Designing for **Inclusion, Designing for All**
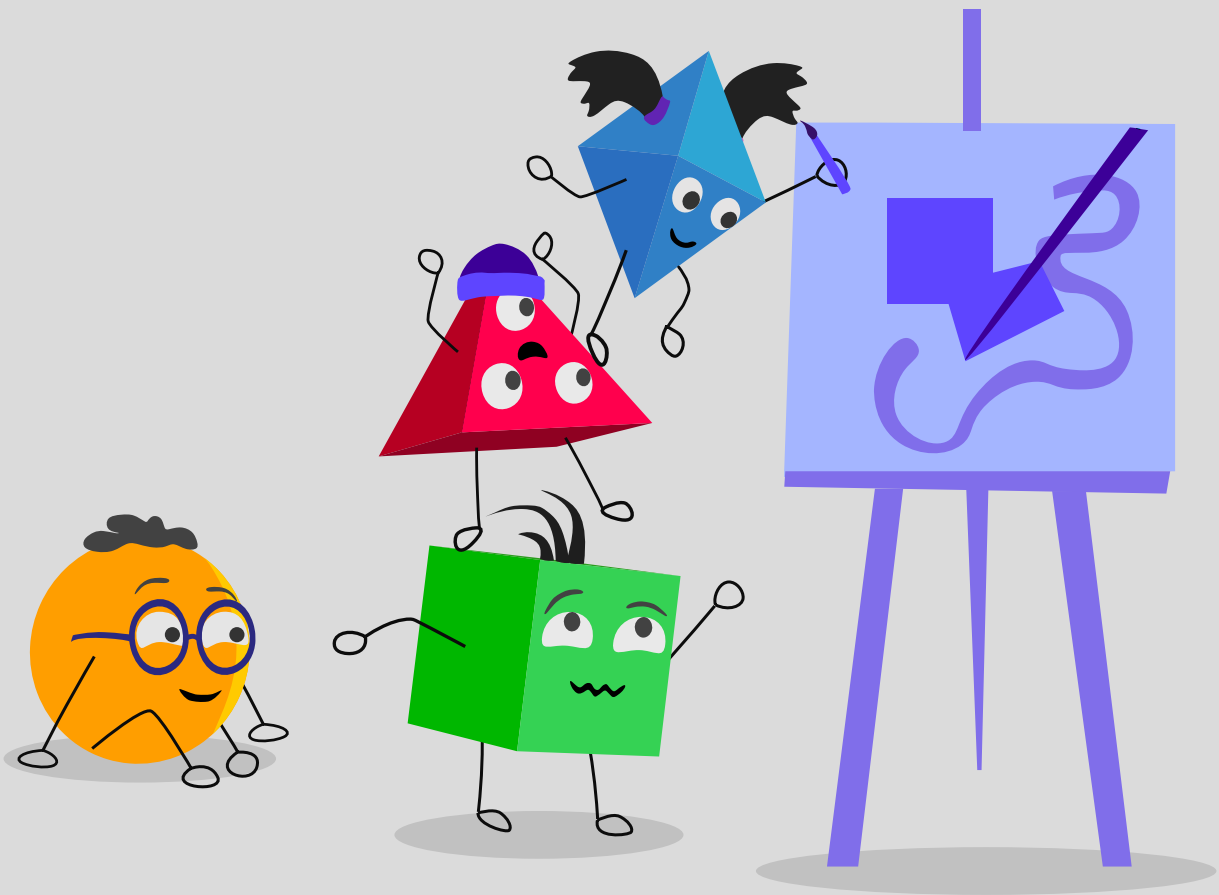
A mindset shift and practical approaches to further your journey toward inclusive design in EdTech

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Foreword

by David Rose

Technology has not been as transformative in education as it has been in many other fields. Both skeptics and advocates have argued that schools have adopted new technologies primarily to do old things. In the thoughtful and informative essay that follows, Rosenheck describes the kinds of playful design processes that will be essential in creating educational technologies that are, in fact, transformative. In this foreword, I reflect on my own history and experience with Universal Design for Learning, as I believe there is value in remembering the past as well as imagining the future.

In 1982, I was asked to lead the Medical and Educational Evaluation Center at North Shore Children's Hospital in Boston. Its purpose was to diagnose children who were failing or underperforming in school. From those children I learned several important things.

First, I learned to recognize the great heterogeneity of children who were having trouble in school. Their performance on batteries of neurological and psychological tests was as widely diverse as their performance at school. And I learned that there were not simply two or three kinds of "learning disabilities" but many different kinds of learners (what we now call neurodiversity).

Second, I learned that our "medical" approach—diagnosing children for their defects or disabilities—had significant limitations in making real change for those children. Often the new labels we gave them got mixed results, at best. Those labels often led to lowered expectations (by the teachers and the students themselves) rather than heightened expectations, social and academic exclusion rather than inclusion, all of which did not lead to real improvement in their learning.

Third, I learned that our whole diagnostic approach—the medical model—was too narrow. Its failure to take context and community fully into consideration led us to recommendations that were often misdirected and ineffective. Schools were poorly designed to manage, or benefit from, the diversity of their students. Most lessons were "one size fits all," requiring the same process and outcomes from every student, no matter the obvious differences in their preferences and abilities. As a result, a typical lesson worked well for some students, was only adequate for many, and was full of obstacles for others. The latter ones showed up at our clinic.

So, we began to focus on the obstacles as much as the abilities, for instance noticing that dyslexic students were required to study history (which might have been their passion) when all of the information and the evaluations were presented in text—the

exact medium that posed significant barriers for them. Instead of recognizing the limitations and disabilities of traditional textbooks, existing schools blamed the students, calling them unmotivated, troublesome, or "learning disabled." They flunked history and showed up at our clinic.

At about that time, personal computers started showing up in homes and a few schools. After student evaluations were completed we started informally experimenting with the "patients" on our new computers, playing around with what they could do with the technology. We found lots of ways that our diverse students could do much better when they used these new technologies. Computers could read words aloud, provide translations and captions, do spellchecks, etc.—a far cry from the outdated hurdles posed by old technologies like printed books and blackboards. Over time, we came to refocus our "diagnostics"—instead of focusing only on identifying the disabilities of students, we began to identify the barriers and disabilities in their schools, the obstacles that hindered their participation and progress. They were not hard to find. Eventually we split from the hospital to devote our full attention to providing recommendations to schools about how they could overcome their "teaching disabilities."

Through collaborations with other educators, neuroscientists, designers, technologists, children and teachers with disabilities, we developed guidelines and principles for Universal Design for Learning. But while UDL has steadily increased in prominence and recognition—now instantiated in educational policies and curricular designs throughout the world—it has not yet been fully transformative in practice.

Rosenheck's paper highlights the essential limitation. Most of the applications of the UDL principles have been adopted to make old kinds of curricula more adaptive and accessible. That is a good thing, but not enough. Bart Pisha, on our own staff, summed up the problem succinctly—we are providing equal access to boredom. This whitepaper provides the right challenge and support for learning how to design truly transformative curricula, curricula that can expand not only how, when and what we can teach—but who and why we can teach. For everyone.

The timing is right for the kinds of transformative educational technologies that Rosenheck describes, and as a community of EdTech designers and researchers, there is much to learn, and much to teach.

What I like best about this paper is that Rosenheck is a good teacher. She skillfully shares what she has learned through storytelling and case stories that not only illuminate the obstacles she has faced but models the kinds of "optimal experimentation" she has used to find solutions. Through those lived-in stories she shares, like a good teacher, not only what she has learned, but how she has learned it, and why she has learned it (the three UDL principles in action!).

This paper will help us all learn to make transformative learning technologies, and have more fun doing it!
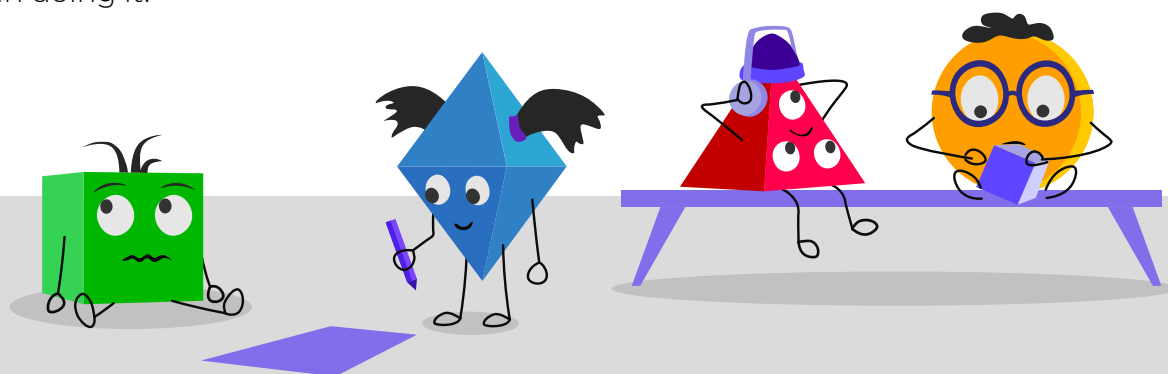
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Executive summary

Inclusive design is both a mindset and a set of approaches that can be used to create learning experiences that are flexible and adaptable, allowing all learners to shine. As society's understanding of neurodiversity has grown, so has the awareness of the need for tools that support all students to access and demonstrate their learning. Neurodiversity is the idea that there are natural differences in the way we all process and experience the world. Inclusive design doesn't mean catering to any one diagnosis or way of thinking; rather, it means designing so that everyone can engage with the experience in the way they learn best. In short, designing for neurodivergent learners means better learning for all.

EdTech has the capacity to be a powerful driver of inclusivity through adaptable and student-centered learning, but only when it is designed to do that. However, when digital learning experiences are designed only *by* one type of learner *for* one type of learner, EdTech can further cement a one-size-fits-all approach that leaves many learners excluded or unable to contribute the great ideas they may have. Frameworks like Universal Design for Learning and Learning through Play can guide educators and designers, and the methods shared in this whitepaper provide an accessible on-ramp for teams to start building more inclusion into their process.

While there are countless ways to center the needs and experiences of learners, and there is no one perfect approach, we present a set of methods used by members of the LEGO Foundation Play for All Accelerator program as they worked to increase inclusivity in their process and therefore their products.

1. Co-design

Bringing learners, especially marginalized learners, into the process as designers early on to understand their needs and base product designs on their ideas.

2. Empathy interviews

Talking to learners and other stakeholders early on in the process to understand their experience and what has and hasn't worked for them in the past.

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3. Rapid prototyping

Creating many variations of a concept and trying them out quickly and simply, to minimize assumptions and get early input on what resonates with learners.

4. Team representation

Including neurodivergent people, or those who have lived experience as a member of the target audience, on the design and development team, to contribute perspectives that may otherwise not be heard.

5. Self check

Taking time to periodically evaluate the team's own work, considering how much it is centering student voices, who may not be accounted for, and whether it aligns with the design principles, in order to keep accountable and maintain quality.

These methods, and myriad variations of them, can be implemented to result in more inclusive and accessible EdTech tools. That may mean more opportunities and modalities for learners to express their ideas, less focus on time pressure and other types of cognitive and sensory overload, multiple ways to be successful, and more. In general, inclusive design processes often result in products that allow for more student voice and choice, while still offering scaffolding and supports to keep the experience accessible.

We hope that EdTech designers and other innovators will learn from our experiences and consider how they can apply these principles and practices of inclusive design to their own work. By catalyzing change and improving practices in EdTech design, as a field we can build the EdTech of the future and support all learners to unleash their potential in the classroom and beyond.

Inclusive design at a glance
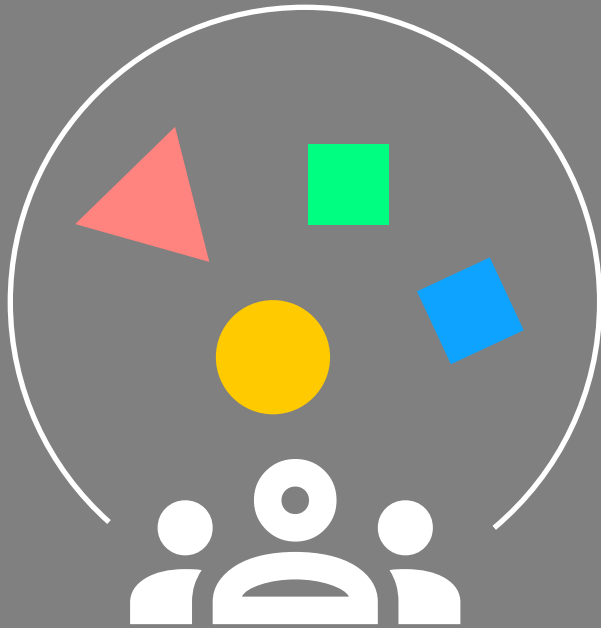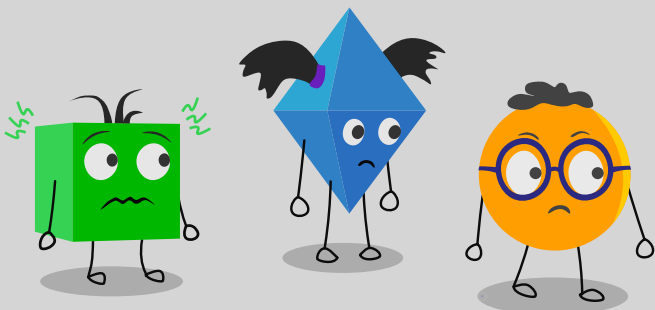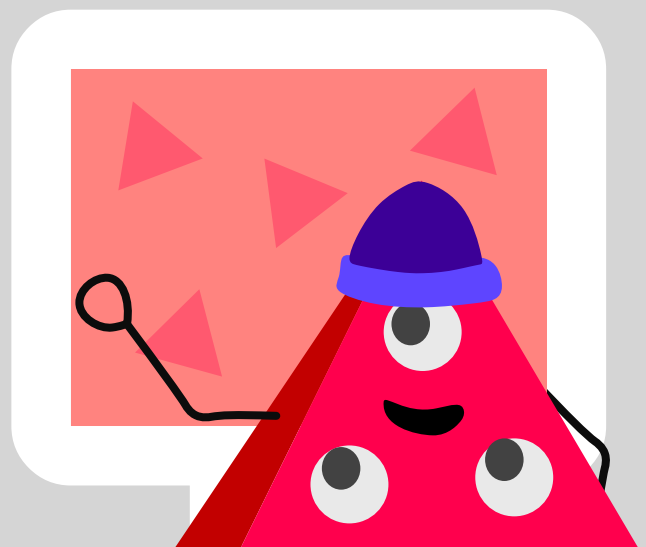
Recognize neurodiversity

Neurodiversity is the idea that there are natural differences in the way we all process and experience the world.

Many EdTech tools expect all students to follow the same path, but that path doesn't work for all learners.

Instead, digital learning experiences should be:

- **flexible**
- **customizable**
- **open-ended**
- **student-centered**

So how do we do that?

Use inclusive frameworks

Universal Design for Learning

CAST

(UDL) is a framework to improve and optimize teaching and learning for all people based on scientific insights into how humans learn.

Learning Through Play

The **LEGO** Foundation

Learning through play is how we're built to learn. And the evidence keeps growing that playing helps children master all the skills they need to thrive in our ever-changing world.

Choose inclusive methods

EMPATHY INTERVIEWS

Understand the needs and context of the user from their own voice, before developing the product.

CO-DESIGN

Include learners in your design project by democratizing decisions, sharing power and generating participatory situations.

TEAM REPRESENTATION

Include a variety of neurodivergent voices in your team that can provide valuable perspective and challenge stigma.

RAPID PROTOTYPING

Use agile methods to create many design alternatives and provide multiple opportunities for testing.
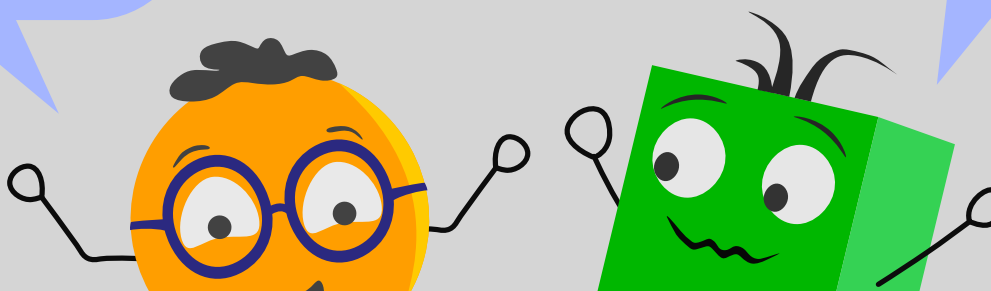
SELF-CHECK

Provide spaces for periodic team assesment to make sure that inclusive design fits in the commercial and logistical realities of your organization.

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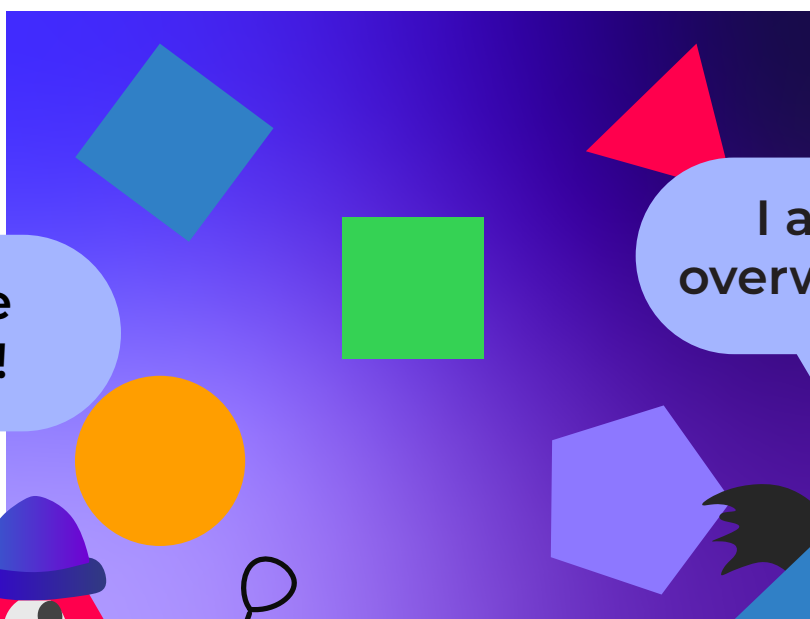# Design an inclusive product

I can choose how to express myself!

I can have big ideas!

I can define my own success!

I can take my time!

I am not overwhelmed!
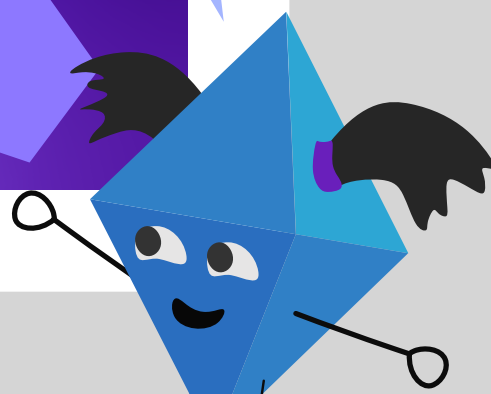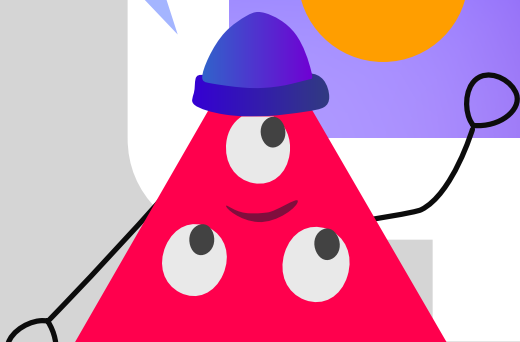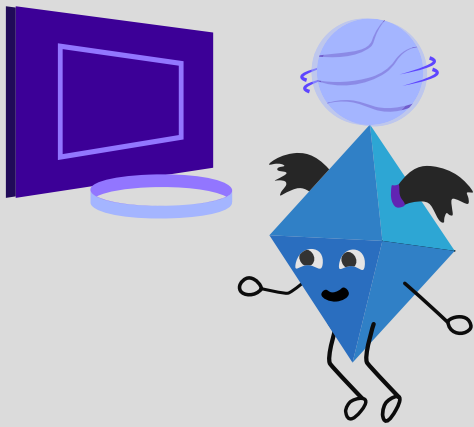
A call for inclusive EdTech

The neurodiverse classroom is every classroom. Imagine a group of 4th graders working independently on an online math curriculum. Jamal is working out problems by hand and answering the questions on the computer, easily switching between paper and screen. Jesse is struggling with the multiple choice format because there's nowhere in the software to show work or express new ideas. Kara is using the hints and diagrams given, to good effect. Aaliyah is overwhelmed by the amount of information on the screen, trying to manage the cognitive load. Everyone wants to engage and succeed, but they can't all access learning to the same degree, because each student's mind works differently and therefore processes information and constructs knowledge differently. This is neurodiversity in any classroom, and this is the challenge of the constraints that come with educational software.

Recent years have brought a growing awareness of neurodiversity—the understanding that all people's brains process information differently and that minds work in many ways. Studies show that 15 - 20 % of the population can be considered neurodivergent[1], meaning different from current sociocultural norms, and teachers recognize a serious lack of products that can effectively serve diverse learners[2]. With so much of education shifting online, what does this mean for the field of education technology and the teams developing digital learning tools for teachers and their neurodiverse classrooms?

A flexible future for EdTech

Many traditional school experiences are one size fits all, with the expectation that all students will complete the same exercises in the same way, and obtain the same knowledge. In reality, this model ends up fitting very few students. While digital learning has the potential to open up opportunities for innovative, flexible, and more meaningful kinds of learning, in practice many EdTech tools perpetuate those conventional approaches where students are served up the same or similar content in familiar, rigid formats[3].

With learning pathways and interactions dictated by the software, it can be even harder for teachers to differentiate instruction and for learners to adapt the materials to their own needs. The future of EdTech tools needs to be designed so that all learners can access learning in ways that work best for them, and so that learners can choose the most meaningful way to demonstrate their learning.

In order to achieve this, individual product teams and the field as a whole needs to design for inclusion from the start and bake it into the entire design and development process. They need to practice inclusion by design. This can be considered a major mindset shift, but it starts with small steps.

Design teams and stakeholders must first build their understanding of neurodiversity, and then explore and learn from inclusive design frameworks, such as the well-established Universal Design for Learning, and the LEGO Foundation's characteristics of Learning through Play. They should then begin to embed inclusive methods into their design process that center the voices of neurodivergent learners and provide more perspectives on what features and elements support learning for whom. Co-design and co-creation, methods that position users as experts and designers, are key parts of this process.

Empowering student choice creates better learning experiences for all

An inclusive design process will lead to more inclusive product elements, in terms of both accessibility and UI/UX design, as well as pedagogy and learning experience design. The ultimate goal of inclusive design is not to address specific needs or diagnoses by creating a separate version of a tool. On the contrary, by utilizing inclusive methods and building in inclusive elements, we can create tools that remove barriers so that every learner can engage and express themselves in ways that work best for them. What's more, adopting this mindset and approach of designing for neurodiverse learners brings about deeper, more meaningful learning for all.

In this white paper, we will share the journey of self-reflection and inclusive design that we have gone through at Kahoot! as part of the LEGO Foundation Play for All accelerator program. We will also highlight examples from others in the field who have also been a part of the accelerator program. Through this, we will present a set of inclusive design practices that anyone can adopt to move toward a more inclusive design process and EdTech products.

This white paper is meant to be both an inspiration to those in the field, communicating the urgent need for more inclusive digital learning, and a guide to empower any design team to get started on their own journey. It is meant to bring about both a systemic mindset shift and concrete additions to the design process. We maintain the vision that if more organizations adopt and develop inclusive design approaches, which gradually become standard practice, over time this will result in more accessible and deeper learning for all students. We welcome you to join us on the journey toward inclusive design for learning.

The future of **EdTech tools** needs to be designed so that all learners can access learning in ways that work **best for them**, and so that learners can choose the most meaningful way to **demonstrate their learning.**

Designing for neurodivergent learners

Neurodiversity, a term brought to popular attention by sociologist Judy Singer in 1998[4], is the idea that there are natural differences in the way we all process and experience the world. When we talk about neurodiversity, we are referring to all people and the natural diversity of our minds. When referring to specific individuals or groups, we might use the adjective neurodivergent to describe a way of being that differs from current sociocultural norms.

As our understanding of cognitive science has grown, there has been greater recognition of the inherent variability in the way we all understand the world. Alongside this, advocacy movements have brought to light the extent to which certain neurotypes have been systematically marginalized. It is important that society accepts, celebrates, and learns from diversity to create a more equitable and just world for all. One necessary part of this is creating products, services, and environments that better reflect and support the diversity of all minds.

There are many challenges that neurodivergent students face when trying to access education, but some of the most common relate to sensory processing issues and the need for executive function support. These do not stem from students' difficulty learning, but rather from the fact that classroom environments and the structure of the school day are often not conducive to neurodivergent students' learning. In fact, the biggest challenges come from a lack of peer understanding, insufficient staff training, and lack of support for particular needs. This often leads to more corrective comments and negative messages, which impacts neurodivergent students' wellbeing, and therefore their ability to fully access the curriculum. The most successful approaches to overcome these barriers are raising awareness, and bringing students themselves into the decision making process when it comes to their educational supports.

While certain neurotypes may share similar traits and are given a certain diagnosis, the type of support they require and the way they engage with learning activities are in fact unique to them and their own context. It is therefore problematic to design supports for a diagnosis as opposed to an individual[5]. For example, designing support for all autistic learners, or all children with ADHD tends not to be effective because those

people, like all people, have widely varying strengths and needs. What we can do is develop a better understanding of the myriad ways in which people experience and interact with the world and design with this in mind. This means building in flexibility and customization so that all of our users can engage with the tools in the way they find most comfortable.
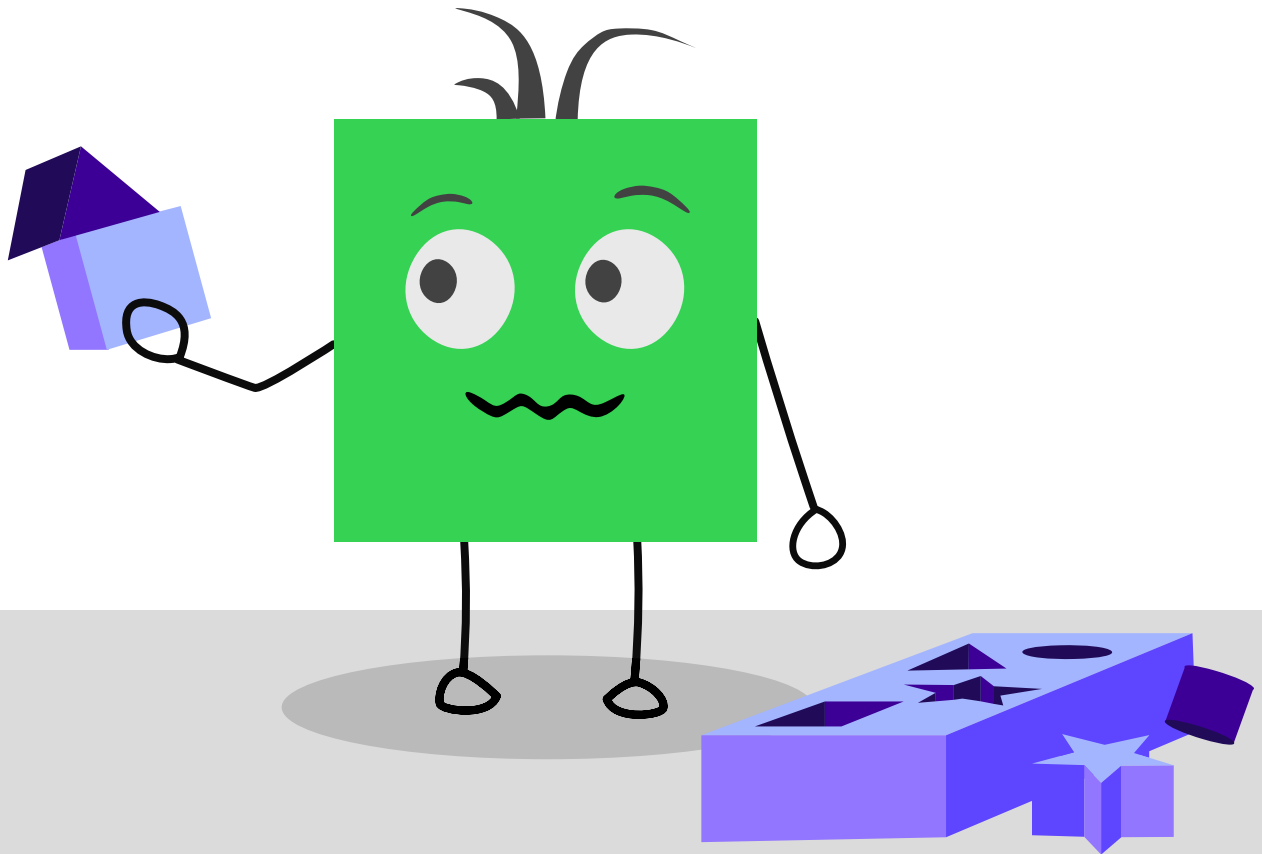
> What we can do is to **develop a better understanding** of the myriad ways in which people experience and interact with the world and **design with this in mind**.

Kahoot!: reflecting on the classic quiz format

What's the story: The Kahoot! team started by analyzing the elements of the classic quiz experience that didn't work for all students, in order to create a new, more inclusive experience.

Top takeaways: The Sparks tool was designed as an alternative to the classic quiz format, providing a platform for expression of creative ideas, scaffolded to remove barriers for diverse learners.

At its core, Kahoot! was designed to make learning fun through social quizzes, with the goal of engaging students who are often disengaged in the classroom, and that has been successful in many ways. However, over the course of our journey, we have come to realize that there are elements of Kahoot! that are fun and exciting for some learners, but actually make it tougher and more frustrating for others.

For example, the way to win in classic mode requires speed and accuracy, selecting the right answer as quickly as possible to earn the most points. For learners who take longer to process information, this can make winning a kahoot far more difficult than for their peers, because they end up with fewer points, or wrong answers if they try to rush. In addition, some entertaining elements such as background music and fast-moving screen changes can be overwhelming for those who have differences in sensory processing. This can impact the player's ability to concentrate on the task, making it more difficult to participate and essentially excluding some students from the learning experience. Having identified these areas, we set out to create a Kahoot! experience that provides more options for ways to play that allow different kinds of minds to engage and succeed.

Creating Kahoot! Sparks

As part of the LEGO Foundation Play for All accelerator program, our team at Kahoot! aimed to design a digital learning experience that was playful, inclusive, and consistent with the Kahoot! platform. We went through an inclusive design process, which directly informed concrete features and design decisions in the product. This led to the invention of Sparks, a creative ideation experience.

Using Sparks, a facilitator hosts the online experience, and participants all join from their own devices. First, a couple spark prompts are given, and participants all enter brief responses. These might be questions like "Enter an emotion word," or "What is one way you like to play?"

Next, the user-generated responses from these are shuffled up and randomly handed back out to participants, as inspiration for the creative task. The task could be something such as, "Come up with a new toy for a 5 year old based on these sparks." Participants then have time to brainstorm and write or draw to communicate their innovative idea. Finally, participants browse each other's ideas and give stickers for the attributes they like best, for example: "very creative," or "inspired a new idea".

This simple, playful mechanic creates a personalized yet scaffolded way for learners to engage in divergent thinking, creative ideation, and collaboration. Throughout this white paper, we will dig into the process we used to make Sparks as inclusive as possible for neurodivergent learners.

Understanding inclusive learning

Before even starting to design, we looked to some research-backed frameworks to help us understand what kinds of learning experiences are more inclusive of different kinds of minds and different ways of learning. Inclusive learning experiences are not just one thing; they have to be adaptable and flexible enough that many different learners can access the learning in meaningful ways. This will include designing for accessibility in the UI/UX, but also designing for different ways to access the learning mechanics, or interactions and features that bring about learning.

The two frameworks below have been particularly useful and inspiring to us and others in the Play for All cohort. They provide both a big picture of what inclusive—and therefore effective—learning looks like, as well as specific characteristics and principles that we can take as design goals. Both frameworks guide us toward deeper learning for everyone. These two frameworks are very much aligned with our core tenet that inclusive design doesn't mean designing for specific needs, but for tools that are adaptable, with multiple means of action, engagement, and expression, and a wide variety of ways to play.

Universal Design for Learning (UDL)

The UDL guidelines[6], developed by education research organization CAST, provide suggestions on how to ensure that all learners can access and participate in meaningful learning experiences. The guidelines are organized according to the three principles of UDL:

1. Engagement

Provide multiple means of engagement - learners are provided with multiple options for engaging with content which allows them to choose content and formats most relevant to them.

2. Representation

Provide multiple means of representation - content is delivered in various forms and various media, so each learner can access content in ways that work best for them.

3. Action and Expression

Provide multiple means of action and expression - learners are provided with options for how to navigate a learning experience and demonstrate their understanding, allowing greater agency.

Giving learners more choice and agency regarding how to explore a topic, practice skills, and demonstrate learning, is a vital foundation for supporting deeper learning for everyone. It may even be essential for learners who are excluded from lessons delivered in "conventional" ways[7].

A tool designed according to UDL principles will allow learners to shape their own experience, perhaps in terms of timing, media type, social interactions, etc. so that it removes barriers to learning while also providing as much scaffolding as necessary. It does not seek to make content easier. Rather, it focuses on making it easier to access. For instance, a digital tool that allows students to type, draw, or audio record their responses means everyone can share their own ideas in their own ways, which is better for both learning and assessment. Moreover, this flexibility fosters a sense of belonging, allowing learners to see their way of engaging be recognized and celebrated instead of marginalized.

Characteristics of Learning through Play

Another useful framework that can help shift our mindset with regards to what learning "should" look like comes from research driven by the LEGO Foundation—a set of five core characteristics of high quality learning through play[8]. Play provides an open-ended, malleable environment for exploration and discovery, some of the most important elements for learning and building skills. Designing an experience that provides the opportunity to take part in these five elements sets the stage for meaningful, personalized learning. This learning is strongest when the playful learning activity:

Is experienced as **joyful**

Helps children **find meaning** in what they are doing or learning

Involves active, engaged, **minds-on thinking**

Involves **iterative thinking** (experimentation, hypothesis testing, etc.)

Provides a chance for **social interaction**

Play as a pedagogical approach lends itself naturally to neurodiverse groups of learners, largely because of the agency that play affords, inviting learners to engage in ways that are meaningful to them and fit their ways of thinking. There is no one right way to play, much as neurodivergent people know there is no one right way to think or process information. For these reasons, learning through play is inherently inclusive.

For example, a game like Minecraft is not only a play experience because it's a game. Looking more closely, we see that players building structures and worlds together is active, iterative, and social, and most players find joy and personal meaning in what they do in the game. The balance of structured tools and materials with an open world environment makes it accessible for all kinds of learners and all kinds of minds to engage and play in ways that feel best for them.

Using the frameworks before, during, and after design

Frameworks such as these serve multiple purposes in guiding the inclusive design of an EdTech tool, and can be utilized at various points in the product life cycle.

Before designing: in the discovery phase

At this stage, frameworks help us understand what inclusive learning looks like, and push our thinking beyond the concrete examples we may know already.

Tip: Select a few of the characteristics or principles that can help meet your intentions for your project and set them as design principles or guiding stars. Communicate them to the whole team so everyone has a shared set of design goals.

2. While designing: in the sketching and prototyping phase

At this stage, you are putting the framework and principles into action by creating the concrete mechanics that the software allows and encourages learners to do.

Tip: As you compare different ideas and iterations of a design, and prioritize which features to include, give more weight to the interactions that align with your chosen design principles. Consider which learners those designs include, and who may still be excluded.

3. After designing: the evaluation phase

At this stage, you have created an experience, and you want to measure it against the frameworks to determine whether you see alignment or if you have missed the mark and need to revise. You should also explicitly gather feedback from your users through playtesting by asking directly if they felt the opportunity to collaborate or iterate, for example.

Tip: Do a self-check reflection to see whether your design embodies some or all of the principles in the frameworks. One way to do this is for each key design principle you chose, see if you can find 3 concrete examples of how the design embodies that type of experience.

Embedding the principles from these frameworks into your design process is a great way to bridge theory into practice. Being consistently reflective on whether your designs align with your inclusive values means that you always have a chance to revise and make the experience more social, more exploratory, more adaptable, etc. It also means that at the end of the process, you already know how to explain the value for learning in terms of inclusion and evidence-based research, which may be key information for marketing, sales, and professional development materials. Ultimately, working from evidence-based frameworks can help make the product more inclusive and therefore better for learning, as well as help articulate the rationale behind it.

Designing an inclusive design process

The first step of any design process is intentionally designing that very process—what Stanford's Carissa Carter calls "designing your design work[9]." We must decide on the methods and tools that are most appropriate to help us meet our goals. This is a key place where we can bring about a more inclusive design process, in which we center the voices of diverse learners, along with others who can provide their perspectives, such as SPED teachers or parents.

The main philosophy here is positioning the learners as experts, and putting aside our own assumptions about how they learn and what they need—a humble recognition of the limitations of our own understanding. Design teams must listen and observe to understand where our current tools may have failed some learners, and to create a vision for how we can improve learning for all. Sometimes we do this by asking directly what they need to succeed, but we also create experiences that may uncover more subtle needs and highlight missing affordances.
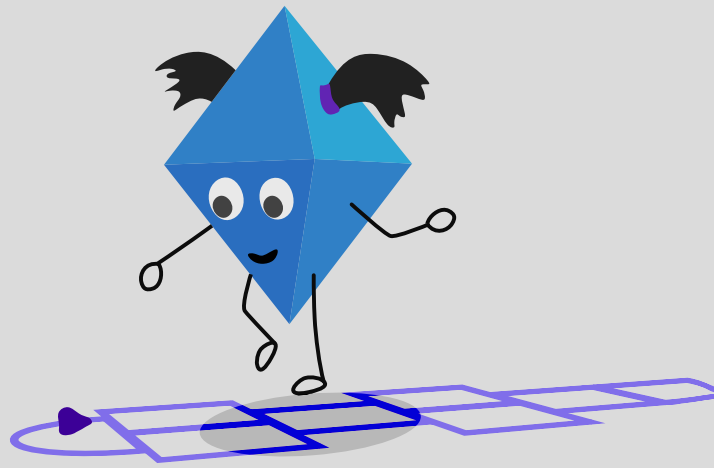
CO-DESIGN	EMPATHY INTERVIEWS	RAPID PROTOTYPING

TEAM REPRESENTATION	SELF CHECK

Co-design

One key way to create products and services that are inclusive is to include diverse learners in the design process. Co-design is a method that positions users, or learners in the case of education technology, as designers themselves. As designers—learning designers, UI/UX designers, etc.—we make decisions about how the tool should work, whose needs it serves, and what values are embedded into the experience. However, without the lived experience of the learners, we cannot truly know best what will make learners feel supported and engaged. Often we end up making assumptions based on our own identities and experiences. Naturally, as learning designers, we do have some expertise that we bring to bear about learning design, but learners also have incredibly valuable funds of knowledge, notably about the experience of learning!

The co-design method intends to democratize the decision-making process, recognizing the opinions of all stakeholders holding equal value, in order to ultimately create a product that will require less iteration, better serve the needs of learners, and be more contextually relevant. As well as the benefits to the end product, the process itself holds value for all those taking part. It is a collaborative process where everyone feels empowered, everyone learns and recognizes what they bring, while also appreciating that other perspectives are just as important. This is the idea of designing "with" our learners, as opposed to just designing something "for" them.

In the context of neurodiversity, co-design centers the experiences of neurodivergent learners, who often have very different experiences of traditional education, and have to navigate a greater range of barriers to access learning. By listening to neurodivergent learners from the beginning of the process, we can understand more about how our current EdTech tools are not meeting their needs, how they learn best, and what types of flexibility we need to build into new products.

Co-design can result in new product or feature ideas, co-created prototypes, and insights that inform a set of design principles. Co-design doesn't mean that every learner gets a version of the product designed to their specifications. Rather, it is an opportunity to create a product that can be customized as much as possible, another way of giving more power to the end users.

While many classrooms include neurodivergent students, their needs are often overlooked or marginalized, which is why in co-design we must be intentional about including a diverse range of learner identities. There are many ways to conduct this kind of co-design, and no one way is best, so it's up to designers to devise a program that fits their project. For example, designers might invite families in for a series of

workshops where parents and children brainstorm and prototype together. Or they might visit a classroom and facilitate a combination of discussions and creative design exercises that get at the design questions in their domain. Co-design can also be done remotely, as a series of virtual sessions with collaboration and community-building in between.

It's important to be aware that any format will have trade-offs. In a school setting, students may feel beholden to implicit norms. At home, they may feel influenced by the presence of a parent. In an office, they may be distracted or uncomfortable due to the unfamiliar environment. While it's important to recognize those compromises and mitigate them where possible, they do not in any way need to hold designers back from conducting co-design! No setup is perfect, but including student voice wherever possible means a more inclusive end product. To guide the decisions on how to conduct co-design sessions, we look to the principles of co-design as articulated by Kelly Ann McKercher in Beyond Sticky Notes[10]:

Principles of Co-design

1. Share power

To enable co-design, it's crucial to acknowledge and address power imbalances and share power in research, decision-making, design, delivery, and evaluation.

2. Prioritize relationships

Establishing trust through social connections and relationships among co-designers, funders, and organizers is essential for successful co-design, enabling constructive conversations that address difficult issues and improve the overall process and outcomes.

3. Use participatory means

Allow people to express themselves and participate in various ways, including using visuals, movements, and discussions, shifting participants to active partners rather than only relaying information through writings or presentations.

4. Build capacity

To help individuals learn from others, have their voices heard, and embrace new ways of being and doing, designers can transition from a position of expertise to that of a coach, recognizing that everyone can both learn and teach.

Little Journey: Young Designers and Little Leaders co-design programs

What's the story: Little Journey held Young Designers workshops in schools, and formed a Little Leaders advisory group of children in order to understand their neurodivergent users on a more personal level.

Top takeaways: Building relationships and creating the right environment makes children more comfortable opening up and sharing. Even so, researchers need to stay flexible and open to the moods and sometimes unexpected contributions of their participants.

Little Journey is a mobile application and platform designed to reduce anxiety for children and families during healthcare interactions. Their co-creation approach involved engaging with neurodivergent children in school-based workshops and playdates with families.

In schools, Little Journey collaborated closely with neurodivergent children by holding "Young Designers" workshops. To establish a comfortable and engaging play partnership, students were on the floor, researchers provided fidgets for students to play with, and participants were never pressured to engage in activities. Activities ranged from open-ended prompts such as "What is your favorite character and what superpowers do they have?" where they were free to use a whole range of materials, to playing with the developed mobile applications and giving feedback on how they felt. Their sessions were focused on the Beyond Sticky Notes principles of prioritizing relationships and using participatory means.

Group size was also an important consideration in the school context. Small groups ensure that the quality of the activity remains high. Larger groups tend to hinder individual participation, making it challenging for everyone to speak up and feel heard. Smaller groups foster intimacy and enable each participant to share their thoughts freely. Little Journey starts their sessions with about 5-7 participants in a big group activity. As the session progresses, they introduce an additional facilitator and split the group, with only 2-3 participants per facilitator. This approach allows for better facilitation and ensures each child's voice is considered.

In addition to school-based sessions, Little Journey formed a "Little Leaders" advisory group through which they also met with families to gain deeper insights into their users' lives and preferences. Team members took the initiative to meet families in familiar environments such as their homes, local coffee shops, or parks. Adding this

personal connection to the playdates allowed them to observe the children's activities and ask about the things they have around them (e.g. at home, they could even ask for tours of their toys), revealing unique details. For instance, they discovered a huge daily organizational board at the center of a child's house, which inspired a part of the app's design with checklists and rewards.

By involving families early on, Little Journey's co-design approach allowed them to move away from assumptions and build confidence that their principles and designs were rooted in the authentic needs and interests of their audience. They made sure that the workshops and playdates embodied key aspects of learning through play. The activities were socially interactive, actively engaging, iterative, meaningful, and enjoyable, ensuring a co-creation process that aligned with the needs and preferences of neurodivergent children and their families.

Especially notable was the thoughtful preparation work the Little Journey team did before the sessions. All information and activities were prepared in a variety of formats so children could choose how to engage, and they made sure children knew what was going to happen so they weren't caught off guard. In this way, the team utilized the principles of UDL not only in their product design, but in their co-design session planning too.

Lessons learned

1. Unpredictability

Students come to workshops in unpredictable states of mind. They may come ready to engage, while other times you might only get minimal input. Sometimes you lose their attention very quickly, which prompts you to swiftly switch activities. As a result, flexibility is key, and it's essential to have plans B and C prepared to ensure a smooth and meaningful co-creation process. Co-creating is about being flexible and accepting unpredictability, especially with children.

2. Natural settings

When researchers met up with families in their homes, they were surprised by how much insight and understanding could be transferred into designing their products. With a more ethnographic approach (working with people in places they are familiar and comfortable in), researchers were able to come up with richer questions about the details of the families' lives.

3. Co-creation is not about productivity

Not all sessions have to feel productive, and we shouldn't expect concrete results all the time. Neurodivergent students are less likely to have been invited to design or involved in development of products before, so they may not contribute in the way adults expect. However, it is a powerful experience for them as learners and young designers, in addition to directly informing the product. The key is to create an environment with possibilities for participants, and to keep engaging and collaborating, which will enable great inspiration to emerge.

> Co-design doesn't mean that every learner gets a version of the product designed to their specifications. Rather, it is **an opportunity** to create a product that can be **customized as much as possible**, another way of giving more power to the end users.

Case study

Kahoot!: distilling design principles from co-design sessions

What's the story: Kahoot! conducted co-design programs in two countries to understand both how neurodivergent students experience the current Kahoot!, and how they feel they learn best.

Top takeaways: Students were drawn to having multiple ways to express themselves, and getting to see their own ideas shared with the larger group. These and other insights formed a set of design principles that guided the rest of the product design process.

An important aspect of co-design is that it is conducted very early on in the design process, before any prototypes or design concepts have been created. This allows the ideas and experiences of the co-designers to influence the learning design from the start. As such, the primary goals of our Kahoot! for All co-design sessions were to understand neurodivergent learners' experience of the current Kahoot! platform, to hear from them firsthand how they learn best, and to gather ideas about ways they would want to play a new version of Kahoot!.

In order to get at these questions, researchers conducted a series of activities where students could explore, create, reflect, and share. Researchers took notes on the students' actions and discussions, and analyzed students' artifacts and teachers' impressions after the sessions. Finally, these were distilled down into a set of insights and design principles that set the direction for subsequent ideation and iteration by the design team. Working with neurodivergent students in the context of current and future Kahoot! gameplay provided anchors that we kept at the center of our work.

We conducted two co-design programs in two different regions, one in the US and one in Norway where Kahoot!'s headquarters is located. In both programs, we partnered with classes of neurodivergent students, with the teacher helping coordinate and facilitate. Each program consisted of four hour-long sessions, which gave students time to become more comfortable with the Kahoot! team members, and allowed for more hands-on activities. The early sessions were focused on relationship-building, exploring students' experience of the current Kahoot! tools, and fostering students' identities as designers themselves.

Sessions then progressed to guided activities with opportunities to share ideas and express themselves in various ways, which illuminated how students choose to learn when given a choice. Finally, the last sessions moved to much more open-ended

imagining of what future Kahoot! activities might be like. With this trajectory, we aimed to encourage students' creativity and comfort with sharing ideas, in order to let them bring their whole selves to the sessions.

Kahoot! team members participated actively with students, encouraging their ideas and probing to understand their reasoning, resulting in collaborative design sessions. This approach embodied the Beyond Sticky Notes principle of capacity building, supporting participants to grow into their own designer identity.

After the co-design sessions, the Kahoot! team members synthesized all observations, notes, and artifacts to distill the findings into actionable takeaways. Although having the students lead this process would have contributed more student voice and stronger agency, due to practical considerations like time constraints and availability of the students, this was a compromise we decided to make. In this initiative, we formed the findings into three categories:

1. Takeaways

These are common observations we saw across students and sites, which we felt could inform the authenticity and usability of our designs. For example, students had a hard time creating kahoots because the amount of information on the screen could be overwhelming. Students appreciated the option to express themselves in different media and were drawn to more visual and active modes over text. In addition, students loved seeing their own responses up on the big screen in certain question types. These insights were all things that could be applied to the design of a new learning experience.

2. Design directions

These are higher-level principles distilled from students' reflections and how they engaged with co-design activities. In our case, the concepts we saw being most important were to include different ways to play in the tool, provide students with choice and voice, and make the activities minds-on. These are all research-backed principles about how people learn, and were corroborated by student co-designers.

3. Personas

These are profiles of different learners/users, based on the students who participated in co-design sessions. They provide a reminder of students' backgrounds, interests, and abilities, and how those play into the way they access and learn from our tool. Creating personas is a common practice in UX design, and they can be made much richer and more relevant when informed by authentic connection with neurodiverse learners.

All of these outputs served to guide the rest of our design process, which is why it is essential to conduct co-design at the very beginning, to infuse student voice into the product from the start. They were easily shared with the rest of the team members, as well as other stakeholders, to help everyone understand our values and guiding stars. They also served as very useful self-checks. As we iterated on concepts, we could frequently refer back to these resources to make sure our designs were addressing these needs. By using a co-design approach, we could mitigate the risk of basing our work on assumptions, instead building confidence that our principles and designs were based on neurodiverse students' needs and interests.
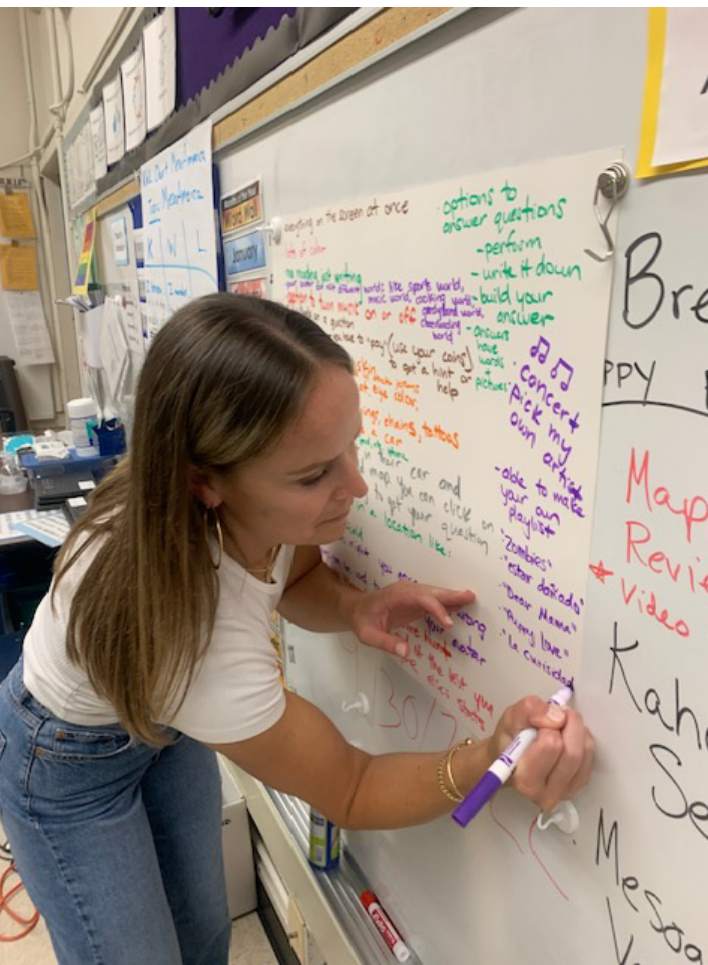
Empathy interviews

Empathy interviews are another user research method that can be a key part of an inclusive design process. Often user interviews are conducted after a product is under development, and focus on usability of the prototype. By conducting interviews early, with the goal of understanding the user's context, needs, and challenges, their lived experience can have a greater impact on the digital tool and its learning design. These users might be neurodivergent learners, or other stakeholders in the learning process such as parents or teachers.
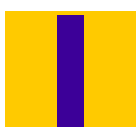
When conducting empathy interviews as part of an inclusive design process, it is important to carefully consider the questions you want to answer. Since you're not yet asking about your new product or concept, it is helpful to ask about other existing products, the person's current practices in learning and teaching, and more broadly how they think about neurodivergence and accessibility. By hearing directly from neurodivergent people and those who work closely with them, we can gain a deeper understanding of how different people access and process information, and how they perceive and interact with technology and the world. This helps create products that are more accessible and inclusive for a broader range of learners.
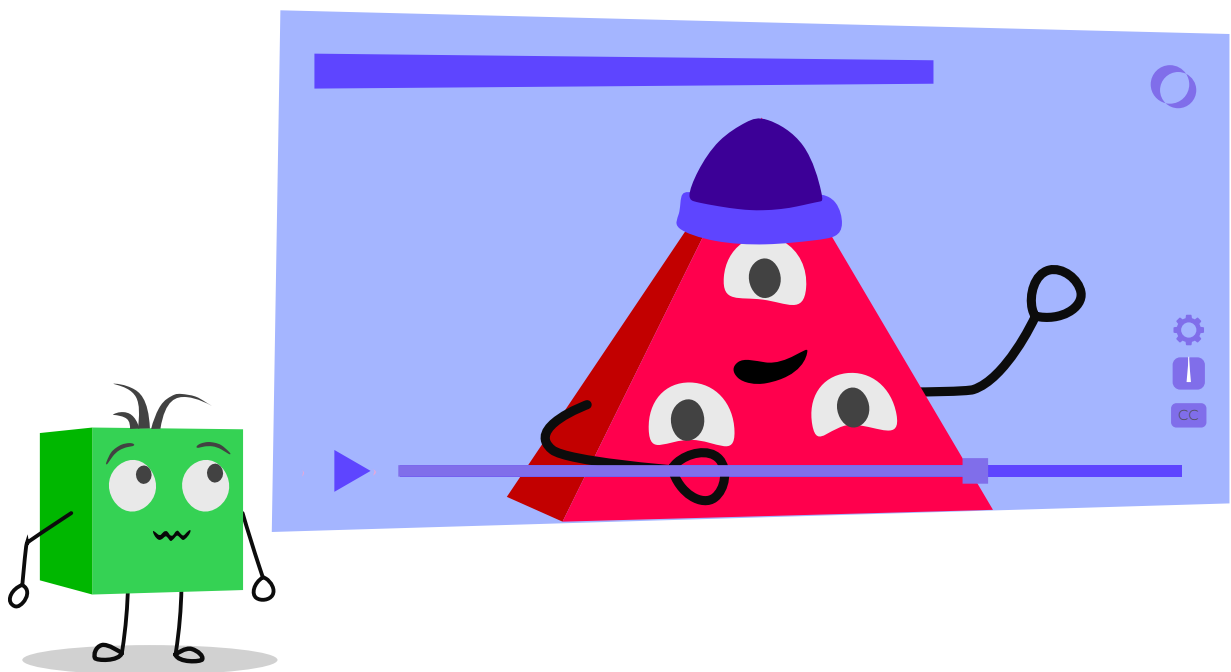
![Kahoot!]

Kahoot!: understanding the SPED teacher perspective

What's the story: Kahoot! conducted empathy interviews with special ed teachers to learn about their strategies for differentiation and inclusive elements of EdTech tools, with the goal of leveraging what works in our own designs.

Top takeaways: The importance of student voice and multiple modes of expression, balanced with a scaffolded, uncluttered experience rose to the top again, underscoring design principles gleaned from student co-design.

n the Kahoot! for All project, after conducting co-design sessions with neurodivergent students, we wanted to focus our empathy interviews on SPED teachers to get their perspective on both the needs of neurodivergent learners and the affordances of EdTech tools to support inclusive teaching. For the Kahoot! platform, the teacher perspective is very important, as teachers not only make decisions about which tools to use and how, but the classroom experience on Kahoot! is most often mediated by teachers hosting the social quiz games.

To gain a deeper understanding of classroom dynamics, we engaged with special education teachers to explore the challenges they face and the strategies they employ. These are some of the themes we heard:

1. Challenges

Neurodivergent students and their teachers face various challenges in the classroom. Socially and emotionally, students often feel left out, not treated fairly, and sometimes embarrassed about receiving special assistance. In terms of learning, there can be difficulties with staying focused, following multi-step instructions, finding motivation, and dealing with reading and writing tasks. There are also behaviors like disruptions, acting out, teasing, and fixation on screens that teachers have to handle on a daily basis.

2. Interventions

Teachers we interviewed employ a range of interventions in the classroom. These include creating structures to help students stay focused and understand their tasks, like assignment outlines, clear rules, visual checklists, guided notes, writing templates, and visual organizers such as anchor charts and thinking maps. They also design activities that are differentiated, make learning relatable, and allow for flexibility. Building positive relationships in the classroom is also a key aspect of their approach.

In order to understand what features and principles could make our new digital learning experience more inclusive, we wanted to learn from EdTech tools that are already out there. We asked teachers to describe which EdTech tools they found most inclusive—for all students, but with a focus on neurodivergent students—and which specific features made them particularly accessible.

The tool most commonly mentioned is Flip: it gives students the freedom to showcase their comprehension or respond to tasks using diverse methods like videos, text, drawings, or even audio (sometimes they even sing!). Offering these multiple options for expression benefits all students, especially those who struggle with reading and writing. Additionally, teachers utilize Flip for giving feedback. Asking questions and providing comments through videos enhances students' engagement and accessibility.

Based on these interviews, we were able to integrate these insights into our designs in the following ways:

1. Positive relationships

To promote positive relationships, we introduced a sticker system as an alternative to the podium. This approach goes beyond highlighting only the fastest and most accurate players and encourages students to recognize the diverse strengths of their peers.

2. Challenge assesment

To address challenges in staying focused, reducing anxiety, and following multi-step instructions, we structured the playing experience into a straightforward step-by-step process. We also implemented a progress bar that visually tracks the current step and utilized a timer solely for time indication instead of a strict time limit.

3. Student Choice

To allow for student choice, we offered both writing and drawing as options for responding to prompts, ideally adding voice recording later in development as well.
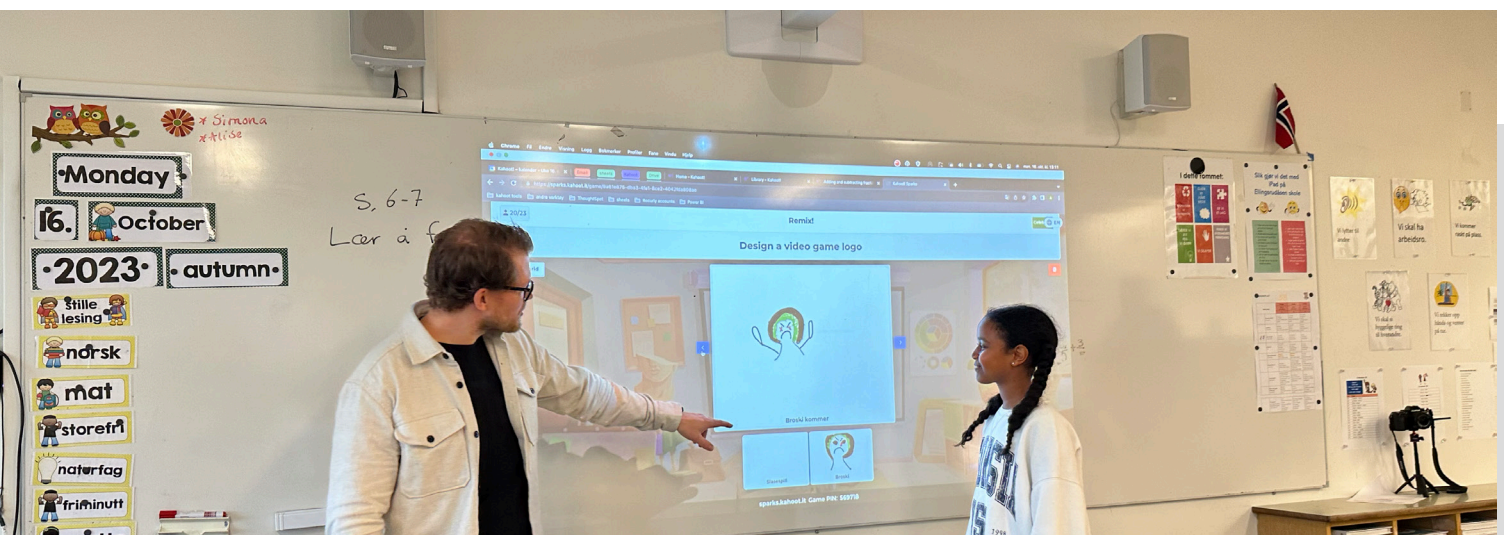
ubongo

Ubongo: perceptions of neurodiversity in African communities

What's the story: Ubongo conducted empathy interviews with a wide variety of stakeholders as proxies for neurodivergent learners and to understand the local landscape of awareness around neurodiversity.

Top takeaways: Misconceptions about neurodiversity and a lack of support systems in the community were uncovered, which underscored the importance of including more authentic portrayals of neurodiverse characters in media.

Ubongo, a dynamic social enterprise headquartered in Tanzania, is a trailblazer in the creation of educational children's TV series in Africa. Over the years, the organization has evolved with an unwavering commitment to inclusivity, striving to produce content that authentically represents the spectrum of neurodiversity and adopting innovative approaches to inclusive design.

Recognizing the need to better comprehend the unique challenges faced by neurodivergent individuals across Africa, Ubongo embarked on a comprehensive series of empathy interviews. These discussions featured a diverse array of participants, including parents of neurodivergent children, teachers, caregivers, psychiatrists, and even a dentist specializing in the care of neurodivergent kids. The interviews unveiled a shared set of challenges experienced by neurodivergent children, irrespective of their geographic location. Key takeaways included a pervasive lack of knowledge about neurodiversity, an absence of suitable support systems, and widespread misconceptions among caregivers and communities.

The most profound realization that emerged during these interviews was the imperative to center the voices of neurodivergent individuals themselves within Ubongo's work. As one team member astutely noted, "Their experiences often diverged significantly from the perceptions held by caregivers, medical professionals, and so-called 'experts.' This underscores the fact that while individuals may interact closely with neurodivergent children, a genuine understanding of the neurodivergent experience necessitates a deeper, more empathetic engagement."

This insight became the linchpin for the organization's commitment to incorporating both lived experiences and societal perceptions into its creative process. They continued to do this by incorporating additional methods such as pilot testing with diverse groups of viewers and stakeholders, and conducting a pioneering baseline

study assessing the level of understanding of neurodiversity in communities across Tanzania, Kenya, and Nigeria.

As a direct result of Ubongo's commitment to neurodiversity inclusivity and its innovative approaches to feedback gathering and research, the organization witnessed a profound transformation in its content creation process. With a genuine understanding of the challenges faced by neurodivergent individuals and a deep respect for their lived experiences, Ubongo's content has become more relevant, insightful, and sensitive.

Their experiences often **diverged significantly** from the perceptions held by caregivers, medical professionals, and so-called 'experts.' This underscores the fact that while individuals may interact closely with neurodivergent children, a **genuine understanding of the neurodivergent experience** necessitates a deeper, more empathetic engagement.
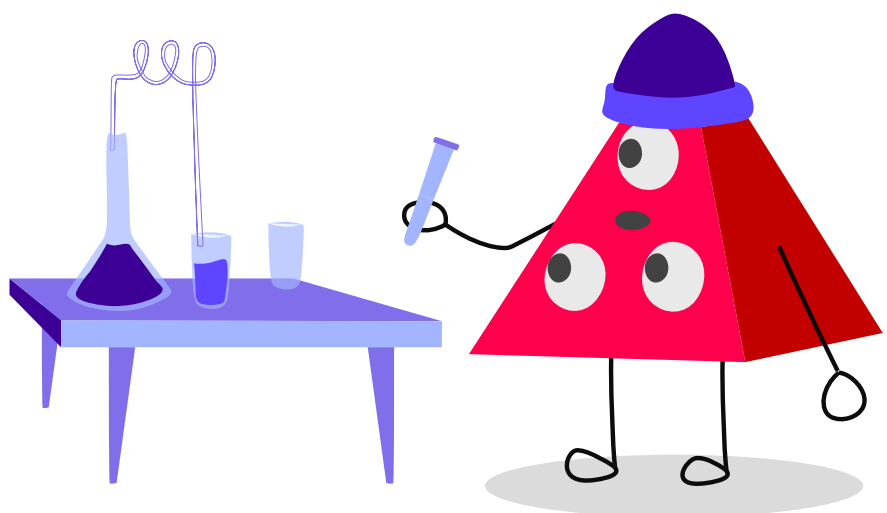
Rapid prototyping

Rapid prototyping is another common practice in product design. The process involves coming up with a wide variety of concepts, creating lo-fi (low fidelity, or not very detailed) prototypes, and testing them out frequently to see what parts of the idea are working and what needs to be changed. In this process, many ideas are put aside, while others evolve to end up with a concept which has been refined and validated by stakeholders along the way.

With some extra attention to how and where we get feedback, rapid prototyping can become an essential part of an inclusive design process. As with co-design, the goal is to mitigate the risk of our own assumptions about what works for diverse learners. By testing out a variety of ideas to see how people understand the mechanics and how they adapt the format in practice, we get insight into which ones create a learning experience in line with our design directions and success criteria.

Another key outcome of rapid prototyping is understanding how best to streamline and scaffold the learning process for neurodiverse learners. People who process information in different ways and engage with a task in different ways may need directions to be simplified or guided, and they may need supports to be successful in the activity. These are key elements to an inclusive EdTech tool, and can be refined through the rapid prototyping process.

Kahoot!: playtesting paper prototypes early and often

What's the story: Rapid prototyping is a way to test assumptions about which designs and mechanics will resonate with neurodiverse learners before getting too attached to any one idea.

Top takeaways: While playtesting can't ensure that a design will work for every possible learner, it provides invaluable feedback on how close a prototype is getting toward the design principles, and how flexible it is in the hands of teachers and students.

In the Kahoot! for All project, we brainstormed and tested out a variety of ideas before landing on two final prototypes. To quickly get insights into these ideas, we storyboarded the interactions and mocked up some simple MVPs to get initial feedback from a diverse audience including our internal team, special education teachers, inclusion classroom students, play advisors from the LEGO Foundation, and advisors from the National Association for Special Educational Needs (NASEN) based in the UK. From there, we worked with teachers to design simple "paper prototypes" to play in their classrooms, which largely meant students writing on post-its or pieces of paper.

"Mix and Match" was a question type that allowed players to pair items together. The items could be generated by the admin (e.g. teachers) and/or by the players themselves by writing or drawing. The matching format was highly flexible for teachers to adapt it in multiple ways, such as for students to review concepts or make new connections. In one case, students matched positive strength words to their friends' names. Some students walked away with a newfound self-confidence from their peers' affirmations.
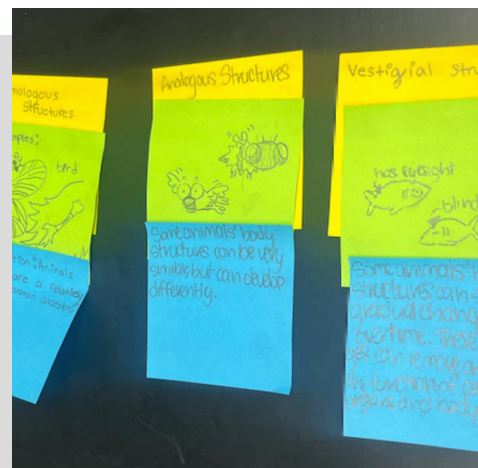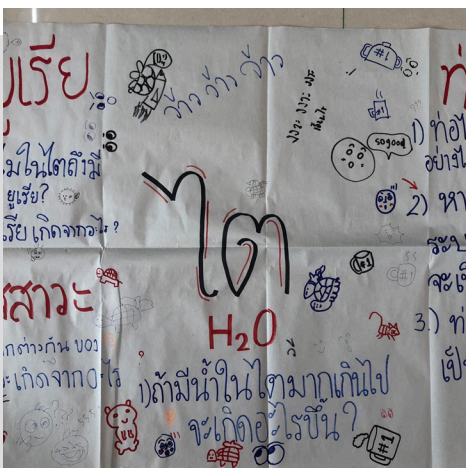
"Word Tile" was a question type that lets players form a phrase, sentence or question based on available words. Admin or players can input the words themselves and work based on the constraints. In one case, teachers had students work with question starter words and keywords from a unit. Students formed questions for each other to answer and the discussion quickly turned into feedbacking what a good question should look like.
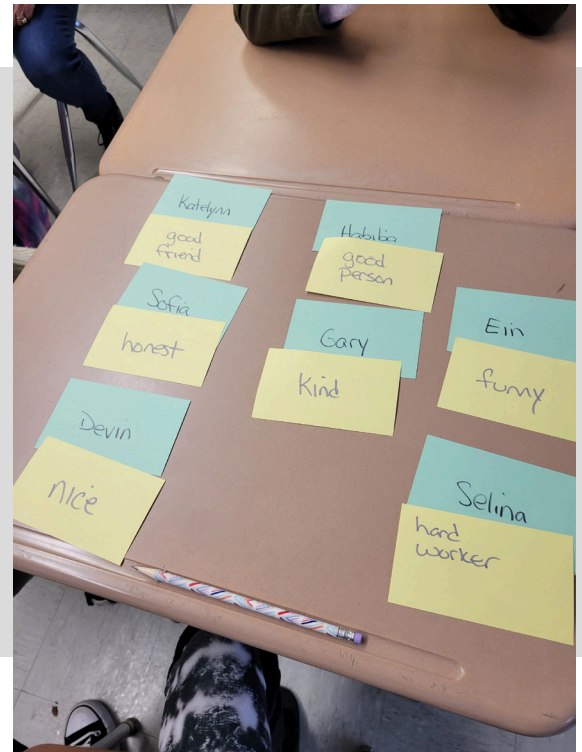
While Mix and Match was quite flexible, the mechanism did not optimally utilize the affordances of technology. On the other hand, Word Tile was a touch too complicated and limiting. Based on the feedback from both teachers, students and advisors, we redesigned a new mechanism that upped Mix and Match's complexity and Word Tile's flexibility. Sparks is the final product that is more inclusive in the following ways:

> Players are not creating answers from scratch but instead will be **connecting ideas** and putting them together in their own way.

> Players generate the input (sparks) and hence, the **constraints are based on the groups' and players' knowledge**.

> Players will have the option to express their responses through **typing, drawing, or both.**

Pulling back from the specifics of the lo-fi prototypes we tested, the main idea of rapid prototyping is in line with the goals of co-design: to recognize that the design team is coming in with assumptions due to a lack of lived experience as a neurodivergent learner; and that to create a more inclusive experience, we want to get input from students themselves early and often in the process.

Team representation

Diversity and representation are important in any context and for any team, and perhaps even more so when designing for an often marginalized group of learners who may not have the chance to advocate for themselves. Including neurodivergent people on the internal design team is a powerful way to have more representation in the process, often resulting in more inclusive and accessible products.

People with lived experience of neurodivergence who are comfortable reflecting and sharing with others can be a great asset to a team. They bring unique perspectives and skills that may help question assumptions and find solutions that improve the product for many learners. For example, individuals with dyslexia or ADHD may provide insights into how to design interfaces and content that are more readable and accessible to people with similar cognitive profiles. Similarly, individuals with autism or sensory processing differences may bring a heightened attention to detail that can be beneficial for catching errors and inconsistencies in the technology. With a neurodiverse team, EdTech tools can be designed to be more flexible, accommodating, and personalized to meet the needs of a wide range of learners.

Moreover, bringing on neurodivergent team members can help to challenge stigmas and misconceptions about neurodiversity. Inclusive EdTech requires a deep understanding of the diverse needs and experiences of learners, and having neurodivergent team members can provide critical insights and contributions towards this goal. People willing to take on that advocacy role can not only impact the product design directly, but also build understanding for others in the organization.

This internal capacity building can result in a team and entire organization that knows the importance of inclusive design, and can speak up for the considerations and differentiation necessary to support all learners. Ultimately, valuing the perspectives and knowledge of neurodivergent team members can both directly and indirectly lead to higher quality products and more inclusive services.

Social Cipher: representation matters at all levels

What's the story: Social Cipher strives for representation not only through neurodivergent game characters, but through neurodivergent team members who contribute in a wide variety of roles.

Top takeaways: Team members who have lived experience with neurodiversity bring another level of understanding and reflection to all aspects of product design, user testing, curriculum development, and business functions.

Social Cipher is a space-pirate adventure game designed to facilitate social-emotional learning (SEL) for neurodivergent youth and their advocates, including counselors, teachers, and mental health professionals. Their goal is to help neurodivergent youth develop a healthy sense of self and find their place in the world without the need to conform to neurotypical norms.

Social Cipher's team is composed of 40 % neurodivergent individuals, including game developers, artists, social-emotional learning experts, and the founder who is autistic herself. The team members bring their unique perspectives and expertise, which leads to ideas and knowledge that help cover everything from accessibility to character development.

Even though they conduct extensive playtesting, piloting, and interviews involving nearly 300 self-advocates, youth, and professionals within the neurodivergent community, the internal team is still essential to make sure the game characters with neurodiverse traits are portrayed authentically and that their agency and individuality are emphasized.

During the development phase, the team responsible for visuals and storytelling actively collaborates with their SEL consultant, an autistic psychologist who has worked with neurodivergent youth and their families, to advise on character development and portrayal. For instance, they discuss questions like how the caretaking relationship between Ava, the main character, and her Captain should appear, how Ava's stimming behavior should be depicted, and how a selectively speaking autistic character would express their emotions.

Following the initial drafts, they conduct several review sessions involving different neurodivergent team members for feedback. These sessions typically include at least two neurodivergent members to ensure that one person's perspective doesn't dominate the discussion and shape the entire experience. The feedback provided mainly focuses on finding the right balance of information to avoid overwhelming the

player, identifying aspects that might not be intuitive, and assessing how relatable the experience is to a neurodivergent audience.

It can be difficult to have student co-designers and other stakeholders available at all times for feedback and in-depth evaluation of each design iteration. For this reason, having internal team members who themselves are neurodivergent provides another layer of authenticity and inclusivity to the product.

Self check

An additional practice that can keep a team accountable to the inclusion principles and goals they have set is to conduct periodic self checks. Inclusive design principles do sometimes compete with other commercial and development priorities—co-design may feel like it slows down the process, and accessibility features may be challenging to fit into a product roadmap. Sometimes in the rush of development, some of the depth of inclusive design and deep learning may get lost or watered down. This is a normal part of the process, and something that should simply be recognized and corrected where possible.

To make self-checks most effective, the team should lay out their agreed upon goals, or north stars, at the start. This may be in the form of design directions, organizational values, or success criteria for a specific feature or product. Ideally, these criteria are informed by inclusive design practices discussed previously, so that everyone knows what they are based on, and that they were not chosen arbitrarily.

After a round of paper prototype testing or a development sprint, the team can take a few minutes to go through each of those criteria and discuss how much they feel the current design embodies or achieves that goal. Often this reflection results in a realization that something that is valued has become less strong, which gives the team a chance to strengthen it, keep an improvement in the backlog, or handle it another way.

Self-checks are therefore a simple practice of reflection during the design process, rather than debriefing only at the end, in order to revise frequently and thereby adhere to the inclusion goals the team has agreed upon. This practice builds on all the other inclusive design methods to ensure those design goals are met.

Inclusive learning design in products

We have just explored several methods to make our design process more inclusive of neurodiverse learners and different kinds of minds. Next, we examine some of the possible results. That is, when an inclusive design approach succeeds, what does it look like in the end product?

Of course, there is no one way to design a learning experience that is inclusive, but we share here several types of inclusive learning designs, with examples that emerged during the development of our Sparks tool. These examples will focus less on accessibility in the UI/UX, although that is also an important consideration, and more on the mechanics of the learning design. By examining the kinds of thinking, synthesizing, and creating the technology enables learners to engage in, we can evaluate to what degree it allows for flexibility and customization.

These examples emerged from our own inclusive design process, and are aligned with the UDL principles. The UDL framework recognizes that different learners require different ways of accessing information, demonstrating their knowledge, and engaging with learning materials. By incorporating multiple means of representation, expression, and engagement, UDL enables educators to provide all learners with the tools and strategies they need to succeed. This approach fosters a sense of belonging and promotes equity by valuing and celebrating the unique strengths and abilities of all learners. So when we look at the features and elements in a product, we want to see those same affordances shining through.

Express yourself

Offering multiple modes of expression is essential in creating inclusive EdTech as it allows learners to express themselves in ways that work best for them. For example, some learners may find it easier to express themselves through writing, while others may prefer verbal communication or drawing. Offering a variety of options can accommodate diverse learning styles and cognitive profiles, making learning more accessible and effective for all learners. In the Sparks tool, we allow students to give their responses by writing or drawing, with audio recording or speech-to-text slated to be added in future updates. This design choice was directly influenced by the co-design sessions in which students showed a preference for modes of expression other than writing.

Big ideas

Another angle on multiple modes of expression is the idea that not everyone should have to give the same answer, and that there are many ways of getting a question "right". The classic Kahoot! quizzes, as they are most commonly used, are made up of questions that have one right answer, which doesn't allow for students who think in different ways to unleash their creativity and be themselves. For this reason, with the Sparks tool we wanted to open up the platform to include an open-ended format that encourages students to ideate and share their creative ideas, demonstrating their learning however makes sense to them.

Take your time

Many students don't think well under pressure. Sometimes this may be due to challenges focusing, or thinking in more detail than others, and these ways of thinking shouldn't be penalized in an inclusive learning experience. For this reason, time limits can be stressful for neurodivergent learners, and may result in not doing well on a question even if they have a deep and nuanced understanding of the concept. In one sense, this is a straightforward adjustment, simply removing the timer. On the other hand, if the fun of an activity is predicated on answering fast, then a more relaxed activity needs to have some other element of fun, and in this case we have filled that in with creative ideation as a form of minds-on play.

Overloaded

Considering sensory and cognitive overload is essential in creating inclusive education technology, especially for learners with sensory processing differences. Sensory overload can occur when a learner is exposed to too much sensory input, such as bright lights, loud noises, or overwhelming visual stimuli, leading to stress, anxiety, and decreased cognitive functioning. By designing education technology that is sensitive to sensory processing differences, such as providing options to reduce visual clutter or adjusting sound levels, learners can have a more comfortable and less stressful learning experience. Cognitive overload is also common when players are asked to pay attention to many things at once. We solve this by separating out each step of the Sparks activity so there are fewer tasks on screen at one time, and by providing scaffolds or constructive constraints that help a player focus their ideas rather than having to consider such a wide possibility space.

Strength in numbers

Learning experiences that provide multiple paths to success can better accommodate diverse learning styles and cognitive profiles, again making learning more accessible and effective for all learners. For instance, an idea could be very detailed or very creative, scientific or artistic. By allowing multiple different success criteria, we can send the message that everyone's strengths and ways of thinking are valid. Our solution for this

involves not limiting the "winner" to one person with the most points, but rather letting peers evaluate each other's ideas according to multiple possible criteria. This way, baked into the technology is the idea that answers aren't right or wrong, but have unique merits that should be celebrated.

Engagement

The aspects and design decisions presented so far all enable the Sparks tool to provide multiple ways to engage with the activity, which means more students can find something in the experience that resonates with them. For instance, one student may love coming up with fast spark prompts and is super excited to see what others added. Another student may be most interested in the creative task and taking time to think it through. Yet another student might really look forward to browsing other people's responses and rating them on different dimensions. Each of these requires minds-on engagement, but they provide different kinds of challenges and different ways of thinking, creating appeal for more diverse learners.

These examples demonstrate how an inclusive design process results in findings and principles that can then be applied to concrete product design and learning mechanics. They also illustrate Universal Design for Learning principles that are embodied in EdTech solutions. Moreover, in each case we emphasize designing not only something different for neurodivergent learners, but something that is adaptable and flexible, to allow all learners to engage in ways that are best for them. This type of learning experience can also result in deeper learning, more minds-on thinking, and building future-ready skills. In other words, designing with neurodiverse learners in mind results in better learning for all.

Offering **multiple modes of expression** is essential in creating inclusive EdTech as it allows learners to **express themselves** in ways that work best for them.

Taking action toward inclusion

When designing with neurodiverse learners in mind, the goal is to create an experience that is flexible enough for everyone to use it in a way that's comfortable for them, and where each student can access the learning. This approach often gives learners more agency and ways to express themselves, which leads to deeper learning for all students.

In this paper, we have described our journey through developing a more inclusive design process here at Kahoot!, but our process was also not perfect—we are always looking for ways to improve and center users' voices more strongly, and acknowledging the compromises we make. Inclusive design, and the resulting elements that make an EdTech tool more inclusive, are by no means an all or nothing proposition. Starting small and expanding our inclusive practices over time is the best way to improve our products and strengthen the impact on student learning.

There are many ways to start small. For example, the team at Little Journey suggests adding some open-ended design questions to playtests or usability tests you may already be doing, to expand the feedback beyond only what users see in front of them. In addition, the Ubongo team suggests forming an inclusion task force, if you don't have the ability to bring on folks experienced in inclusive design, so that a few team members have time and space to learn and develop inclusive methods that make sense for your company. More broadly speaking, when it comes to implementing more inclusive design methods, there are three overarching takeaways for all learning designers and EdTech professionals to keep in mind:

1. Inclusion is a mindset shift

Making an EdTech product more inclusive doesn't just mean changing fonts and colors, or accommodating specific needs. Rather, it means providing all kinds of learners access to the learning experience. It means changing the way you do design, and even your identity as a designer, individually and/or as an organization, to amplify the voices of neurodivergent learners or those with other marginalized identities.

2. Value the time it takes

Designing a more inclusive design process can often feel like it takes more time and more resources, and in some cases it does. In addition, you can't control what you get out of co-design sessions and interviews, and you never know when the real gems and actionable insights will come out. However, building a greater understanding of how diverse learners want to use your tool will pay off in the long

in the long run, giving you more knowledge of how best to design the tool, and more evidence for why your tool is effective. So listen to your learners, and trust the process.

3. Start small and iterate

This is a good design practice in general, and the same applies on the level of creating an entire approach to inclusive design. Don't be afraid to add in more inclusive design practices because they don't feel widespread enough. Start with inviting one neurodivergent person to your team, or working with one SPED classroom. Gradually see what insights you get, and then start to expand your practices as you figure out what works for your team and your diverse learners.

At the end of the day, we are all working on EdTech products because we want to improve learning and make a difference. Inclusive design, especially following frameworks such as Universal Design for Learning and Learning through Play, can both deepen learning and expand who belongs in that learning environment. The more that teams in every company think about and talk about inclusion, the greater collective impact we can make. With that, we invite all EdTech professionals, educators, and learners alike, into the conversation and on a journey towards more inclusive design.
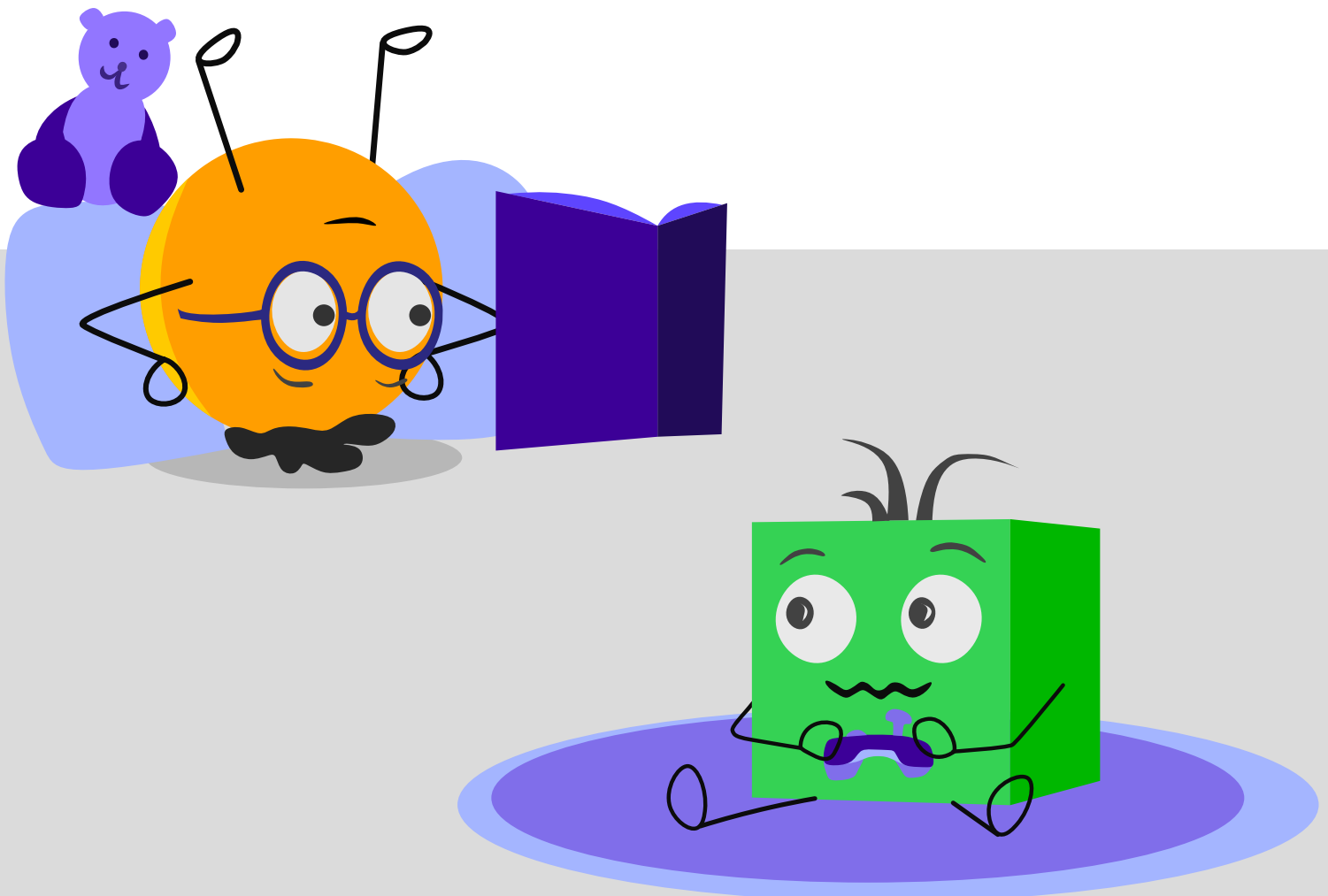
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