

Media Use as a Context for Cognitive Development: What Is and Should Be Known?

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This text is designed to provide a survey of the impact of media use on key aspects of children's and adolescents' cognitive development pertaining to attention, memory, language, and executive functioning. In addition to our focus on learning, we examine how children and adolescents evaluate the content presented to them via the diverse screens they encounter, and how they understand the affordances of different types of screen media—topics subsumed by the term *media literacy* (Potter, 2004). Media literacy has long been examined in the fields of communications and media studies but is largely unexamined from a developmental psychology perspective, despite strong concerns about the vulnerability of young audiences to screen-based content (Blumberg, Williams, & Kelley, 2014; Hobbs, 2004; Livingstone & Haddon, 2012).

The collection of chapters in this volume was motivated by the paucity of work concerning children and adolescents with regard to linkages between media use and cognitive development, and increasing acknowledgment that screen time is not necessarily detrimental to child development. For example, until 2016, the American Academy of Pediatrics (AAP) recommended no screen time for children under 2 years of age. However, given the ubiquity of mobile devices and television in young children's lives, the AAP Council on Communications and Media released a new policy statement (Council on Communications and Media, 2016). In this report, the AAP reaffirmed its position that early learning occurs primarily during interactions with care-givers, thus endorsing what many researchers and practitioners have long known about the cognitive and socio-emotional benefits of parental co-viewing and mediation of children's screen viewing habits (see Chakroff & Nathanson, 2011; Nathanson, 2015; Warren, 2005). Accordingly, the nature of parental interactions with their children around media features

prominently in chapters in this volume. As will be demonstrated, parental goals when interacting with their children include facilitating their learning of content presented via different media platforms, and promoting their understanding of the explicit and implicit messages communicated via this content, as in the case of the advertisements. Such goals dovetail with concerns of media literacy educators. As children take more ownership of their media use, their ideas about what is appropriate content and activity may differ from that of their parents (Vaterlaus, Beckert, Tulane, & Bird, 2014). The vast number of media and apps available can be difficult even for the savviest adults to sort through, especially in light of aggressive marketing of products as educational without provision of what most researchers would consider to be sufficient evidence of their efficacy (DeLoache et al., 2010; Richert, Robb, Fender, & Wartella, 2010). As children are now users of digital media often from infancy, the need for direct media literacy instruction to guide children and their parents is increasingly necessary.

The prevalence of screens in the lives of children and adolescents is reflected in large-scale national surveys such as those conducted by Common Sense Media, the Kaiser Family Foundation, and the Pew Research Center. For example, in a survey of 1463 parents of children ages 8 years and younger, Common Sense Media reported that, as of 2013, more than a third (38%) of infants and toddlers under 2 years of age had access to mobile devices (e.g., smartphones and iPads) and used them for media-related activities (e.g., watching television or videos, playing games or apps)—a significant increase from the rate of 10% reported in 2011 (Rideout, 2013). Not surprisingly, usage is even higher among older children, as 80% of 2-to-4-year-olds (up from 39% in 2011) and 83% of 5-to-8-year-olds (up from 52% in 2011) have been found to use mobile devices for entertainment or educational purposes (Rideout, 2013). The usage of mobile devices for media use by tweens (8-to-12-year-olds) and teens (13-to-18-year-olds) is also high, with 41% of tweens' and 46% of teens' screen time spent on mobile devices (Rideout, 2015). Further, findings from the Entertainment Software Association (2016) indicate that 63% of US households include at least one individual who plays video games for three or more hours per week. Within these households, 27% of players are younger than 18 years of age.

Given the proliferation of educational games and apps aimed at school-age children in today's marketplace, there is increasing attention being paid to design and formal features that promote learning (Brunick, Putnam, McGarry, Richards, & Calvert, 2016; Hirsh-Pasek et al., 2015; Lee, Plass, & Homer, 2006; U.S. Department of Education, Office of Educational Technology, 2013). Much of the interest in serious games, characterized

as games designed to train, educate, and entertain (see [Blumberg, Almonte, Anthony, & Hashimoto, 2013](#)), has been driven by federal funding agents such as the National Science Foundation and the Institute of Education and Sciences, and private funders such as the Bill and Melinda Gates Foundation and the MacArthur Foundation. In fact, as recently reported in a market analysis posted on the independent news site Gamesandlearning¹ in Sep. 2016, investment in game-based learning firms was slated to increase 20% in 2016 over that of investments in 2015.

With prominent national surveys attesting to increasing rates of media use among adolescent and preadolescent youth (see [Lenhart, 2015](#); [Rideout, Foehr, & Roberts, 2010](#)), research on media usage has tended to focus on the vulnerability of these media users. Specifically, these users are seen as potential victims of privacy violation, cyber-bullying, exposure to inappropriate content and advertisements, and Internet and/or video game addiction ([Anderson et al., 2010](#); [O’Keeffe & Clarke-Pearson, 2011](#); [Przybylski, 2014](#)). Collectively, these concerns have dominated research on youth media use, and overshadowed studies highlighting possible benefits of digital media as tools for fostering cognitive development, many of which have been examined within the context of video game play. Specifically, frequent game play has been shown to facilitate mental rotation and spatial visualization skills ([De Lisi & Wolford, 2002](#); [Feng, Spence, & Pratt, 2007](#)), control of attention ([Dye, Green, & Bavelier, 2009](#); [Greenfield, DeWinstanley, Kilpatrick, & Kaye, 1994](#)), inferential reasoning ([Pillay, 2002](#)), and executive functioning ([Staiano & Calvert, 2011](#)). The accumulation of work demonstrating these benefits has helped shift the rhetoric on the effects of digital game play from primarily negative in emphasis (e.g., [Funk, Baldacci, Pasold, & Baumgardner, 2004](#); [Gentile, 2009](#)) to facilitative ([Blumberg & Fisch, 2013](#); [Granic, Lobel, & Engels, 2014](#)). Notably, much of this body of research includes late adolescents and young adults as participants rather than children.

However, much of what we do know about the impact of media on cognitive development is based on 40+ years of research on children’s television. This literature includes seminal studies of the impact of educational programs such as *Sesame Street* on school readiness of preschool children, especially with regard to development of language and numeracy skills ([Anderson & Pempek, 2005](#); [Bogatz & Ball, 1971](#); [Fisch & Truglio, 2001](#)). Concern with

¹ Gamesandlearning.org was initiated as a project of Joan Ganz Cooney Center funded through the Bill and Melinda Gates Foundation. This nonprofit news organization is designed to provide researchers and educators with independent news to inform research and game development for children and young adults.

the impact of media on the cognitive development of young children continues as media forms become more interactive (see [Anderson & Kirkorian, 2015](#); [Barr & Linebarger, 2017](#); [Kirkorian, Choi, & Pempek, 2016](#); [Schroeder & Kirkorian, 2016](#); [Sheehan & Uttal, 2016](#)) with far fewer studies examining the impact of media on children's behavior once they begin formal schooling. In fact, when children and adolescents are examined with regard to how media affects their behavior, the examined behavior is usually socio-emotional in nature. For example, researchers have examined the use of social media as promoting a positive sense of self ([Valkenburg, Schouten, & Peter, 2005](#)), facilitating new friendships among children aged 9–18 ([Lenhart & Madden, 2007](#); [Pempek, Yermolayeva, & Calvert, 2009](#)), and strengthening relationships with current friends, particularly among older adolescents aged 15–17 ([Madden, Cortesi, Gasser, Lenhart, & Duggan, 2012](#); [Pempek et al., 2009](#)). Surveys of findings within the literature on social media use also attest to its potential to help adolescents regulate their mood and emotion more generally (see [Blumberg, Rice, & Dickmeis, 2016](#) for a review). Examination of these behaviors is likely seen as elucidating factors that contribute to psychological well-being in the digital age (see [Cillessen & Bellmore, 2014](#); [Pea et al., 2012](#)). This examination has helped to quell long-standing fears that digital media use, as reflected in, for example, game play, texting, and social media posting, is most likely to result in impaired peer interactions and social isolation (see [Kraut et al., 1998](#)).

In the chapters that follow, the potential benefits associated with screen use among children and adolescents are examined from up-to-date theoretical and practical vantage points as organized in four sections. The first section of the volume addresses young children's learning from screens, such as those provided via television and tablets, and factors that contribute to learning, such as parental scaffolding of child–screen interactions. The second section focuses more specifically on the cognitive skills that are enhanced via children's and adolescents' interactions with digital media during game play, while texting, and when immersed in virtual reality. The third section highlights children's and adolescents' cognitive abilities as reflected through their media literacy. The final and concluding section presents policy and practical recommendations for children's and adolescents' media use. A brief overview of each of these sections follows.

YOUNG CHILDREN'S LEARNING FROM DIGITAL MEDIA

Courage opens this section with a detailed summary of research on young children's attention and learning in the context of digital media. Specifically,

she describes factors that contribute to learning, such as parental scaffolding and support of their child's understanding of concepts, and interactive features of e-books that potentially interfere with parents reading to their children by competing for the child's attention. Troseth, Strouse, and Russo address issues surrounding very young children's apparent difficulties in learning from video-based educational media. They review studies on young children's early symbolic development in relation to video-based educational media, and highlight how active co-viewing with an adult can support young children's learning by directing the child's attention to important information depicted in the video, helping interpret what the child sees, and connecting the information to real life.

Pempek and Lauricella explore how parent-child social interaction influences the child's learning from screen-based media, and how screen-based media influence the quality of parent-child interaction in the context of foreground media (i.e., media content intended for children) and background media (i.e., media content intended for older children and adults). Dore and colleagues examine the impact of interactive electronic toys and digital media on young children's language development. This examination highlights the importance of social contingency and feedback in supporting infants' and toddlers' learning from digital media, for example, by contrasting the efficiency of word learning from live interaction on Skype versus noncontingent video.

Calvert concludes this section by discussing how children's attachments to media characters (referred to as parasocial relationships), such as *Dora the Explorer*, can support their learning of STEM (science, technology, engineering, mathematics) concepts embedded in educational programs. Using examples from *Dora*, Calvert describes how children can collaborate with their screen friends to solve various types of problems that require mathematical concepts and other academically relevant skills.

CHILDREN AND ADOLESCENTS' COGNITIVE SKILLS ARE ENHANCED VIA MEDIA

The second section of this volume explores the affordances of digital media for enhancing a broad range of cognitive skills, including visual attention, executive functioning, and literacy. The first two chapters in this section focus specifically on video games. Gorman and Green emphasize the differential impact of action video games (first- and third-person shooter games) relative to other types of video games in enhancing aspects of perceptual and

cognitive processing, including contrast sensitivity, peripheral vision, object tracking, and control of attention among primarily adult study participants. The authors further highlight the need for game developers to combine the perceptually demanding elements of action video games with more age-appropriate content for children. Lane and Yi consider the profound impact of the game *Minecraft* in today's youth culture and its adoption by schools as a means of engaging youth in creative projects that may spark their interest in STEM fields. The authors consider the need for research to evaluate how specific implementations of *Minecraft* in school settings impact both student motivation and targeted cognitive skills.

Fietzer and Chin evaluate claims that interactions with digital technologies, primarily video games, impact executive functioning, including their control of attention, working memory, planning, and problem solving among typically developing individuals and those with special needs. Bailey and Bailenson review what is meant by immersive virtual reality (IVR) and how it might be used as a venue for informal education and remediation of skills. The authors also consider the ramifications of IVR for cognitive development.

Wood and Johnson consider texting in relation to the development of literacy skills (reading, spelling, and writing). Specifically, they review recent research suggesting that the use of *textspeak* (i.e., texting language that includes acronyms, initials, and emoticons, and other abbreviations) facilitates phonological development, which includes awareness of how speech sounds map onto written units (orthography). They conclude that texting allows children and adolescents to practice skills necessary to master the writing system, which benefits their literacy development.

In the final chapter of this section, Fisch advocates for increased collaboration between children's media producers and academics. Specifically, he proposes that applying theory that can be used to examine children's learning from media (e.g., Sweller's Cognitive Load Theory and Fisch's Capacity Model) to the production of educational media results in products that maximize learning.

MEDIA LITERACY AS A COGNITIVE SKILL

The third section of this volume examines media literacy as an important aspect of children's cognitive development as media consumers. Bordoff and Yan review their work examining the developmental trajectory of children's understanding of the technical and social complexity of the Internet, which has ramifications for how they engage with others online, how

much personal information they disclose, and with whom they disclose this information. Hobbs discusses varying approaches to media literacy designed to empower youth to utilize, evaluate, and create digital media and also protect them from potential threats, such as cyber-bullying, sexting, or targeted advertising. She also outlines methods of developing students' critical thinking skills in evaluating the purpose, targeted audience, point of view, and construction of media messages; necessary skills given the current widespread concern about fake news.

Haddon and Livingstone shift the point of view from educators to youth by examining 9- to 16-year-olds' views about cyber threats and safety issues associated with Internet use. Using interview data, the authors identify a number of themes in youth discussions about their online activities, which suggest that they are more savvy about the social complexity of the Internet than studies utilizing other methods (see [Bordoff & Yan, this volume](#)).

POLICY AND PRACTICE RECOMMENDATIONS FOR FACILITATING LEARNING FROM MEDIA

The final section of this volume considers policy and practice implications for facilitating learning among child media users. Vaala and Jordan discuss challenges in providing up-to-date recommendations for children's media use in a rapidly evolving digital world. They discuss efforts by organizations such as *Common Sense Media* to help mitigate this challenge by providing reviews of apps and games that are intended to guide parent choice given the lack of industry-wide rating systems for mobile media. Uhls and Robb conclude the text and volume with consideration of how parents can support their children's decision making around media use. Given the ubiquity of mobile devices in today's households, the authors recommend that parents and children work together to develop a family media plan, with adults modeling the media habits they wish their children to follow.

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