Senator Sheldon Whitehouse
Senate Judiciary Committee Hearing
"Protecting Our Children Online"
Questions for the Record
for Mitch J. Prinstein
Submitted February 21, 2023

1. Please describe your preferred legislative changes, if any, to the federal immunity granted under Section 230 of the Communications Decency Act of 1996 (47 U.S.C. § 230).

   Sec. 230 has failed to protect children. As noted in my testimony, there is evidence that some content being hosted on social media platforms is associated with mental health harms in children. APA supports the use of warning labels for adolescents. We strongly encourage platforms to take steps to prevent children from being presented with content associated with harmful impacts, especially in the event where the content is being served to children and users through automated services such as algorithms. In the absence of platforms taking action, APA believes the safe harbor under current law that protects online platforms from legal liability does not go far enough and mechanisms should be promptly put in place to protect children from the barrage of harms noted in my testimony. We are happy to discuss specific legislative and regulatory proposals that require companies to take steps to mitigate the known harms of their platforms on our children.

Judiciary Committee Hearing: Protecting Our Children Online
February 14, 2023
Questions for the Record
Senator Peter Welch

Questions for Dr. Mitch Prinstein

In addition to using personal devices at home, many children have access to technology in classrooms and use devices as part of standard lessons.

1. What research exists regarding how the use of technology in the classroom either positively or negatively affects students' mental health, physical health, learning outcomes, and behavior?

As with several areas of research involving the impact of technology, the findings are mixed. We have compiled the below set of resources for your review. I would be happy to meet with you and/or your staff to discuss further.

Evidence of the positive impact of technology use is widespread. (Brief list)

- Bower (2020, 2021) reports the beneficial use of technology for young children's cognitive and math learning, especially for those from under-resourced backgrounds.
    - Bower, C. A., Zimmermann, L., Verdine, B. N., Pritulsky, C., Golinkoff, R. M., & Hirsh-Pasek, K. (2021). Enhancing spatial skills of preschoolers from under-resourced backgrounds: A comparison of digital app vs. concrete materials. Developmental Science, 25(1). https://doi.org/10.1111/desc.13148
    - Bower, C., Zimmermann, L., Verdine, B., Toub, T. S., Islam, S., Foster, L., Evans, N., Odean, R., Cibischino, A., Pritulsky, C., Hirsh-Pasek, K., & Golinkoff, R. M. (2020). Piecing together the role of a spatial assembly intervention in preschoolers' spatial and mathematics learning: Influences of gesture, spatial language, and socioeconomic status. Developmental psychology, 56(4), 686–698. https://doi.org/10.1037/dev0000899
- Work conducted by Abrami and colleagues (2017) regarding early literacy and early numeracy software indicates that when used appropriately the outcomes of technology are consistently positive, with examples of international effects also evident.
    - Mak, B.S.Y., Cheung, A.C.K., Guo, X. et al. Examining the impact of the ABRACADABRA (ABRA) web-based literacy program on primary school students in Hong Kong. Educ Inf Technol 22, 2671–2691 (2017). https://doi.org/10.1007/s10639-017-9620-3

- A recent meta-analysis was conducted examining the overall effect of 36 intervention studies evaluating the effectiveness of educational apps for preschool to Grade 3 children. They found an overall significant, positive effect on students'

achievement (SD=.31) and similar effects when broken down by math and literacy (Kim et al., 2021).
    - Kim, J., Gilbert, J., Yu, Q., & Gale, C. (2021). Measures Matter: A Meta-Analysis of the Effects of Educational Apps on Preschool to Grade 3 Children's Literacy and Math Skills. AERA Open, 7. https://doi.org/10.1177/23328584211004183
- When ebooks contain supportive features, such as question prompts, video links, or shared note taking with peers, evidence shows that students learn more (Clinton-Lisell et al., 2023). Moreover, the more students read, the better they will read and the more they will learn, and children are more likely to read if books interest them. Digital libraries allow for a wealth of books quickly and easily available thereby increasing the likelihood students will find books they are interested in.
    - Clinton-Lisell, Virginia & Gwozdz, Lindsey. (2023). Understanding Student Experiences of Renewable and Traditional Assignments. College Teaching. 10.1080/87567555.2023.2179591.
- "Collaborativism," refers to collaborative knowledge-building process in virtual environments (Crites et al., 2020) including virtual individual brainstorming, disagreeing, debating and considering new ideas and exploration of the merits of the differing perspectives of the group members (Harasim, 2017). Through their online discourse, students are able to interact with other cultures, points of view, and those from different socioeconomic statuses. As such, collaborativism is fundamentally a socio-cultural phenomenon influenced by cultural differences afforded by the use of technology in learning (Blau et al., 2020; Crites et al., 2020; Harasim, 2017; Stockleben et al., 2016). Such collaborativism has social, psychological, and academic benefits (Ali, 2021). For example, it positively impacts students' intellectual development in early childhood and improve their long-term educational outcomes. Socially, students enhance their social understanding and acceptance. Students show more tolerance and are open to diversity. Psychologically, students have increased self-esteem and are less anxious in the learning environment. Academically, students have more satisfaction in the learning process and feel content and satisfied. Students develop high-level skills like critical thinking, analytical thinking, synthesis, and evaluation (Ali, 2021).
    - Crites, G. E., Berry, A., Hall, E., Kay, D., Khalil, M. K., & Hurtubise, L. (2020). Applying multiple frameworks to establish effective virtual collaborative teams in academia: a review and recommendations. Medical education online, 25(1), 1742968. https://doi.org/10.1080/10872981.2020.1742968
    - Harasim, L. (2017). Learning Theory and Online Technologies (2nd ed.). Routledge. https://doi.org/10.4324/9781315716831
    - Blau, I., Shamir-Inbal, T., & Hadad, S. (2020). Digital collaborative learning in elementary and middle schools as a function of individualistic and collectivistic culture: The role of ICT coordinators' leadership experience, students' collaboration skills, and sustainability. Journal of

Computer Assisted Learning, 36(5), 672–687. https://doi.org/10.1111/jcal.12436.

- Harasim, L. (2017). Learning theory and online technologies (2nd ed.). Routledge.
- Stockleben, B., Thayne, M., Jäminki, S., Haukijärvi, I., Mavengere, N. B., Demirbilek, M., & Ruohonen, M. (2016).Towards a framework for creative online collaboration: A research on challenges and context. Education and Information Technologies, 22(2), 575–597. https://doi.org/10.1007/s10639-016-9483-z.
- Ali, H. A. (2021). The impact of a program based on collaborativist learning theory on developing EFL critical writing skills and interaction among languages and translation students. CDELT Occasional Papers in the Development of English Education, 75(1), 215–252. https://doi.org/10.21608/opde.2021.208443.

- A randomized field trial with 2,850 seventh-grade mathematics students, evaluated whether an educational technology intervention increased mathematics learning. They predicted that combining an online homework tool with teacher training could increase learning. The online tool (ASSISTments) (a) provides timely feedback and hints to students as they do homework and (b) gives teachers timely, organized information about students' work. Results showed that the intervention significantly increased student scores on an end-of-the-year standardized mathematics assessment as compared with a control group that continued with existing homework practices. Students with low prior mathematics achievement benefited most.
  - Liu, K., & Wu, J. (2021). The Effect of Online Homework (IXL) on Students' Mathematics Achievement. Asian Journal of Education and Training.
- In an examination of the effectiveness of a technology-based algebra curriculum in a wide variety of middle schools and high schools in seven states, participating schools were matched into similar pairs and randomly assigned to either continue with the current algebra curriculum for 2 years or to adopt Cognitive Tutor Algebra I (CTAI), which uses a personalized, mastery-learning, blended-learning approach. Analysis of posttest outcomes on an algebra proficiency exam finds no effects in the first year of implementation, but positive effects in the second year. The estimated effect was statistically significant for high schools but not for middle schools; in both cases, the magnitude is sufficient to improve the median student's performance by approximately eight percentile points.
  - Pane, J. F., Griffin, B. A., McCaffrey, D. F., & Karam, R. (2014). Effectiveness of Cognitive Tutor Algebra I at Scale. Educational Evaluation and Policy Analysis, 36(2), 127–144. https://doi.org/10.3102/0162373713507480.
- Karno and Hatcher (2019) utilized social cognitive theory to examine computer-supported collaborative learning in early childhood. The researchers observed multiple problem-solving strategies suggesting that the collaborative learning technology enabled collective agency.

    - Karno, D., & Hatcher, B. (2019). Building computer supported collaborative learning environments in early childhood classrooms. Educational Technology Research and Development. https://doi.org/10.1007/s11423-019-09686-z
- Similarly, Kuzmina and Praizendorf (2022) sought to understand how collaborative learning technologies impacted the formation of self-awareness in preschool twins. The results showed increased self-esteem, motivation for cooperation, and decreased aggressiveness and rivalry.
    - Kuzmina, A. S., & Praizendorf, E. S. (2022). Collaborative Learning Technologies in Teaching Preschool Twins. Journal of Higher Education Theory and Practice, 22(14), 123–132. https://doi.org/10.33423/jhetp.v22i14.5540.
- Schools need to understand the critical importance of a student's sense of belonging to school (the feeling of being accepted, respected and valued in the school environment McCahey et al., 2021), and that and fostering a sense of belonging can be facilitated through technology (e.g., see Allen et al., 2018). This can be critical for some groups of students (e.g., those already ostracized, socially anxious, isolated, or lonely; see review Allen et al., 2014 and Ryan et al., 2017 for early adulthood). The same strategies that foster a sense of belonging in the classroom can also foster a sense of belonging on virtual learning platforms (e.g., students feels that the teacher-student relationship is core to their sense of belonging and that they feel like they belong most when teachers show they care, are approachable, provide emotional support as well as academic support and have a good rapport them) (Allen et al., 2021).
    - Allen, K. A., Berger, E., Grove, C., Patlamazoglou, L., Gamble, N., May, F., Wurf, G., & Reupert, A. (2022). “Ask me how I am doing, be kind, and encourage me to get involved”: Students’ perspectives for improving belonging in secondary schools. OSF Preprints. https://doi.org/10.31219/osf.io/b4q6m
    - Allen, K. A., Ryan, T., Gray, D. L., McInerney, D., & Waters, L. (2014). Social media use and social connectedness in adolescents: The positives and the potential pitfalls. The Australian Educational and Developmental Psychologist, 31(1), 18-31. https://doi.org/10.1017/edp.2014.2
    - Geary, E., Allen, K. A., Gamble, N., & Pahlevansharif, S. (2023). Online learning during the COVID-19 pandemic: Does social connectedness and learning community predict self-determined needs and course satisfaction? Journal of University Teaching & Learning Practice, 20(1). https://ro.uow.edu.au/jutlp/vol20/iss1/13
    - Allen, K. A., Kern, M. L., Vella-Brodrick, D., Hattie, J., & Waters, L. (2018). What schools need to know about fostering school belonging: A meta-analysis. Educational Psychology Review, 30(1), 1-34. https://doi.org/10.1007/s10648-016-9389-8
    - McCahey, A., Allen, K. A., & Arslan, G. (2021). Information communication technology use and school belonging in Australian high school students. Psychology in the Schools

- In online higher education spaces as well, a sense of belonging is critical for motivation and academic outcomes and mechanisms that support belonging can include fostering autonomy and competence (e.g., Geary et al 2023)
    - Geary, E., Allen, K. A., Gamble, N., & Pahlevansharif, S. (2023). Online learning during the COVID-19 pandemic: Does social connectedness and learning community predict self-determined needs and course satisfaction? Journal of University Teaching & Learning Practice, 20(1). https://ro.uow.edu.au/jutlp/vol20/iss1/13
- Using technology to support psychological services in schools should remain an ongoing consideration during times where campuses become unavailable to physically attend (Reupert et al. 2021; 2022).
    - Reupert, A., Greenfeld, D., May, F., Berger, E., Morris, Z. A., Allen, K.-A., Summers, D., & Wurf, G. (2022). COVID-19 and Australian school psychology: Qualitative perspectives for enhancing future practice. School Psychology International, 43(3), 219–236. https://doi.org/10.1177/01430343221091953
- Even the integration of artificial intelligence and education can create new opportunities to vastly improve the quality of teaching and learning. Intelligent systems that aid in assessments, data collection, improving learning progress, and developing new strategies can benefit teachers. Smart tutors and asynchronous learning can help students achieve better learning outcomes. (Hwang et al, 2020).
    - Hwang, T. J., Rabheru, K., Peisah, C., Reichman, W., & Ikeda, M. (2020). Loneliness and social isolation during the COVID-19 pandemic. International psychogeriatrics, 32(10), 1217–1220. https://doi.org/10.1017/S1041610220000988.
- Even "gaming" gets in on the action. For example, quiz apps (that can be designed as a game) are useful and effective tools that can support the acquisition and retention of semantic knowledge in different learning settings (Ruth et al, 2021).
    - Ruth, K.S., Day, F.R., Hussain, J. et al. Genetic insights into biological mechanisms governing human ovarian ageing. Nature 596, 393–397 (2021). https://doi.org/10.1038/s41586-021-03779-7

Challenges

It is also important to point out that evidence demonstrating technologies without positive outcomes exists as well (e.g., https://detaresearch.org/research-support/no-significant-difference; Tamim, et. al.) In order to explore this phenomenon extensively, David Cohen (1987) investigated the relations between educational policy and teaching practice in instructional innovations many years ago. He recognized that Instructional practice in schools is situated in a larger organization and a longer history of academic instruction than are usually considered. Cohen concluded that rather than being a failure of technology, issues such as how technology is integrated in the classroom, teachers' familiarity with the technology, and teacher's ability to teach effectively with the technology play a significant role on how impactful the technology can be. This work clarifies the

importance of supports educators need to implement technology effectively. It is also important to note, as do Wood and colleagues (2018), that technology can work as a distraction, a challenge that has to be navigated by teachers as they learn to use technology in the classroom.

In summary, it is important therefore to note, that Institutions should not look to technologies alone for significantly improving learning outcomes. Improved learning outcomes in any classroom (in-person, online, hybrid) are the result of numerous factors (learners, curriculum, teachers, technology, materials, etc.), and thus institutional decisions must take a complex systems perspective. This is not to say the technologies are not valuable in the classroom, they are, but they are just one ingredient in a complex recipe for student success.

Citations:

- Tamim, R. M., Bernard, R. M., Borokhovski, E., Abrami, P. C., & Schmid, R. F. (2011). What forty years of research says about the impact of technology on learning: A second-order meta-analysis and validation study. Review of Educational research, 81(1), 4-28.
- Cohen, D. K. (1987). Educational Technology, Policy, and Practice. Educational Evaluation and Policy Analysis, 9(2), 153–170. https://doi.org/10.3102/01623737009002153
- Wood, E., Mirza, A., & Shaw, L. (2018) Examining On-Task and Off-Task Multitasking when Technologies Support Instruction in the Classroom, Journal of Computing in Higher Education, 30(3), 553-571;
- Wood, E., Grant, A.K., Gottardo, A., Savage, R. & Evans, M.A. (2016) Software to promote young children's growth in literacy: A comparison of online and offline formats. Early Childhood Education Research Journal, 45 (2), 207-217 DOI:10.1007/s10643-016-).

2. How should educational institutions consider this research when making decisions regarding technology use in classrooms?

   The role of technology in the classroom is an ever evolving question as more research and newer technologies are developed. Below are some important considerations supported by research on how a teacher or educational administrator might evaluate the role of technology in the classroom.

   - **Fidelity to Research**
     - The proliferation of technology use in education is inescapable, and generally speaking, there is broad evidence that educational technology can support many educational objectives and aims. but how educational technology is used matters. *It needs to be grounded on research-based science of learning and developmental psychology principles.* As Hirsh-Pasek et al. (2015) argue, technology use must be grounded in science-of-learning principles that need to be included for them to actually be considered "educational." Such learning experiences need to promote active, engaged, meaningful, and socially

interactive learning in order to honor the research base. Even recommended guidelines for technology build upon principles drawn directly from what we know about learning science. For example, Aguilar (2021) suggests: 1) give students "big picture" projects instead of attempting to recreate a school-like structure; 2) embrace asynchronous activities, rather than relying on synchronous experiences that may place more burdens on families; 3) focusing on ways to connect with students; 4) learn about students and their families aside from assigning learning objectives and coursework; and 5) foster opportunities for students to play in manner that encourages them to engage with ideas, foster a sense of agency or give them opportunities to be connected to others. In addition, it is essential that technology strategy choice be based on research.

- Hirsh-Pasek, K., Zosh, J. M., Golinkoff, R. M., Gray, J. H., Robb, M. B., & Kaufman, J. (2015). Putting education in "educational" apps: Lessons from the science of learning. Psychological Science in the Public Interest, 16(1), 3–34. https://doi.org/10.1177/1529100615569721.
- Aguilar, S.J., Rosenberg, J., Greenhalgh, S.P., Lishinski, A., Fütterer, T., & Fischer C. (2021). A different experience in a different moment? Teachers' social media use before and during the COVID-19 pandemic. AERA Open DOI: 10.1177/23328584211063898
- Aguilar, S.J., Galperin, H., Baek, C., & Gonzalez, E. (2021). Live instruction predicts engagement in K-12 remote learning. Educational Researcher. DOI: 10.3102/0013189X211056884 (Impact Factor: 6.39) Informed CA Assembly Bill No. 1176 (Feb 18th, 2021)
- Aguilar, S.J., Karabenick, S., Teasley, S., Baek, C. (2021). Associations between learning analytics dashboard exposure and motivation and self-regulated learning. Computers & Education. DOI: 10.1016/j.compedu.2020.104085 1:1048576

- **Teacher Support**
  - While there is research supporting both positive and negative outcomes, the question of what impact technology use has on students depends heavily on just how interested and skilled teachers are in using it productively. That is, the impact of technology use on students depends heavily on how effectively teachers' make use of its potential. Thus, teaching training and support regarding both technical and pedagogical issues is crucial to achieving positive outcomes, issues that often do not get enough attention (Schofield, 1995; Schofield et al, 2002). Teachers should be free to define their learning goals and objectives, to use the research literature to help them select the appropriate technology to support meeting the goals, and be given opportunities to receive appropriate instruction regarding effective implementation and support especially during early acquisition.

        - Schofield, J.W. (1995) Computers and Classroom Culture. Cambridge University Press, New York
        - Schofield, J. W., & Davidson, A.L. (2002). Bringing the Internet to school: Lessons from an urban district. San Francisco. Jossey Bass.

- **Equity**
    - The educational technology landscape requires educators to better attend to differences among their students with respect to both the type of technology their students have access to (e.g. tablets, laptops, desktops), and the infrastructure they have access to (e.g. high-speed internet, a quiet place to study). This requires educators to better attend to differences among their students with respect to both the type of technology their students have access to (e.g. tablets, laptops, desktops), and the infrastructure they have access to (e.g. high-speed internet, a quiet place to study).
      This digital equity gap is persistent and has manifested in different ways based on which new technologies have become prevalent in educational settings. It results from a gap in understanding on the part of well-intentioned educational organizations that wish to implement novel, technology-driven approaches without sufficiently investigating what is possible within the communities they serve.