ENCYCLOPEDIA
on Early Childhood
Development

Technology in early childhood education: overall commentary

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Introduction

The six papers[1-6] presented in this section review the scientific literature on the potential harms and benefits of digital media for supporting language and literacy development in young children. The project itself presupposes the inevitable penetration of digital media into our homes and schools for entertainment and educational purposes. Although television and video remain the most commonly used forms of screen media by children, access to mobile devices is growing by children as young as two years of age.[7] Some people are afraid that increased exposure to digital media will harm the developing brain, but their warnings are based more on moral panic than evidence.[8] Most scientists are taking a cautious approach, working to understand the conditions under which digital media support learning and to identify factors that undermine the learning potential of these new technologies: for example, Courage and Troseth[1] conclude that toddlers may learn from ebooks with adult guidance but warn against excessive exposure to screen media at too young an age; Zosh, Hirsh-Pasek, Golinkoff, and Parish-Morris[2] report that good quality educational apps support guided exploration toward a learning goal; Korat and Segal-Drori[4]

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identify multimedia e-book features that facilitate learning as well as interactive features that distract from learning; Roskos and Brueck[5] consider the use of e-books in the school environment and focus on the need for more research on best practices by teachers; Savage and Wood[3] review computer based reading programs and note that their effectiveness depends upon the congruence of the program with literacy research and on the expertise of the teachers who implement them; finally, Wong and Neuman[6] discuss the potential of e-books to help prepare English Language Learners for school in the majority language.

Research and Conclusions

The research reviewed in these six papers[1-6] takes a cognitive approach, describing how individual learners respond to digital media given variations in the characteristics of specific applications. Universal principles of learning are abstracted from this research, which in turn motivate certain guidelines that are offered to parents and teachers for the selection and use of educational media. In particular it is recommended that an adult guide the child's interactions with digital media: to direct the child's attention, help the child regulate their own behaviour and emotion, and relate the screen content to their own life experiences. E-books should also be designed to encourage guided exploration by the child toward a clear learning goal with multimedia elements used to focus attention on content that supports language and literacy learning.

The research reviewed is excellent and the general message abstracted is most assuredly sound: the potential of digital media to support children's learning is determined by the quality of the specific apps and the way in which they are implemented in the home and school environment. However, research with mobile devices is only just beginning and there are significant gaps in our knowledge, bringing much uncertainty regarding the policy implications of this research. A primary concern is the need for research targeting diverse groups of users. Korat and Segal-Drori[4] point out that multimedia features in e-books appear to be especially valuable for children from socially disadvantaged families; therefore, "one size fits all" guidelines for book design and use may not be ideal. Courage and Troseth[1] identify a research gap for children with language impairments – it is not known whether this population will uniquely benefit from the multimedia stimulation offered by e-books or be uniquely vulnerable to the distracting elements contained in these books. It is also not known whether the standard dialogic reading and language stimulation training program provided to parents of children with language impairments will generalize to the e-book reading context. Wong and Neumann[6] discuss the potential for multimedia e-books to support English language learning by minority language students, thus easing the transition to

school. However, research with multilingual students in other contexts is lacking: for example, in some countries the state may support retention of the minority home language; in others, the schools are teaching multiple official languages; and increasingly, there is a need to preserve indigenous languages. More research is required to determine how best to design and implement digital technologies to support language and literacy learning in multiple languages in these varied contexts.

Implications for Policy and Service Development

The policy implications of the research presented in these papers is directed at individual consumers. Parents are encouraged to engage jointly with their children when they are playing with apps and to share ebooks just like paper books.[9,10] Teachers and librarians are exhorted to select apps according to scientific principles and implement them according to best practice.[11,12] However, there is no research to indicate that these guidelines will be effective for the target individuals. Furthermore, we don't know that services designed to change individual behaviour will have broader impacts, especially for the groups already mentioned: children from lower income families, children with language impairments, and multilingual children.

It is well known that the uptake of new technologies lags in families with fewer financial resources, creating a "digital divide."[13] For example, in Canada, 7% of households do not have internet access and 11% do not have a cell phone; the gap between the poorest and the richest households is about 30% for both technologies.[14] Families that do not have these technologies cite a broad range of reasons but prohibitive cost and poor quality service in rural regions play a significant role. Access to technology is not the only issue however; the way in which these technologies are used differs across families. Even when internet access is universal, less advantaged young people use computers primarily to play games whereas more advantaged young people also use computers to search for information, read the news, and access important services.[15] Families from different social groups appear to have different attitudes about their young children's use of digital media. Upper middle class parents are somewhat less likely to consider tablet apps to be "educational" and do not like to read e-books to their children because they are actively limiting "screen time." Less advantaged parents report that they do not have time to share e-books and apps with their children; therefore, they might appreciate access to educational apps that effectively substitute for this time.[7,16,17] These differences across social groups in access to financial, skill, and time resources suggest that policies should be tailored to the needs of specific families. Public education campaigns that exhort all parents to share paper

and e-books with their children may serve to widen rather than narrow the digital divide. In any case, research must directly assess the outcomes of policies and services across a range of social groups.

Some studies have found that digital books enhance language and literacy learning by socially disadvantaged children.[18] Subsequently, it has been suggested that children with biological risk factors, and in particular boys with language and reading disabilities, might benefit especially from digital media.[19,20,21] Text highlighting draws the child's attention to print, animations teach vocabulary and print-meaning connections, and text-to-speech functions facilitate story comprehension. The multimedia experience afforded by e-books is engaging and may be particularly motivating to children who are reputed to be uninterested in print book reading. This hypothesis has not been fully investigated however and it seems equally likely that these technological features might be especially disruptive rather than adaptive for children with special needs. It is possible that children with weak language and literacy skills may become distracted by the interactive features or overly reliant on the nonprint aspects of the books for comprehension; subsequently, their experience with actual reading would be further reduced. The impact of digital media on the literacy skills of children with special needs requires urgent research attention.

The research gap with multilingual learners is also particularly acute. E-books have many features with potential to support the maintenance of the home language and acquisition of the school language by multilingual children.[22] In particular, options to add multilingual narration to commercial stories or to produce personalized stories are promising, as demonstrated in a project to use multimedia computer stories to revitalize endangered Indigenous languages.[23] Adapting policy and services for children across a broad spectrum of social, cultural, and linguistic communities requires close collaboration among researchers, families, communities, educators and app designers; these collaborations in turn require a solid foundation of public funding and support. Ultimately, the full potential of digital media cannot be realized by addressing the users of these tools simply as individual consumers.

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