Digital technology

Moderate impact for moderate cost, based on limited evidence.

Digital technology approaches employ computer or digital technologies to support children's development and learning within early years settings. This includes approaches where:

- children use technology independently, either as part of their planned experiences or as part of teaching activities such as instructional games;
- technology, such as interactive whiteboards or digital cameras, is used by early years professionals to support their interactions with children; and
- technology is used to support the professional development of early years practitioners.

How effective is it?

Overall, studies investigating the use of digital technology find that it is associated with moderate learning gains of, on average, an additional four months' progress over the course of a year. Evidence suggests that technology should be used to supplement, rather than replace, other teaching activities and interactions. Introducing new technology on its own is unlikely to have an impact; it must be accompanied by a change in pedagogy to improve learning.

A number of digital structured programmes and instructional games for four to five year old children that aim to supplement the teaching of early literacy or mathematics skills have been evaluated and have shown positive impacts on learning. There is also evidence from the USA that the use of technology can support the professional development of early years teachers in mathematics. A study showed that providing video examples of effective practice for early years professionals to apply and develop can directly benefit children's learning.

The degree to which digital technology should be used in early years education is highly contested. Some studies suggest that excessive screen-time (e.g. more than 1-2 hours a day, including television) is linked to attention problems, sleep and eating disorders and obesity. However, no high quality evaluations have assessed the link between extended use of technology and educational outcomes in the early years.

How secure is the evidence?

Overall, the evidence related to digital technology is limited. The evidence for the benefits of digital technology on young children is based mainly on single studies rather than meta-analyses, and is weaker than the evidence that focuses on older age groups. The key messages from the evidence are broadly consistent with evidence about use of technology in schools. It is also important to remember that the pace of technological change means that evidence is usually about yesterday's technology rather than today's. For example, no high quality evaluations appear to have assessed the impact of tablets on educational outcomes in the early years. This means that evaluating new approaches is important. The average impact of digital technology programmes has remained relatively consistent for some time, suggesting that general messages are likely to remain relevant, even as specific digital technologies change.

There is a growing literature on the role of digital technology in Australian schools and early years settings. A study published in 2013 used a randomised controlled trial to assess the impact of a computer-based programme for struggling early readers in the Northern Territory. The approach appeared to have a particular impact on the phonological awareness of Indigenous children.

What are the costs?

The initial costs of investing in new technologies are high. Once technology has been purchased, it can usually be used for several years, and many early years settings are already equipped with computers, digital cameras and interactive whiteboards. The evidence suggests that early years settings rarely take into account, or budget for, the additional training and support costs that are likely to make the difference to how well the technology is used. Expenditure is estimated at an average of £300 per child for equipment and technical support and a further £500 per nursery class (£35 per child) for professional development. Costs are therefore estimated as moderate.
Digital technology: What should I consider?

Before you implement this strategy in your learning environment, consider the following:

1. Introducing new technology does not automatically lead to improved educational outcomes. How will you use the technology to support learning?
2. Early years professionals need support and time to learn to use new technology effectively. This involves more than just learning how to use the technology; it should include support to understand how it can be used to improve learning.
3. It is important to evaluate the impact of using new technology. Have you considered how you will evaluate the impact of any new approaches?
**Technical Appendix**

**Definition**

Digital technology is mainly associated with computer or digital technology based strategies to support children’s development and learning within educational settings and contexts for early years learning. There are different approaches which can be classified into: a) technology for children to use, where digital technologies are used as part of their planned experiences or as part of teaching activities, b) technology for early years professionals, where equipment such as interactive whiteboards or digital cameras is used to support the interactions with children, and c) technology to support professional development. It includes digital technologies such as smart devices, cameras, video and DVDs as well as computers, laptops and tablets.

Search Terms: digital technology, word processing computer/education technology, online/e-learning, computer assisted instruction

**Evidence Rating**

There is one meta-analysis analysing the impact of digital technology on attainment. The degree to which digital technology should be used in early years education is highly contested. Some studies suggest that excessive use of digital technology (e.g. more than 1-2 hours a day, including television) is linked to attention problems, sleep and eating disorders and obesity. However, no high quality evaluations have assessed the link between extended use of technology and educational outcomes in the early years. Evidence suggests that digital technology is associated with moderate learning gains. The evidence indicates digital technology should be used to supplement, rather than replace, other teaching activities and interactions. Introducing new technology on its own is unlikely to have an impact; it must be accompanied by a change in pedagogy to improve learning. Overall, the evidence related to digital technology is limited.

**Additional Cost Information**

The initial costs of investing in new technologies are high. Once technology has been purchased, it can usually be used for several years, and many early years settings are already equipped with computers, digital cameras and interactive whiteboards. The evidence suggests that early years settings rarely take into account, or budget for, the additional training and support costs that are likely to make the difference to how well the technology is used. Expenditure is estimated at an average of £300 per child for equipment and technical support and a further £500 per nursery class (£35 per child) for professional development. Costs are therefore estimated as moderate.
References


For more information, tools & supporting resources, please visit: https://educationendowmentfoundation.org.uk/
Zucker, T. A., Moody, A. K., & McKenna, M. C. (Abstract)

The effects of electronic books on pre-kindergarten-to-grade 5 students' literacy and language outcomes: A research synthesis

### Summary of effects

<table>
<thead>
<tr>
<th>Meta-analyses</th>
<th>Effect size</th>
<th>FSM effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zucker, T. A., Moody, A. K., &amp; McKenna, M. C (2009)</td>
<td>0.31</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Single Studies</th>
<th>Effect size</th>
<th>FSM effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comaskey, E. M., Savage, R. S., &amp; Abrami, P (2009)</td>
<td>-</td>
<td>Non-significant for letter knowledge</td>
</tr>
<tr>
<td>Foster, M. E., Anthony, J. L., Clements, D. H., Sarama, J., &amp; Williams, J. M (2016)</td>
<td>0.43</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0.37</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0.52</td>
<td>-</td>
</tr>
<tr>
<td>Macaruso, P., &amp; Walker, A (2008)</td>
<td>0.48</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0.87</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0.55</td>
<td>-</td>
</tr>
<tr>
<td>Park, J., Bermudez, V., Roberts, R. C., &amp; Brannon, E. M (2016)</td>
<td>0.41</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0.42</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0.24</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0.20</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0.30</td>
<td>-</td>
</tr>
<tr>
<td>What Works Clearinghouse (2006)</td>
<td>0.62</td>
<td>-</td>
</tr>
</tbody>
</table>

### Effect size (indicative) | 0.35

The right hand column provides detail on the specific outcome measures or, if in brackets, details of the intervention or control group.

### Meta-analyses abstracts


   Electronic books (e-books) are a prevalent method for integrating technology in preschool and elementary classrooms; however, there is a lack of consensus concerning the extent to which e-books increase literacy skills in the domains of comprehension and decoding. This article assesses the efficacy of e-books with a comprehensive review method, including a systematic literature search, comparison of outcomes with effect sizes, and discussion of individual studies that met either (a) randomized-trial synthesis criteria, or (b) quasi-experimental/observational narrative synthesis criteria. Seven studies met the randomized trial criteria and 20 studies met the quasi-experimental/observational narrative review criteria. Results from the randomized trials indicate that the effects of e-books on comprehension-related outcomes were small to medium in size. Only two randomized trials examined decoding-related outcomes, thereby preventing firm conclusions. The narrative review suggests some interactive e-book features support comprehension, whereas other incongruent features may hinder comprehension. Educational implications and future research directions are discussed.