From big ideas to big readers:

Experts guiding innovations in literacy edtech

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Introduction

For more than 15 years, the Joan Ganz Cooney Center—an independent research and innovation lab within Sesame Workshop—has been conducting research on emerging technologies and collaborating with technologists, digital media producers, and educators to advance positive futures for kids in the digital world. This work embodies the approach Joan Ganz Cooney pioneered with *Sesame Street*: When media creators bring together developmental research and child-focused design methods, the resulting product can have a real impact on engagement and learning.

In 2023, the Center launched the Cooney Center Sandbox to help digital media innovators answer the following questions: *How do you know that what you are making is engaging and appropriate for kids? And, how do you know it will have a positive impact?* The Sandbox couples evidence-based approaches with a collaborative design method, called co-design, which invites kids into product development. Grounded in scholarly research, co-design is a creative process through which kids' ideas and views shape design, including early-stage planning, key decision making, and the re-imagining of products and features (Druin, 2002; Fails, Guha & Druin, 2013).

Beginning in 2025, the Cooney Center Sandbox is embarking on a new focus: to engage product developers targeting the science of literacy development. This project kicked off with an advisory meeting, convening key experts in literacy, educational technology (edtech), and educators to ground and commence the three-year Sandbox for Literacy Innovations.

Nine advisors gathered for an all-day meeting on November 14, 2024. This report captures highlights from the shared presentations and discussions and synthesizes key takeaways relevant for product developers who will be joining the Sandbox for Literacy Innovations over the next few years. Each advisor, as well as a handful of other experts, met with the Sandbox team leading up to this event, providing insights to shape the day's agenda and sharing important resources from academia and industry. The agenda for the advisory meeting and advisors' bios are available in the appendices at the end of this report.

OBJECTIVES OF THE SANDBOX FOR LITERACY INNOVATIONS ADVISORY MEETING

The advisory meeting gathered a distinguished panel of educators, community leaders, and researchers to offer knowledge and expertise on the following: the science of reading; the current challenges and opportunities schools face in ensuring that all kids develop fluent reading comprehension; and the promise of educational technology (edtech) to fill gaps and serve specific populations of students. The Advisory discussion sought to:

+ Discuss the current state of research on literacy development, from early childhood through adolescence;

+ Understand how the edtech field is evolving to reflect the latest learning sciences and technological capabilities and pinpoint existing gaps that could be better filled; and

+ Identify how co-design with diverse children and youth might lead to impactful and scalable research-backed literacy products.

Context and background

In her introduction to the day, Dr. Medha Tare shared how both Sesame Workshop and the Joan Ganz Cooney Center are focused on helping kids grow smarter, stronger, and kinder. One tremendous area of need for kids across the world is the development of literacy skills required to thrive in school and life. According to the 2024 NAEP assessments, 69% of U.S. fourth graders had reading levels that were basic[1] or lower. When disaggregated by race, ethnicity, and socioeconomic status, we see disproportionately lower levels of attainment for Black and Hispanic students as well as those coming from lower-income households. As troubling, only 28% of children are "frequent readers," reading five or more days per week, according to the Scholastic Kids and Family Reading Report.

Meanwhile, school districts across the country accessed more than 2,700 distinct edtech tools last year (Instructure, 2024), an increase of 8% over the prior year. Students, on average, will use 45 different edtech platforms over the course of a year. Yet the evidence of efficacy for edtech is limited, and many questions remain about the quality of these ubiquitous products (Kucirkova, 2024).

The Cooney Center launched its co-design work to support industry partners by engaging them with quality empirical research and connecting them to kids and families whose voices and participation can meaningfully shape product development.

The Sandbox for Literacy Innovations brings this approach to edtech product teams committed to creating engaging, research-aligned products that contribute to overcoming literacy gaps. In particular, the initiative will focus on supporting literacy development of specific populations of young people who would benefit from greater differentiation, additional instruction, increased relevance, and other areas of opportunity afforded by technology.

The theory behind the Sandbox is that products will be both more engaging and more impactful if developer teams 1) understand the research behind literacy development and edtech efficacy; 2) engage in co-design with kids to shape their product roadmaps; and 3) use these insights to inform measurements of success.

[1] Per NAEP, "Basic" denotes partial mastery of prerequisite knowledge and skills that are fundamental for performance at the NAEP "Proficient" level.

Research grounding

The advisory meeting included two research presentations. The first focused on edtech as a literacy learning tool. Dr. Rebecca Silverman shared high-level findings from a recent meta-analysis she and her team conducted (Silverman et al., 2024), looking at studies focused on elementary-school-based literacy interventions leveraging edtech. This presentation was intended to introduce and set up a group conversation about the current state of research on literacy and educational technology.

Following that, Dr. Jason Yip provided an introduction to co-design as a participatory design method that can be used in product research and development. This presentation was included to invite advisors to think specifically about designing for diverse students and their varied needs and to consider how co-design might generate new insights and perspectives to advance literacy learning for multilingual, neurodiverse, or older students.

Details from each presentation follow here:

PRESENTATION BY DR. REBECCA SILVERMAN
Edtech and the science of literacy development: Results from a meta-analysis
Silverman presented work she and her colleagues Kristin Keane, Elena Darling-Hammond, and Saurabh Khanna published in 2024; their meta-analysis sought to answer:

+ What are the effects of educational technology interventions on K-5 literacy-related outcomes, including decoding, language comprehension, reading comprehension, and writing proficiency?

+ Do the effects differ depending on outcome, intervention, or participant characteristics?

As Silverman shared, this research is needed because of the enormous growth the industry is experiencing, while significant questions remain about edtech product efficacy. According to HolonIQ, educational technology is predicted to become a $7.3 trillion global industry by 2025. The vast majority of teachers embed technology to support student learning, though 73% say there is insufficient information about the effectiveness of such tools (Calderon & Carlson, 2019).

Meanwhile, recent media coverage on the science of reading has brought literacy development into both public discourse and legislative focus. Silverman highlighted the importance of understanding the "science of reading" as an ever-evolving evidence-base that has demonstrated that children's reading comprehension is the product of decoding skills and language comprehension, as conceptualized in the Simple View of Reading (National Reading Panel & NICHD, 2000; Gough & Tunmer, 1986). Scarborough's Reading Rope expands the Simple View, identifying a suite of eight components under the two strands, language comprehension and word recognition which includes decoding (see Figure 1). Skilled Reading results as Language Comprehension becomes increasingly strategic and Decoding becomes increasingly automatic.

Silverman et al. identified 119 peer-reviewed articles and dissertations for inclusion in the meta-analysis; these were published between 2010 and 2023 and involved K-5 classroom interventions. These studies were analyzed for both participant and outcome characteristics, as well as intervention characteristics, including pedagogical approach, program features, program type, instructional context, and duration.

FIGURE 1: SCARBOROUGH'S READING ROPE
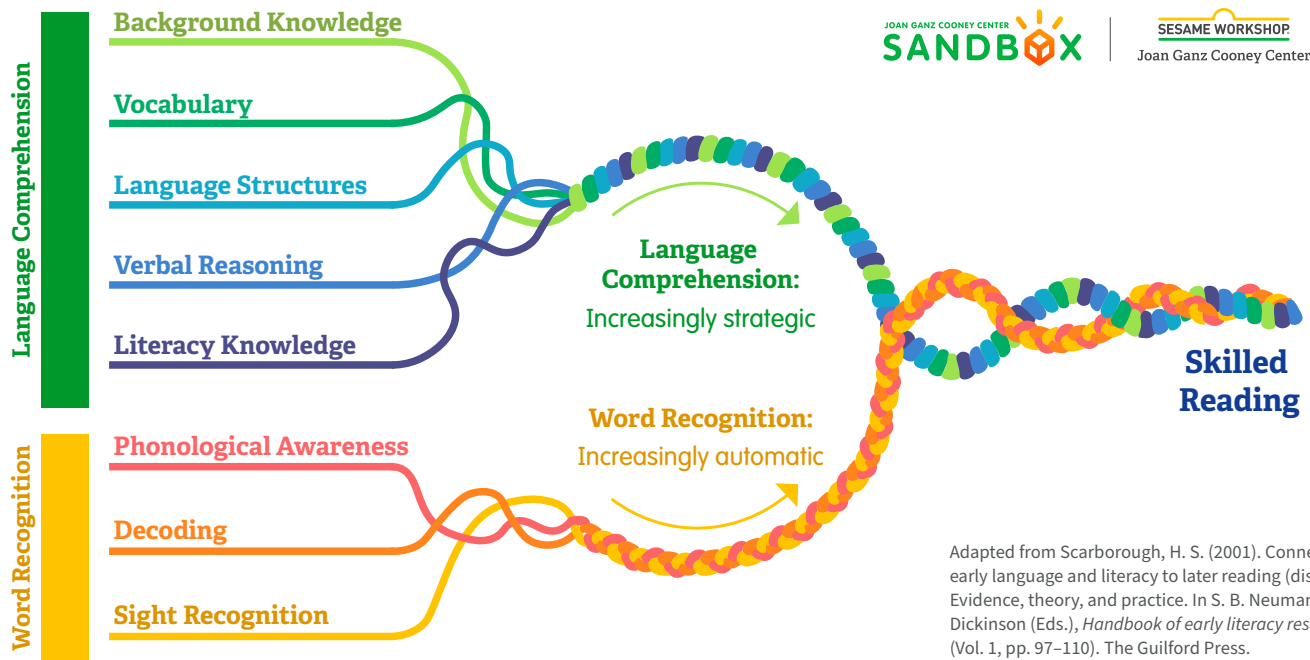
Adapted from Scarborough, H. S. (2001). Connecting early language and literacy to later reading (dis)abilities: Evidence, theory, and practice. In S. B. Neuman & D. K. Dickinson (Eds.), *Handbook of early literacy research* (Vol. 1, pp. 97–110). The Guilford Press.

The findings include:

+ There are more examples of edtech focused on decoding than on language and reading comprehension outcomes. (86 studies included in the meta-analysis focused on decoding versus 64 for language and 65 for reading comprehension.)

+ Overall, effect sizes for studies investigating decoding-focused tools were greater than those focused on language and reading comprehension. This may be explained by the fact that decoding is comprised of more discrete and narrow skills to measure, while language comprehension depends more broadly on knowledge.

+ Only six studies looked at writing proficiency; however, those showed generally strong effects.

+ Many of the programs that focused on decoding and fluency took a behavioral approach; that is, they offered repeated opportunities for practice with more closed-ended prompts. These kinds of programs supported decoding skill development.

+ In comparison, programs that focused on reading comprehension were more likely to take a cognitive approach; that is, they taught strategies and approaches for reading. For example, a study looking at a program with a web-based text structure showed it to be effective at improving reading comprehension, while another program, using video to teach strategies to bilingual learners, had preliminary results demonstrating boosts in academic language and reading comprehension in 4th and 5th graders.

+ There were few programs studied that employed a constructivist approach (i.e., open-ended and exploratory); however, those that did had positive and significant effects on language comprehension. Well-designed ebooks, for instance, offered an effective constructivist approach, leading to growth in language comprehension.

+ Importantly, effective programs often include a mix of pedagogical approaches for different components of reading.

+ The researchers were surprised to find that gamification, adaptivity, and feedback did not have positive effects on literacy outcomes. Gamification has shown mixed results, with some research indicating it can distract from learning (Takacs et al., 2015), while other research demonstrates benefits (Boggio et al., 2023). Solheim (2018) theorizes that the discrepancy in findings on gamification may be because some programs do not offer optimally adaptive or supportive feedback to learners.

+ Few studies detailed a specific sub-population for programs; however, studies that included students from lower socioeconomic backgrounds showed greater effects with decoding outcomes.

Silverman shared five key takeaways from her team's meta-analysis that she believes are relevant to the work of the Sandbox for Literacy Innovations:

1. Programs should have a clear logic model explaining what skills are targeted and how they will be targeted.

2. Programs should be developed to promote decoding, but programs are also needed to support language and writing skills and reading comprehension.

3. Programs should be developed based on what we already know (e.g., too much gamification might hinder learning).

4. Programs should be clear about how teachers and parents are involved and what kind of training or support they need.

5. Programs should be clear about how technology is designed to meet the needs of specific populations.

PRESENTATION BY DR. JASON YIP
Co-design with kids

Dr. Jason Yip, Director of [KidsTeam at The University of Washington](#), next shared a primer on co-design methodology with kids. The foundational idea of co-design is to collaboratively partner kids and adults, in balanced and equitable ways, in order to prototype and ideate on new technology designs.

Co-design is a kind of participatory research. What distinguishes co-design from other design methods is the relationship between the adult researcher and child participant. In a traditional UX research approach, the adult observes the child or may engage in dialogue, yet the power dynamics are clear: the adult is in the driver seat. Co-design offers a different model—one with the intention of inviting children's creativity, agency, and voice into the process.

In co-design, the relationship between children and adults is one of authentic partnership, described in the scholarship as "design partnerships," a notion pioneered by Allison Druin and her team at the Human-Computer Interaction Lab (HCIL) at the University of Maryland. Co-design can be distinguished from traditional user testing based on both the activities and the quality of interaction. In user testing, a child might be in the role of a tester (e.g., playtesting for usability) or informant (such as in a focus group), while the adult researcher facilitates testing, interprets findings, and observes children in play.

Yip shared the KidsTeam model of engaging kids in co-design: a cohort is recruited to work with the KidsTeam over a year, in as many as 60 sessions during which engagements range from co-creation of new technology or features in technology to more traditional user testing. Yip described activities designed to equalize social dynamics inherent between kids and adults and to encourage what he describes as "balanced" participation, in which adults and children elaborate on each other's ideas. Shared agency (amongst child and adult participants) in both ideation and decision-making is an important feature of co-design sessions.

FIGURE 2: INTERACTIONS BETWEEN ADULTS AND CHILDREN DURING CO-DESIGN SESSIONS
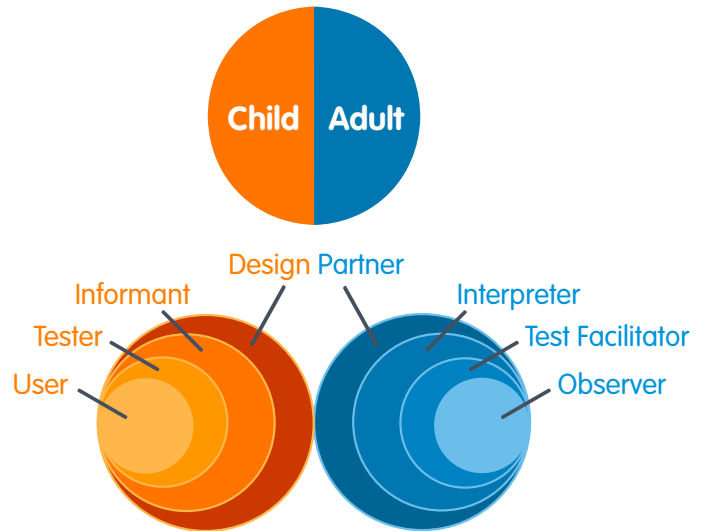
Adapted from "What's an Equal Partnership?: Examining Adult-Child Interactions in Intergenerational Participatory Design," by Yip, J.C., Sobel, K., Pitt, C., Lee, K.J., Chen, S., Nasu, K., & Pina, L.R., 2017, *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*.

Key findings from presentations and discussion

The remainder of the day involved a dialogue with the advisors as a panel, followed by breakout conversations around the needs of particular populations—multilingual, neurodiverse, and older[2] learners. Below are key findings gleaned from these conversations.

1. The science of *literacy* provides the most useful framing.

Developing robust and fluent reading comprehension begins with foundational reading skills coupled with language comprehension, as captured in Scarborough's Reading Rope. Research also indicates that writing skills and learner mindsets, such as motivation and self-identification as a reader, are central to a child's literacy development. While there is robust evidence that decoding skills matter enormously, a narrow focus on phonics is not sufficient. Writing, in particular, is an aspect of literacy development that is often overlooked. As researcher Dr. Steve Graham shared in a pre-planning expert interview, writing and reading support each other bidirectionally: developing fluent reading depends on, and is supported by, growing writing competency.

> " *The notion of "Science of Reading" focuses on critical skills—phonemic awareness, phonics, fluency, vocabulary, comprehension. I would argue that we need the addition of writing and content knowledge…. We should be talking about the science of literacy.*
> DR. SUSAN NEUMAN

> " *The science of learning has identified some key learning principles that apply to literacy learning across languages (e.g., cognitive flexibility, memory, executive functioning). These principles are underrepresented in current edtech tools.*
> DR. NATALIA KUCIRKOVA

2. Language comprehension is fundamental to reading comprehension, but products targeting language are less common.

Support for language comprehension—including building children's funds of knowledge, developing vocabulary, and making meaning from sentence structure—is a particular area of need and opportunity. At present, products focused on phonics and phonemic awareness are over-represented, while those focused on language comprehension are under-represented. Products specifically targeted to writing development will also serve to boost language comprehension.

> " *High school students are under pressure to graduate, and in order to graduate they need to be writing. Programs need to be able to support students to get through courses and graduate high school while building their literacy skills, and writing needs to be a key component of that.*
> JAHIRA ALONSO

[2] For this project, we conceptualize "older" students as those, roughly fourth grade and beyond, who have not yet reached the "decoding threshold."
See *Decoding and reading comprehension: A test of the decoding threshold hypothesis*.

> *Very often, children are first introduced to reading through storybooks, yet what we're finding through our eye tracking is, actually, the children want information. They want to learn, and it gives them a purpose for reading. They become experts in a domain, and I think that we underestimate the power of a child's desire to learn and to understand their world, and that makes reading purposeful and important.*
>
> DR. SUSAN NEUMAN

> *I cannot say enough about the need to focus on language comprehension to support all students' reading achievement. Edtech can (and should) play an important role in facilitating that development. This includes language comprehension assessments that can feasibly inform practice (in and out of school). I also want to stress that there is so much in common about how we support reading development among students from linguistically diverse homes and students from English-only homes.*
>
> DR. JEANNETTE MANCILLA-MARTINEZ

3. Efficacy begins with coherence and focus.
Edtech products need a strong logic model rooted in the science of literacy to be effective. (See "Unlocking Success: The Power of a Research-Based Theory of Change for EdTech Companies" by advisor Natalia Kucirkova for more.) These logic models should be transparent to teachers or other adults supporting the child's learning. Scarborough's Reading Rope can be used for products focused on the skills of reading, with the complex view of reading available to conceptualize reading instruction with more nuance.

One example of how lack of coherence may hinder efficacy is the role of gamification. Gamification is regularly used in edtech products. Boggio et al. (2023) suggest gamification that boosts engagement and is intentionally tied to specific learning outcomes

may have a positive effect on learning. However, gamification that distracts learners from key outcomes will detract from learning (Takács et al., 2015). A meta-analysis on digital versus analog books demonstrates the same: distracting elements detract from learning, so particular care must be paid to any feature designed to spark attention (Furenes, Kucirkova, & Bus, 2021). Having a coherent logic model from the outset to drive design and critically examining features is essential to any learning technology.

4. Educational technology for classroom use should complement teachers' instruction and supplement their expertise.
Teachers would benefit from research-based products that individually support students to progress in their reading development, aligned with evidence related to that progression. Teachers may not have complete information about research-backed practices, and they certainly lack the time and resources to individualize support and feedback for each student. School-focused edtech should dovetail with instruction, differentiate support or offer adapted tasks aligned to learning goals, and/or provide teachers (and parents) with accessible information about a child's strengths and areas of needed growth. Safety, privacy/security, and interoperability are important for school adoption, as is user testing with teachers to confirm that the product is intuitive and easy to learn.

> *We make an assumption that principals and teachers understand literacy… [But] what ends up happening is that there's a disconnect. Teachers may not know what addresses fluency, what addresses reading comprehension. The adults in the building may not know how to identify the needs of the students because they're not literacy specialists. So, in designing these things, how do you create something that's user friendly that helps teachers and the work being done?.*
>
> JAHIRA ALONSO

❝ *I think it is important to consider tools that can enable teachers to do their jobs better and easier. How can edtech support differentiation? Can embedded assessments be used for progress monitoring so students don't have to take a million more tests? Can AI-powered observation tools help teachers refine their practice based on assessment-informed instructional recommendations? (See Carol Connor's* work*.)*

DR. REBECCA SILVERMAN

5. Technology designed with diverse students' needs in mind promises to alleviate inequities in access and outcomes. Yet more innovative use of tech affordances is required.
To develop fluent reading, children need to thrive in their language development. This includes building strong vocabulary, drawing from and expanding their funds of knowledge. Dialogue and breadth of experience contribute to content knowledge, which, in turn, builds robust language development. For multilingual learners, development in the family's home language and translingual support to connect concepts and vocabulary across languages are key. Technology offers unique potential to bridge gaps, to draw from existing funds of knowledge, to scaffold content knowledge development, and to encourage family-based dialogue.

❝ *Knowledge building is independent of the language it is in, so much of that will be done in the home language. Teachers can't support every student's home language; that is an opportunity for edtech.*

DR. JEANNETTE MANCILLA-MARTINEZ

❝ *When we think about edtech, we build it for the individual kid. Where do the adults play in this as well? How do adults act as supporters or cheerleaders? How can families learn how to engage? We know dialogic inquiries are incredibly important. The advent of AI is very exciting– maybe families can learn how to ask questions of kids or begin to look at story time and other aspects of reading as a positive interaction, not as a chore that kids do.*

DR. JASON YIP

6. Particular technology-enabled approaches show strong promise for reading, yet more research is needed.
As highlighted in the meta-analysis conducted by Silverman et al., research demonstrates positive effects for particular edtech approaches and affordances.

Silverman specifically called out three approaches showing preliminary promise in the area of writing: digital storytelling (Sarica & Usluel, 2016), computer-based graphic organizers designed to promote self-regulation in the writing process (Boykin et al., 2019), and a digital writing workshop model (Aktaş & Akyol, 2020) all demonstrated positive effects. Each writing approach would benefit from further implementation and research.

Additionally, advisors noted that there has been considerably more research focused on the constrained skills of decoding than on the more complex acquisition of knowledge and skills needed for language and reading comprehension. This is an area of need and an innovation opportunity for research and industry.

Silverman et al.'s meta-analysis also indicates that products that include varied reading skills and adjust pedagogical approaches to match purpose (e.g., using a cognitive approach to teach reading strategies or a pedagogical approach to building vocabulary) hold great promise for meaningfully strengthening reading comprehension.

Finally, very few studies to date have investigated how edtech impacts student motivation and/or how engagement strengthens learning outcomes, particularly in literacy. Interestingly, while gamification is a regular design feature in edtech, with the intent of boosting engagement, the meta-analysis reveals that, across studies, gamification is not consistently correlated to learning outcomes. More research is clearly needed to understand what invites and sustains interest in learning with edtech tools, how edtech may promote intrinsic motivation and other positive mindsets such as self-identification as a reader, and how engagement online boosts interest in offline reading as well.

7. Established research on computer-assisted instruction can provide a basis for thinking about good design for AI-enabled edtech.
Research demonstrates that the kind of feedback children receive determines whether the feedback supports their learning and growth. One likely use of artificial intelligence (AI) is to personalize and differentiate feedback, such as with AI-powered tutors. While this is a new area of development, an established body of research on feedback and adaptability in computer-assisted instruction can guide best practices.

Research shows that surface-level feedback, such as "Well done!" or "Oops! Try again" is less likely to be effective than feedback that is concrete, content-specific, and actionable. Similarly, adaptive programs that simply move kids down or up a level are less effective than those that make more granular adjustments to the challenge level of content or features in response to a student's measured skills. As AI embeds in products, researchers will want to understand how the models can be best trained to offer this kind of personalized, specific alignment to skill and interest, expanding children's horizons with relevant and interesting content. As advisor Natalia Kucirkova articulated in a recent piece, "The Opportunities and Drawbacks of AI-Powered Reading Coaches, Assistants and Tutors", while AI offers great promise for personalization, more work and research are needed to connect AI-enabled edtech products to the evidence base.

> " *AI has helped teachers to grade and respond and give feedback to students… [One product we use], Amira, builds student fluency and comprehension. It is one-on-one individualized to the student. It can pick up on different dialects and give them feedback in the moment to make adjustments. AI is really helping teachers to give individualized instruction to meet the needs of kids.*
> RACHEL NUGENT

Recommendations and considerations for edtech developers

Below are recommendations for edtech developers to keep in mind, based on our expert conversations and review of the literature.

I: Articulate a logic model tied to the science of literacy

From the outset, articulate a logic model to inform the development process and clarify aims. Scarborough's Rope is recommended as a conceptual, evidence-based framework to guide the logic model of products focused on reading comprehension. Use the logic model to inform co-design sessions with kids, families, and/or teachers and to shape the product roadmap, including journey mapping, design features, assessment processes, and other points of interaction.

> *The first indicator of a positive impact of edtech is whether the tool follows a specific logic model. Are there some assumptions embedded in the tool in terms of looking at outcomes over time? Has the tool been tested in rigorous designs? Is there a literature review or some kind of evidence review behind the tool that connects the features?*
> DR. NATALIA KUCIRKOVA

2: Embed co-design in the development process

Using co-design or other participatory design methods early in the development process allows you to test theories and collaboratively build approaches that work for kids, families, and/or teachers. It's best to engage young people early in the process before investing in features or designs that are difficult to change. Involving young people from specific populations can help ensure that blind spots are addressed and needed insights are captured.

> *We were working with a school district where the students decided on a solution around mental health. They decided to co-design (with social workers) a professional development led by students, so teachers could understand what they are navigating. They wanted to help teachers help them. Adults would never design something like that. We would probably never have that thought. Students do, and different products come out on the other end when the process represents them.*
> KIMBERLY SMITH

> *Going back to the idea of agency, of choice, of preferences, and strength-based data: there are opportunities [for insights], coming directly from the children. Not necessarily being filtered through adult biases about what children should be reading or what they should be liking or how they should engage with content. There's an opportunity there to address intrinsic motivation.*
> ALVIN IRBY

> *One of the things I would suggest today is that we begin to focus on motivation, bringing children's voices more to bear in what we create in early literacy.*
> DR. SUSAN NEUMAN

3: Design for and measure motivation

Include outcomes related to student motivation and mindset as central to efficacy, in addition to defining success in terms of concrete reading skills. Partner with researchers to better understand how social-emotional measures influence kids' reading growth. Seek to design for positive states, such as self-identification as a reader, a sense of autonomy and agency, self-efficacy, and interest in learning. Use extrinsic motivators (e.g., points, wins, streaks, badges) judiciously. Determine ways to boost and measure intrinsic motivation, including through culturally relevant and developmentally appropriate content.

> *It's not just about language comprehension for design, it's much more about identity development, self-efficacy, and being able to use tools beyond extrinsic motivations. There has to be something much more core and deeper for readers than points, streaks and [extrinsic rewards] like that.*
> DR. JASON YIP

> *Students at this age are really exercising their agency. We talk about three things: voice, choice, and contribution. They may not feel agency around reading, but they feel agency around something in their life and around their voice. There's an opportunity to help them utilize their voice in different ways, in concert with the literacy activities in some way... What does it look like for me to shape and design my own kind of reading progression, to step into it in a way that I feel most comfortable?*
> KIMBERLY SMITH

> *One of the things that we heard from a lot of parents was that having Black teenage boys facilitating early literacy experiences in our program, Reading So Lit, really had an impact on the social-emotional, the motivation, the self-advocacy, the identity, and the engagement components of the reading.*
> ALVIN IRBY

4: Complement social learning

Design tools to work in tandem with children's social learning environment. Consider how your technology might complement existing efforts by teachers, parents, or other caregiving adults to support children to become fluent, enthusiastic readers. Recognize that technology cannot replace the joy and meaning-making that come from communicating and connecting with others. Think creatively about ways that technology might enhance dialogue, co-engagement, or shared experience among kids and adults.

> *The best digital books enhance the reading experience by fostering rich conversations and meaningful dialogue between children and adults. They elevate the interaction to new dimensions, creating unique opportunities for family members to connect and bond.*
> DR. NATALIA KUCIRKOVA

5: Round out the edtech ecosystem with tools focused on language comprehension and writing

Language comprehension depends on depth and breadth of knowledge, on extent of vocabulary, and on capacity to infer and interpret meaning. These are skills supported through social communication. Developing skillful writing also supports language development, particularly at the older grade levels, as children need to make sense of more complex sentence structures, syntax, and vocabulary. At present, the edtech ecosystem lacks products focused on the broad suite of skills that comprise literacy development, with most products narrowly focused on decoding. New edtech tools targeting language comprehension and writing skill development are especially needed.

Older students and multilingual learners, in particular, may benefit from technology-enhanced literacy experiences that focus on language learning by personalizing needed scaffolding (e.g., interactives to access content information, to support translingual meaning-making, to prompt strategies for deduction). AI-enabled technologies offering translingual support or nuanced adaptations based on home language and reading levels seem particularly promising.

> *There is a real need to support students, particularly in upper elementary, middle, and high school, with language comprehension. It is so complex. Could the tech world figure out how we can support kids on an individualized basis with what they need in those circumstances?*
> RACHEL NUGENT

6: Design with a key audience in mind

Many products today are designed with a general audience in mind, yet specific audiences of children and youth have particular needs and motivations that technology could help bridge. To ensure that edtech alleviates, rather than deepens, educational inequities, product teams can design with a key audience in mind, asking how the product features might make adaption or personalization possible in unique ways.

Embedding adaptive features and personalized supports– supporting Universal Design for Learning– enhances efficacy for targeted students while strengthening the value of a product for all audiences (Tare & Shell, 2019).

> *We should focus on specific populations of students, for example, what kinds of support can we include for multilingual learners to really use edtech to their advantage, like translation, collaboration tools, vocabulary or hypertext links, avatars to support comprehension.*
> DR. REBECCA SILVERMAN

> *What can a teacher use to differentiate for all students, including those struggling as well as those who are at grade-level? Newsela is a platform that allows readings to be differentiated for children's different levels, provides vocabulary support, and builds teachers' capacity for vocabulary instruction.*
> JAHIRA ALONSO

> *One example [of community-engaged work] is a randomized controlled trial... working with Spanish-speaking households to help students further develop their language comprehension skills via storytelling. It's a more organic way that families engage with their children. Book reading is fantastic, but it's not the only way that you might develop your language skills. And it's been really fabulous so far. We also have a parent workshop component where we talk about myths and misconceptions surrounding bilingual language and literacy development. There's a lot of promise in that type of community-based approach.*
> DR. JEANNETTE MANCILLA-MARTINEZ

7: Leverage AI thoughtfully

While efficacy research on AI-enabled edtech is too nascent to have been included in this meeting, many companies are developing products that incorporate AI into edtech for children and for teachers. Some possible promising use cases for AI-enhanced literacy products include:

+ Responsively adapting content and instruction based on complex student performance measures (as opposed to current, less effective approaches that shift full levels up or down but aren't capable of more nuanced leveling).

+ Providing specific, just-in-time feedback tailored to age, preferences, language, and other variables

+ Coaching students through strategies for effective reading and/or writing

+ Translingual support that helps a student access background knowledge or vocabulary from their home language

+ Offloading cumbersome or time-intensive tasks for teachers (i.e., individual assessments, analysis of assessment results) so that teachers can engage in social learning with children

" *AI is still in its infancy. We need to have rapid cycle research as things come out to understand what effects AI-powered tools are having. There are some promising areas with giving feedback. One area is developing a tool to help teachers automate feedback in writing. Another is giving feedback to teachers on how to support language.*

DR. REBECCA SILVERMAN

We invite you to learn more about the Joan Ganz Cooney Center Sandbox and our projects. Please visit joanganzcooneycenter.org/sandbox for more information.

Jahira Chambers Alonso is a doctoral candidate in the Education Leadership and Policy Studies program at New York University and a passionate education professional serving New York City Public Schools. Currently, she works as a school coach for a citywide district, supporting over 50 high schools. In this role, Jahira coaches school leaders in strategic planning, progress monitoring, and developing visions for high-quality instruction. With a background in Public Relations, Jahira has served New York City Public Schools in various capacities at both the school and district levels. Jahira's work as a school coach, combined with her research, informs her aspiration to promote teacher effectiveness and responsive professional learning.

Alvin Irby is an award-winning early childhood educator, nonprofit leader, edtech entrepreneur, and TED speaker. He is Founder and Executive Director (Chief Reading Inspirer) at Barbershop Books, a national literacy organization that inspires Black boys and other vulnerable children to read for fun. Irby has been recognized as a CNN Hero, won the National Book Foundation's Innovations in Reading Prize, and received an honorary degree from his alma mater Grinnell College for his work expanding reading opportunities for children. Irby is passionate about helping educators, librarians, and caregivers create learning experiences and environments that inspire children to identify as readers.

Natalia I. Kucirkova is a research professor affiliated with the University of Stavanger, Norway and The Open University and University College London, UK. Natalia's research takes place collaboratively across academia, commercial, and third sectors. She co-founded and currently directs the International Centre for edtech Impact that connects edtech academia and industry. Natalia is widely published on topics of edtech evidence in leading journals, including Nature and NPJ of Learning. Her research on personalized learning, early literacy, and digital books is highly cited and was covered in The Guardian, Newsweek, and The Washington Post.

Jeannette Mancilla-Martinez is an associate professor in the Special Education Department and Associate Dean for Academic Affairs and Graduate Education at Peabody College, Vanderbilt University. Her research is focused on advancing students' language and reading comprehension outcomes, including those from linguistically diverse and low-income homes. Her recent work examines the intersection of language and special education status. Jeannette was appointed to the National Assessment of Education Progress Standing Committee on Reading, is a Research Affiliate for Tennessee Education Research Alliance, and serves on the Early Literacy Advisory Council for the Tennessee Department of Education.

Susan B. Neuman is a Professor of Teaching and Learning at New York University, specializing in childhood education and early literacy development. Previously, she has been a Professor at the University of Michigan and has served as the U.S. Assistant Secretary for Elementary and Secondary Education. Her research and teaching interests include early childhood policy, curriculum, and early reading instruction, pre-K–grade 3 for children who live in poverty. Neuman has received two lifetime achievement awards for research in literacy development, is a member of the Reading Hall of Fame, and a Fellow of the American Educational Research Association. She has written over 100 articles and authored and edited 12 books. Her newest is the "Handbook of the Science of Early Literacy" (2023).

Rachel Nugent is a dedicated educator with over 17 years of experience in the New York City Department of Education. She began her career as a NYC Teaching Fellow and has taught in both district schools and a high-performing charter school, teaching elementary and middle school students across various grades and content areas. For the past three years, Rachel has served as a District Achievement and Instructional Specialist for District 14 in Brooklyn, NY, where she supports school leaders and teachers in enhancing instructional practices to accelerate student learning in literacy.

Rachel holds dual certifications in School Leadership from Hunter College, as well as a Master's Degree in Public Administration from Baruch College, and a Master's Degree in Urban Education from Mercy College.

Rebecca D. Silverman is the Judy Koch Professor of Education at the Stanford Graduate School of Education. A former elementary school teacher, Dr. Silverman's research focuses on language and literacy development and instruction in early childhood and elementary school. She is currently involved in projects related to language-based instruction for multilingual learners, computer-adaptive assessment of language and literacy skills, and the effectiveness of a supplemental digital literacy program. Her research has been published in the Review of Educational Research, Reading Research Quarterly, and The Reading Teacher. She is the current Editor-in-Chief of the Elementary School Journal; she serves on the Board of Directors for the International Literacy Association; she is affiliated with the Stanford Accelerator for Learning and the Stanford Center on Early Childhood; and she serves on the Steering Committee for the Stanford Haas Center for Public Service.

Kimberly A. Smith is co-founder and leader of the Center for Inclusive Innovation at Digital Promise,, supporting a national network of forward-thinking school district leaders working in partnership with communities to co-create solutions that advance equity and excellence for every learner. She held previous education leadership positions at the Network for Teaching Entrepreneurship, PBS, Discovery Education, and the Corporation for Public Broadcasting. She is an Aspen-Pahara Institute fellow and co-founder of the National Charter Collaborative. She serves on the boards of CatalystEd, Learner Centered Collaborative, the National Charter Collaborative, and Beacon House in Washington, DC.

Jason Yip is an associate professor at the Information School and adjunct associate professor in Human Centered Design & Engineering at The University of Washington. His research examines how technologies can support parents and children learning together through co-design, building new technologies and theories, and examining mainstream integrated home technologies. He is the principal/co-investigator on numerous federal grants from the National Science Foundation, Institute of Museum and Library Services, National Institutes of Health, and gifts from Amazon, Google, and Duolingo, totaling $18M. Dr. Yip is the recipient of the Jacobs Foundation Early Career Research Fellowship 2020 – 2022 and National Science Foundation CAREER in 2020.

Welcome	Michael Preston, Joan Ganz Cooney Center, and Alison Bryant, Sesame Workshop
Introducing the Sandbox for Literacy Innovations	Medha Tare, Joan Ganz Cooney Center
Edtech and the science of literacy development	Rebecca Silverman, Stanford University

Discussion: Opportunities for edtech solutions

Advisors

+ What are the needs in schools for K-3? 4-8? Beyond?
+ What are the indicators of quality edtech tools? Who is doing this well?
+ How should we think about the use cases for edtech focused on the broad goal of reading comprehension? In schools? In families?
+ How might community-engaged work influence our thinking?
+ How might emerging technologies (AI, voice recognition, AR, multimedia) enable different/ needed pedagogical approaches or better serve the needs of diverse populations?
+ How do motivation and other SEL factors impact literacy development? How does this evolve as children age?
+ What do we know about reading and writing on digital media and the opportunities and challenges presented with the medium?

Primer on co-design	Jason Yip, University of Washington

Breakout groups

Participants worked in three small groups to focus on multilingual, neurodivergent, or older students and were asked to consider:

What does research say about supporting this audience of kids?
+ Imagine doing co-design with this group of kids, what might we learn?
+ What are the opportunities with edtech for meeting their needs?
+ What different use cases, within a classroom or with families, can we design for?
+ What promising practices or solutions (tech or otherwise) exist?

Closing and final reflections

+ What insights from today seem particularly important to prioritize in the efforts to bring the science of literacy development to edtech products?
+ What recommendations do you have for further engagement of communities in this process?
+ What hopes do you have for the future of literacy-focused edtech to meet the needs of the children you work with? What will be needed– and avoided– to bring those hopes to life?
+ Please share any resources or research you think should be incorporated into this project's work.

Aktas, N., & Akyol, H. (2020). Effect of digital writing workshop activities on writing motivation and development of story writing skills. *International Journal of Progressive Education*.

Boggio, C., Zaher, A., & Bosse, M. L. (2023). ECRIMO, an app to train first graders' spelling: Effectiveness and comparison between different designs. *British Journal of Educational Technology*.

Boykin, A., Evmenova, A. S., Regan, K., & Mastropieri, M. (2019). The impact of a computer-based graphic organizer with embedded self-regulated learning strategies on the argumentative writing of students in inclusive cross-curricula settings. *Computers & Education*.

Calderon, V. J., & Carlson, M. (2019). Educators agree on the value of Ed Tech. *Gallup Education*.

CAST (2024). Universal Design for Learning Guidelines version 3.0. Retrieved from https://udlguidelines.cast.org

Druin, A. (2002). The role of children in the design of new technology. *Behaviour and Information Technology*.

Furenes, M. I., Kucirkova, N., & Bus, A. G. (2021). A comparison of children's reading on paper versus screen: A meta-analysis. *Review of Educational Research, 91*(4), 483-517.

Gough, P. B., & Tunmer, W. E. (1986). Decoding, reading, and reading disability. *Remedial and Special Education*.

Guha, M. L., Druin, A., & Fails, J. A. (2013). Cooperative inquiry revisited: Reflections of the past and guidelines for the future of intergenerational co-design. *International Journal of Child-Computer Interaction*.

Kucirkova, N. (2024). Unlocking success: The Power of a research-based theory of change for edtech companies. International Centre for *EdTech Impact (WiKIT)*. https://www.foreduimpact.org/thoughtleadership/theory-of-change

Kucirkova, N. (2024). Fostering children's agency in their learning futures: Exploring the synergy of generative AI and sensory learning. *First Monday*.

Kucirkova, N. (2024, April 17). The opportunities and drawbacks of AI-powered reading coaches, assistants and tutors. *EdSurge*. Retrieved from www.edsurge.com/news/2024-04-17-the-opportunities-and-drawbacks-of-ai-powered-reading-coaches-assistants-and-tutors.

Landesman, R. (2024, December 10). AI goes to school: Exploring AI's impact on personalized learning. Joan Ganz Cooney Center. https://joanganzcooneycenter.org/2024/12/10/ai-goes-to-school/

McCaffery-Pomerleau, K. A. (2024). *Unlocking the power of co-collaboration: The impact of educator involvement in educational technology development* (Doctoral dissertation, Northeastern University).

National Reading Panel (US), National Institute of Child Health and Human Development (US). (2000). *Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction: Reports of the subgroups.*

Sarica, H. Ç., & Usluel, Y. K. (2016). The effect of digital storytelling on visual memory and writing skills. *Computers & Education, 94*, 298-309.

Silverman, R. D., Keane, K., Darling-Hammond, E., & Khanna, S. (2024). The effects of educational technology interventions on literacy in elementary school: A meta-analysis. *Review of Educational Research*.

Solheim, O. J., Frijters, J. C., Lundetræ, K., & Uppstad, P. H. (2018). Effectiveness of an early reading intervention in a semi-transparent orthography: A group randomised controlled trial. *Learning and Instruction*.

Takacs, Z. K., Swart, E. K., & Bus, A. G. (2015). Benefits and pitfalls of multimedia and interactive features in technology-enhanced storybooks: A meta-analysis. *Review of Educational Research*.

Tare, M. (2024, March 8). Re-imagining reading: How reluctant readers would design their own educational technology. *Joan Ganz Cooney Center*. https://joanganzcooneycenter.org/2024/03/08/re-imagining-reading-how-reluctant-readers-would-design-their-own-educational-technology/

Tare, M., & Ruppel Shell, A. (2019). Designing for learner variability: Examining the impact of research-based edtech in the classroom. Digital Promise Global.

Wang, Z., Sabatini, J., O'Reilly, T., & Weeks, J. (2019). Decoding and reading comprehension: A test of the decoding threshold hypothesis. *Journal of Educational Psychology*.

Zielezinski, M. (2020, January 24). The missing piece: What most edtech companies need & only a few have. *Digital Promise*. https://digitalpromise.org/2020/01/24/guest-post-the-missing-piece-what-most-edtech-companies-need-only-a-few-have/

SESAME WORKSHOP

Joan Ganz Cooney Center

The Joan Ganz Cooney Center is an independent research and innovation lab within Sesame Workshop that advances positive futures for kids in the digital world. We conduct research on emerging technologies and collaborate with technologists, digital media producers, and educators to put this research into action to support children's learning and well-being. We facilitate an international network of researchers and partner with young people themselves, elevating their voices in our research and engaging them in co-designing digital media experiences. We also work directly with policy makers and investors to drive national conversations and decisions that help children thrive within our digital world.

WALTON FAMILY
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The Walton Family Foundation is at its core, a family-led foundation. Three generations of the descendants of our founders, Sam and Helen Walton, and their spouses, work together to lead the foundation and create access to opportunity for people and communities. We work in three areas: improving education, protecting rivers and oceans and the communities they support, and investing in our home region of Northwest Arkansas and the Arkansas- Mississippi Delta. To learn more, visit waltonfamilyfoundation.org.

SESAME WORKSHOP®

Joan Ganz Cooney Center

1900 Broadway
New York, NY 10023

cooney.center@sesame.org
joanganzcooneycenter.org