, and they may be needed to greater or lesser degrees. In developing a plan to integrate ICT into early childhood settings, it is therefore critical to consider the different provider types and to adapt policies to integrate technology into all of the care settings. It will also be important to find ways of reaching children who are not enrolled in ECE, as these children—who are more likely to come from low-income families—could benefit substantially from exposure to ICT.

Figure 2. Five key supports are required to ensure the achievement of basic technology literacy and foundational skills

Using Early Childhood Education to Bridge the Digital Divide
The integration of technology into ECE offers substantial possibilities for addressing the digital divide, as well as disparities in other areas. But questions remain. For example, how can we support integration that both benefits children and helps us better understand still-unresolved issues, such as optimum exposure time? Successful integration will require careful thought and planning, and a broad group of stakeholders must be invited to the discussion. Parents, ECE providers, policymakers, and researchers will have unique perspectives and competing priorities that should be understood and addressed in the planning process. We believe that the road ahead should focus on achieving a better understanding of the goals of ICT and its use in the ECE curriculum and on identifying how the five supports discussed earlier should be structured to enable effective implementation. This leads to five key questions that must be answered in order to support the successful integration of computer-based technology into ECE.
Question 1: What is the goal for information and communication technology in early childhood education?

One of the primary purposes of ECE is to ensure that all students enter kindergarten on an equal footing in the areas of academic and nonacademic preparation. We have concluded that eliminating the digital divide by ensuring basic technology literacy for all students regardless of differences in income, family structure, and parents’ educational attainment should be seriously considered as a first-stage goal for ICT. Another goal, which may be pursued at the same time or as a second stage, is to use ICT to build skills in math and reading, as well as social skills and motivation.

In addition to student-focused goals, there may be secondary goals for technology in ECE. For example, some public ECE pro-
grams target parents and families in an effort to transform home environments and improve learning opportunities elsewhere outside of the classroom. Given the digital divide that persists in homes, one goal of using ICT in ECE may be to improve access to and support the effective use of ICT in the home.

Determining, prioritizing, and sequencing the goals for ICT in ECE should be carried out collaboratively by a broad group of stakeholders. Findings from research, policy priorities, and conditions within early childhood education settings should be considered in deciding how to define these goals.

Question 2: How do we define appropriate use of technology in ECE?

An important message from the literature on ECE and technology is that the way computers and the Internet are used is a primary determinant of the effectiveness of technology in promoting skill development and minimizing any potential negative consequences. However, the literature is not as clear in defining what developmentally appropriate use looks like. Standards must be developed to inform policymakers and practitioners about what constitutes developmentally appropriate use among young children. The NAEYC has developed guidelines about what it considers developmentally appropriate technology use for young children. It argues, for instance, that technology use must be active, meaning that the student must be interacting with the computer regularly. Developmentally appropriate technology use for young children must be scaffolded by an adult. And, as noted earlier, the potential negative consequences of excessive screen time should be avoided by exposing young children to less than two hours a day of screen time.66

However, a number of aspects of developmentally appropriate use of ICT in ECE have not yet been resolved. Despite guidelines to avoid more than two hours of screen time, the NAEYC, in its 2012 position statement, questions whether all screen time should be considered equal.67 For example, two hours of active engagement with developmentally appropriate software and facilitation from a well-trained adult may have very different effects on children compared with two hours of watching entertainment-focused television. It is unclear what developmentally appropriate software looks like, and standards for ECE software have yet to be decided. Questions about Internet use among young children have not been directly addressed. Additional research on the effects of using different types of technology could also be helpful in determining whether the intuitive notions of developmentally appropriate use are supported by evidence. These facets of use include time, interactions between the student and the software, different approaches to technology use employed by ECE environments in lower-income versus upper-income areas (perhaps to account for lower parental involvement in the former group), interactions between the student and adult facilitators, interactions between the student and peers, the types of software provided, and the types of devices used.
**Question 3:** Once defined, how do we support effective use through devices, connectivity, software, and other components of ICT infrastructure?

Earlier, we explored whether technology will be used primarily to build basic ICT literacy, or whether it will be used as a tool to develop skills in other foundational areas. Related to this question is where to focus resources. The government, industry, and nonprofits have traditionally focused primarily on access, but it is important to consider whether resources should instead be devoted to supporting effective use. It may be that the United States has made such great strides in basic access that hardware and the Internet will soon filter down to access-free households without additional government effort. In this case, attention might be better focused on supporting appropriate use. Or, it may be that access remains a critical issue as devices age and as new, more highly functioning or portable devices are introduced.

The rapid pace of software and device evolution suggests that we need to better understand the locus and scope of decision-making. Among the questions that need to be addressed are whether the federal government should set minimum access standards for disadvantaged families and ECE environments, or whether such decisions are best made by state and local governments. Another question arising from the rapid pace of software evolution concerns the role of commercial software providers. At present, commercial software makers are largely left out of formalized ECE initiatives because ECE programs and providers do not usually have the budget to buy educational games and other software on commercial terms. Should they be part of the decisionmaking process, for example, through state support for public-private partnerships on software development?

**Question 4:** How do we ensure that ECE providers are prepared to address the digital divide?

As noted earlier, the availability of a teacher who can properly facilitate the use of technology in ECE settings is important to ensuring that computer-based devices are used effectively to build technology literacy and improve skill growth. For example, in one study, children were separated into different groups, with preschool teachers for each group providing varying levels of guidance. Children who were actively guided through computer-based tasks showed more growth in abstract reading, vocabulary, and visual motor coordination compared...
Children who were actively guided through computer-based tasks showed more growth in abstract reading, vocabulary, and visual motor coordination compared with children whose teachers provided minimal help.68 Another study shows that technology integration with support for teachers led to significant improvements in basic literacy outcomes.69 According to the NAEYC, technology literacy for ECE providers is the understanding, skills, and ability to use technology and interactive media to access information, communicate with other professionals, and participate in professional development to improve learning and prepare young children for a lifetime of technology use. Digital and media literacy for educators means that they have the knowledge and experience to think critically about the selection, analysis, use, and evaluation of technology and media for young children in order to evaluate their impact on learning and development.70

However, there are significant deficits in both the technology literacy of ECE providers and their ability to provide scaffolding for others. A 2010 survey of ECE providers indicated that, although teachers reported frequently using the Internet for business purposes and to search for classroom activity ideas, they used computers and the Internet less often in regular classroom activities.71 When computers were used in the classroom, they were often used for activities that are not considered developmentally appropriate, according to standards set by the NAEYC.

We need to better understand the training needs of ECE providers. Evidence suggests that ECE providers receive little or no training on the use of computer-based technology in the classroom.72 For example, a 2010 survey of 23 ECE training programs found that less than half involved coursework on the use of technology in the classroom. Several organizations, including the NAEYC and the Joan Ganz Cooney Center at Sesame Workshop, have argued that facilitator preparation is a priority.73 As providers integrate technology into early childhood classrooms, it will be critical to think about how they can be supported to become effective facilitators. Without well-trained and technologically literate adults to scaffold early childhood computer use, access to computers and the Internet in ECE settings may have little effect on the technology literacy of children and on their ability to use computers for skill development. The facilitators may also need training to adopt approaches that differ across the income groups from which children come. Further, research shows that receiving support from colleagues and sharing professional experiences in the classroom are essential to successfully using technology to enhance children’s learning.74 How may networks of collaboration promote professional development?
**Question 5:** What relationship should parents and families have to the integration of technology into ECE?

There has long been a close relationship between ECE providers and families. Given the young age of children in ECE settings, parents are involved in most decisionmaking related to education and to all the other activities in which their child engages. In addition, because most children spend only 3–6 hours in ECE, parents also play an important role as “teachers” during time spent outside the classroom. For this reason, ECE programs and policies are often developed with the role of the family in mind.

The question is whether ECE should be used to support more effective use of ICT in the home. Early childhood is an important time for the development of basic math and reading skills, as well as motivation and socialization, and interactions with parents and other family members have been shown to be related to skill development in these areas. In the area of ICT, parental roles in technology use are shown to be important in building technology literacy. However, studies indicate that home environments look quite different for disadvantaged children: While middle-class children typically have substantial amounts of...
structured time that often includes adult supervision and instruction, their less-advantaged peers have fewer opportunities for out-of-school extracurricular activities and adult supervision. It is possible, therefore, that ECE providers could contribute to a child's learning by developing parents' confidence and capability to guide their children's ICT use.

With regard to ICT access, the question is whether ECE resources should be used to provide greater access to ICT in the home. Access to computer-based devices in the home can afford young children additional time to explore and build literacy. In addition, such policies have the potential to improve technology literacy among the entire family. Through loaner and free or reduced programs, ECE settings may help reduce barriers to access for low-income households. If the goal is to also improve the skills of the family, software and electronic content can also be made available for parents and siblings.

Yet another question is whether ICT could also be used with the families of young children to support parental involvement. Studies have demonstrated that parental involvement and engagement with what is being learned in the classroom can have positive effects on a child’s learning. By making information on the students and the activities in the classroom available on electronic platforms, ICT may be able to reduce barriers to involvement in the case of parents with extended or inflexible work schedules. However, given limited access to computers in low-income homes, there may be barriers to accessing these resources. Providing opportunities for families to come into the classroom to use technology is another possible way of providing opportunities for parent and teacher communication and engagement.

**Concluding Thoughts**

Due to longstanding concerns about the role of electronic media on a child’s physical and mental development, the integration of technology into ECE settings has rightly been a marked, careful process. Recent academic studies are playing an important role in advancing our understanding of developmentally appropriate uses of ICT, and helping build a body of evidence that shows the importance of integrating ICT into the ECE curriculum in an appropriate way. As this evidence grows, the challenge for policymakers is to ensure that ICT can help bridge learning gaps that disadvantaged children face, rather than accentuate them. We identified five key arenas for policy action. Setting goals appropriately, defining suitable uses of ICT, and supporting access and use through devices, connectivity, and software constitute the infrastructural supports. To enable their effective use, preparing teachers and supporting parental involvement among disadvantaged families will be critical.
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50 McCarrick and Li, 2007.


54 Gray et al., April 2010.


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For more information and resources on technology in early childhood education, please visit: www.rand.org/education/projects/t-is-for-technology
About This Perspective

This Perspective explores how early childhood education might help bridge the “digital divide”—the disparity in access to and use of technology that exists in the United States despite two decades of rapid growth in the use of digital technology. The authors also discuss technology’s potential to address early disparities in academic achievement and “soft skills,” such as motivation and socialization.

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