

A joint position statement of 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

Technology and Interactive Media as Tools in Early Childhood Programs Serving Children from Birth through Age 8

Television was once the newest technology in our homes, and then came videos and computers. Today's children are growing up in a rapidly changing digital age that is far different from that of their parents and grandparents. A variety of technologies are all around us in our homes, offices, and schools. When used wisely, technology and media can support learning and relationships. Enjoyable and engaging shared experiences that optimize the potential for children's learning and development can support children's relationships both with adults and their peers.

Thanks to a rich body of research, we know much about how young children grow, learn, play, and develop. There has never been a more important time to apply principles of development and learning when considering the use of cutting-edge technologies and new

media. When the integration of technology and *interactive media* in early childhood programs is built upon solid developmental foundations, and early childhood professionals are aware of both the challenges and the opportunities, educators are positioned to improve program quality by intentionally leveraging the potential of technology and media for the benefit of every child.

Interactive media refers to digital and analog materials, including software programs, applications (apps), broadcast and streaming media, some children's television programming, e-books, the Internet, and other forms of content designed to facilitate active and creative use by young children and to encourage social engagement with other children and adults.

This statement is intended primarily to provide guidance to those working in early childhood education programs serving children from birth through age 8. Although not developed as a guide for families in the selection and use of technology and interactive media in their homes, the information here may be helpful to inform such decisions.

NAEYC and the Fred Rogers Center do not endorse or recommend software, hardware, curricula, or other materials.



This 2012 position statement reflects the ever-changing digital age and provides guidance for early childhood educators about the use of technology and interactive media in ways that can optimize opportunities for young children's cognitive, social, emotional, physical, and linguistic development. In this position statement, the definition of technology tools encompasses a broad range of digital devices such as computers, tablets, multitouch screens, interactive whiteboards, mobile devices, cameras, DVD and music players, audio recorders, electronic toys, games, e-book readers, and older analog devices still being used such as tape recorders, VCRs, VHS tapes, record and cassette players, light tables, projectors, and microscopes.

Throughout the process of researching and writing this position statement, we have been guided by the legacy of Fred Rogers. By appropriately and intentionally using the technology of his day—broadcast television—to connect with each individual child and with parents and families, Fred Rogers demonstrated the positive potential of using technology and media in ways that are grounded in principles of child development.

Statement of the Issues

Technology and interactive media are here to stay. Young children live in a world of interactive media. They are growing up at ease with digital devices that are rapidly becoming the tools of the culture at home, at school, at work, and in the community (Kerawalla & Crook 2002; Calvert et al. 2005; National Institute for Literacy 2008; Buckleitner 2009; Lisenbee 2009; Berson & Berson 2010; Chiong & Shuler 2010; Couse & Chen 2010; Rideout, Lauricella, & Wartella 2011). Technology tools for communication, collaboration, social networking, and user-generated content have transformed mainstream culture. In particular, these tools have transformed how parents and families manage their daily lives and seek out entertainment, how teachers use materials in the classroom with young children and communicate with parents and families, and how we deliver teacher education and professional development (Rideout, Vandewater, & Wartella 2003; Roberts & Foehr 2004; Rideout & Hamel 2006; Rideout 2007; Foundation for Excellence in Education 2010; Gutnick et al. 2010; Barron et al. 2011; Jackson 2011a, 2011b; Wahi et al. 2011). The pace of change is so rapid that society is experiencing a disruption almost as significant as when there was a shift from oral language to print literacy, and again when the printing press expanded access to books and the

printed word. The shift to new media literacies and the need for *digital literacy* that encompasses both technology and media literacy will continue to shape the world in which young children are developing and learning (Linebarger & Piotrowski 2009; Flewitt 2011; Alper n.d.).

The prevalence of electronic media in the lives of young children means that they are spending an increasing number of hours per week in front of and engaged with screens of all kinds, including televisions, computers, smartphones, tablets, handheld game devices, and game consoles (Common Sense Media 2011). The distinction among the devices, the content, and the user experience has been blurred by multitouch screens and movement-activated technologies that detect and respond to the child's movements. With guidance, these various technology tools can be harnessed for learning and development; without guidance, usage can be inappropriate and/or interfere with learning and development.

There are concerns about whether young children should have access to technology and screen media in early childhood programs.

Several professional and public health organizations and child advocacy groups concerned with child development and health issues such as obesity have recommended that passive, *non-interactive* technology and screen media not be used in early childhood programs and that there be no screen time for infants and toddlers. NAEYC and the Fred Rogers Center are also concerned about child development and child health issues and have considered them carefully when developing this position statement.

The term ***digital literacy*** is used throughout this statement to encompass both technology and media literacy.

Non-interactive media include certain television programs, videos, DVDs, and streaming media now available on a variety of screens. Noninteractive technology tools and media are not included in the definition and description of effective and appropriate use in this statement unless they are used in ways that promote active engagement and interactions. Noninteractive media can lead to passive viewing and over-exposure to screen time for young children and are not substitutes for interactive and engaging uses of digital media or for interactions with adults and other children.

The American Academy of Pediatrics (2009, 2010, 2011a, 2011b) and the White House Task Force on Childhood Obesity (2010) discourage any amount or type of screen media and screen time for children under 2 years of age and recommend no more than one to two hours of total screen time per day for children older than 2 (Funk et al. 2009; Campaign for a Commercial-Free Childhood 2010). The Early Childhood Obesity Prevention Policies (Birch, Parker, & Burns 2011; Institute of Medicine of the National Academies 2011) recommend that child care settings limit screen time (including television, videos, digital media, video games, mobile media, cell phones, and the Internet) for preschoolers (age 2 through 5) to fewer than 30 minutes per day for children in half-day programs or less than one hour per day for those in full-day programs. The report further encourages professionals to work with parents to limit screen time to fewer than two hours per day for children age 2 through 5. These recommendations to limit children's exposure to screen time are related to two factors potentially contributing to early childhood obesity: the food and beverage marketing that children may experience when they are watching television or interacting with other media and the amount of overall screen time to which they are exposed (Birch, Parker, & Burns 2011; Institute of Medicine of the National Academies 2011). The Let's Move! Child Care initiative recommends that caregivers allow no screen time for children under 2 years of age. For children 2 and older, caregivers are encouraged to limit screen time to no more than 30 minutes per week during child care, and parents and caregivers are advised to work together to limit children to one to two hours of quality screen time per day (Schepper 2011; White House 2011). Early childhood educators need to be aware of all these concerns and understand the critical role that they as educators play in mediating technology and media use and screen time for young children.

All screens are not created equal. The proliferation of digital devices with screens means that the precise meaning of "screen time" is elusive and no longer just a matter of how long a young child watches television, videos, or DVDs. Time spent in front of a television screen is just one aspect of how screen time needs to be understood and measured. Children and adults now have access to an ever-expanding selection of screens on computers, tablets, smartphones, handheld gaming devices, portable video players, digital cameras, video recorders, and more. Screen time is the total amount of time spent in front of any and all of these screens (Common Sense Media 2011; Guernsey 2011c). As digital technology has expanded in scope beyond linear, non-interactive media to include interactive options, it is evident that each unique screen demands its

own criteria for best usage (Kleeman 2010). The challenge for early childhood educators is to make informed choices that maximize learning opportunities for children while managing screen time and mediating the potential for misuse and over-use of screen media, even as these devices offer new interfaces that increase their appeal and use to young children.

There is conflicting evidence on the value of technology in children's development. Educators and parents have been cautioned about the negative impact of background television (Kirkorian et al. 2009; AAP 2011b), passive use of screen media (AAP 2011b), and the relationship between media use and child obesity (White House Task Force on Childhood Obesity 2010; Birch, Parker, & Burns 2011; Schepper 2011). Possible negative outcomes have been identified, such as irregular sleep patterns, behavioral issues, focus and attention problems, decreased academic performance, negative impact on socialization and language development, and the increase in the amount of time young children are spending in front of screens (Cordes & Miller 2000; Appel & O'Gara 2001; Christakis et al. 2004; Anderson & Pempek 2005; Rogow 2007; Vandewater et al. 2007; Brooks-Gunn & Donahue 2008; Common Sense Media 2008, 2011; Lee, Bartolic, & Vandewater 2009; Campaign for a Commercial-Free Childhood 2010; DeLoache et al. 2010; Tomopoulos et al. 2010; AAP 2011a, 2011b).

However, research findings remain divided and therefore can be confusing to educators and parents. Some children's media researchers have found no evidence to support the belief that screen media are inherently harmful. The evidence from public broadcasting's Ready To Learn initiative suggests that when television shows and electronic resources have been carefully designed to incorporate what is known about effective reading instruction, they serve as positive and powerful tools for teaching and learning (Pasnik et al. 2007; Neuman, Newman, & Dwyer 2010; Corporation for Public Broadcasting 2011). Similarly, Wainwright and Linebarger (2006) concluded that while critics have issued many warnings against television and computers and their negative effects on children's learning, the most logical conclusion to be drawn from the existing scholarly literature is that it is the educational content that matters—not the format in which it is presented (Wainwright & Linebarger 2006). In short, there are some educationally valuable television shows, websites, and other digital media, and there are some that are less valuable or even educationally worthless.

The amount of time children spend with technology and media is important (Christakis & Garrison 2009; Vandewater & Lee 2009; Tandon et al. 2011), but how children spend time with technology must also be taken into account when

determining what is effective and appropriate (Christakis & Garrison 2009; Tandon et al. 2011). The impact of technology is mediated by teachers' use of the same developmentally appropriate principles and practices that guide the use of print materials and all other learning tools and content for young children (Van Scoter, Ellis, & Railsback 2001; Clements & Sarama 2003a; Plowman & Stephen 2005, 2007).

The appeal of technology can lead to inappropriate uses in early childhood settings. Technology and media are tools that are effective only when used appropriately. The appeal of technology and the steady stream of new devices may lead some educators to use technology for technology's sake, rather than as a means to an end. Technology should not be used for activities that are not educationally sound, not developmentally appropriate, or not effective (electronic worksheets for preschoolers, for example). Passive use of technology and any type of screen media is an inappropriate replacement for active play, engagement with other children, and interactions with adults. Digitally literate educators who are grounded in child development theory and developmentally appropriate practices have the knowledge, skills, and experience to select and use technology tools and interactive media that suit the ages and developmental levels of the children in their care, and they know when and how to integrate technology into the program effectively. Educators who lack technology skills and digital literacy are at risk of making inappropriate choices and using technology with young children in ways that can negatively impact learning and development.

Issues of equity and access remain unresolved. The potential of technology and interactive media to positively influence healthy growth and development makes it important for early childhood educators to carefully consider issues of equity and access when they select, use, integrate, and evaluate technology and media. Early childhood educators have an opportunity to provide leadership in assuring equitable access to technology tools and interactive media experiences for the children, parents, and families in their care.

In the early 1960s, Head Start and other early childhood programs targeted the differences in access to print media for children from differing economic backgrounds. Today, educators face similar challenges with regard to technology tools, media, and broadband access to the Internet. Children growing up in affluent families more often have access

to technology tools and broadband connections to the Internet in their homes, begin using the Internet at an early age, and have highly developed technology skills and beginning digital literacy when they enter school. Children in families with fewer resources may have little or no access to the latest technologies in their homes, early childhood settings, schools, or communities (Becker 2000; Burdette & Whitaker 2005; Calvert et al. 2005; National Institute for Literacy 2008; Cross, Woods, & Schweingruber 2009; Common Sense Media 2011).

Young children need opportunities to develop the early "technology-handling" skills associated with early digital literacy that are akin to the "book-handling" skills associated with early literacy development (National Institute for Literacy 2008). The International Society for Technology in Education (2007) recommends basic skills in technology operations and concepts by age 5. Early childhood settings can provide opportunities for exploring digital cameras, audio and video recorders, printers, and other technologies to children who otherwise might not have access to these tools. Educators should also consider the learning and creative advantage that high-quality interactive media can bring to children, especially when combined with skillful teaching and complementary curriculum resources that work together to accelerate learning and narrow the achievement gap between children from low-income families and their more affluent peers.

When educators appropriately integrate technology and interactive media into their classrooms, equity and access are addressed by providing opportunities for all children to participate and learn (Judge, Puckett, & Cabuk 2004; Cross, Woods, & Schweingruber 2009). In such an environment, accommodations are made for children with special needs to use technology independently (Hasselbring & Glaser 2000), and technology strategies to support dual language learners are in place.

Issues of equity and access also have implications for early childhood professionals and policymakers. Some early childhood educators face the same challenges in their own access to technology tools and Internet broadband at work or home as do the families of children in their care. Research and awareness of the value of technology tools and interactive media in early childhood education need to be shared with policy makers who are interested in issues of access and equity for children, parents, families, and teachers.

The Position

It is the position of NAEYC and the Fred Rogers Center that:

Technology and interactive media are tools that can promote effective learning and development when they are used intentionally by early childhood educators, within the framework of developmentally appropriate practice (NAEYC 2009a), to support learning goals established for individual children. The framework of developmentally appropriate practice begins with knowledge about what children of the age and developmental status represented in a particular group are typically like. This knowledge provides a general idea of the activities, routines, interactions, and curriculum that should be effective. Each child in the particular group is then considered both as an individual and within the context of that child's specific family, community, culture, linguistic norms, social group, past experience (including learning and behavior), and current circumstances (www.naeyc.org/dap/core; retrieved February 2, 2012).

Children's experiences with technology and interactive media are increasingly part of the context of their lives, which must be considered as part of the developmentally appropriate framework.

To make informed decisions regarding the intentional use of technology and interactive media in ways that support children's learning and development, early childhood teachers and staff need information and resources on the nature of these tools and the implications of their use with children.

NAEYC and the Fred Rogers Center offer the following principles to guide the use of technology and interactive media in early childhood programs.

Principles to Guide the Appropriate Use of Technology and Interactive Media as Tools in Early Childhood Programs Serving Children from Birth through Age 8

Above all, the use of technology tools and interactive media should not harm children. The healthy cognitive, social, emotional, physical, and linguistic development of the whole child is as important in the digital age as ever. Access to technology tools and interactive media should not exclude, diminish, or interfere with children's healthy communication, social interactions, play, and other developmentally appropriate activities with peers, family members, and teachers. Technology and media should never be used in ways that are *emotionally damaging, physically harmful, disrespectful,*

degrading, dangerous, exploitative, or intimidating to children.

This includes undue exposure to violence or highly sexualized images (NAEYC 1994; AAP 2009).

Just as early childhood educators always have been encouraged and advised to monitor and apply the latest research findings in areas such as health and child development, so too should they continually monitor and assess research findings on emerging issues related to technology, including 3D vision and eye health, exposure to electromagnetic fields and radiation from cellular phones (EMR Policy Institute 2011), toxins from lead paint or batteries, choking hazards involving small parts, child obesity, screen time, or any other potentially harmful, physiological, or developmental effects or side effects related to the use of technology.

Developmentally appropriate practices must guide decisions about whether and when to integrate technology and interactive media into early childhood programs. Appropriate technology and media use balances and enhances the use of essential materials, activities, and interactions in the early childhood setting, becoming part of the daily routine (Anderson 2000; Van Scoter, Ellis, & Railsback 2001; Copple & Bredekamp 2009; NAEYC 2009a). Technology and media should not replace activities such as creative play, real-life exploration, physical activity, outdoor experiences, conversation, and social interactions that are important for children's development. Technology and media should be used to support learning, not an isolated activity, and to expand young children's access to new content (Guernsey 2010a, 2011b).

For infants and toddlers, responsive interactions between adults and children are essential to early brain development and to cognitive, social, emotional, physical, and linguistic development. NAEYC and the Fred Rogers Center join the public health community in discouraging the use of screen media for children under the age of 2 in early childhood programs. Recognizing that there may be appropriate uses of technology for infants and toddlers in some contexts (for example, viewing digital photos, participating in Skype interactions with loved ones, co-viewing e-books, and engaging with some interactive apps), educators should limit the amount of screen time and, as with all other experiences and activities with infants and toddlers, ensure that any use of technology and media serves as a way to strengthen adult-child relationships. Early childhood educators always should use their knowledge of child development and effective practices to carefully and intentionally select and use technology and media if and when it serves healthy development, learning, creativity, interactions with others, and relationships. This is especially true for those working with infants and toddlers.

Professional judgment is required to determine if and when a specific use of technology or media is age appropriate, individually appropriate, and culturally and linguistically appropriate. Early childhood educators are the decision makers in whether, how, what, when, and why technology and media are implemented through applying their expertise and knowledge of child development and learning, individual children's interests and readiness, and the social and cultural contexts in which children live. The adult's role is critical in making certain that thoughtful planning, careful implementation, reflection, and evaluation all guide decision making about how to introduce and integrate any form of technology or media into the classroom experience. Selecting appropriate technology and media for the classroom is similar to choosing any other learning material. Teachers must constantly make reflective, responsive, and intentional judgments to promote positive outcomes for each child (NAEYC 2009a).

Developmentally appropriate teaching practices must always guide the selection of any classroom materials, including technology and interactive media. Teachers must take the time to evaluate and select technology and media for the classroom, carefully observe children's use of the materials to identify opportunities and problems, and then make appropriate adaptations. They must be willing to learn about and become familiar with new technologies as they are introduced and be intentional in the choices they make, including ensuring that content is developmentally appropriate and that it communicates anti-bias messages.

When selecting technology and media for children, teachers should not depend on unverifiable claims included in a product's marketing material. In the selection process, program directors and teachers should consider the allocation of limited resources and cost effectiveness, including initial cost, the ongoing costs of updating and upgrading hardware and software, and other nonspecified costs such as additional items needed to use the product. Other considerations include durability for active use by young children and replacement costs if the device is dropped or damaged. Incentives for children to use the product or buy more products from the vendor should be reviewed and considered carefully. If developers and publishers of technology and media commit to using research-based information in the development, marketing, and promotion of their products, the selection of technology and interactive media tools will be less driven by commercial concerns and will become less mysterious and easier to choose for teachers and parents (Buckleitner 2011a; Fred Rogers Center n.d.).

Appropriate use of technology and media depends on the age, developmental level, needs, interests, linguistic background, and abilities of each child. There is a developmental progression in children's use of tools and materials, typically moving from exploration to mastery and then to functional subordination (using the tools to accomplish other tasks). Anecdotal evidence suggests this same progression is evident in the ways that children interact with technology tools. Children need time to explore the functionality of technology before they can be expected to use these tools to communicate. Just as we encourage children to use crayons and paper well before we expect them to write their names, it seems reasonable to provide access to technology tools for exploration and experimentation.

Certainly, most technology and media are inappropriate for children from birth to age 2 (at the time of this writing), and there has been no documented association between passive viewing of screen media and specific learning outcomes in infants and toddlers (Schmidt et al. 2009). Infants and toddlers need responsive interactions with adults. Yet mobile, multitouch screens and newer technologies have changed the way our youngest children interact with images, sounds, and ideas (Buckleitner 2011b). Infant caregivers must be sure that any exposure to technology and media is very limited; that it is used for exploration and includes shared joint attention and language-rich interactions; and that it does not reduce the opportunities for tuned-in and attentive interactions between the child and the caregiver. Preschoolers have varying levels of ability to control technology and media, but with adult mediation they can demonstrate mastery of simple digital devices and are often seen using the tools as part of their pretend play. School-age children who are more proficient in using technology can harness these tools to communicate ideas and feelings, investigate the environment, and locate information. As devices and apps become more user-friendly, younger children are becoming increasingly proficient in using technological tools to accomplish a task—making a picture, playing a game, recording a story, taking a photo, making a book, or engaging in other age-appropriate learning activities. Technology tools and interactive media are one more source of exploration and mastery.

Effective uses of technology and media are active, hands-on, engaging, and empowering; give the child control; provide adaptive scaffolds to ease the accomplishment of tasks; and are used as one of many options to support children's learning. To align and integrate technology and media with other core experiences and opportunities, young children need tools that help them explore, create, problem solve, consider, think, listen and view criti-

cally, make decisions, observe, document, research, investigate ideas, demonstrate learning, take turns, and learn with and from one another.

Effective technology tools connect on-screen and off-screen activities with an emphasis on co-viewing and co-participation between adults and children and children and their peers (Takeuchi 2011). These tools have the potential to bring adults and children together for a shared experience, rather than keeping them apart. For example, a caregiver may choose to read a story in traditional print form, as an interactive e-book on an electronic device, or both. When experienced in the context of human interaction, these different types of engagements with media become very similar. Early book reading and other joint adult-child exploration can include co-viewing and co-media engagement. Growing concerns that television viewing and computer games are taking time away from physical activities and outdoor play can be offset by the use of technology and interactive media that encourage outdoor exploration and documentation of nature or that integrate physical activity and encourage children to get up and be mobile rather than sit passively in front of a screen.

Technology and media are just two of the many types of tools that can be used effectively and appropriately with young children in the classroom. As with many things, technology and media should be used in moderation and to enhance and be integrated into classroom experiences, not to replace essential activities, experiences, and materials.

When used appropriately, technology and media can enhance children's cognitive and social abilities. Technology and media offer opportunities to extend learning in early childhood settings in much the same way as other materials, such as blocks, manipulatives, art materials, play materials, books, and writing materials. Screen media can expose children to animals, objects, people, landscapes, activities, and places that they cannot experience in person. Technology can also help children save, document, revisit, and share their real-life experiences through images, stories, and sounds.

The active, appropriate use of technology and media can support and extend traditional materials in valuable ways. Research points to the positive effects of technology in children's learning and development, both cognitive and social (Haugland 1999, 2000; Freeman & Somerindyke 2001; Heft & Swaminathan 2002; Clements & Sarama 2003a, 2003b; Fischer & Gillespie 2003; Rideout, Vandewater, & Wartella 2003; Greenfield 2004; Kirkorian, Wartella, & Anderson 2008; Linebarger, Piotrowski, & Lapierre 2009; Adams 2011). Additional research is needed to confirm the positive outcomes of technology tools on children's language and

vocabulary development, logical-mathematical understanding, problem-solving skills, self-regulation, and social skills development.

Interactions with technology and media should be playful and support creativity, exploration, pretend play, active play, and outdoor activities. Play is central to children's development and learning. Children's interactions with technology and media mirror their interactions with other play materials and include sensorimotor or practice play, make-believe play, and games with rules. Therefore, young children need opportunities to explore technology and interactive media in playful and creative ways. Appropriate experiences with technology and media allow children to control the medium and the outcome of the experience, to explore the functionality of these tools, and to pretend how they might be used in real life. Increasingly, educational media producers are exploring the learning power of interactive games and collaborative play involving children and their family members or teachers. Digital games fall into a similar category as board games and other self-correcting learning activities, with the same opportunities and cautions related to children's developmental stages.

Technology tools can help educators make and strengthen home-school connections. With technology becoming more prevalent as a means of sharing information and communicating with one another, early childhood educators have an opportunity to build stronger relationships with parents and enhance family engagement. Early childhood educators always have had a responsibility to support parents and families by sharing knowledge about child development and learning. Technology tools offer new opportunities for educators to build relationships, maintain ongoing communication, and exchange information and share online resources with parents and families. Likewise, parents and families can use technology to ask questions, seek advice, share information about their child, and feel more engaged in the program and their child's experiences there.

Technology tools such as smartphones, mobile devices, and apps offer new and more affordable ways for busy family members to communicate, connect to the Internet, and access information and social media tools to stay in touch with their families and their child's teachers and caregivers. Internet-based communication tools offer new opportunities for video calling and conferencing when face-to-face meetings are not possible; these same technology tools can connect children to other family members who live at a distance. As they do for young children, educators have a

responsibility to parents and families to model appropriate, effective, and positive uses of technology, media, methods of communication, and social media that are safe, secure, healthy, acceptable, responsible, and ethical.

Technology tools can support the ways educators measure and record development, document growth, plan activities, and share information with parents, families, and communities. Teachers can use digital portfolios that include photographs as well as audio and video recordings to document, archive, and share a child's accomplishments and developmental progression with families in face-to-face conferences or through communication and social media tools. Displaying photos in the classroom of children's drawings or block buildings, along with narratives dictated by the children or explanations of why these types of play are important, can help families understand the critical role of play in early childhood development. Sending weekly, monthly, or even daily updates through social media or e-mail can help families feel more connected to their children and their activities away from home. Inviting children to take a picture of something they have done and helping them upload the photo to a file that can be e-mailed promote children's understanding of ways to communicate with others while also contributing to their learning more about the functions of reading and writing.

Most educators understand the value of writing down or recording notes that a child may want to give to parents. Using e-mail, educational texting, or other communication tools demonstrates the same concept about communication and helps to build digital literacy skills at the same time. If information is stored on a computer, the photos and notes can be printed and given to families who do not use technology to send or receive messages (Edutopia 2010).

Modeling the effective use of technology and interactive media for parent communication and family engagement also creates opportunities to help parents themselves become better informed, empowers them to make responsible choices about technology use and screen time at home, engages them as teachers who can extend classroom learning activities into the home, and encourages co-viewing, co-participation, and joint media engagement between parents and their children (Stevens & Penuel 2010; Takeuchi 2011).

Technology and media can enhance early childhood practice when integrated into the environment, curriculum, and daily routines. Successful integration of technology and media into early childhood programs involves the use of resources such as computers, digital cameras, software applications, and the Internet in daily classroom practices (Edutopia 2007; Technology and Young Children Interest Forum 2008; Hertz 2011). True integration occurs

when the use of technology and media becomes routine and transparent—when the focus of a child or educator is on the activity or exploration itself and not on the technology or media being used. Technology integration has been successful when the use of technology and media supports the goals of educators and programs for children, provides children with digital tools for learning and communicating, and helps improve child outcomes (Edutopia 2007).

Careful evaluation and selection of materials are essential in early childhood settings. For example, one of the earliest and most familiar technologies in early childhood settings is Froebel's use of blocks. Montessori materials are another example of what we consider to be traditional early childhood supplies. Felt-tipped markers brought a new way for children to explore graphic representation that fell somewhere between paintbrushes and crayons.

As the lives of children, parents, families, and educators are infused with technology and media, early childhood classrooms can benefit from the possibilities of extending children's learning through judicious use of these tools. As part of the overall classroom plan, technology and interactive media should be used in ways that support existing classroom developmental and educational goals rather than in ways that distort or replace them. For example, drawing on a touch screen can add to children's graphic representational experiences; manipulating colorful acetate shapes on a light table allows children to explore color and shape. These opportunities should not replace paints, markers, crayons, and other graphic art materials but should provide additional options for self-expression.

With a focus on technology and interactive media as tools—not as ends in and of themselves—teachers can avoid the passive and potentially harmful use of non-interactive, linear screen media that is inappropriate in early childhood settings. Intentionality is key to developmentally appropriate use. One must consider whether the goals can be more easily achieved using traditional classroom materials or whether the use of particular technology and interactive media tools actually extends learning and development in ways not possible otherwise.

Exciting new resources in today's technology-rich world, such as 3D-rendered collaborative games and immersive world environments, represent the next frontier in digital learning for our youngest citizens, leaving it to talented educators and caring adults to determine how best to leverage each new technology as an opportunity for children's learning in ways that are developmentally appropriate. Careful evaluation and selection of materials is essential for the appropriate integration of technology and media in early childhood settings.

Assistive technology must be available as needed to provide equitable access for children with special needs.

For children with special needs, technology has proven to have many potential benefits. Technology can be a tool to augment sensory input or reduce distractions. It can provide support for cognitive processing or enhancing memory and recall. The variety of adaptive and assistive technologies ranges from low-tech toys with simple switches to expansive high-tech systems capable of managing complex environments. When used thoughtfully, these technologies can empower young children, increasing their independence and supporting their inclusion in classes with their peers. With adapted materials, young children with disabilities can be included in activities in which they once would have been unable to participate. By using assistive technology, educators can increase the likelihood that children will have the ability to learn, move, communicate, and create.

Technology has supported inclusive practices in early childhood settings by providing adaptations that allow children with disabilities to participate more fully. Augmentative communication devices, switches, and other assistive devices have become staples in classrooms that serve children with special needs. Yet, with all of these enhanced capabilities, these technologies require thoughtful integration into the early childhood curriculum. Educators must match the technology to each child's unique needs, learning styles, and individual preferences (Behrmann 1998; Muligan 2003; Sadao & Robinson 2010). It is critically important that all early childhood teachers understand and are able to use any assistive technologies that are available to children with special needs in their classrooms and to extend similar or comparable technology and media-based opportunities to other children in their classrooms.

Technology tools can be effective for dual language learners by providing access to a family's home language and culture while supporting English language learning.

Research has shown that access to information in the home language contributes to young children's progress both in their home language and in English (Espinosa 2008). Digital technologies allow teachers to find culturally and linguistically appropriate stories, games, music, and activities for every child when there may be no other way to obtain those resources (Uchikoshi 2006; Nemeth 2009). Because every child needs active practice in the four domains of language and literacy (speaking, listening, writing, and reading), technology resources should support active learning, conversation, exploration, and self-expression. Technology should be used as a tool to enhance language and literacy, but it should not be used to replace personal interactions. The role of language in developing self-esteem and social

skills must also be considered in making technology plans for diverse classrooms.

Digital technologies can be used to support home languages by creating stories and activities when programs lack the funds to purchase them or when languages are hard to find. Technology can be used to explore the cultures and environments that each child has experienced, and it allows children to communicate with people in their different countries of origin. Technology may be needed to adapt existing materials; for example, by adding new languages to classroom labels, translating key words in books and games, or providing models for the writing area. With technology, adults and children can hear and practice accurate pronunciations so they can learn one another's languages. If teachers do not speak a child's language, they may use technology to record the child's speech for later translation and documentation of the child's progress. As linguistic and cultural diversity continues to increase, early childhood educators encounter a frequently changing array of languages. Appropriate, sensitive use of technology can provide the flexibility and responsiveness required to meet the needs of each new child and ensure equitable access for children who are dual language learners (Nemeth 2009).

Digital literacy is essential to guiding early childhood educators and parents in the selection, use, integration, and evaluation of technology and interactive media.

Technology and media literacy are essential for the adults who work with young children. The prevalence of technology and media in the daily lives of young children and their families—in their learning and in their work—will continue to increase and expand in more ways than we can predict. Early childhood educators need to understand that technology and media-based materials can vary widely in quality, and they must be able to effectively identify products that help rather than hinder early learning (NAEYC 2009a).

For the adults who work with young children, digital literacy includes both knowledge and competence. Educators need 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. Digital and media literacy for children means having critical viewing, listening, and Web-browsing skills. Children learn to filter the messages they receive to make wise choices and gain skills in effectively

using technology and technology- and media-based information (NAMLE 2007; Rogow & Scheibe 2007; ISTE 2008a, 2008b; Center for Media Literacy 2010; Hobbs 2010). These habits of inquiry transfer to all areas of the curriculum and to lifelong learning.

Using technology to support practice and enhance learning requires professional judgment about what is developmentally and culturally appropriate (Hobbs 2010). Early childhood educators who are informed, intentional, and reflective use technology and interactive media as additional tools for enriching the learning environment. They choose technology, technology-supported activities, and media that serve their teaching and learning goals and needs. They align their use of technology and media with curriculum goals, a child-centered and play-oriented approach, hands-on exploration, active meaning making, and relationship building (Technology and Young Children Interest Forum 2008). They ensure equitable access so that all children can participate. They use technology as a tool in child assessment, and they recognize the value of these tools for parent communication and family engagement. They model the use of technology and interactive media as professional resources to connect with colleagues and continue their own educational and professional development.

Digital citizenship is an important part of digital literacy for young children. Digital citizenship in the context of early childhood programs refers to the need for adults to help children develop an emerging understanding of the use, misuse, and abuse of technology and the norms of appropriate, responsible, and ethical behaviors related to online rights,

roles, identity, safety, security, and communication. Adults have a responsibility to protect and empower children—to protect them in a way that helps them develop the skills they need to ultimately protect themselves as they grow—and to help children learn to ask questions and think critically about the technologies and media they use. Adults have a responsibility to expose children to, and to model, developmentally appropriate and active uses of digital tools, media, and methods of communication and learning in safe, healthy, acceptable, responsible, and socially positive ways.

The term ***digital citizenship*** refers to the need for adults and children to be responsible digital citizens through an understanding of the use, abuse, and misuse of technology as well as the norms of appropriate, responsible, and ethical behaviors related to online rights, roles, identity, safety, security, and communication.

Young children need to develop knowledge of and experiences with technology and media as tools, to differentiate between appropriate and inappropriate uses, and to begin to understand the consequences of inappropriate uses. Issues of cyber safety—the need to protect and not share personal information on the Internet, and to have a trusted adult to turn to—are all aspects of a child’s emerging digital citizenship that can begin with technology and media experiences in the early years. Children need to be protected by educators and parents against exploitation for commercial purposes. A child’s image should never be used online without parental consent (ISTE 2007). Digital citizenship also includes developing judgment regarding appropriate use of digital media; children and adults need to be able to find and choose appropriate and valid sources, resources, tools, and applications for completing a task, seeking information, learning, and entertainment.

Early childhood educators need training, professional development opportunities, and examples of successful practice to develop the technology and media knowledge, skills, and experience needed to meet the expectations set forth in this statement. In recent years, smartphones, tablets, apps, game consoles and handheld game devices, streaming media, and social media have found their way into the personal and professional lives of early childhood educators; into early childhood programs serving young children, parents, and families; and into the homes of young children (Donohue 2010a, 2010b; Simon & Donohue 2011). Early childhood educators, parents, and families need guidance to make informed decisions about how to support learning through technology and interactive media, which technology and media tools are appropriate, when to integrate technology and media into an early childhood setting and at home, how to use these tools to enhance communication with parents and families, and how to support digital and media literacy for parents and children.

To realize the principles and recommendations of this statement, early childhood educators must be supported with quality preparation and professional development. Early childhood educators need available, affordable, and accessible professional development opportunities that include in-depth, hands-on technology training, ongoing support, and access to the latest technology tools and interactive media (Appel & O’Gara 2001; Guernsey 2010b, 2011a; Barron et al. 2011). Educators must be knowledgeable and prepared to make informed decisions about how and when to appropriately select, use, integrate, and evaluate technology and

media to meet the cognitive, social, emotional, physical, and linguistic needs of young children. Educators also need to be knowledgeable enough to answer parents' questions and steer children to technology and media experiences that have the potential to exert a positive influence on their development (Barron et al. 2011; Guernsey 2011b, 2011c; Takeuchi 2011).

Teaching in the age of digital learning also has implications for early childhood teacher educators in how they integrate technology tools and interactive media in the on-campus and online courses they teach, how well they prepare future early childhood teachers to use technology and media intentionally and appropriately in the classroom with young children and how well future teachers understand and embrace their role with parents and families (NAEYC 2009b; Rosen & Jaruszewicz 2009; Barron et al. 2011). Teacher educators need to provide technology-mediated and online learning experiences that are effective, engaging, and empowering and that lead to better outcomes for young children in the classroom. This requires knowledge of how adults learn and of how technology can be used effectively to teach teachers (NAEYC 2009b; Barron et al. 2011).

Current and future early childhood educators also need positive examples of how technology has been selected, used, integrated, and evaluated successfully in early childhood classrooms and programs. To implement the principles and recommended practices contained in this statement, educators need access to resources and online links, videos, and a professional community of practice in which promising examples and applications of emerging technologies and new media can be demonstrated, shared, and discussed.

Research is needed to better understand how young children use and learn with technology and interactive media and also to better understand any short- and long-term effects. The established body of research and literature on the effects of television viewing and screen time on young children, while foundational, does not adequately inform educators and parents about the effects of multiple digital devices, each with its own screen. As multitouch technologies and other emerging user interface possibilities become more affordable and available, new research is needed on what young children are able to do and how these tools and media can be integrated in a classroom. Research-based evidence about what constitutes quality technology and interactive media for young children is needed to guide policy and inform practice and to ensure that technology and media tools are used in effective, engaging, and appropriate ways in early childhood programs.

Recommendations

NAEYC and the Fred Rogers Center recommend that early childhood educators

1. Select, use, integrate, and evaluate technology and interactive media tools in intentional and developmentally appropriate ways, giving careful attention to the appropriateness and the quality of the content, the child's experience, and the opportunities for co-engagement.
2. Provide a balance of activities in programs for young children, recognizing that technology and interactive media can be valuable tools when used intentionally with children to extend and support active, hands-on, creative, and authentic engagement with those around them and with their world.
3. Prohibit the passive use of television, videos, DVDs, and other non-interactive technologies and media in early childhood programs for children younger than 2, and discourage passive and non-interactive uses with children ages 2 through 5.
4. Limit any use of technology and interactive media in programs for children younger than 2 to those that appropriately support responsive interactions between caregivers and children and that strengthen adult-child relationships.
5. Carefully consider the screen time recommendations from public health organizations for children from birth through age 5 when determining appropriate limits on technology and media use in early childhood settings. Screen time estimates should include time spent in front of a screen at the early childhood program and, with input from parents and families, at home and elsewhere.
6. Provide leadership in ensuring equitable access to technology and interactive media experiences for the children in their care and for parents and families.

Summary

This statement provides general guidance to educators on developmentally appropriate practices with technology and interactive media. It is the role and responsibility of the educator to make informed, intentional, and appropriate choices about if, how, and when technology and media are used in early childhood classrooms for children from birth through age 8. Technology and interactive media should

not replace other beneficial educational activities such as creative play, outdoor experiences, and social interactions with peers and adults in early childhood settings. Educators should provide a balance of activities in programs for young children, and technology and media should be recognized as tools that are valuable when used intentionally with children to extend and support active, hands-on, creative, and authentic engagement with those around them and with their world.

Educators should use professional judgment in evaluating and using technology and media, just as they would with any other learning tool or experience, and they must emphasize active engagement rather than passive, non-interactive uses. To achieve balance in their programs and classrooms, they should weigh the costs of technology, media, and other learning materials against their program's resources, and they also should weigh the use of digital and electronic materials against the use of natural and traditional materials and objects.

Support for early childhood professionals is critically important. Educators need available, affordable, and accessible technology and media resources as well as access to research findings, online resources and links, and a professional community of practice. Preservice and professional development opportunities should include in-depth, hands-on technology experiences, ongoing support, and access to the latest technology tools and interactive media. To improve and enhance the use of technology and interactive media in early childhood programs, educators also need positive examples of how technology has been selected, used, integrated, and evaluated successfully in early childhood classrooms and programs.

Further research is needed to better understand how young children use and learn with technology and interactive media and also to better understand any short- and long-term effects. Research also is needed to support evidence-based practice for the effective and appropriate uses of technology and interactive media as tools for learning and development in early childhood settings.

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