3 | Reimagining learning ecosystems

Future of Education

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Foreword

At Google, we believe that, no matter your background, everyone deserves access to great learning experiences. The opportunity to learn in the classroom, at home, and everywhere in between, has never been more important than it is today.

As the world evolves, driven in part by pressing global issues and the accelerated rate of technological innovation, what we learn and how we learn will evolve too. This will mean developing new mindsets and skill sets to become global problem solvers and lifelong learners; evolving how we teach and learn by making learning more personal and accessible to all; and finding more meaningful ways to evaluate learning tools and learner progress, to best support the goals of educators, students, and families.

As we march towards a radically different future, what should the role of education be and how might it look? To begin to answer this question, we collaborated with research partner Canvas8 to conduct a global study in 24 countries that synthesizes insights from 94 educational experts, two years of peer-reviewed academic literature, and a media narrative analysis across the education sector. Global nonprofit American Institutes for Research

served as an advisor and consultant to this research. The result is a three-part report on the future of education.

This is Part 3: Reimagining learning ecosystems.

We acknowledge that, just as there is Maslow's hierarchy of needs for life, so too there exists a hierarchy of needs in education. Some educators and leaders have the luxury of building for the future, while others are forced to tackle more immediate challenges, such as student attendance or literacy. As such, the future of education will be shaped by a complex, nuanced process rather than a single wave of change. We also recognize that there is significant variation in perspectives on the role of education across and within different markets; our intention is not to present a comprehensive or uniform view of the future.

Instead, we hope that this research can help provide educators and education leaders with a common understanding of the trends informing the future of education, and spark ideas and discussion on how we can best work together to help all learners — and those who help them — succeed.

Thanks for coming with us on this journey,

Shantanu Sinha
VP, Google for Education
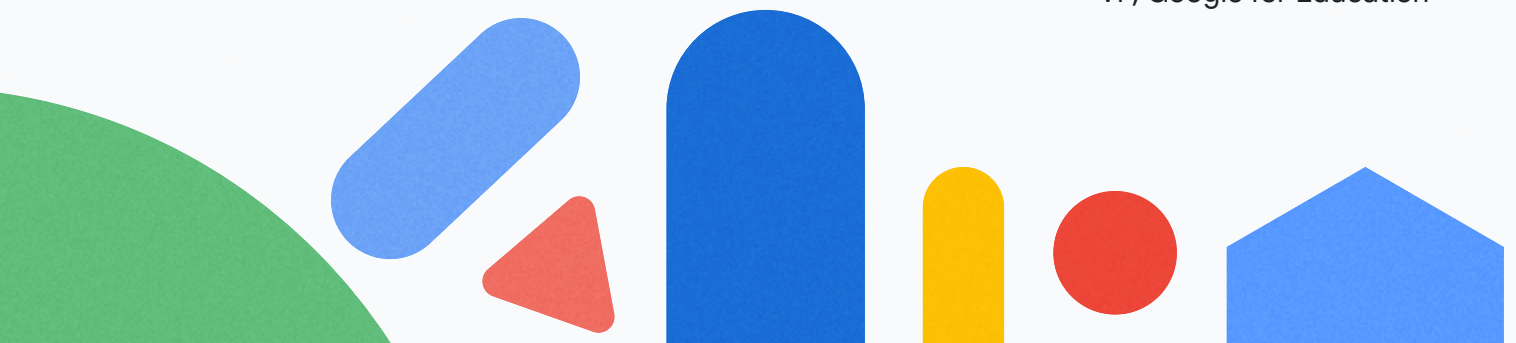
Executive summary

What might the future of education look like? The experts we interviewed shared their vision for reimagining the education ecosystem around the learner, using data to help inform decisions around teaching, learning, and measuring student progress.

The views and opinions expressed in this report are those of the experts and do not necessarily reflect the views or positions of any entities, institutions or organizations they represent.

In our research, we identified three key trends driving this shift

Upgrading learning environments

Investments in digital infrastructures are helping to create new visions of learning environments that blend technology, pedagogy, and physical space.

Empowering educators with data

Greater access to data and insights helps educators determine which tools and practices are likely to have the greatest impact.
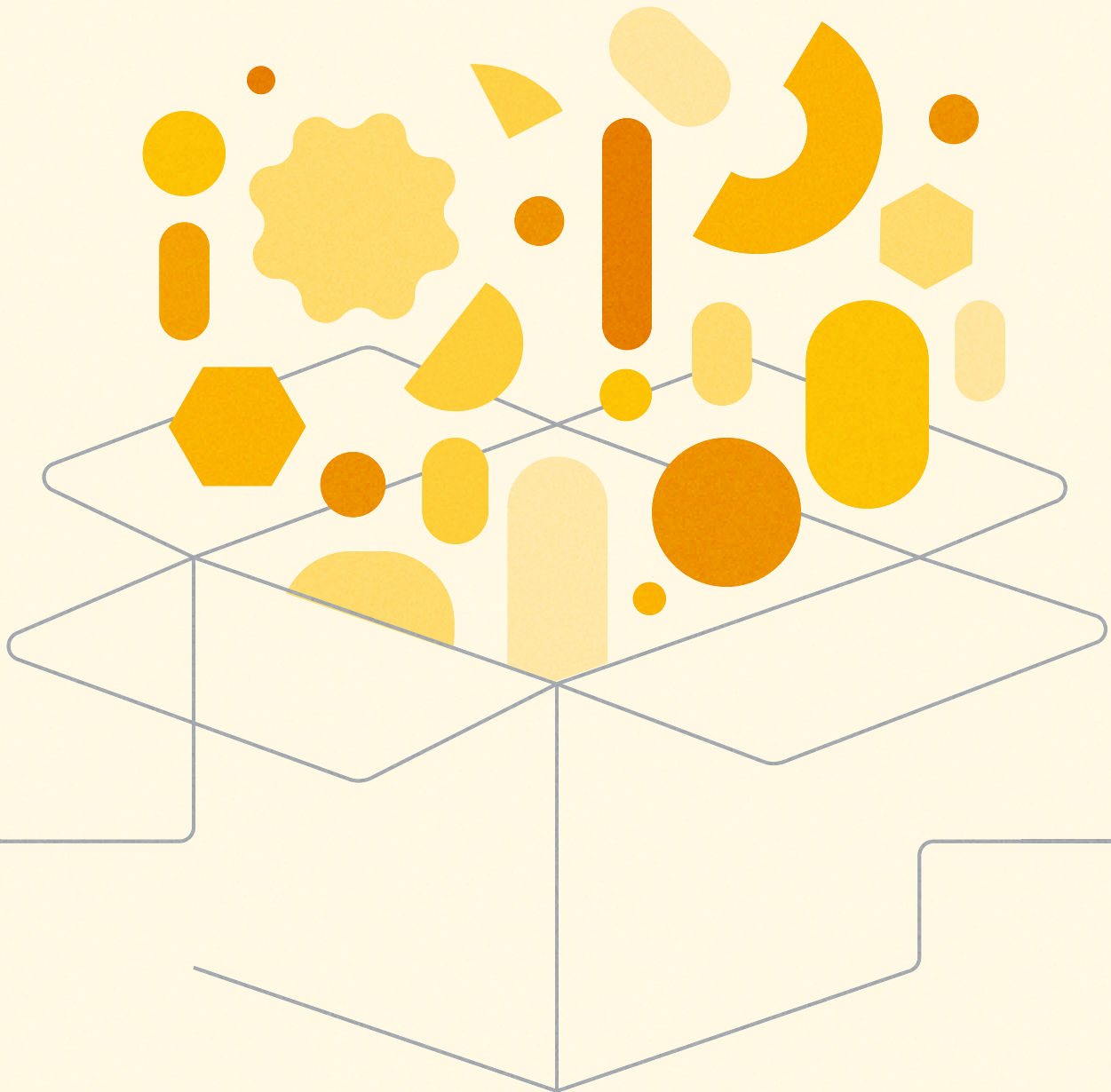
Re-evaluating student progress

Rising demand for more meaningful ways to track and drive student progress triggers a shift towards faster, fairer, and more effective modes of assessment.

Upgrading learning environments

Investments in digital infrastructures are helping to create new visions of learning environments that blend technology, pedagogy, and physical space.

What does the school of the future look like?

For centuries, education has been organized around physical spaces: the classroom, the lecture hall, the school, the university campus. And, while education has changed a lot over the past few centuries, little has actually changed in the design of these spaces — until recently.

Over the past decade, studies have emerged that point to something many intuitively knew: students' learning environments can play a significant role in the quality of their education. In fact, all things being equal, the impact of moving a child to a classroom that's been optimized for learning (considering factors like lighting, layout, and design) can account for as much as 16% variation in student progress over the course of a year.[1] Insights like this are prompting educators to rethink the role that environments can play in optimizing how, where, and when learning happens.

Technology provides educators with new ways to optimize learning environments, and has enabled several emerging models of education. Flipped classrooms, for example, are becoming increasingly popular in secondary and post-secondary education.[2,3] By turning lectures — historically conducted inside the classroom — into the homework done via technology outside the classroom, teachers are finding ways to refocus the physical in-class time on "active learning experiences" such as problem-solving and group discussions.

Emerging models of education

1 **Hybrid learning**

Where some students attend class in-person, while others join the class remotely.[4]

2 **Blended learning**

Where all students receive a mixture of in-person and virtual/remote instruction.[5]

3 **Flipped classroom**

Where students learn knowledge (e.g. reading, videos) at home and work on live problem-solving during class (a form of blended learning).

4 **Hyflex learning**

Where students are given choice in how they participate in hybrid or blended learning modes.[7]

While each model is slightly different, all are united by the belief that technology can optimize and enhance learning environments in new and meaningful ways. National governments' digital infrastructure investments over the past two decades have made this possible — with many schools having access to more devices, greater bandwidth, and new software systems than ever before.[8] Across OECD countries, close to one computer is now available per student at secondary school level.[9] And while access to devices and quality internet at home and at school is uneven, the digital divide continues to close, opening up new opportunities for different types of learning environments to flourish.[10]

" Our world needs creative people who think outside the box and can find innovative solutions to extremely complex issues. A school where students sit on chairs, quietly, for eight hours a day can't produce that.

Svenia Busson
co-founder, European Edtech Alliance, France

The Covid-19 pandemic was arguably the biggest remote learning experiment in history, with 1.6 billion students unable to attend school physically during the peak. The situation underscored the importance of digital technologies in the future of education; and the physical and social spaces that provide a critical in-person element.[11]

This insight is crucial for how experts see the future: blended. This is reinforced by the shift of online-only learning providers to invest in building physical spaces — something already playing out in India, the second biggest market for online education globally. Major edtech company Byju began as online only, but in the past few years, the provider has opened 80 new physical learning centers with plans for 500 more in the coming years.[12]
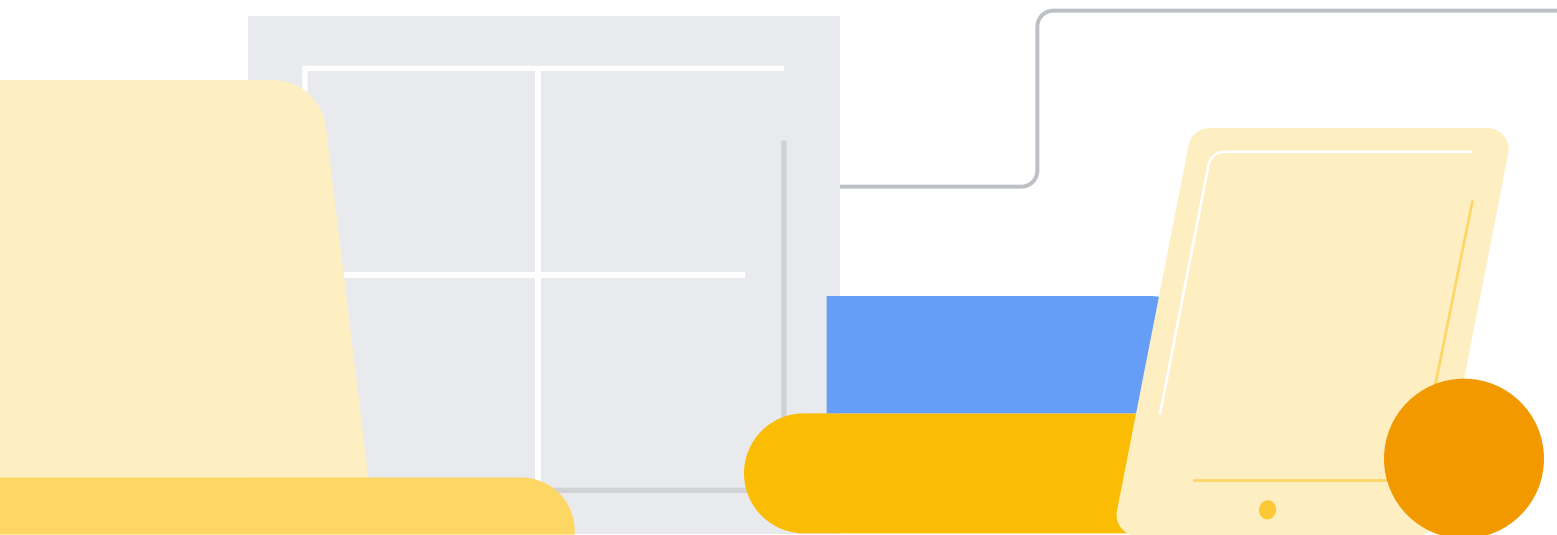
Key to the success of any future learning environment is how technology is applied, and the conditions required to use it meaningfully. Given that technology changes so quickly, ongoing training is important, yet only 56% of teachers across OECD countries received formal training on how to use information and communications technology (ICT) for teaching; even after receiving training, only 43% of teachers felt prepared to use ICT for teaching purposes.[13]

> Key to the success of any future learning environment is how technology is applied, and the conditions required to use it meaningfully.

Beyond training, other important factors include the purposeful matching of technology to an identified need, and the appropriate level of funding. Without the right conditions, studies have shown that simply investing in more laptops and tablets in schools can have a negative impact on student performance.[14]

Experts believe getting this right is critical, and that future learning environments will likely vary depending on local context. This means moving away from a universal model of one kind of learning environment, to better account for the specificities of each school system — including funding, leadership, training, and ongoing support for administrators, teachers, and students.

> "Let's give students opportunities to not just learn inside of the classroom, but make the world their learning platform — classrooms without borders. By having the opportunity to learn outside, we can explore the idea of what learning in urban spaces can look like and embed things that are culturally relevant to them to help make students both interested in their environment and their studies at the same time.

Keishia Thorpe
Global Teacher Prize Winner, 2021, English success coach, United States

Ideas in action | *Australia*

Redesigning learning environments

Curtin University in Australia has committed to an ambitious strategy that reimagines how its spaces support blended and hybrid learning. Over 50 traditional classrooms and lecture halls have been converted into "collaborative learning spaces" with flexible seating and a variety of hardware, including cameras and screens. Centralized software enables teachers to book rooms to match their requirements, and all lectures are recorded and uploaded so students have 24/7 access. Some 83% of the university's courses use a flipped approach where students review materials online before a face-to-face session.[15]
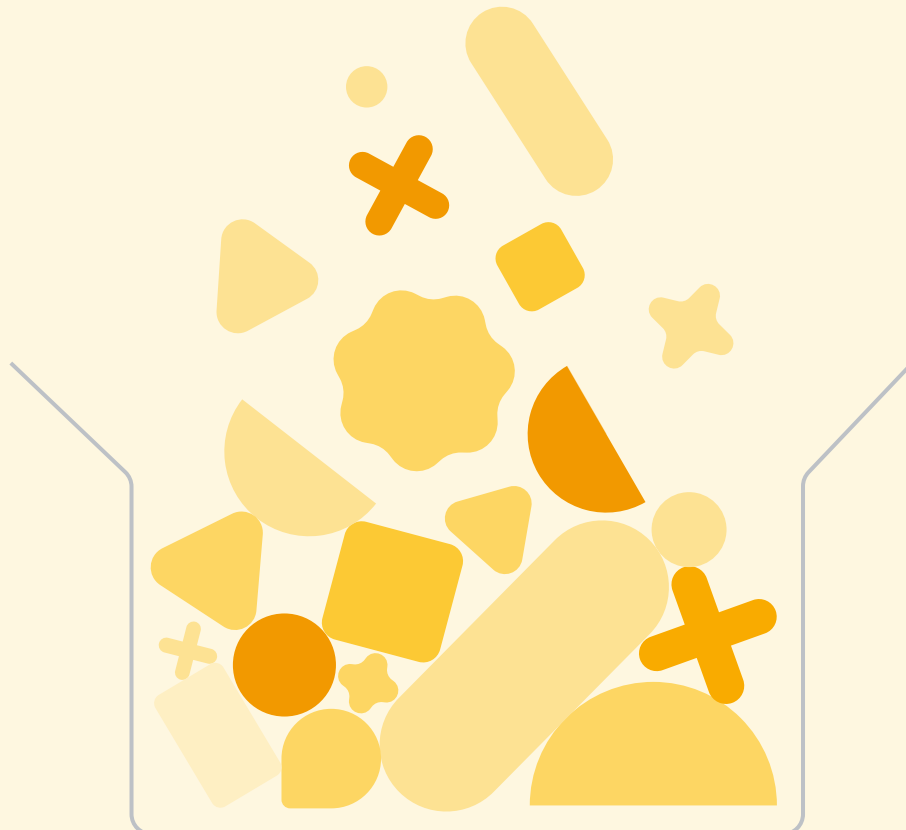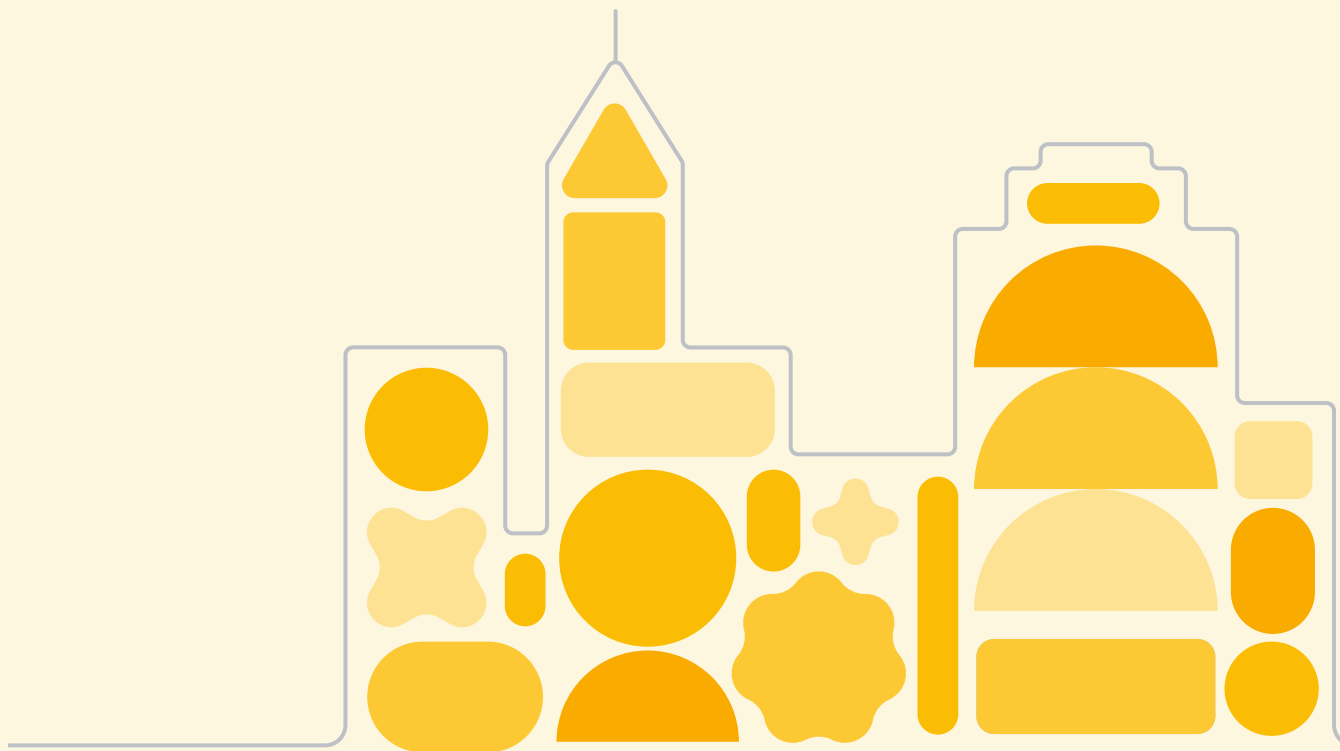
Ideas in action | *United States*

Reimagining cities as learning hubs

A network of cities around the world are revitalizing public spaces, such as bus stops, supermarkets, and parks, to encourage learning experiences among younger children. These Playful Learning Landscapes (PLL) aim to bring education into wider urban planning and policy. In Chicago, for example, a laundromat was transformed into an interactive play space inviting children to start conversations with caregivers about shapes and patterns. It even turned sorting clothing into a math activity. Evidence suggests these result in improved outcomes, including increased interaction between caregivers and children around language, literacy, and STEM.[16]
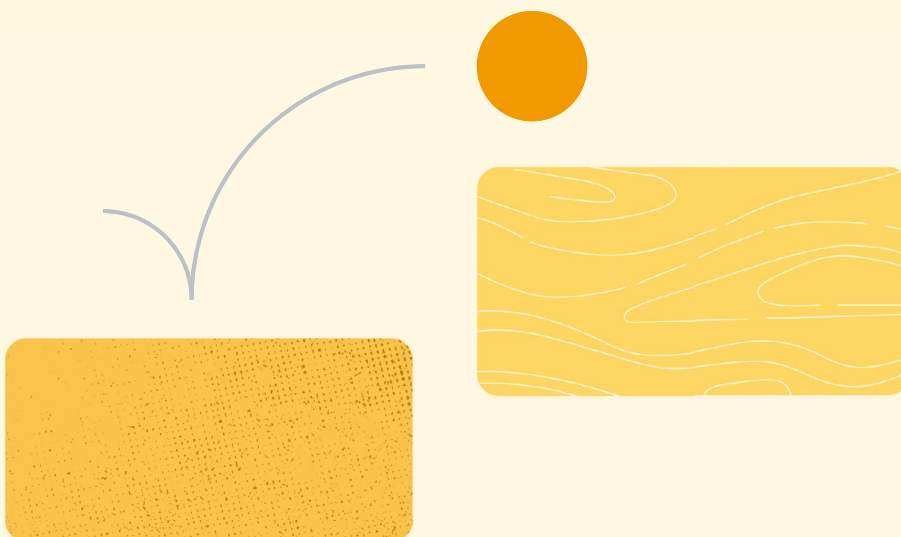
Ideas in action | *United Kingdom*

Creating multi-platform learning environments

The UK's Denbigh High School is internationally acclaimed and has received recognition from the United Nations for its technology integration. It was commended for its device-agnostic, multi-platform learning environment, which makes use of technology to deliver innovative and engaging lessons.

Google tools have been rolled out across the entire school: a Google Site enables teachers to easily showcase best practices; Google Classroom is used to create shared lessons and enhance online assessment and Google Forms are regularly used to survey pupils and staff to identify training and development needs. While many of the pupils come from low-income families where access to technology may be limited, the school took steps to ensure that technology implementation was accessible to all, including an audit of teacher and student needs and teacher training before the tools were rolled out.[17]

Ideas in action | *United States*

Building a learning environment for empathy

Developed by a coalition of San Diego civic leaders and educators, High Tech High (HTH), which opened in 2000, has expanded from a small charter school into an integrated network of 16 charter schools serving approximately 6,350 students in grades K-12 across four campuses.

One of its student projects explored how technology can create more access to economic and social opportunities for individuals with disabilities. Students were introduced to the AbleGamers organization and went through several simulations to build empathy, being challenged to do certain tasks without the use of arms, or reading all directions through a mirror. Using Xbox adaptive controllers and Arduino boards connected to gaming PCs and laptops, students engineered and built real working controller devices that allowed users to access and play games with their tongues, feet, arms — whatever was needed to adapt to their disability.[18]
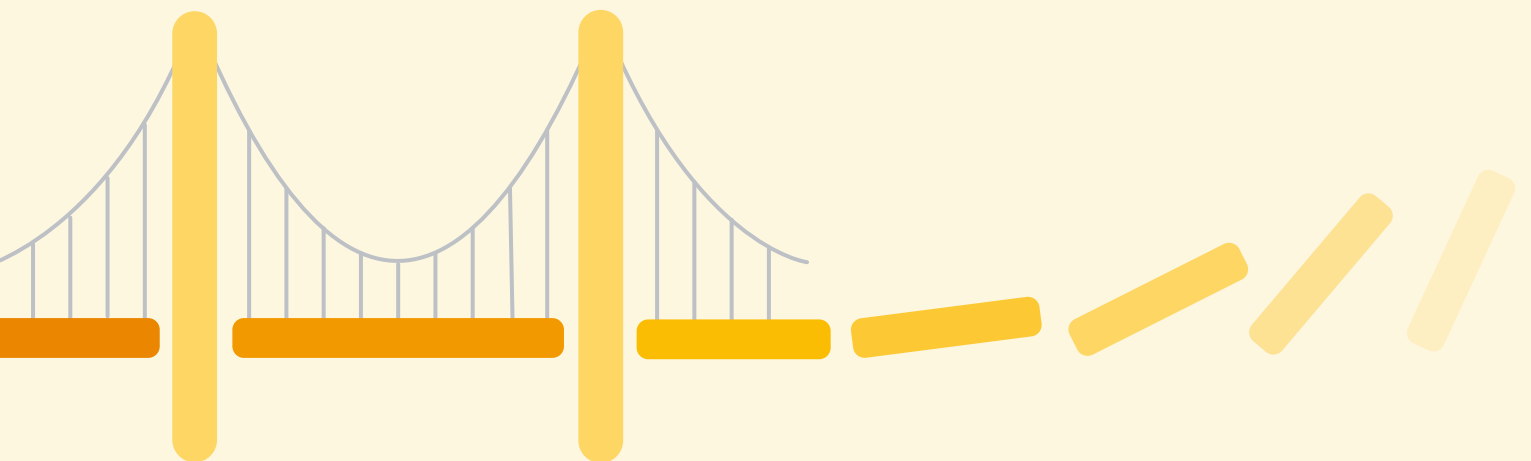
The Google perspective

Upgrading learning environments

As we work to help students and educators pursue their personal potential, we recognize that this process may look different from one person to the next. Similarly, the process of upgrading learning environments may look different from one school to the next. At Google, our goal is to help schools optimize their learning environments, no matter where they are in their process. It's why we build simple, flexible solutions that can be adapted to a school's specific needs, and pursue integrations with complementary products.

We've seen firsthand that when schools are equipped with the right tools and training to help support productive learning environments, teachers and education leaders are inspired to push the boundaries of what is possible. For example, Chicago Public Schools (CPS) — home to 642 schools, 25,000 teachers and more than 350,000 students — wanted to integrate tech devices with classroom teaching. They selected Chromebooks, rolling out 300,000 devices over a several-year period. The hope was to use technology to support and transform teaching at the classroom and school system level. What CPS saw is that the adoption of Chromebooks — and Google Workspace — inspired teachers to think creatively about lesson plans and further explore how technology could be used to uplevel learning environments. At the system level, Chromebooks helped the district centralize device management. With a click of a button, a single IT manager was able to manage every device in the district using the Admin Console.

While the decision to upgrade learning environments at a school, system, state or even country-level is complex, we believe that implementing a solution should be as simple as possible. It's why we've created things like zero-touch enrollment — an alternative to manually enrolling devices — that allows schools to manage and deploy Chromebooks at scale easily. To help schools refresh older devices and increase their performance for more efficient teaching and learning, we developed ChromeOS Flex, a fast, secure, cloud-first, easy-to-manage operating system for Macs and PCs. With tools like Google Meet, we help make learning environments more flexible and accessible, ensuring that collaboration is possible — and simple — even beyond the four walls of the classroom.

To encourage collaborative learning environments, we've developed Cast moderator, a new mode coming to select Chromebook devices with Google TV. It enables educators and students to wirelessly share their Chromebook screen to a class display using an access code, so that only people in the same classroom as the display are able to cast. By providing students and educators with the opportunity to share their screens with others in their class, we hope to create learning environments where content — whether it's a learning resource or a student project — can be shared, discussed, and celebrated.

We help make learning environments more flexible and accessible, ensuring that collaboration is possible.

The last few years have shown us that it is possible for learning environments to flex and evolve to meet the immediate needs of teachers, students, and society at large. As teachers work to create the optimal learning environment for their students, our goal is to give them the tools they'll need to ensure simplicity, safety, and flexibility, whether learning takes place at school, home or somewhere in between.
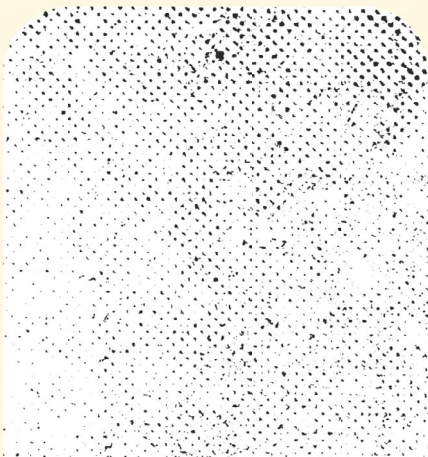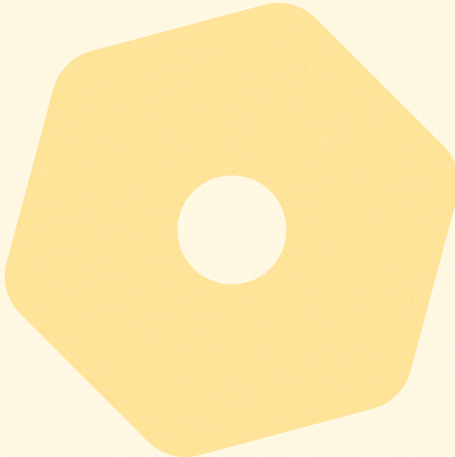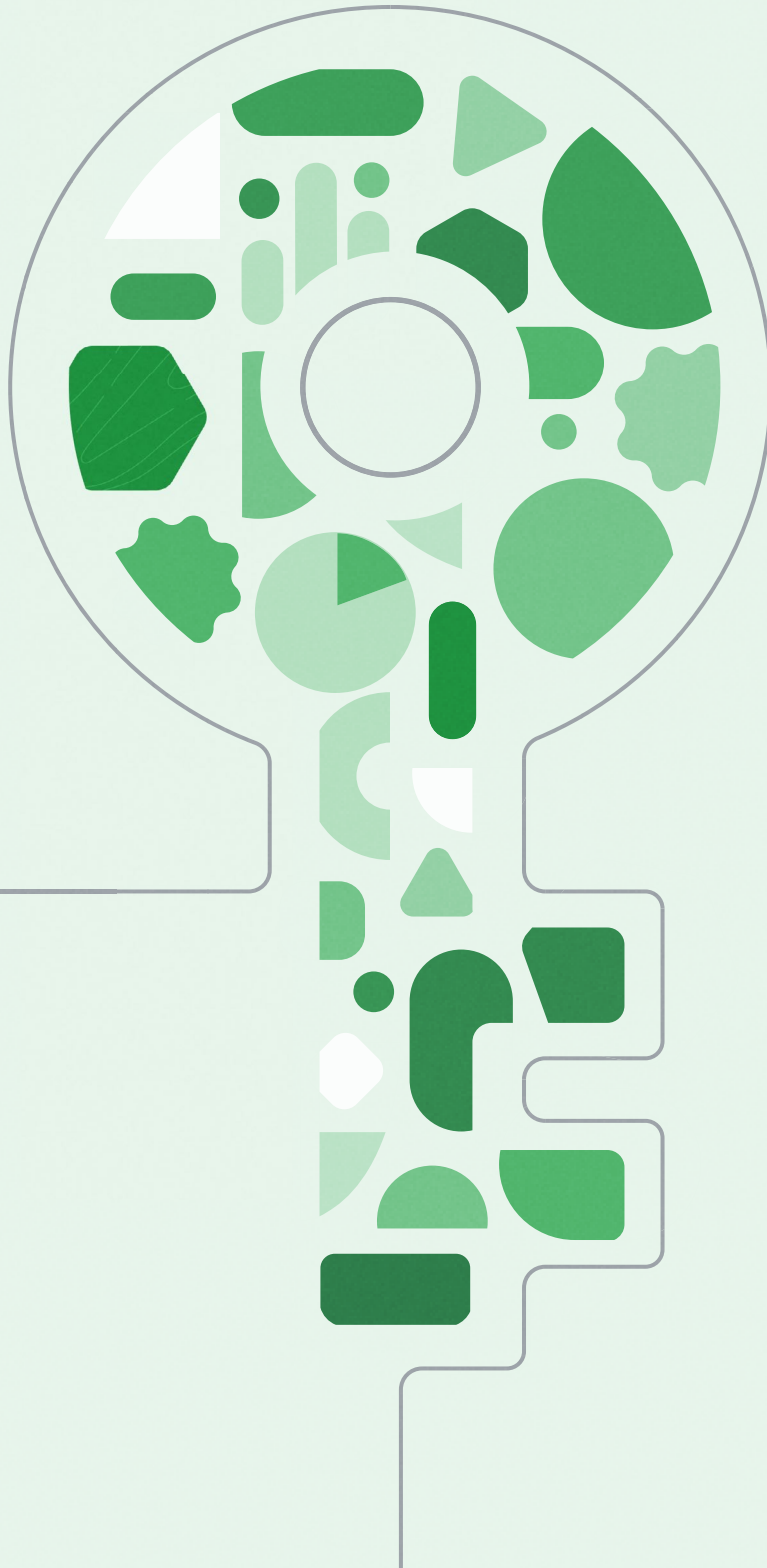
Empowering educators with data

Greater access to data and insights helps educators determine which tools and practices are likely to have the greatest impact.

How is data unlocking new insights to transform learning?

For decades, researchers have been trying to measure the effectiveness of teaching practices — to separate what works from what doesn't. Without these efforts, teachers would be reliant on educational strategies that might not be as effective for learning as other, more promising ideas.[19] With better data, and more access to evidence-informed resources, teachers, school leaders, and policymakers are given greater visibility over which teaching styles and tools actually support student learning outcomes, giving them greater confidence to implement them.[20]

This movement — sometimes called 'evidence-based education' — is accelerating, as digital publishing and platforms enable educators to more quickly and easily find and share best practices.[21] In turn, governments are mandating stricter evidence standards required for an effective education program. As outlined in the 2015 Every Student Succeeds Act (ESSA), to make use of much federal and stimulus funding, school districts in the US are required to choose "evidence-based interventions."[22]
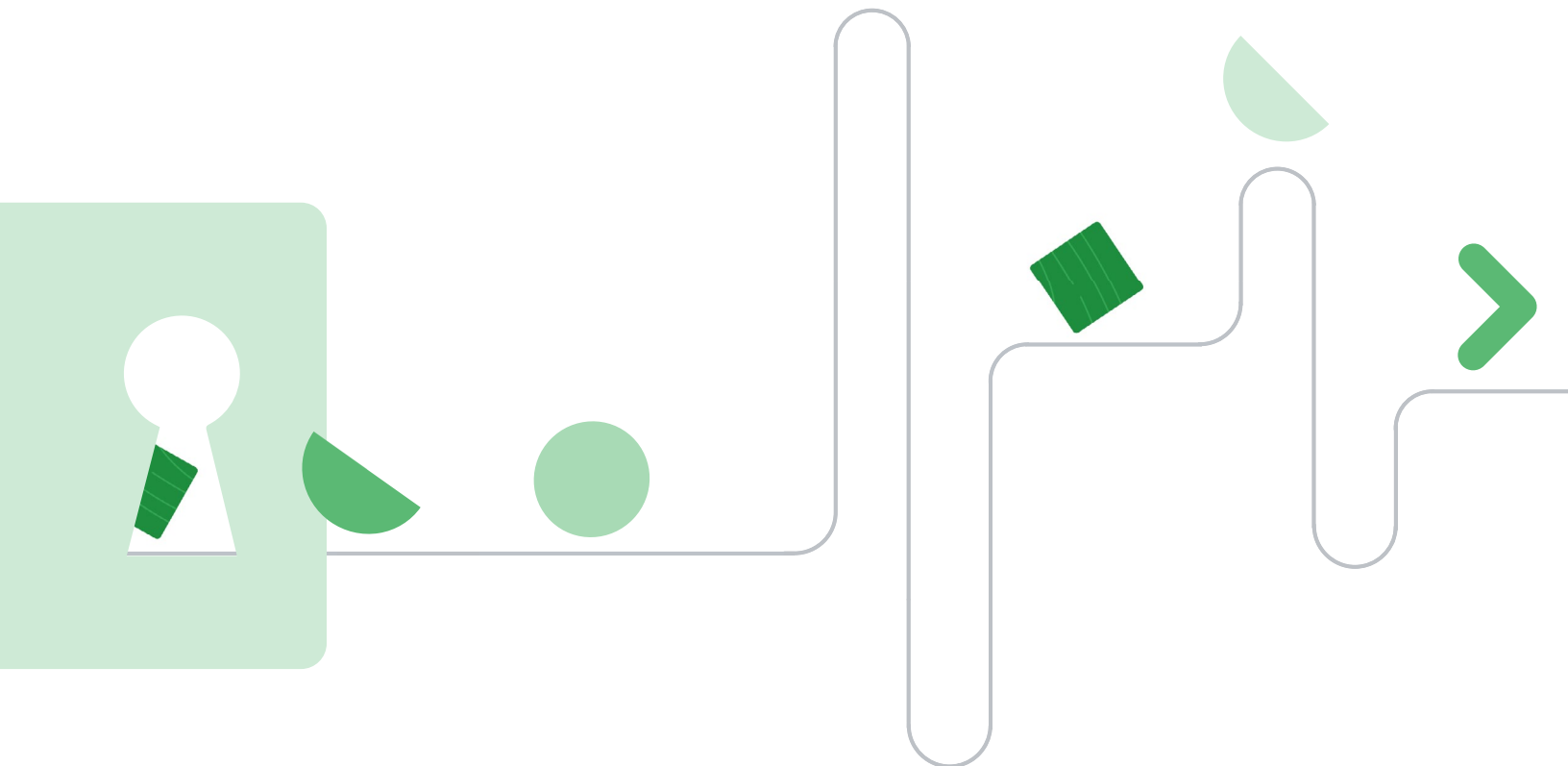
As more education technology makes its way into the classroom, there is increasing focus on how effective these tools are in making a difference for students and teachers. This information can be challenging to come by — for example, in the US, where school districts use an average of 1,417 digital tools per month, less than a third of teachers, principals, and administrators feel that there is a lot of information available on how effective their edtech tools are.[23,24]

This is because collecting and analyzing evidence surrounding the effectiveness of edtech tools has historically been costly and complex, creating a major barrier for many education technology providers. As such, educators have often made decisions based on anecdotal evidence and word of mouth, even though the success of edtech interventions may vary depending upon local context.[25]

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The ways in which edtech platforms and products provide access to real-time or near real-time data should be a researcher's treasure trove ... that's exciting for the sector as a whole.

**Verna Lalbeharie**
executive director at EdTech Hub, Global

Educational researchers have responded by creating their own banks of evidence, which aggregate existing research findings on different edtech interventions. For example, in the US, researchers, educators, industry representatives, and policymakers collaborate to create the EdTech Evidence Exchange Platform — a common framework for assessing the effectiveness of different edtech tools in different settings. The tool will allow educators to document how well various edtech interventions work within the unique contexts of their local schools and districts, information that empowers other educators to learn from those working in similar contexts.[26] Digital tools and platforms like US-based LearnPlatform, are also emerging to make it easier for edtech providers to demonstrate evidence to educators. This type of third-party validation helps edtech providers stand out from their peers and provides educators with better visibility on what new ideas and tools are working.[27]

There are also national initiatives geared towards supporting schools as they choose appropriate edtech interventions for their students. The UK's Department of Education has shared guidance for finding quality-checked suppliers, as well as commissioning research to build an evidence base on technology in education.[28]

Of course, evidence is not the only thing that matters in deciding how to educate learners; teaching cannot be reduced to a science. And teachers can't be expected to simply adapt overnight to changing research — scaling new pedagogies takes effort and time.[29] Still, new information on the effectiveness of edtech can help empower educators and policymakers to make more informed and independent decisions, to deliver a better future for learners, and ensure that teachers have the tools best suited to the task, at their disposal.

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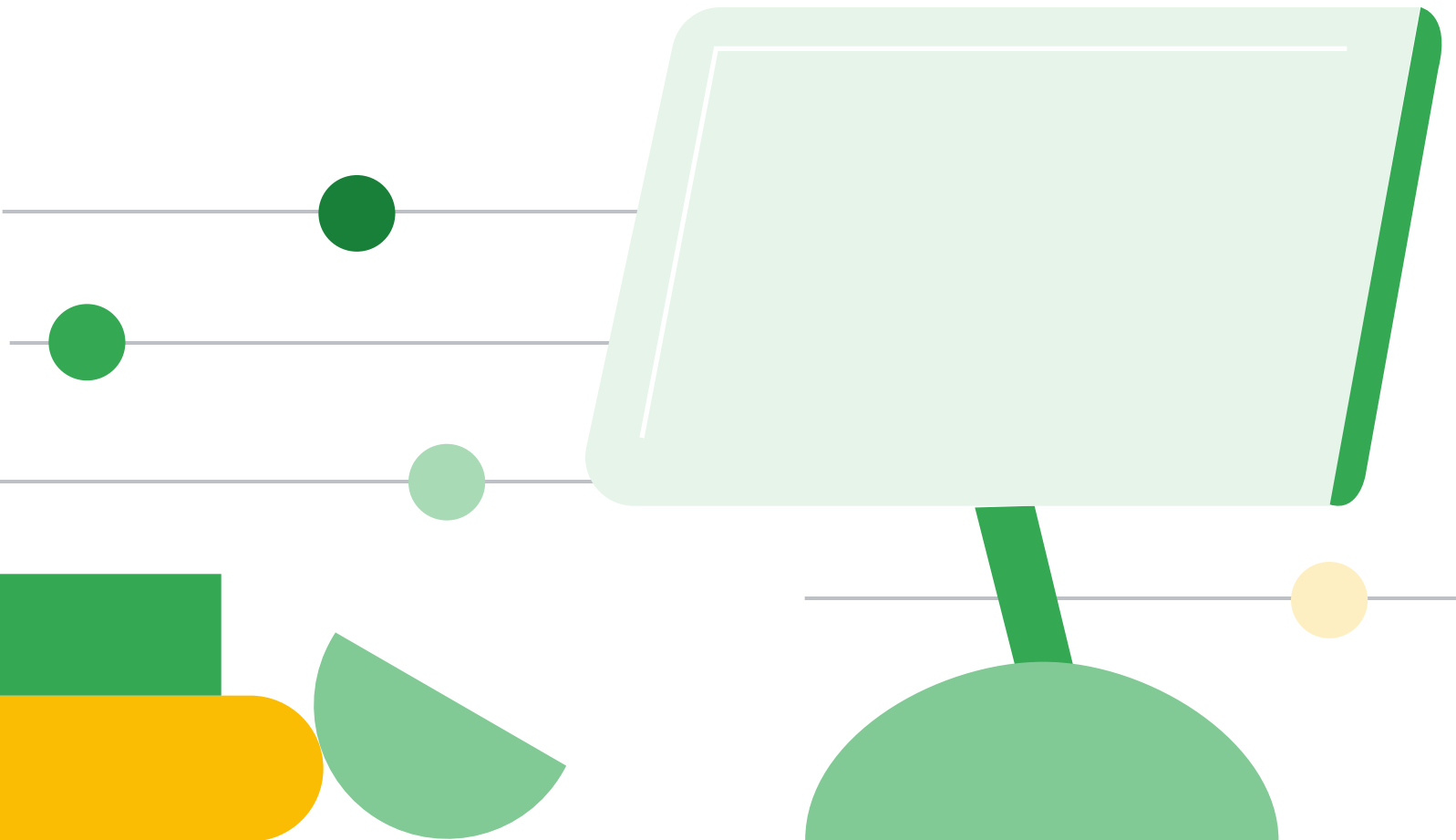
One of the arguments I've made for a long time is that a lot of education is not historically based on robust evidence … people are starting to ask more and more questions about whether the practices commonly recommended in the classroom really match up with this evidence.

Daisy Christodoulou
director of education, No More Marking, and author of three books about education: Teachers vs Tech, Making Good Progress, and Seven Myths about Education, United Kingdom
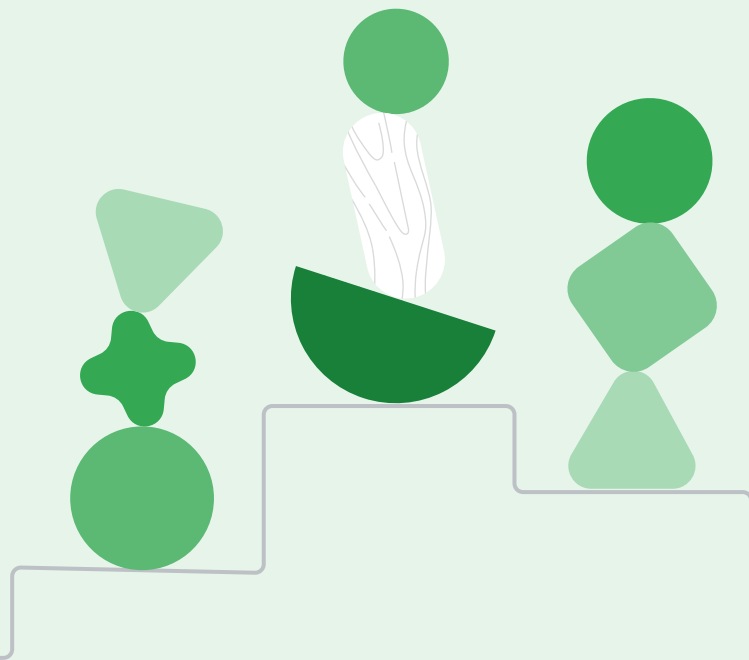
Ideas in action | *United States*

Edtech product certifications

Digital Promise is a global non-profit that works to expand opportunity for each learner. As part of its work, it helps educators and administrators evaluate and compare the quality of edtech products, by providing competency-based, research-driven product certifications that verify edtech products against a specific set of indicators.[30] Digital badges and certification information can be displayed on edtech product websites.

For example, Pear Deck, a formative assessment tool designed by teachers to support student engagement, has earned two product certifications from Digital Promise: a research-based design certification and learner variability product certification.[31] This recognition serves as a signal to educators, administrators, and families that this product has undergone rigorous research and evaluation and meets a set of well-defined standards for supporting learner needs.

Ideas in action | *United States*

Evidence-as-a-service

LearnPlatform, an edtech effectiveness system, rolled out a new subscription-based model aimed at helping edtech providers measure the effectiveness of educational programs against ESSA evidence requirements, which include four tiers of evidence: Tier 4: demonstrates a rationale; tier 3: promising evidence; tier 2: moderate evidence; and tier 1: strong evidence.

LearnPlatform does this by guiding the user through the steps required, including measuring student impact, assessing equity, and complying with data privacy laws. By quickly and affordably enabling the validation of edtech tools, educators have greater choice, and confidence that a solution is going to be successful.[32]

Ideas in action | *Global*

Leveraging data for real-time policy decisions

Founded in 2019, the World Bank's Global Education Policy Dashboard aims to leverage data collection to give low- and middle-income governments a better sense of what's happening at classroom level, so they can make real-time policy decisions at a national level.[33]

By measuring four key school-level ingredients of learning — teaching, school management, inputs and infrastructure, and learner preparation — the dashboard highlights gaps between current practice in schools and systems and what the evidence suggests would best improve learning. It also provides tools to help governments set priorities and track progress as they close those gaps. While in early stages of development, currently covering four education systems with more being added in late 2024, the dashboard is a signal of new ways data can be used to better inform policymaking in real-time.
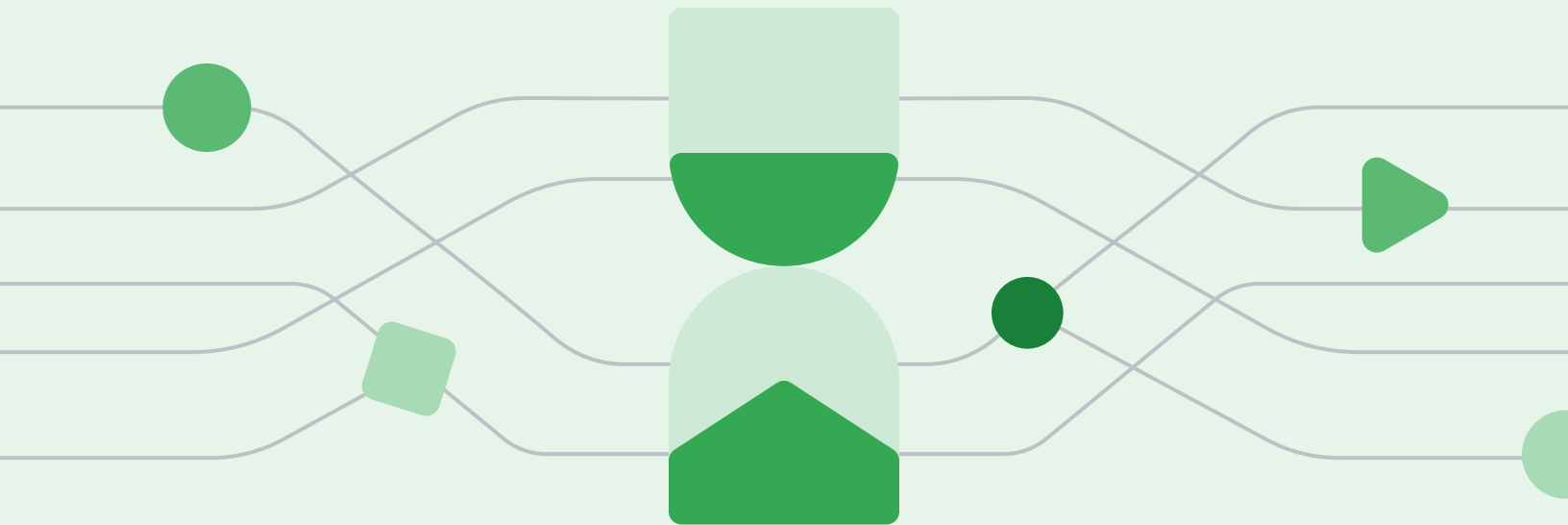
The Google perspective

Empowering educators with data

As technology becomes further integrated into education, we are generating more data than ever before. This data can be used to inform decisions, so that educators can feel confident that they are bringing the best edtech tools into their classrooms and using them most effectively to help enhance and elevate instruction.

Measuring the impact of technology on teaching and learning is a complex, nuanced process that requires data and input from multiple stakeholders. Also challenging is the process of measuring the impact of technology on instruction. Today, there are frameworks that measure the efficacy of technology application, such as how well a teacher is using the technology, but it's more difficult to evaluate whether that effective tech use is having a positive impact on instruction — and to what degree. Through cross-industry collaborations, Google is working to help education leaders measure the instructional impact of effective tech use, while internally coming up with a system to measure our own commitment to supporting that instructional improvement.

The goal is not to use data to standardize a single "best" approach to teaching and learning, but simply to provide educators with useful insights that could better inform the impact of the effective use of technology on instruction.

One way we're doing this is by supporting data-driven instruction, that is, ensuring that educators have the information they need in order to differentiate instruction and best meet the needs of their students. For example, a Chicago charter school organization turned to Data Studio, Google's data visualization tool, to help support their organization's personalized learning goals. With real-time monitoring of student progress, the tool supports teachers

with data-driven insights about academic performance, classroom behavior, and social-emotional learning. By combining data from internal sources like Google Sheets with external public data sets, Data Studio helps teachers analyze trends across schools and adjust their lesson plans. As a result of using Data Studio, the school system had a better understanding of student growth and realized new opportunities for instruction.

Figuring out how to sift through a lot of data can be overwhelming, especially when educators and leaders are pressed for time. We aim to simplify the process by building insights-based

tools directly into advanced editions of Google Workspace for Education. For example, with practice sets in Google Classroom (in beta at the time of writing), teachers can receive snapshots of student progress and view automated insights of assignment performance trends to help them tailor instruction for each student. To analyze student engagement, educators now have the ability to use the log export features in Gmail and Classroom to export data to BigQuery, our fully-managed data analytics warehouse. With audit logs, systems leaders can analyze individual activity and aggregated usage metrics across a broad range of integrated tools including Admin console, Devices, Login, and Google Workspace apps like Calendar and Drive. Further, with BigQuery it's possible to combine activity reports with usage data from other apps used by your organization to perform advanced searches on Google Workspace activity.

Intentionally designing features that are connected to learning, behavioral, and attitudinal impact is core to our product development process. One example of this is with Read Along, our AI-enabled app developed for elementary school students, which uses speech recognition and text-to-speech, to help children learn to read with support from in-app reading buddy Diya. The app also works offline on low-cost phones, which means children with the greatest need also have access to the app. To evaluate the impact of Read Along, we partnered with Sattva Consulting and conducted a study in five phases, in seven regions across India. The study found that, through Read Along app usage, a statistically significant proportion of early learners improved their reading fluency levels. In addition, parents perceived a positive impact of Read Along on their child's confidence.

Intentionally designing features that are connected to learning, behavioral, and attitudinal impact is core to our product development process.

As we generate more data than ever before, we have the potential to make more informed decisions, from the technologies we select, to how, when, and with whom they are being used, both in and out of the classroom. We believe that the use of data to help educators make better, evidence-based decisions will, in turn, help teaching and learning feel more personal and rewarding, and elevate teacher instruction. While complex, this is an area where we see greater focus in the years to come.
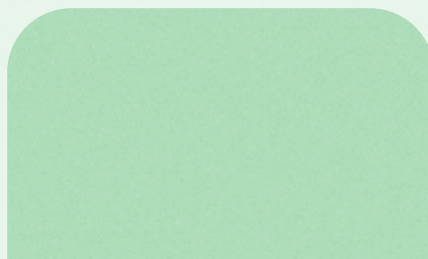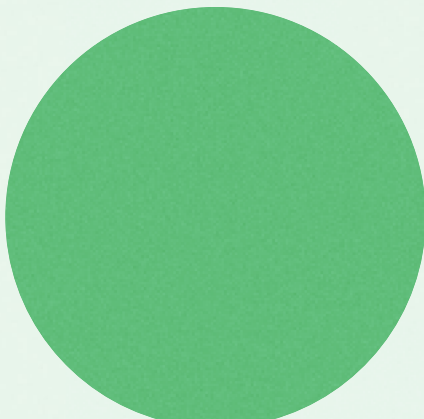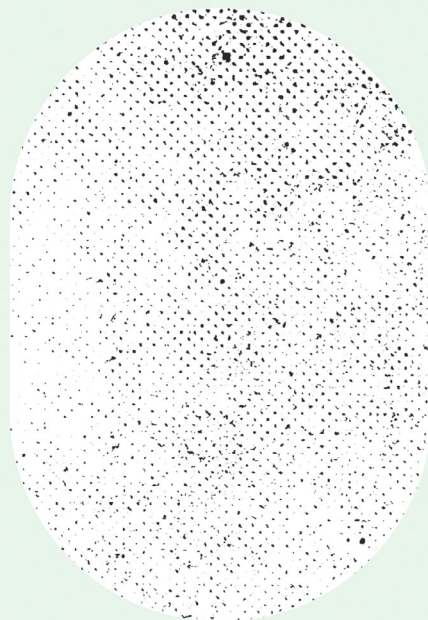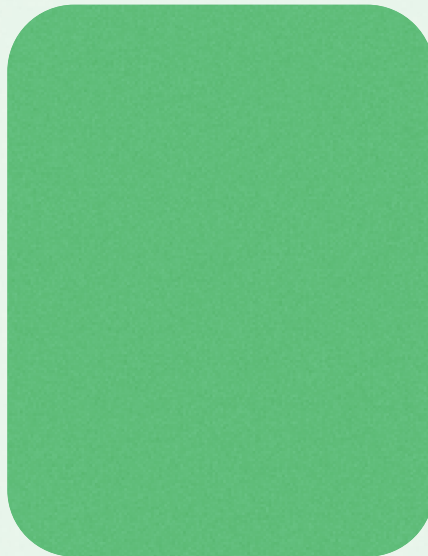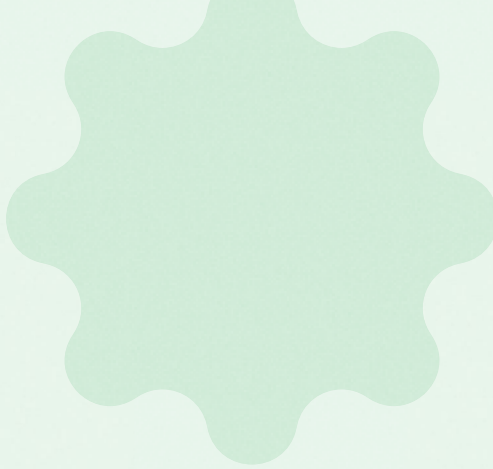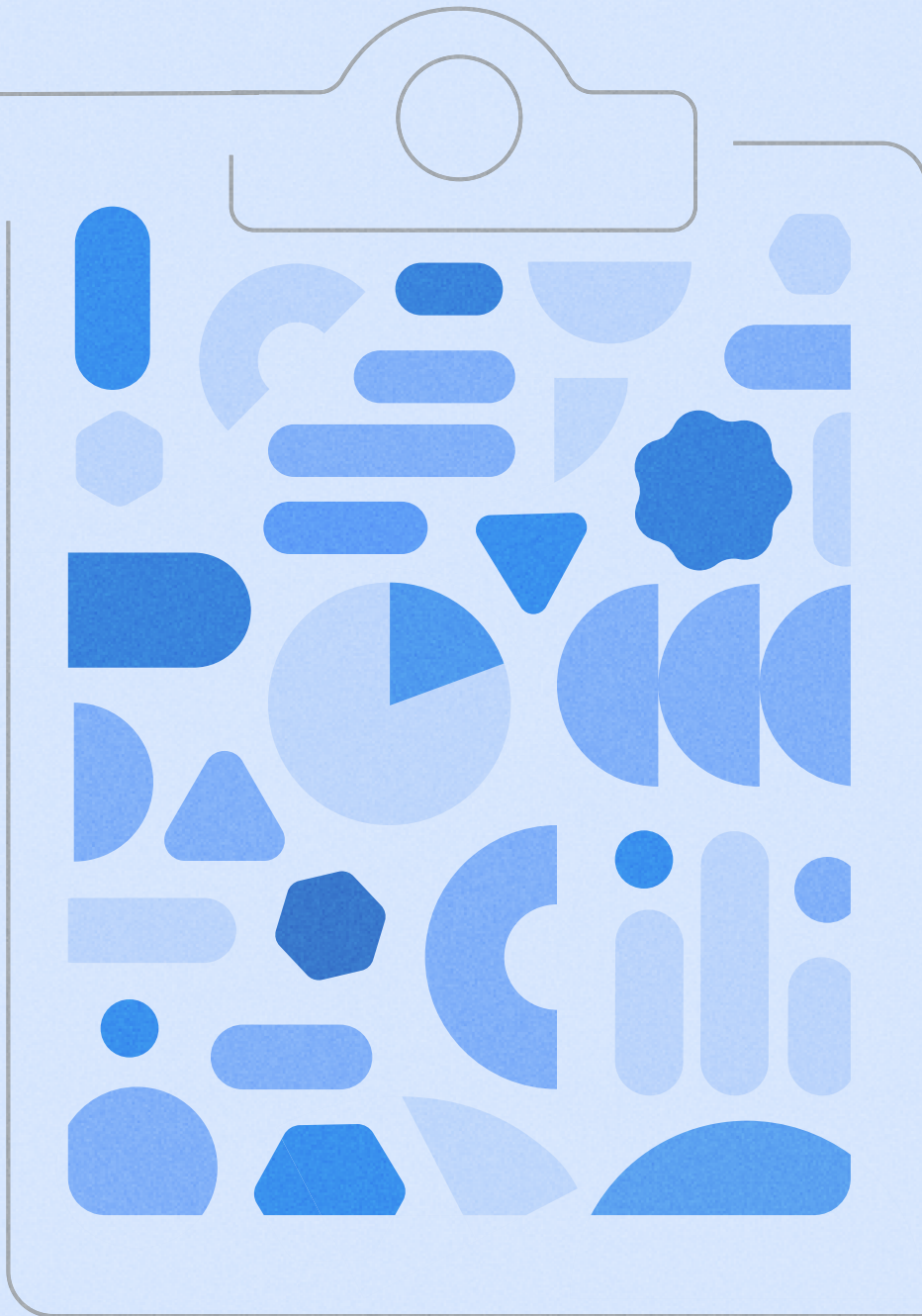
# Re-evaluating student progress

Rising demand for more meaningful ways to track and drive student progress triggers a shift towards faster, fairer, and more effective modes of assessment.

What innovations are shaping the future of assessment?

Assessments can play a pivotal role in the trajectory of a student's life — the grades they receive affect everything from their personal belief in their academic capabilities, to their ability to progress to higher education, and their future careers.[34] Testing is also an important means of keeping schools and teachers accountable for academic achievement.[35] However, as it stands, most assessments measure progress against a very narrow set of criteria, at a given moment in time.

Many educators believe that this system creates a limited snapshot of a student's abilities and potential, failing to capture a broader picture of everything they have learned and achieved.[36] Further to this, they believe that traditional, end-of-year standardized means of assessment place too much emphasis on a student's ability to retain and reproduce information, placing stress on teachers to prepare students to become 'test-takers,' rather than focusing on their broader educational needs.[37]

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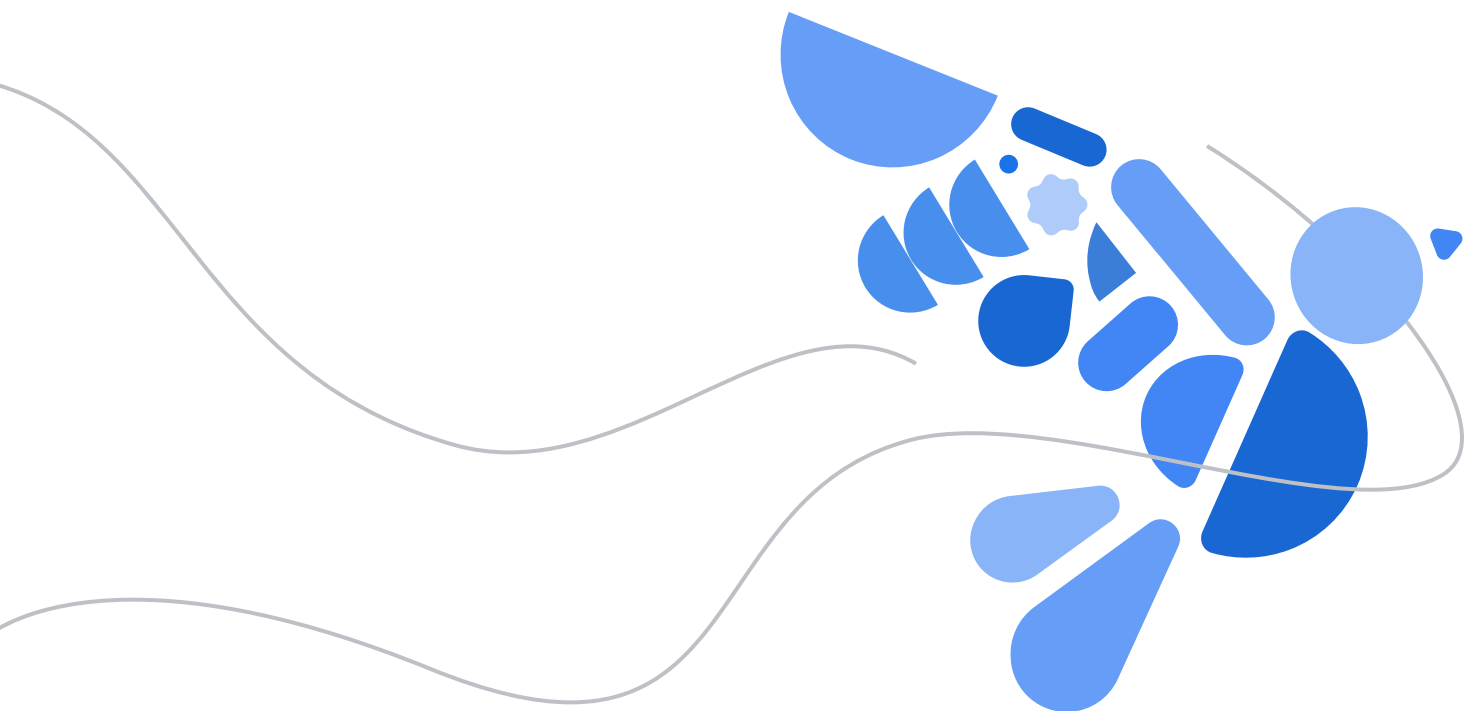
More portable micro-credentials will give people much greater ownership over what they learn, how they learn, when they learn.

Andreas Schleicher
director for education and skills, and special advisor on education policy to the secretary-general at the Organisation for Economic Co-operation and Development (OECD)

From the student perspective, the anxiety that comes from high-stakes, end-of-year assessments can hinder their performance and mask their abilities, especially for economically disadvantaged students, who have been found to experience elevated stress levels in test environments.[38] Poorly designed assessments can widen attainment gaps. One study found that test format alone accounts for 25% of the variation in achievement gaps by gender for reading and math.[39]

To realize a more equitable future, educators are rethinking the design and delivery of assessments. They're looking for ways to assess and provide feedback on students' ongoing progress in a way that motivates learners to continue to develop; and to find better indicators of student attainment that spotlight the strengths and abilities of each individual, without limiting anyone to a single grade or test score.

This type of system-wide change is typically slow and hard to implement at scale, but education systems around the world are taking steps in this direction. For example, in France, the secondary school assessment, known as the baccalauréat, has been reformed to look beyond only end-of-year exams. End-of-year testing now represents 60% of a student's final grade with the remaining 40% determined by year-round assessment.[40]

In addition, proficiency-based assessments — an approach that focuses on measuring the advancement of students based on mastery of content rather than grades, age, attendance, or other factors — is gaining steam as an alternative to grade-based assessment throughout the US. While its application varies from classroom to classroom, the core idea is to allow students to progress through learning material at their own pace, only passing on to new material when they are proficient in a given topic. The method includes frequent assessment of progress to identify areas for improvement, encouraging students to view learning as a process.[41]

Over 75 schools in New York City have adopted the proficiency-based approach, a small but growing effort organized by a group called the Competency Collaborative. Early analysis suggests that the approach is effective in closing equity gaps by boosting graduation and college readiness rates — a promising sign.[42] However, designing and implementing a system for such assessments, and the individualized learning paths they require, is a complex and time-consuming task for educators. For future innovation, being able to identify ways to apply this approach at scale is a key challenge.[43]

> The core idea is to allow students to progress through learning material at their own pace, only passing on to new material when they are proficient in a given topic.

Technology is also helping to provide different means of evaluating student progress. Digital badge systems are being implemented in schools, often in tandem with traditional grading. Much like scout badges, students earn badges by demonstrating their proficiency in a particular area — which can either be academic, or extracurricular. For example, in order to achieve a writing badge, students would build a portfolio of writing projects. These badges can then be collected and stored in cloud-based digital portfolios, which serve as alternative academic transcripts. The system allows students to collect evidence of their own learning, building a more detailed view of their ongoing progress.[44]

More broadly, one of the big shifts shaping student assessment is the globalization of content and curriculum. Countries and regions are becoming increasingly similar in the content of their assessments. For developed countries, the content can come from the frameworks of international assessments such as TIMSS, PIRLS, and PISA.[45] For developing countries, there is the content in the Global Proficiency Framework (GPF) that is gaining traction.[46] These frameworks synthesize content standards (what students should know and be able to do) from countries around the world. They serve as a reference point for curriculum reform, which in turn affects what is included in student assessments. Countries are increasingly using global content standards and aligned assessments as a way of improving their economic competitiveness.

There are certainly promising changes in this space. However, the move to new, better forms of assessment can only happen if schools, teachers, parents, exam boards, and policymakers work together. If assessments are there to both define and measure "what counts" in society, getting this right is not just important for education, it's important for everyone.

"We make all of these decisions about schools in education policy based on average test scores, which don't actually tell us very much about what our students are learning. Tests aren't structured in a way to facilitate learning, and they end up eating into instructional time.

Elaine Allensworth
director of the Lewis-Sebring Consortium of the University of Chicago, United States

" A lot of learners have capacities which are outside the things that we measure. There's frustration among parents because we are saying to a child, 'you are lesser or better,' but only judging upon a very, very, very small subset of things that are important in life.

Claire Boonstra
founder, Operation Education, the Netherlands

Ideas in action | *Australia*

Alternative pathways to higher education

The University of Technology Sydney's U@Uni Academy is a program that enables students from low-socioeconomic partner schools to progress to higher education, by diversifying how students' abilities are assessed. The approach looks beyond the conventional Australian Tertiary Admission Rank (ATAR) scoring system[47] — a measure used nationally for tertiary admissions. Instead, applicants can join a two-year program that involves a combination of on-campus experiences and in-school mentoring and tutoring.

Students who complete the course and demonstrate skills such as collaboration, creativity, and critical thinking receive a place at the institution. Since its founding in 2019, the program has made university education more accessible to students who were not on track to qualify through traditional routes.[48]

Ideas in action | *United States*

Replacing standardized testing with student-led active learning

The New York Performance-based Assessment Consortium is a collective of 38 schools with nearly 30,000 students across New York State, where standardized assessment has been replaced with an alternative, nationally-recognized system of 'performance assessment.'

Schools award diplomas to students who can demonstrate their knowledge in the form of projects, papers, performances, experiments, and experiences. Known as Performance-based Assessment Tasks, or PBATs, students are externally assessed on topics they choose, like a paper written about the Civil Rights Movement, or researching 'The Effect of Tank Volume on Goldfish Growth.' These schools have had higher levels of college enrollment than students from other New York City public schools.[49]

Ideas in action | *United States*

Exploring the digital transcript

The Mastery Transcript Consortium is a growing network of public and private schools in the US that are introducing a digital high school transcript that visualizes each learner's strengths, skills, and competencies.[50] Instead of the grades that would show up on a traditional academic transcript, this transcript takes a more granular and detailed view of a student's portfolios of skills, which can include areas such as 'leadership skills,' 'writing skills,' or proficiency in 'scientific experiment design.'

Serving as an alternative to traditional grades-based systems, the transcript enables students to elect which projects, achievements, interests, and abilities they display to higher education institutions and employers. It's designed to suit learners of all backgrounds, supporting them in a variety of post-school paths, from university to entry into the workforce.

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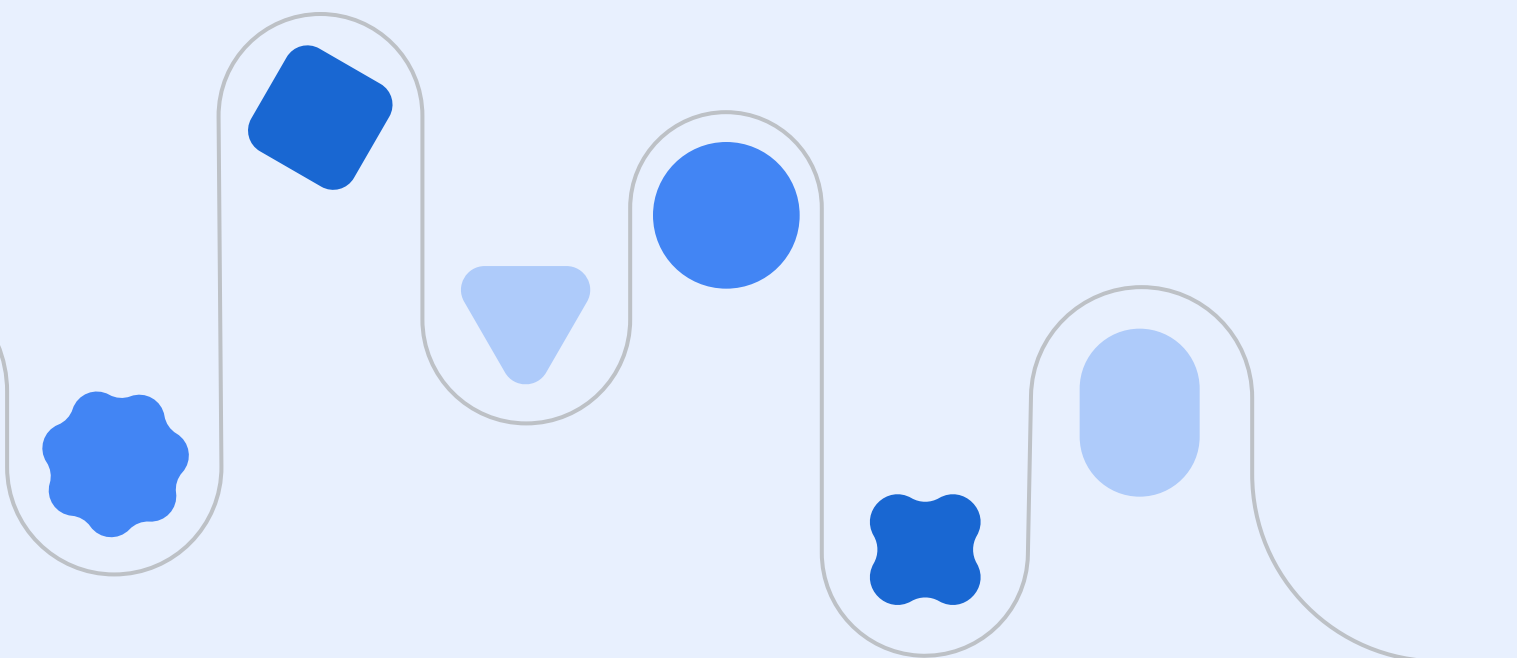
The Google perspective

Re-evaluating student progress

The process of rethinking the design and delivery of student assessments is complex. It requires a consensus on which skills and competencies should be measured, and a scaleable, effective way to measure them. Determining what to measure is part of a much broader conversation around which skill sets are and will be most valuable in the future, which we discuss at length in Part 1 of this research. In this section, we'll focus on the tools we're building to help educators better assess and address student performance at scale.

At Google, one of our goals is to help educators differentiate learning, to address students' personal learning needs. For example, we're seeing in field studies that a lot of teachers are using our AI-driven, interactive assignment tool practice sets (in beta at the time of writing) to run quick assessments, to get a sense of how their class is doing with new concepts, so instruction can be tailored accordingly. With practice sets, students receive immediate feedback and tutor-like support. Auto-grading allows teachers to quickly and easily gain insight into individual and class-level performance, which in turn informs their next lesson plan and assessment. Typically, this learning loop would take weeks or months to complete. With AI,

student needs can be assessed and addressed with greater immediacy, and at a scale that was previously not possible.

There are several tools in Classroom to help teachers quickly evaluate student progress, so they can determine where and with whom they need to spend extra time. When teachers create assignments in Google Classroom, they have the ability to provide feedback by leaving comments on submitted assignments, or writing directly on student work. To help streamline the feedback process, Classroom automatically saves a teacher's most-used feedback to a personalized and automated comment bank. In addition, teachers can draw or write on student work using the Classroom mobile app.

To help ensure consistent and transparent grading, teachers can set up their own rubrics. With rubrics, teachers can grade student work with rubric criterion descriptions displayed right alongside the assignment, and leave personalized feedback for students. Also within Classroom, teachers can create and grade quizzes using Google Forms on its own or by creating a quiz assignment in Classroom.

Of course, we can't do this alone. It's why we're working with partners like IXL, Nearpod, Formative, Kahoot!, Pear Deck, and others, to offer add-ons for Classroom that allow teachers to find, add, use, and grade content from popular edtech tools. With formative assessment opportunities across several add-ons, we aim to provide educators with real-time visibility into student performance, and simple, flexible tools to evaluate progress. In doing so, we also aim to reduce the amount of time it takes for students to take an assessment and receive teacher feedback. This helps students quickly understand where they need to improve and helps teachers understand where to focus.

As leaders and educators re-evaluate how we define and measure student progress, and how to make student feedback both personal and actionable, we believe that AI-supported technology has a big role to play here. By giving teachers the ability to quickly assess student progress and providing students with in-the-moment feedback, AI has the power to close the learning loop faster, at scale. This space is still in its early days, with lots of room for innovation — and we're just getting started.
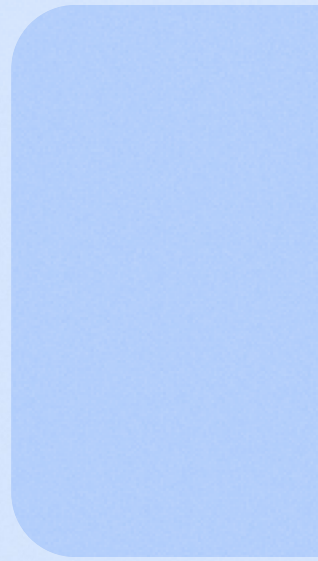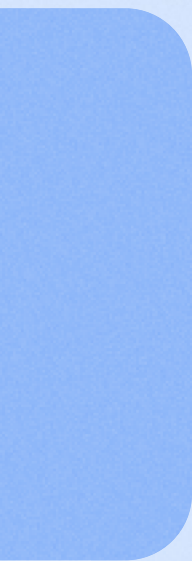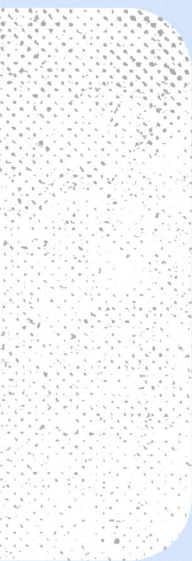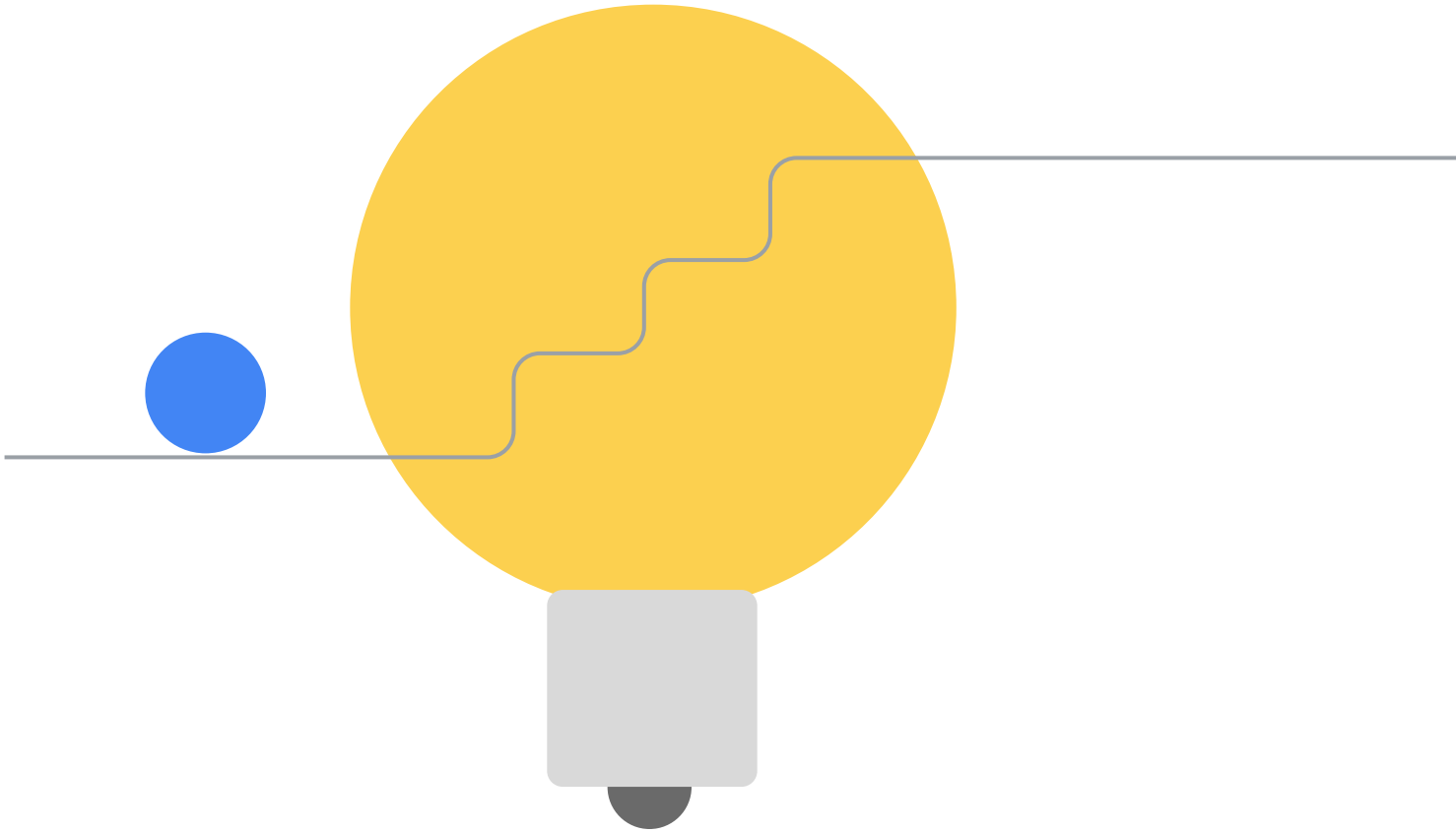
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anything in the world.

Glossary

Blended learning

Where all students receive a mixture of in-person and virtual/remote instruction.[51]

Evidence-based education (also known as 'evidence-based teaching,' 'evidence-based practice' and 'evidence-based learning')

Teaching practice or school-level approaches that are based on evidence.[52]

Flipped classroom

Where students learn knowledge (e.g. reading, videos) at home and work on live problem-solving during class (a form of blended learning).[53]

Formative assessments

The frequent assessment of a student's progress to identify learning needs and adjust teaching appropriately.[54]

Hybrid learning

Where some students attend class in-person, while others join the class remotely.[55]

Hyflex learning

Where students are given a choice in how they participate in hybrid or blended learning modes.[56]

ICT

Information and communications technology.

OECD

Organisation for Economic Co-operation and Development. Member countries include the United States, Mexico, Japan, Turkey, Germany, United Kingdom, France, Italy, South Korea, Spain, Poland, Canada, Australia, Chile, Costa Rica, Colombia, Netherlands, Belgium, Sweden, Czech Republic, Greece, Portugal, Hungary, Israel, Austria, Switzerland, Denmark, Slovakia, Finland, Norway, New Zealand, Ireland, Lithuania, Slovenia, Latvia, Estonia, Luxembourg, and Iceland.

Proficiency-based learning (also known as mastery-based, or competency-based learning)

Systems of instruction, assessment, grading, and academic reporting that are based on students demonstrating that they have learned the knowledge and skills they are expected to learn as they progress through their education.[57]

Summative assessments

The measure of what students have learned at a fixed point in time (e.g. end of year exams) to ensure they have met any required standards.[58]

Transcript (also known as a 'Transcript of Record')

A record of a student's achievements which could include course units or modules taken, the credits gained, and the grades awarded.[59]

Our research approach

It is Google's goal to help learners develop the knowledge, mindsets, skill sets, and tool sets necessary to thrive in a transforming world and actively co-construct a flourishing, diverse and equitable society.

Supporting this ambition, in collaboration with our research partner Canvas8, we conducted a global study to better understand the emerging shape of tomorrow's education ecosystem.

Methodology

Our study took us around the world, including

- 94 in-depth expert interviews with global and country-specific thought leaders in education, including experts in policy, academic researchers covering education, district-level representatives, school principals and teachers and edtech leaders.

- Academic literature review focusing on the last two years of peer-reviewed publications, and desk research and media narrative analysis‡ across the education sector, including policy research and teacher surveys.

Macro questions we asked

- How do we expect education to evolve over the next 5-10 years?

- What are the implications of macro trends on education and schools?

- What are the emerging education technology trends in each market?

Our process

- Interviews were conducted with a panel of international experts to identify the forces shaping the education landscape.

- The interview transcripts were coded to create initial hypotheses which informed a discussion guide for local market interviews.

- Local market interviews were coded by local contributors to identify the most prevalent themes across markets.

- Workshops with experts and consultants helped refine the articulation and organization of the themes.

- Finally, desk research was conducted to elaborate the themes, providing additional theory and context for the readers.

Interviews were conducted between March 2022 and July 2022.

Countries included in the study

Austria, Australia, Belgium, Brazil, Canada, Denmark, Finland, France, Germany, India, Indonesia, Italy, Ireland, Japan, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, the United Kingdom, and the United States of America. The central focus was primary and secondary education (K-12), with acknowledgement to how the trends are also impacting post-secondary education.

Research partner and advisor

Canvas8 (www.canvas8.com) is an award-winning strategic insights practice operating out of London, LA, New York, and Singapore. Its focus is on enabling organizations to be better, by understanding changes in human culture and behavior.

Global nonprofit American Institutes for Research (AIR) (www.air.org) served as an advisor and consultant to this research. Founded in 1946, AIR is one of the largest behavioral and social science research and evaluation organizations in the world. Its mission is to generate and use rigorous evidence that contributes to a better, more equitable world.

Limitations

This work is not intended to be a definitive or comprehensive view of the future of education. It aims to bring together a range of expert perspectives from around the world, and across the education ecosystem, to provide a picture of some of the key trends that will be shaping the future, especially when considering the role of technology. The views and opinions expressed in this report are those of the experts and do not necessarily reflect the views or positions of any entities, institutions or organizations they represent. This report is intended to provide a global view of trends that are relevant across 24 countries. It also acknowledges that each country is different and that there are significant variations within markets. By taking a big picture view, we aim to help educators identify common challenges, ideas, and opportunities around the world.

‡ *Using media intelligence platform NetBase Quid (www.netbasequid.com), we conducted a "future of education" keyword search across global English-language media sources, covering the five-year period from December 2016 - December 2021. This surfaced important events and topics, which fed into the global analysis.*
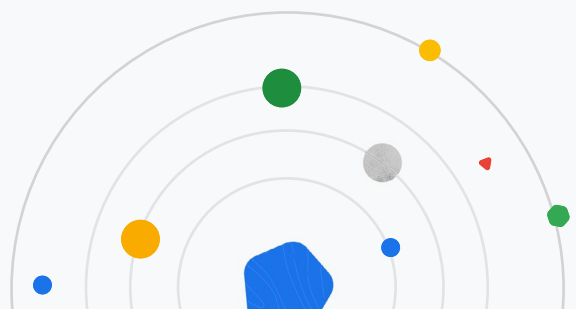
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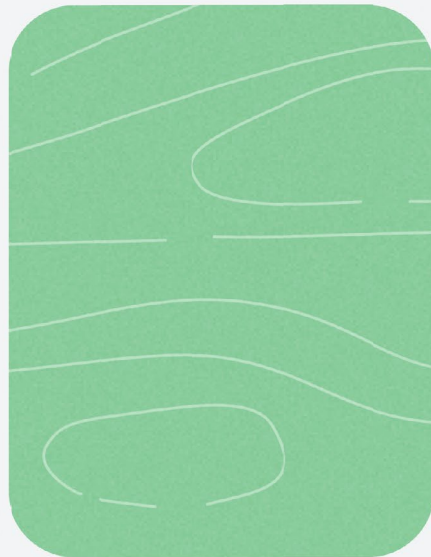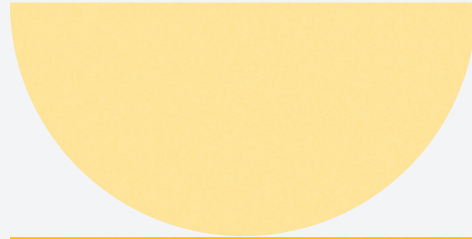
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"Reimagining learning ecosystems" is the third installment of the Future of Education report. Check out Part 1 and Part 2 below.
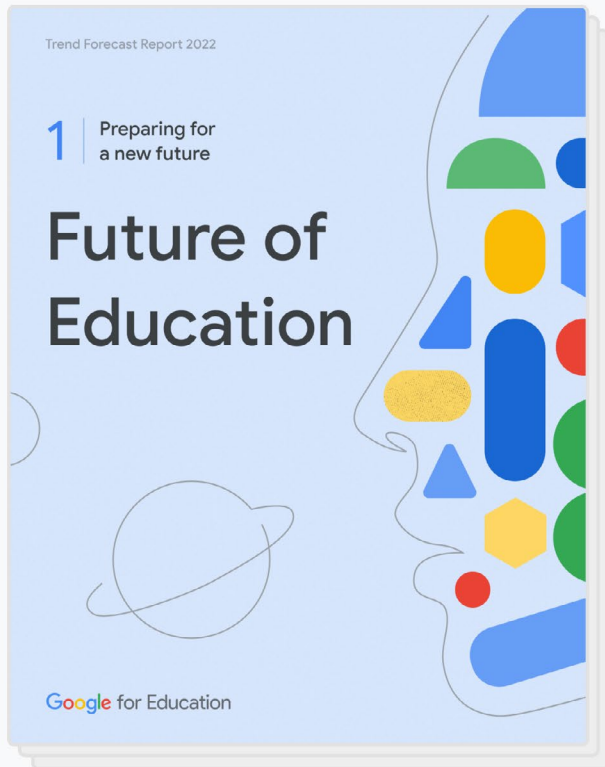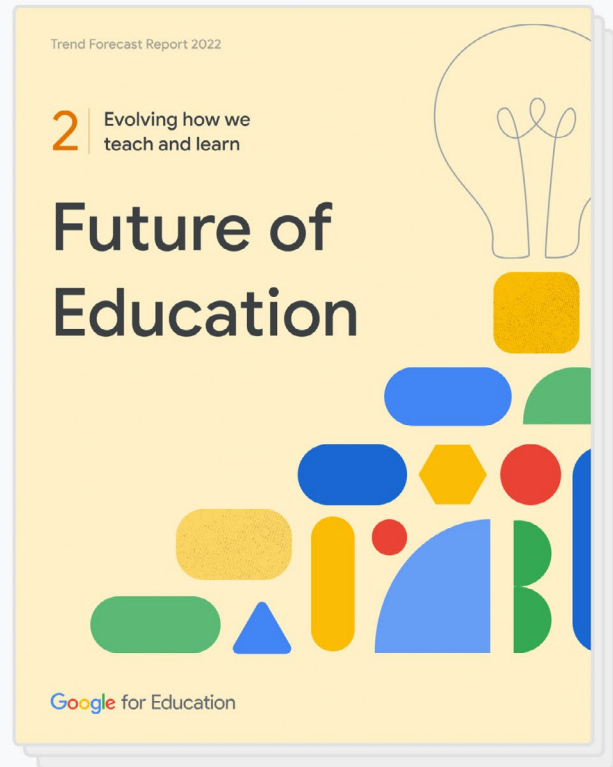
PART 1

Preparing for a new future

The future is shaping up to look radically different from today. As educators work to equip students with the skills and mindsets they'll need to navigate massive change and prepare for a new future, the educational experts we interviewed discussed how and why they're rethinking the role of education.

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PART 2

Evolving how we teach and learn

The rate of change in education has accelerated faster than anyone thought possible.
The experts we interviewed shared how technological advances are evolving how we think about teaching and learning, and how new immersive technologies are reframing our approach to learning design.

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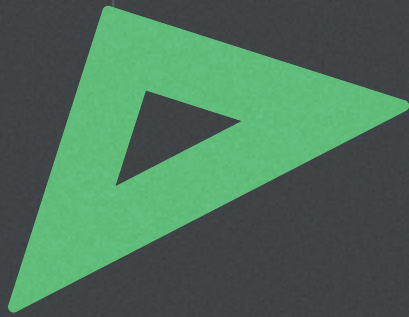
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