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Written Testimony for the Senate Committee on Commerce, Science, and Transportation hearing "Plugged Out: Examining the Impact of Technology on America's Youth"

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I thank Chair Cruz and Ranking Member Cantwell for this opportunity to testify regarding the impact of technology on America's youth. I am an Associate Professor of Pediatrics and Director of the Division of Developmental Behavioral Pediatrics at the University of Michigan Medical School. My clinical work focuses on children with autism, ADHD, and learning disabilities, while my NICHD-funded research lab examines how young children and parents use mobile and interactive technology, parent-child relationships, and child self-regulation. I have authored the American Academy of Pediatrics (AAP) policy statements *Media and Young Minds* and *Digital Advertising to Children,* am Immediate Past Chair of the AAP Council on Communications and Media, and currently act as o-Medical Director of the Center of Excellence on Social Media and Youth Mental Health. From 2024-2025, I led the first Behavioral Team at the Federal Trade Commission (FTC), helping teams enforce cases related to child wellbeing. My testimony today reflects my own views as a researcher and clinician but does not reflect the views of the FTC or any of the Commissioners, the AAP, or the University of Michigan.

Parents say that raising children has never been more stressful than it is today,[1] and they identify technology as a primary source of that stress.[2] There are industry and design reasons for why parenting around young children feels so challenging:

- The tech industry prioritizes growth and a "move fast and break things" ethos, which means that digital products are released rapidly before they have been adequately tested for safety
- Most digital products used by youth were designed by adults for adults,[3] and only retrofitted once youth usage[4] and harms[5] were recognized.

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[1] The U.S. Surgeon General. (2024). Parents Under Pressure: The U.S. Surgeon General's Advisory on the Mental Health & Well-Being of Parents. https://www.ncbi.nlm.nih.gov/pubmed/39250580

[2] Auxier B, Anderson M, Perrin A, Turner E. Parenting Children in the Age of Screens. Pew Research Center (July 28, 2020). Parenting approaches and concerns related to digital devices | Pew Research Center

[3] 5 Rights Foundation. Pathways: How digital design puts children at risk (July 2021). https://5rightsfoundation.com/wp-content/uploads/2021/09/Pathways-how-digital-design-puts-children-at-risk.pdf

[4] For example, YouTube had a large number of child viewers, but prior to the 2019 FTC settlement, continued to collect data for behavioral advertising purposes, stating that its policies intended usage for individuals 13 and over: www.ftc.gov/news-events/news/press-releases/2019/09/google-youtube-will-pay-record-170-million-alleged-violations-childrens-privacy-law

[5] For example, Snapchat removed its speed filter, which displayed the user's real-time speed on photos and videos, in 2021 after cases in which teens had died from reckless driving while using the filter:

- The metrics prioritized by industry, such as view time, are often at odds with youth developmental needs, such as a good night's sleep.[6]

The conversation around children and technology is often framed around *screen time*, the daily dose of screens that children and teens consume. Time is one important dimension of technology use that shapes youth wellbeing, as it relates to the displacement of other healthy behaviors.[7] However, in this testimony I offer a framing of evidence around *child-centered design* – the concept that if we design technologies with youth needs as a first principle, we are much more likely to maximize opportunities and minimize harms. My goal is to help apply things we have learned from research on consumer technologies like mobile devices, apps, and social media to the discussion around educational technology.

In my research lab at the University of Michigan, we have found repeated instances of digital platform design that revolves around revenue generation goals at the expense of child wellbeing, and in a manner that misaligns with child and teen developmental needs.

Early childhood device and app usage

We track young children's smartphones and tablets to understand what they play and for how long. In an NICHD-funded R21 grant, we examined the apps used by 346 3–5-year-olds between 2018 and 2020.[8] We found that:

- Young children accessed a range of different apps whose privacy policies noted they were not intended for children under 13 (such as YouTube, Facebook Messenger, Candy Crush, and Musical.ly, before it was TikTok) or whose app store ratings indicated content flags such as violence, horror, or gambling (such as Cashman, Granny, or Terrorist Shooter). Many apps, such as YouTube, were regularly used in the overnight hours. This study revealed how porous, low-friction app store designs and limited parental controls on children's personal devices can lead to easy downloading of age-inappropriate content.
- When we analyzed the Android apps used by young children in this study,[9] we found that the majority (67%) of apps transmitted hundreds of persistent identifies to up to 33 different third party domains (such as advertising networks and data brokers). Children heavy data privacy violations were more likely to be from lower-socioeconomic households. These data privacy violations were not only illegal under COPPA, but could

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www.npr.org/2021/06/17/1007385955/snapchat-ends-speed-filter-that-critics-say-encouraged-reckless-driving

[6] Radesky J, Hiniker A. From moral panic to systemic change: Making child-centered design the default. International journal of child-computer interaction. 2022 Mar 1;31:100351.

[7] See the concept of "crowding out" other healthy behaviors such as sleep, physical activity, focused homework time, or family/peer time: www.aap.org/5cs

[8] Radesky JS, Weeks HM, Ball R, Schaller A, Yeo S, Durnez J, Tamayo-Rios M, Epstein M, Kirkorian H, Coyne S, Barr R. Young children's use of smartphones and tablets. Pediatrics. 2020 Jul 1;146(1).

[9] Zhao F, Egelman S, Weeks HM, Kaciroti N, Miller AL, Radesky JS. Data collection practices of mobile applications played by preschool-aged children. JAMA pediatrics. 2020 Dec 1;174(12):e203345-.

lead to establishment of an early data profile about a child's digital footprint. These findings demonstrate the ubiquity of a data surveillance-based economy in children's digital products and lack of transparent labeling of data privacy risks on the app store, which were not available at the time.

- When we studied the interactive designs in the 133 highest-duration apps, we found that almost all (99%) of children played apps with at least one manipulative design. These manipulative designs appeared intended to prolong gameplay (65% of apps, used by 95% of children), encourage purchases (56% of apps, used by 80% of children), or encourage interaction with ads (32% of apps, 34% of children).[10]
- Many apps in the app stores make claims of being "educational" without evidence of efficacy. When we downloaded and analyzed apps with educational claims based on science of learning criteria (Pillar 1: Active Learning, Pillar 2: Engagement in the Learning Process, Pillar 3: Meaningful Learning, Pillar 4: Social Interaction),[11] we found that overall quality of apps was quite low across all pillars. Free apps had significantly lower Pillar 2 (Engagement in Learning Process) scores and overall quality scores when compared to paid apps, due to the presence of distracting enhancements and ads.

In summary, our research has found tablets and apps commonly have designs that can lead to exposure to inappropriate or violent content, which is associated with worse outcomes.[12] Popular apps also commonly have designs that encourage prolonged viewing, which create more family conflict and difficulty transitioning away from technology.[13] Although thoughtful child-centered digital products are made by nonprofits and companies with mission-driven goals,[14] and guidance exists on responsible innovation for children's technology,[15] the process for creating child-centered products is slower and more expensive. Often, thoughtful, purpose-built products cannot compete in a marketplace that prioritizes free and rapidly-introduced products.

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[10] Radesky J, Hiniker A, McLaren C, Akgun E, Schaller A, Weeks HM, Campbell S, Gearhardt AN. Prevalence and characteristics of manipulative design in mobile applications used by children. JAMA network open. 2022 Jun 1;5(6):e2217641-.

[11] Meyer M, Zosh JM, McLaren C, Robb M, McCaffery H, Golinkoff RM, Hirsh-Pasek K, Radesky J. How educational are "educational" apps for young children? App store content analysis using the Four Pillars of Learning framework. Journal of children and media. 2021 Oct 2;15(4):526-48.

[12] Browne KD, Hamilton-Giachritsis C. The influence of violent media on children and adolescents: a public-health approach. The Lancet. 2005 Feb 19;365(9460):702-10.

[13] Munzer TG, Miller AL, Wang Y, Kaciroti N, Radesky J. Tablets, toddlers, and tantrums: The immediate effects of tablet device play. Acta paediatrica (Oslo, Norway: 1992). 2020 Aug 18;110(1):255. And Hiniker A, Suh H, Cao S, Kientz JA. Screen time tantrums: How families manage screen media experiences for toddlers and preschoolers. InProceedings of the 2016 CHI conference on human factors in computing systems 2016 May 7 (pp. 648-660).

[14] Landesman R, Radesky J, Hiniker A. Let kids wonder, question and make mistakes: How the designers of Children's technology think about child well-being. InProceedings of the 22nd Annual ACM Interaction Design and Children Conference 2023 Jun 19 (pp. 310-321).

[15] See UNICEF's Responsible Innovation in Technology For Children framework and implementation toolbox: www.unicef.org/childrightsandbusiness/workstreams/responsible-technology/online-gaming/ritec-design-toolbox

Young children's YouTube viewing

Because YouTube is one of the most popular and longest-running apps on children's devices, my lab has conducted several in-depth reviews of the content quality children are consuming on this free platform, which offers a mix of professionally-made and user-generated content. High-quality educational content with prosocial role-modeling has been consistently associated with stronger language[16] and social-emotional skills[17] in young children, so it is important to understand whether the platforms where young children spend the most time are providing this type of content.

- In 2020, we partnered with Common Sense Media to analyze over 1600 YouTube videos watched by children 0 to 8 years old.[18] We found that the highest advertising load was present in early childhood YouTube videos (on videos posted by top child-directed creators, duration of ads was sometimes longer than the video itself),[19] and ads could disrupt and distract from educational content. Many videos had commercial content (46%) or problematic themes such as violence (30%).
- In the 6-8-year-old children in this sample, YouTube histories commonly included video gamers and influencers. We conducted a follow-up study in 2022 in which we examined how the YouTube algorithm recommended content based on popular searches a child this age might make (e.g., Roblox, memes, Mr. Beast). We analyzed the thumbnails presented on the YouTube recommendations grid and found high degrees of problematic imagery (e.g., violent, luxury excess, or sexy content).[20] We concluded that creators appeared to be competing for attention and clicks, so that they would be recommended by the algorithm.
- Our most recent NICHD R01 study, which involves collecting the YouTube viewing histories of 2-year-olds,[21] toddlers who watch YouTube had higher daily screen time (median of 1.3 hours/day) than non-YouTube viewers (median of 0.6 hours/day). We are finding that educational quality of viewed videos continued to be absent (50% of videos)

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[16] Madigan S, McArthur BA, Anhorn C, Eirich R, Christakis DA. Associations between screen use and child language skills: a systematic review and meta-analysis. JAMA pediatrics. 2020 Jul 1;174(7):665-75.
[17] Coyne SM, Padilla-Walker LM, Holmgren HG, Davis EJ, Collier KM, Memmott-Elison MK, Hawkins AJ. A meta-analysis of prosocial media on prosocial behavior, aggression, and empathic concern: A multidimensional approach. Developmental psychology. 2018 Feb;54(2):331.
[18] Radesky, J. S., Schaller, A., Yeo, S. L., Weeks, H. M., & Robb, M.B. (2020). Young kids and YouTube: How ads, toys, and games dominate viewing, 2020. San Francisco, CA: Common Sense Media: www.commonsensemedia.org/sites/default/files/research/report/2020_youngkidsyoutube-report_final-release_forweb.pdf
[19] Yeo SL, Schaller A, Robb MB, Radesky JS. Frequency and duration of advertising on popular child-directed channels on a video-sharing platform. JAMA Network Open. 2021 May 3;4(5):e219890-.
[20] Radesky J, Bridgewater E, Black S, O'Neil A, Sun Y, Schaller A, Weeks HM, Campbell SW. Algorithmic content recommendations on a video-sharing platform used by children. JAMA Network Open. 2024 May 1;7(5):e2413855-.
[21] Woods M, McClure M, Schaller A, Weeks HM, Suh B, Chaudhry S, Tibbets A, Kirkorian H, Barr R, Coyne SM, Radesky JS. YouTube viewing and content quality in toddlers. Infancy (in revision)

or shallow (33%) in most videos. We are also seeing evidence that young children are starting to watch Shorts and AI-generated content in their viewing histories

Thus, YouTube is another example of a free ad-supported platform where children spend significant amounts of time, but whose recommender system elevates attention-grabbing, rather than educational, content. This can lead to the displacement of developmentally enriching activities, parent-child interaction, and developmental delays when screen time is excessive.[22] Platforms like YouTube need to provide parents more control over what shows up in their child's feed, or the ability to turn algorithmic feeds off altogether.

Tween and Teen Smartphone Use

Getting a child or teen their first smartphone is a fraught process for many families, because smartphones provide access to so many apps and internet-connected experiences that are not developmentally aligned with youth needs. Although more parental controls and family settings are available on smartphones, our research tracking the devices of 203 11-17-year-olds[23] has found that distractions and access to age-inappropriate apps remain common. For example, we found that:

- During school hours (Monday through Friday, 8 a.m. to 3 p.m., excluding holidays), 97% of participants used their phones. The app categories that took up the highest proportion of time during school hours were social media (32% of smartphone use during school hours), gaming (17%), and YouTube (26%) – all of which are platforms that contain engagement-prolonging designs.
- Overnight on school nights, 59% of participants used their phones. App categories that took up the highest proportion of school night use included YouTube (47% of smartphone usage on school nights), social media (39%), and gaming (29%).
- Notifications were plentiful, with half participants receiving 237 or more per day, ranging up to >4500/day.
- Of 85 participants who were under age 13, 68% used social media apps
- Almost half (45%) of participants used apps with mature (17+) or adult only (18+) ratings, such as Pornhub, fantasy sports/betting apps (Yahoo Fantasy Sports & Daily, Sleeper Fantasy Football), Telegram, Reddit, Parler, 4chan, casino games, or violent games such as Call of Duty

These results highlight several mismatches between what teens need for physical and mental health (e.g., sufficient sleep, time outdoors, ability to focus on school) and the engagement-based

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[22] Madigan S, Browne D, Racine N, Mori C, Tough S. Association between screen time and children's performance on a developmental screening test. JAMA pediatrics. 2019 Mar 1;173(3):244-50.

[23] Radesky, J., Weeks, H.M., Schaller, A., Robb, M., Mann, S., and Lenhart, A. (2023). Constant Companion: A Week in the Life of a Young Person's Smartphone Use. San Francisco, CA: Common Sense. www.commonsensemedia.org/sites/default/files/research/report/2023-cs-smartphone-research-report_final-for-web.pdf

designs that monetize their time and attention. For families who purchase a smartphone, default settings are needed that minimize engagement-based designs (e.g., notifications, use of social media or games during school or sleep hours), support youth self-regulation (i.e., disengaging from devices), and provide safe access to the digital world. These healthy defaults would allow considerable improvement in youth wellbeing without adding burden to parents and families to manage all of the levels of risk that a fully-enabled smartphone introduces. Moreover, age assurance methods are needed to prevent under-13s from accessing social media (at these younger ages, the risk of negative outcomes is higher)[24] and all minors from accessing 18+ and mature content.

Social media apps were the source of the most time spent and notifications sent for most tweens and teens in this study. In the most recent 2025 Pew Research Center survey of U.S. teens age 13-17 years,[25] 76% reported using YouTube daily (43% several times a day, 17% almost constantly), 61% reported using TikTok daily (34% several times a day, 21% almost constantly), and 61% reported using Instagram daily (31% several times a day, 12% almost constantly). Teens do not perceive all of this time on social media to be time well spent. In qualitative studies, teens report spending more time online than they intend, feel pressure to engage, and find it hard to stop using platforms.[26],[27] Nearly three-quarters of teenagers believe that technology companies manipulate users to spend more time on their products.[28]

In Pew's 2024 survey of teens' social media use,[29] 45% of teens said they spend too much time on social media, which up from 36% in 2022. Over this time period, when more social media use comprised consumption of short-form content delivered in algorithmic feeds, there was an increase in the proportion of teens who believe that social media platforms have a mostly negative effect on people their age (48%, up from 32%), while there was a decrease in belief that social media has a mostly positive effect (11%, down from 24%). The main areas of harm reported by teens included sleep (45%), productivity (40%), and mental health (19%).

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[24] Charmaraman L, Lynch AD, Richer AM, Grossman JM. Associations of early social media initiation on digital behaviors and the moderating role of limiting use. Computers in Human Behavior. 2022 Feb 1;127:107053. And Nagata JM, Otmar CD, Shim J, Balasubramanian P, Cheng CM, Li EJ, Al-Shoaibi AA, Shao IY, Ganson KT, Testa A, Kiss O. Social media use and depressive symptoms during early adolescence. JAMA Network Open. 2025 May 1;8(5):e2511704-.

[25] Faverio M, Sidoti O. Teens, Social Media and AI Chatbots 2025. (2025). Pew Research Center. Available at: https://www.pewresearch.org/internet/2025/12/09/teens-social-media-and-ai-chatbots-2025/

[26] Weinstein, Emily, and Carrie James. Behind.their.screens¿What.teens.are.facing.(and.adults.are.missing). MIT Press, 2022.

[27] 5Rights Foundation. (2021). Pathways¿How.digital.design.puts.children.at.risk¡ Available at: https://5rightsfoundation.com/uploads/Pathways-how-digital-design-puts-children-at-risk.pdf

[28] Rideout, V., & Robb, M. B. (2018). Social media, social life: Teens reveal their experiences. San Francisco, CA: Common Sense Media. Retrieved from https://www.commonsensemedia.org/sites/default/files/research/report/2018-social-mediasocial-life-executive-summary-web.pdf

[29] Faverio M, Anderson M, Park E. Teens, Social Media, and Mental Health (April 22, 2025). Pew Research Center. Available at: https://www.pewresearch.org/internet/2025/04/22/teens-social-media-and-mental-health/

Therefore, concerns are emerging about increasing rates of problematic, compulsive, or addictive-like social media use. In a 2025 publication from the Adolescent Brain and Cognitive Development (ABCD) study,[30] roughly 40% of teens 11-15 years of age had concerning trajectories for media addiction symptoms. Teens within these trajectories had over twice the risk of suicidal behaviors than teens with low social media addiction symptoms. Recent studies have pointed to the use of AI-based algorithmic feeds as a source of worsening teen experiences on social media. A 2026 study of 479 teens who reported their social media duration and mental wellbeing on a daily basis for 100 days examined within-person correlations between time spent on the most popular platforms and daily fluctuations in wellbeing. The researchers found that participants had the most negative daily correlations between time spent on feed-based platforms (TikTok, Instagram, and YouTube) compared to platforms used primarily for messaging (Snapchat, WhatsApp).[31]

As children and teens interact with increasingly automated systems, particularly ones that are trained on engagement signals rather than measures of youth wellbeing[32] or other non-engagement signals,[33] risks will include exposure to extreme and emotional content,[34] algorithmic amplification (e.g., eating disorder filter bubbles),[35] negative social comparison,[36] and prolonged usage.[37]

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[30] Xiao Y, Meng Y, Brown TT, Keyes KM, Mann JJ. Addictive screen use trajectories and suicidal behaviors, suicidal ideation, and mental health in US youths. JAMA. 2025 Jul 15.

[31] Id., van der Wal

[32] Moehring A, Cooper A, Narayanan A, et al. Better Feeds: Algorithms that Put People First. Knight-Georgetown Institute (March 4, 2025): https://kgi.georgetown.edu/research-and-commentary/better-feeds/

[33] Cunningham T, Pandey S, Sigerson L, Stray J, Allen J, Barrilleaux B, Iyer R, Kothari M, Rezaei B, Kairam S, Milli S. Ranking by engagement and non-engagement signals: Learnings from industry. Annals of the New York Academy of Sciences. 2025 Sep;1551(1):19-32.

[34] Milli S, Carroll M, Wang Y, Pandey S, Zhao S, Dragan AD. Engagement, user satisfaction, and the amplification of divisive content on social media. PNAS nexus. 2025 Mar;4(3):pgaf062.

[35] See Farthing R. "Designing for Disorder." Fairplay (2022): https://fairplayforkids.org/wp-content/uploads/2022/04/designing_for_disorder.pdf and Center for Countering Digital Hate (2022): https://counterhate.com/blog/tiktok-bombards-teens-with-self-harm-and-eating-disorder-content-within-minutes-of-joining-the-platform/ and Horwitz, J. Instagram shows more 'eating disorder adjacent' content to vulnerable teens, internal Meta research shows. Reuters (October 20, 2025). Available at: https://www.reuters.com/business/instagram-shows-more-eating-disorder-adjacent-content-vulnerable-teens-internal-2025-10-20/; https://www.reuters.com/investigates/special-report/assets/usa-tech-meta-teens/Viewing-Content-on-IG_Redacted.pdf

[36] Harvard Kennedy School Shorenstein Center on Media, Politics and Public Policy. (2023). Discussion.Paper¿ Case.Study.on.Youth.Online.Harms.- .Project.Daisy, Appendix A (p.14). Available at: https://shorensteincenter.org/wp-content/uploads/2023/11/Discussion-Paper_Youth-Online-Harms-and-Project-Daisy_For-Shorenstein-Publication.pdf

[37] OfCom. (2022) Research into risk factors that may lead children to harm online. Available at: https://www.ofcom.org.uk/siteassets/resources/documents/research-and-data/online-research/keeping-children-safe-online/risk-factors-that-may-put-children-at-harm-online/children-risk-factors-report.pdf?v=328565

These risks also apply to generative artificial intelligence (AI) chatbots that prioritize user engagement over safety or wellbeing. Since the introduction of ChatGPT in November 2022, several sentinel cases[38] of alleged child harm from social AI products have quickly come to public attention.[39] Developmentally, children and teens are more likely to trust anthropomorphized (i.e., human-like) AI. For example, research assessing 6-10-year-old children's beliefs about AI assistants shows that many children think these products can think (46 percent), are smart (93 percent), can learn (41 percent), have feelings (21 percent), can be a friend (65 percent), can be trusted with a secret (41 percent), and would be good to spend time with if the child was lonely (48 percent).[40] Research in middle schoolers shows that they have multiple misconceptions about the way ChatGPT works (e.g. they think it is always correct, it can understand hidden context, it has a gender).[41]

No period of life has more sensitivity to peer feedback, belonging, or rejection than the tween and teen years. Therefore, this group will be highly sensitive to several designs of social AI products, such as sycophancy, mirroring, and empathic, human-like responses. In one study, researchers posing as teens on Character.ai found that chatbots frequently provided adoration, expressed emotional support (even if it was dangerous, such as agreeing with a teen that she should stop her depression medication), and initiated intimate interactions with users.[42] The chatbots treated users as special, pinged them with notifications saying they missed them, and expressed love and infatuation with users.[43]

The teen years are full of mild "social friction" that provides helpful social feedback but is experienced as awkwardness or self-consciousness to teens. In contrast, interacting with social AI agents has the potential to breed dependence because it is so easy, free of judgment or vulnerability Lonely teens will also likely be drawn to these products, as supported by recent research from the MIT Media Lab finding that lonelier adults reported more and emotional

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[38] I use the term "sentinel cases" based on experience in medical safety, in which "sentinel events" trigger a morbidity and mortality review by hospital safety teams. For example, a new pattern of cases of infection with use of a new medical device would be consider "sentinel events" and would trigger a rapid case review and decisions on how to prevent similar cases moving forward.

[39] See Kate Payne. *An AI chatbot pushed a teen to kill himself, a lawsuit against its creator alleges*. ASSOCIATED PRESS (Oct 25, 2024), https://apnews.com/article/chatbot-ai-lawsuit-suicide-teen-artificial-intelligence-9d48adc572100822fdbc3c90d1456bd0 and Bobby Allyn. Lawsuit: A chatbot hinted a kid should kill his parents over screen time limits. NATIONAL PUBLIC RADIO (Dec 10, 2024), https://www.npr.org/2024/12/10/nx-s1-5222574/kids-character-ai-lawsuit and Kashmir Hill. A Teen Was Suicidal. ChatGPT Was the Friend He Confided In. THE NEW YORK TIMES (Aug 26, 2025), https://www.nytimes.com/2025/08/26/technology/chatgpt-openai-suicide.html.

[40] Girouard-Hallam LN, Streble HM, Danovitch JH. Children's mental, social, and moral attributions toward a familiar digital voice assistant. Human Behavior and Emerging Technologies. 2021 Dec;3(5):1118-31.

[41] Belghith Y, Mahdavi Goloujeh A, Magerko B, Long D, Mcklin T, Roberts J. Testing, Socializing, Exploring: Characterizing Middle Schoolers' Approaches to and Conceptions of ChatGPT. InProceedings of the 2024 CHI Conference on Human Factors in Computing Systems 2024 May 11 (pp. 1-17).

[42] *"Darling, Please Come Back Soon": Sexual Exploitation, Manipulation, and Violence on Character AI Kids' Accounts.* PARENTS TOGETHER ACTION (Sept 3, 2025), https://heatinitiative.org/wp-content/uploads/2025/08/HEAT_REPORT_CharacterAI_FINAL_PM_29_09_25.pdf

[43] *Ibid.*

dependence on ChatGPT.[44] Yet, avoiding moments of interpersonal human vulnerability means that teens will lose practice in navigating core experiences that build trust and relational health.

How these insights apply to educational technology

I show these examples contrasting child-centered and engagement-based designs to frame the conversation around educational technology ("ed tech"), which can be purpose-driven and evidence-based, crafted carefully around how children learn across different developmental stages – or which can be sloppily introduced and designed around engagement. Like with children's consumer technology, the market for ed tech needs to elevate the evidence-based, effective options while policies around ed tech need to support boundaries and safety.

I am not an ed tech researcher, but I have experience with its use based on my clinical role in Developmental Behavioral Pediatrics over the past 15 years. I have had hundreds of patients with learning disabilities who have benefitted from assistive technology in the form of specialized reading tutoring programs, speech-to-text and word processing programs, and other ways technology helps them access the curriculum. Before the pandemic, I never heard complaints about ed tech from my patients' parents.

During remote learning and the rapid deployment of 1-1 devices and ed tech software, I heard many complaints from parents. Why are these devices allowing access to the very attention-grabbing consumer technologies – YouTube and video games – that my lab was studying? Why did the version of YouTube accessible to students include the whole library of videos, not just the ones teachers chose? Once children were back in the classroom, why were school-issued devices anecdotally being used as a reward or a way to keep students occupied? I have since written letters for selected patients requesting that they have only limited, intentional access to their school device during the day to prevent risk of behavioral dysregulation when they are asked to transition from this highly preferred activity.

Like I saw with consumer-facing technologies, many parents felt little agency to manage what their child had access to, didn't have transparent data about how to choose effective products, and found themselves in a battle over screen time limits and access to consumer tech platforms they would prefer their child not use, on a device they hadn't intended for their child to have.[45]

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[44] Cathy M Fang et al. How AI and Human Behaviors Shape Psychosocial Effects of Chatbot Use: A Longitudinal Controlled Study. MIT MEDIA LAB (March 21, 2025), https://www.media.mit.edu/publications/how-ai-and-human-behaviors-shape-psychosocial-effects-of-chatbot-use-a-longitudinal-controlled-study/.

[45] McDaniel BT, Gullo N, Kaiser Z, Reining L, Chang IJ, Drouin M. School-Issued Devices for Home Use in Kindergarten through 5th Grade and Parent Perceptions of Child Learning, Behavior, and Conflict. Human Behavior and Emerging Technologies. 2023;2023(1):3240832. And Page Jeffery C. 'It's just another nightmare to manage:'Australian parents' perspectives on BYOD and 'ed-tech'at school and at home. Learning, Media and Technology. 2022 Oct 2;47(4):471-84.

Recommendations:

Based on the research on child-centered design and what we have learned about families' struggles with consumer-facing technology, I offer these insights:

1. Introduction of new educational technologies should be intentional and not rushed. Ed tech products should be rigorously evaluated for safety and effectiveness – meaning, they lead to learning gains that can be generalized to real-world experiences – so that schools can find the products that will best support their learners.
2. Use of educational technologies and school-issued devices should be aligned with children's developmental needs.
    a. Assistive technology accommodations for children with specific learning needs should continue to be developed and implemented.
    b. In kindergarten and elementary school, children learn through a variety of different hands-on, social and pedagogical approaches. 1-1 devices are not needed throughout the day for children in K-5 education (except as a communication device), but could be used for supplementing instruction, provide practice and help teachers understand specific areas of learning need. Digital literacy skills can be taught as a class and through supervised time interacting with computers. At this age, distractibility is highest, so devices should have strict filter limits.
    c. In middle and high school, students reap more benefits from using software for organization of assignments, delivery of educational content, and writing/research. However, curiosity about sex, drive to connect with peers, wanting to escape the stresses of school, and mental health challenges increase in the tween and teen years, so filters need to be agile and responsive to the range of harmful and distracting content that students can access through school-issued devices – including video games, social media, and unapproved AI products. Companies who provide filtering software could be asked to achieve specific benchmarks of safety and provide transparent data about the types and frequency of distractions occurring on their devices.
    d. At all ages, ed tech products should have interactive designs that support learning without over-gamification or purchase pressure, should contain no advertising, and data practices should comply with COPPA and FERPA.
    e. At all ages, boundaries around device use are needed. School districts should consider policies regarding:
        i. Whether the device needs to go home for homework. If so, guidance on how parents can set limits around school-issued devices (e.g., WiFi limits and filters) should be provided.
        ii. Not using school-issued devices as a reward for completing work or as a way to pass the time in class. Children and teens need practice learning to self-regulate, rather than filling downtime with technology. Alternate

activities such as reading, artwork, mindfulness, etc could be offered for classroom downtime.

iii. Children who struggle with transitions away from technology should have accommodations in their IEP or 504 plan that outlines the best ways to intentionally use technology in circumscribed ways.

3. There needs to be market incentives for the high-quality, purpose-driven, rigorously-tested products to succeed – rather than whatever is lowest-cost (e.g., "freemium") or rushed to market first.
    a. One approach to this is outcomes-based payment contracting, in which the school district pays a vendor based on the learning gains demonstrated by the ed tech product.
    b. Ed tech products could undergo independent evaluation with transparent data available to teachers and parents (such as the EdTech Index), so that schools and families can know which ed tech products are actually improving outcomes and meet safety and privacy specifications. This would support market competition based on quality metrics and evidence.
4. A mix of universal guardrails – to make the ecosystem safer – and local controls are needed.
    a. KOSA includes a duty of care to design with youth needs in mind, accountability to measure and mitigate harms, and better parental controls
    b. Data privacy could be provided through updated COPPA legislation, with enforcement for platforms accessed by youth from school-issued devices
    c. Guidance could be provided from the Dept of Education on appropriate boundaries and implementation of ed tech in schools and classrooms.
    d. Local policies should be developed at the state and school district level that focus on boundaries, transparency and communication with families, and intentional ed tech implementation.
5. I am concerned that threatening federal programs like E-rate would both reduce the opportunities that come from well-designed ed tech (career connectedness, new learning opportunities) and would put other important infrastructure at risk. Schools in rural and urban communities rely on E-rate for school connectivity that supports administrative, educational, and student use. Without this support, rural schools risk losing access to the connectivity that helps reduce physical plant costs, improve administrative efficiency, and risk leaving our most vulnerable students unprepared for the tech- and now AI-infused workplace. Instead, I encourage Congress to put pressure on the source of the problem by requiring tech companies to prioritize children's well-being and safety. This would help all the downstream caregivers - both educators and parents - to help protect and support children.
6. Until industry is held accountable for creating safer and healthier products, it is important to support all downstream caregivers. For schools, I recommend supporting and

empowering both parents and educators through consistent funding for the "full bundle" of tech tools needed for safe and meaningful use of today's technologies - consistent school connectivity, curriculum-appropriate devices, cybersecurity, tech support/IT professionals, teacher professional development, and digital literacy training (for students and caregivers).