



Children and Technology: Positive and Negative Effects

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Imagine spending a year or more of your childhood almost entirely at home: no time in a classroom, no chance to join friends on the playground, and very few opportunities to enjoy favorite pastimes and experience new places, people, and activities.

The worldwide lockdowns that helped limit the spread of the coronavirus [created a kind of twilight zone for children](#) that put much of their environment off-limits and kept them separated from everyone but their immediate families. However, not all was lost. What vestiges of their pre-COVID life children were able to maintain were made possible by a range of technologies that kept them learning, interacting with friends, and entertained.

The growing presence of technology in children's lives, from their first year through their teens, is a double-edged sword. While technologies are neutral, how they are applied and how children are exposed to them can be either positive or negative.

The impact of children and technology becomes increasingly difficult to gauge as the pace of technological innovation speeds up. This guide presents a snapshot of the many roles that technology products and services play in the lives of children. It balances the pluses and minuses of the effects of technology use by children on their development, social interactions, and prospects for the future.

Evolution of Children's Use of Technology

From the earliest electric model trains in the early 20th century through the first home video game systems and remote-controlled toys, children's introduction to technology has been through their toys. What were marvels of technology three, two, or even one generation ago seem almost quaint by today's standards. However, the progress from [Pong](#) to [Oculus virtual reality games](#) occurred in a relatively brief period of time.

Early Examples of Children and Technology

Children have been interacting with digital technology since the [earliest days of the PC revolution](#). One of the first electronic educational toys was Texas Instruments' Speak & Spell, which was released in the late 1970s. This relatively simple device was a precursor to the first PCs designed for children in the 1980s. It also presaged the growth of computer-assisted instruction hardware and software in the pre-World Wide Web era.

- The first Speak & Spell toys debuted in 1979 to teach children ages 7 and older how to pronounce and spell 200

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- While [Magnavox's Odyssey](#) was the first gaming console upon its release in 1972, the device was soon eclipsed by the home version of [Atari's Pong](#) arcade video game, which began shipping in 1975. This was followed by the Atari 2600 game console in 1977 and similar devices from Nintendo, Mattel, and Coleco, among other vendors. Sega and Nintendo came to dominate the home video market through the 1980s, along with Commodore, Atari, and Sony's PlayStation, which was released in 1994.

Evolution of Technology Designed to Educate and Entertain Children

The arrival of the World Wide Web in the mid-1990s changed that nature of tech toys and education hardware and software. [Smart Toy Lab](#), an Intel and Mattel joint venture launched in 1998, developed the first web-connected interactive toys, or "smart toys." Among the first toys the lab developed were the QX3 Microscope, which featured a built-in video camera that sent images to a PC via a USB link, and the Me2Cam, which let children play interactive games using gestures to move "objects" on the screen.

Some early internet-connected toys and educational devices were criticized for [violating children's privacy](#) by collecting personal information without parental consent. For example, [Hello Barbie](#) was released in 2015 and featured a built-in microphone and voice recognition software, as well as a Wi-Fi connection. The doll's call-and-response function was a precursor to Amazon's Alexa/Echo and Apple's Siri voice assistants. However, hackers soon figured out how to break into the toy's system and access users' private information.

Today many children — from toddlers to teenagers — regularly use tablets, smartphones, and virtual environments for entertainment and educational purposes. Pandemic-related restrictions have [increased children's reliance](#) on these and other technologies to connect with the outside world. With increased use of these products comes heightened prospects of damage and abuse:

- A recent study published in *Children and Youth Services Review* identified [problematic smartphone use](#) (present in 16.4% of high school students surveyed), daytime sleepiness (20.2%), and symptoms of post-traumatic stress disorder (6.9%) as spiking during pandemic lockdowns.
- A study published in the *Italian Journal of Pediatrics* found that 66.3% of the children and adolescents surveyed used their smartphone for [more than four hours a day](#) during the pandemic, compared with 16.3% who did so before the pandemic. In addition, 56% of the children and adolescents surveyed used their smartphone after midnight at least three times each week, compared with 30.4% before the pandemic.

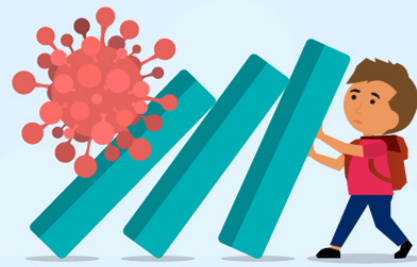
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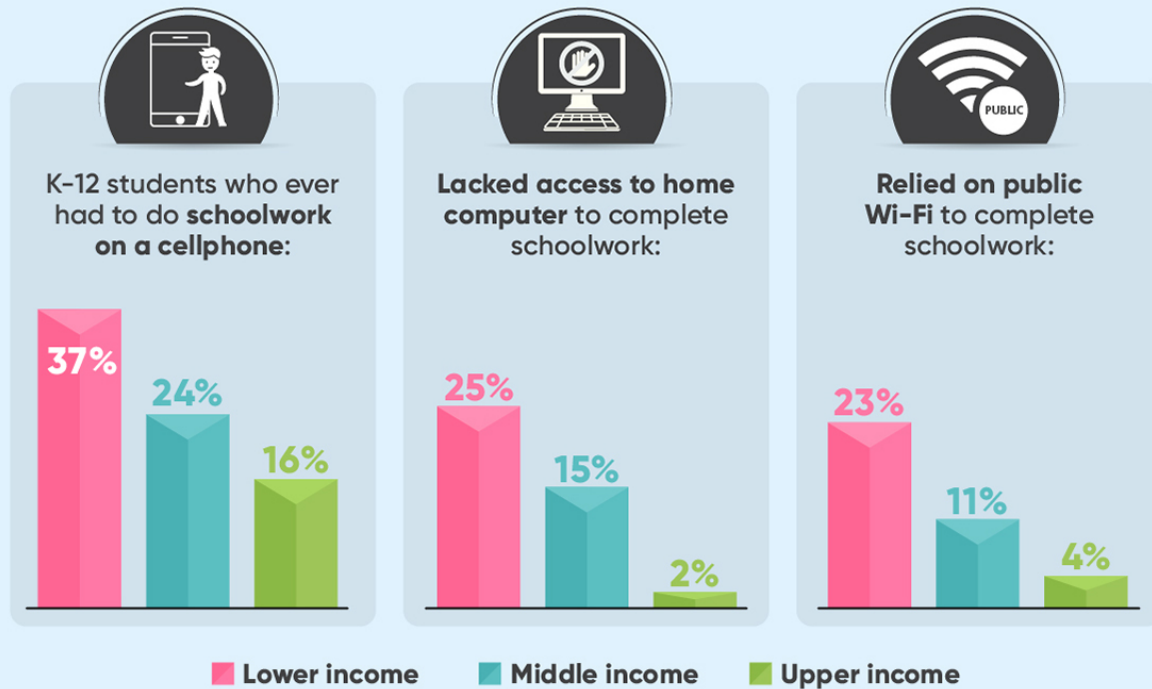


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CHILDREN AND THE DIGITAL DIVIDE: IMPACT OF COVID-19



The shutdown of schools during the COVID-19 pandemic brought the damaging effect of the digital divide between rich and poor families into sharp focus. The “homework gap” created by remote learning affected low-income families more than middle- and upper-income families.



Source: Pew Research Center

The shutdown of schools during the COVID-19 pandemic brought the damaging effect of the digital divide between rich and poor families into sharp focus. Pew Research Center data shows that the “homework gap” created by remote learning affected low-income families more than middle- and upper-income families. K-12 students who ever had to do schoolwork on a cellphone: lower income: 37%; middle income: 24%; upper income: 16%. K-12 students who ever lacked access to a home computer to complete schoolwork: lower income: 25%; middle income: 15%; upper income: 2%. K-12 students who ever relied on public Wi-Fi to complete schoolwork: lower income: 23%; middle income: 11%; upper income: 4%.

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Positive and Negative Effects of Technology on Children

Children can benefit from technology by gaining new learning opportunities; it’s especially important for children who are physically or developmentally challenged. However, technology use has also been found to contribute to poor self-esteem and isolation in some children. As digital technologies become more ubiquitous, parents struggle to [find the optimum amount of](#) technology for their children’s lives.

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boosts their creativity. Tech hardware and software helps children develop social skills and introduces them to various arts and sciences.

These are among the less obvious positive effects of technology on children:

- Technology allows children to connect with their family, friends, and others in ways that enrich their relationships, especially when using video chat and other real-time interactions.
- Parents and caregivers are learning to slow down and tone down the applications, games, and other content children use to avoid overloading their senses. This teaches children how to moderate their own use of technology.
- Rather than trying to eliminate all risk to children when using technology, the goal should be reducing the risk and adapting when problems arise, such as preventing children from accessing devices at specific times of the day.

Many parents hesitate to allow their preschool-age children to use technology products and services due to concerns about how it'll impact their well-being and development. However, the children are surrounded by technology, much of which [offers them significant benefits](#), as BSD Education explains:

- **Technology helps children become independent learners more quickly. Once they learn how to access digital information sources safely, they're able to explore the topics that interest them on their own.**
- **Children learn the importance of building communities and how to interact with people in social situations.** When circumstances prevent children from establishing physical bonds with family members, friends, and others, they're able to use technology to create "virtual bonds."
- Early access to technology teaches the digital literacy skills that children will need for their future success in school and as adults.
- Many technology products promote hand-eye coordination in young children, while others focus on developing their language and problem-solving skills.

Negative Effects of Technology on Children

Children are especially susceptible to technology overuse. The American Psychological Association (APA) recommends [limiting the use of technology](#) to one hour per day of high-quality programming for children ages 2 to 5. For children ages 6 and up, it's most important to set consistent limits on various types of media, such as gaming devices and smartphones.

APA suggests that parents focus on the content on children's screens and how the children are interacting with it. A survey of research on the possible negative effects of technology on children [establishes a connection](#) between the level of a child's use of technology and various developmental and behavior problems.

- Lack of attention, aggressive behaviors, obesity, physical inactivity, sleep problems
- Musculoskeletal problems related to a sedentary lifestyle
- Greater risk of lifetime obesity and cardiovascular disease
- Sleep disturbances and poor-quality sleep for children who overuse social media or keep mobile devices in their bedroom

These are among the negative effects of technology on children:

- **Exposure to harmful online content and sexual exploitation:** A study by Irish researchers found that children of all ages are able to [bypass the age verification systems](#) of social media apps, such as Snapchat, TikTok, Instagram, and Facebook. This can bring children into direct contact with potential predators and other dangers.

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- **Low self-esteem and increased anxiety:** CNN reports that teens and adolescents are [using image filters on Instagram](#) to enhance their appearance even though the result looks nothing like them. “Self-esteem addiction” can make young people feel inadequate. As children spend more time on social media, they may [become withdrawn](#) or find themselves obsessively checking their social media feeds.

Resources on Ways Children Are Affected by Technology

- [The Register, “Technology Does Widen the Education Divide. But Not Always in the Way You Expect”](#) – One educator found that upon returning from online education during lockdown, children had turned away from technology, preferring real books and nontech activities because tech is no longer seen as “fun.”
- [Edutopia, “Helping Parents Feel More Comfortable with Tech”](#) – Advice for teachers about how to convince parents to support technology in the classroom.
- [UNICEF, “Harnessing the Power of Technology and Digital Innovation for Children”](#) – A report describing the initiatives and successes of the Digital UNICEF 2020 program, which is intended to extend the reach of UNICEF’s aid efforts.

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Technology and Children Statistics

When it comes to children’s access to technology, the digital divide between rich and poor persists. The increased reliance of children on technology for remote schooling during the COVID-19 pandemic adds a new and dangerous dimension to the problem, which some analysts refer to as the “[homework gap](#).”

- A survey by Common Sense Media found that 49% of 8- to 18-year-olds in the U.S. had [attended classes fully or partially online](#) since the start of the pandemic.
- Hispanic/Latinx students (48%) and Black students (39%) were much more likely than their white counterparts (20%) to attend school fully online.
- Similarly, students from low-income families (42%) were more likely to rely completely on online instruction than those from middle-income and high-income families (31% and 27%, respectively).
- While 92% of white students had a computer at home, only 87% of Hispanic/Latinx students and 78% of Black students did.
- Broadband access at home was available to 90% of students from families with high incomes, compared with 80% for middle-income families and 61% for lower-income families.
- In addition, 88% of white families had broadband access at home, while 76% of Black families and 68% of Hispanic/Latinx families had broadband access at home.

Common Sense Media estimates that [closing the digital divide](#) for K-12 public school students will cost between \$6 billion and \$11 billion in the first year, and between \$4 billion and \$8 billion annually in subsequent years. An additional \$1 billion will be required to upgrade the remote access technologies that teachers use.

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APPS USED MOST OFTEN BY TEENS AND PRETEENS



In 2020, TikTok surpassed YouTube to become the most frequently used app by teens and preteens in the U.S.

App name	Average daily usage	% of children who use it
TikTok	105.1 minutes	32%
YouTube	102.6 minutes	69.7%
ROBLOX	90 minutes	24%
Amino	89.5 minutes	1.18%
avakin life	86.6 minutes	1.32%
YouTube Kids	85.8 minutes	6.9%
wattpad	80.6 minutes	2.9%
NETFLIX	80.6 minutes	27.4%
IMVU	72.8 minutes	1.3%
hulu	71 minutes	9.2%

Source: MMGuardian

In 2020, TikTok surpassed YouTube to become the most frequently used app by teens and preteens in the U.S., according to MMGuardian. 1. TikTok: average daily usage, 105.1 minutes; % of children who use it, 32%. 2. YouTube: average daily usage, 102.6 minutes; % of children who use it, 69.7%. 3. Roblox: average daily usage, 90 minutes; % of children who use it, 24%. 4. Amino: average daily usage, 89.5 minutes; % of children who use it, 1.18%. 5. Avakin Life: average daily usage, 86.6 minutes; % of children who use it, 1.32%. 6. YouTube Kids: average daily usage, 85.8 minutes; % of children who use it, 6.9%. 7. Wattpad: average daily usage, 80.6 minutes; % of children who use it, 2.9%. 8. Netflix: average daily usage, 80.6 minutes; % of children who use it, 27.4%. 9. IMVU: average daily usage, 72.8 minutes; % of children who use it, 1.3%. 10. Hulu: average daily usage, 71 minutes; % of children who use it, 9.2%.

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Statistics on Children’s Online Activities

The most [common activity for children online](#) is accessing software, audio, and video content (44% of children had done so between March 2020 and April 2021). The next most popular activities are using internet-based communications (22%); playing video games (14%); accessing online stores, banks, or payment systems (13%); and reading news media

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programs. This resulted in “unusually high” rates of socio-emotional and mental health problems in children as reported by their parents.

- Twenty-two percent of 4- to 7-year-olds had high levels of conduct problems in the fall of 2020, compared with 11% who did so in a survey conducted before the pandemic.
- Higher levels of hyperactivity (15% vs. 10%), peer problems (17% vs. 9%), lack of prosocial behavior (20% vs. 8%), and total difficulties (15% vs. 8%) were also recorded among 4- to 7-year-olds during the pandemic.

How Children’s Screen Time Correlates to Their Mental and Physical Health

A primary concern among parents about their children’s use of technology is the amount of time children spend in front of a television, computer, smartphone, or another screen. Researchers have established a link between the [amount of time adolescents spend in front of a screen](#), their level of moderate or vigorous physical activity (MVPA), and the amount of sleep they get.

- Screen time involves sedentary activities that detract from MVPA and delay bedtime and that interrupt sleep with digital notifications.
- The result is an increased risk of children becoming overweight or obese, as well as more sleepiness during the day and lower academic achievement.
- While most of the 13- and 14-year-olds in the study met the recommendations for total screen time (less than two hours per day) and MVPA (at least one hour per day), only half met the recommendation for sleep (8.5 hours per night). Meeting the recommendation for screen time and one of the other two factors led to better academic outcomes.

Some research into the connection between children’s screen time and their psychological well-being has been [brought into question](#) because of discrepancies between actual and reported use of digital media by children. A recent meta-analysis of research on the [impact of screen time on children](#) found either no significant impact or only a moderate impact. More indicative of potential psychological or developmental problems in children than overall screen time is the type of content that children view and interact with.

However, studies have established a link between [excessive screen time](#) and children’s levels of attention deficit symptoms; impaired emotional and social intelligence; social isolation; phantom vibration syndrome; and diagnosable mental illnesses, such as depression, anxiety, and technology addiction.

Finding the Right Amount of Time Online for Children

Many activities that benefit children can become dangerous if used too much. During the pandemic, the time that [adolescents spent in front of a screen](#) nearly doubled, according to a study published in *JAMA Pediatrics*. Adolescents were spending an average of 7.7 hours a day in front of a screen early in the pandemic, compared with 3.8 hours per day before the pandemic. Indications are that the elevated level of screen time will persist.

Determining the optimal amount of screen time for children has become challenging for parents because of the potential problems arising related to children’s vision, posture, and other physical development concerns. While the standard recommendation of experts remains that children under the age of 8 spend less than two hours per day in front of a screen, [many factors must be considered](#) when setting a limit for children:

- Allow more screen time for positive educational activities.
- Encourage children to take breaks from the screen that involve outdoor activities.
- Avoid using screens as “babysitters” that keep children occupied. Find other nonscreen activities, such as creative toys, coloring books, and storybooks.

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Tech Companies' Growing Impact on Children

After pressure from government regulators, Facebook shelved its plans to [develop a version of Instagram](#) called Instagram Kids that targeted children under the age of 13, as *The New York Times* reports. In 2019, YouTube paid \$170 million to settle claims that it targeted children under the age of 13 in its advertising and collected personal information about them.

These are just two of the many examples of giant tech companies targeting children to meet their need for continuous growth. In the absence of federal privacy laws, companies such as Google (which owns YouTube), Facebook (now known as Meta), Amazon, and TikTok are left to self-regulate their privacy and other policies.

- The Verge reports that Facebook is [exploring the use of playdates](#) to spur children to use its Messenger Kids application.
- According to Reuters, attorneys general of several states are [investigating Instagram](#) for its attempts to attract young children in violation of consumer protection laws.
- [YouTube is being sued](#) in the U.K. over alleged violations of children's privacy and data rights, according to Tech Monitor.
- A recent survey by Accountable Tech found that 74% of parents believe that [Facebook cares more about profits](#) than about keeping their children safe on the site.

Parents, educators, and regulators are also concerned about the [safety of educational technology platforms](#) that use machine learning and other artificial intelligence technologies to harvest massive amounts of data about children. Many fear that ubiquitous surveillance will lead to behavioral control and potentially a total loss of privacy for children. They're calling for more accountability from such platforms, as well as legislation that guarantees children's "right to future tense."

Resources Providing Statistics on Children and Technology

- [International Central Institute for Youth and Educational Television, International Data Youth and Media 2021](#) – Statistics on the types of technologies that children use in countries around the world, as well as daily use of media by children in various age groups.
- [Family Online Safety Institute, "Healthy Screen Time: Mobile Technology's Relationship with Children's Exercise"](#) – A study reporting a sharp decrease in the amount of time children spend playing outdoors and the growing reliance on applications that entail physical activity, such as Nintendo's Wii console.

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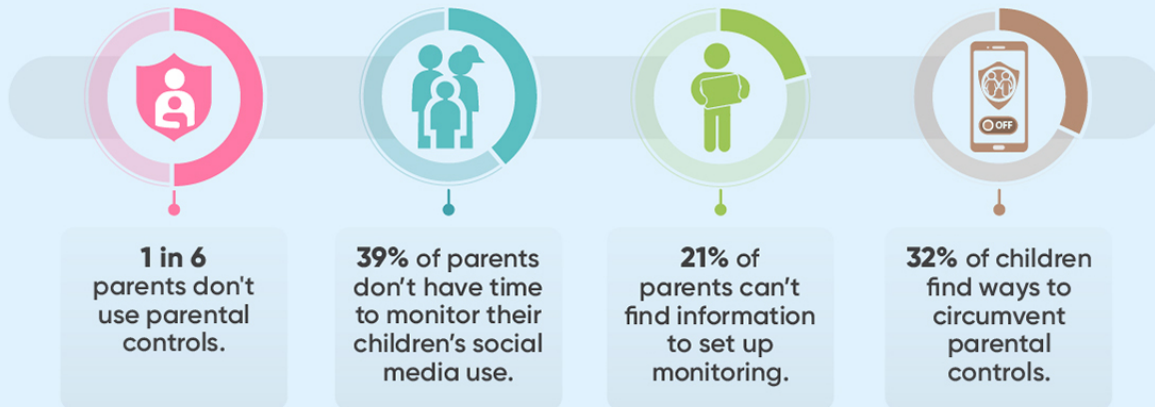


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CHILDREN'S SOCIAL MEDIA USE CHALLENGES PARENTS



Half of children ages 10 to 12 and **one-third** ages 7 to 9 use social media. A recent poll of parents with children ages 7 to 12 identified the areas of children's social media use that parents struggle to control.



Source: Mott Poll

Half of children ages 10 to 12 and one-third ages 7 to 9 use social media, according to a recent Mott poll of parents with children ages 7 to 12. Parents identified the areas of children's social media use that they struggle to control; for instance, one in six parents don't use parental controls. Additionally, 39% of parents don't have time to monitor their children's social media use, 21% of parents can't find information to set up monitoring, and 32% of children find ways to circumvent parental controls.

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Technology and Social Interaction in Children

The lockdowns deprived young children of [opportunities to develop social skills](#) by interacting with other children. As a result, educators report that some children returning to school are struggling with classroom routine. However, the pandemic has disrupted the lives of many families of students and teachers.

- Some children are experiencing anxiety in the classroom that may relate to separation anxiety after spending a prolonged period with family.
- While most students readjust quickly to their school routine, those who've experienced trauma at home are most likely to struggle in school. This is especially true for children in kindergarten and first grade.
- Children are showing their resilience in adapting quickly to masking and social distancing requirements.

Research presented at a recent conference of the Society of Neuroscience indicates that isolation in adolescents can [change the development of the brain systems](#) related to fear, risk and reward, and social recognition. This may make it

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Child Development and Technology

Researchers are studying how [the way young children play with technology](#) compares with the way they play with real-world toys. They've found that all the types of play in the nondigital environment are present in the digital realm as well.

- Digital play develops a range of abilities in children, including subject knowledge and understanding; digital skills; and skills related to social, emotional, cognitive, and creative development.
- Because digital and physical play are intermixed in children's lives, it's more appropriate to look at play holistically.

Most research on children and technology relates to children ages 9 to 16, but interactions with technology may have a greater impact on the development of children ages 3 to 8. [Digital education](#) for young children increasingly takes the form of applications running on tablets and smartphones, language development applications, and physical coordination from manipulating game controls and videos that teach dancing and other activities.

Since the advent of Apple's iPad in 2010, [computer use by young children has skyrocketed](#), especially as teaching philosophies focus on play activities over traditional classes and formal teaching. Some schools now test each child's digital skills and teach children digital competence, such as knowing when and why digital tools are used.

One approach to understanding the complexity of technology's impact on children is the domestication theory that compares the introduction of digital tools into society to the process of taming a wild animal. The four phases of the domestication process render the tools nonthreatening and also make them useful, important, and meaningful.

- **Appropriation** is the reason for acquiring the digital tool.
- **Objectification** of the digital tool instills a personal meaning for the tool in the child using it.
- **Incorporation** describes how the digital tool becomes a part of the child's life. It also explains appropriate and inappropriate uses of the tool.
- **Conversion** occurs when the digital tool has redefined the child's worldview and relations with others.

Resources on the Impact of Technology on Children's Development and Social Interactions

- [Early Childhood Education Journal, "Investigating Young Children's Interactions During Digital Play"](#) – Research into children's social behaviors within digital play environments found that adding a social dimension increased a child's engagement in the activity.
- [OECD iLibrary, "Children and Digital Technologies: Trends and Outcomes"](#) – Topics include use of social robots to help treat children with chronic diseases and the impact of digital technologies on children's physical health.

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Ensuring Safe and Nurturing Digital Environments for Children

Technological advances happen so quickly that parents and educators don't have much opportunity to consider how children's growth and well-being may be improved or impaired by the types of technologies they interact with and the ways in which those interactions occur. However, technology continues to play a more important part of the lives of most children when they're in school, at home, and at play. The judicious application of technology will enhance a child's education and other aspects of life.

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Infographic Sources

[Associated Press, "TikTok Is Now the Most-Used App by Teens and Pre-teens in the U.S."](#)

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