

Building Education System Resilience to Meet the Challenges of the Future



Exploring new ways of teaching and using technology to prepare students for the workforce of tomorrow.

Assuring the right to quality education throughout life. The right to education, as established in Article 26 of the Universal Declaration of Human Rights, must continue to be the foundation of the new social contract for education and must be expanded to include the right to quality education throughout life. It must also encompass the right to information, culture and science – as well as the right to access and contribute to the knowledge commons, the collective knowledge resources of humanity that have been accumulated over generations and are continuously transforming.¹

– UNESCO's 2021 Call to Action, recognizing the unique and crucial role of education in improving standards of living

Introduction

The transition to digital has accelerated since 2020, intensifying demand for workers with skills to meet today's challenges and adapt to tomorrow's. In response, efforts to prepare students to enter the workforce are expanding, but a confluence of forces, including teacher shortages, gaps in education infrastructure, and pandemic-related learning losses, are slowing momentum. A widening skills gap is impacting the well-being of communities around the globe and heightening urgency to increase education access and relevance as well as education system resilience.

In this paper, we will explore the issues impacting education today, highlight factors to consider in planning to meet current challenges, and discuss new circumstances that offer reasons for optimism.

Striving for Sustainable, Inclusive Growth in a Changing World

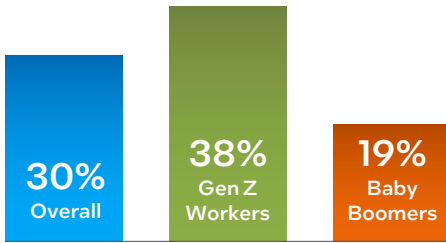
Addressing learning inequities and the rapid technological change of the Fourth Industrial Revolution (4IR) have long topped education priority lists. It has been clear for years that changes in the jobs landscape driven by increasing automation and data-centric business models have created an urgent need for workers with analytical, social-emotional, and technical skills—yet millions of young people have no way to learn these skills.² Discussions of adapting traditional school systems to meet this need were well underway when the pandemic arrived, bringing new and immediate imperatives for change.

If the need to prepare students with 21st century skills was urgent before 2020, then by all accounts it is now acute. Currently, 30 percent of young women and 13 percent of young men worldwide are not in any form of employment, education, or training (NEET).⁴ In all, nearly 1.6 billion children and young people were impacted by school closures in the past two years.⁵ These learning losses turn into lower future earnings potential for students and lower economic productivity for nations. It's estimated that by 2040, the economic impact of pandemic-related learning delays could lead to annual losses of \$1.6 trillion worldwide, or 0.9 percent of total global GDP.⁶

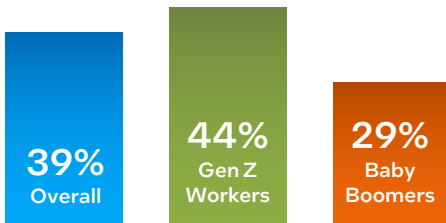
Beyond the financial impact, the pressures of the past several years are affecting our youth's emotional health. In a recent New York Times survey, 94 percent of school counselors said that students are showing more signs of anxiety and depression now than before the pandemic.⁷ Climate change and other stressors are also causing distress, anger, and other negative emotions among young people worldwide. A recent survey of 16- to 25-year-olds found that 60 percent are 'very worried' or 'extremely worried' about climate change, with 45 percent saying they feel the impact of that anxiety daily.⁸

Technology’s job impact over the next three years, % of responders

Concerned that their role will be replaced by technology



Concerned about not getting sufficient training in digital and technology skills from their employer



Base: Gen Z = 5,506
Base: Baby Boomers = 6,951

Figure 1. Younger workers are more concerned that technology will replace their roles.³

Complicating strategies to remediate these issues, there simply aren’t enough teachers. While 85 million teachers are currently employed worldwide, an additional 69 million will need to be recruited to reach the United Nations Sustainable Development Goal 4 (SDG), Quality Education.⁹

These pressing challenges call for quick and meaningful action. The good news is that recent positive developments offer hope.

In one example, teachers, based in part on their experiences using technology during the pandemic, are now more willing

to engage digitally and have more experience with digital tools. Their new mindset and skills have the potential to be transformative on multiple levels. In the classroom, whether in-person, virtual or hybrid, increased comfort and engagement make it easier for teachers to support essential digital skills development in their students. In addition, the ability to offer remote learning ensures that learning can continue even when unexpected disruptions arise. On a societal level, the ripple effects of students’ increased workforce readiness can lift families and, ultimately, national economies.

Another example comes from the private sector, where companies are investing in training and education to help bridge the skills gap. Intel, Microsoft, IBM, and Google, among others, have collaborated with academic and industry partners to introduce several programs ranging from technical education for teens at brick-and-mortar public schools and universities to paid, on-site internships and apprenticeships. These private sector efforts are helping to expand opportunities worldwide.¹⁰

While not complete answers by themselves, these examples show promise as parts of a more comprehensive solution.

The experiences of the past few years underscore the importance of education system resilience, relevance, and access to the well-being of our youth and our global society. To strengthen these qualities going forward, education leaders are exploring new ways of teaching and using technology to improve student outcomes. Lessons learned show that technology, when applied properly, can be a valuable part of the solution, helping enable individuals to raise their standard of living and create long-term social and economic well-being for themselves, their families, and their communities.

Exploring New Ways of Teaching

As the world rapidly changes, teaching and learning experiences are transforming, too. Perhaps the most obvious development is the evolution of the classroom. In some geographic areas, students and teachers are again meeting daily in a physical classroom. In others, newer learning modalities such as “anywhere learning” are enabling more flexibility, a key component to help ensure

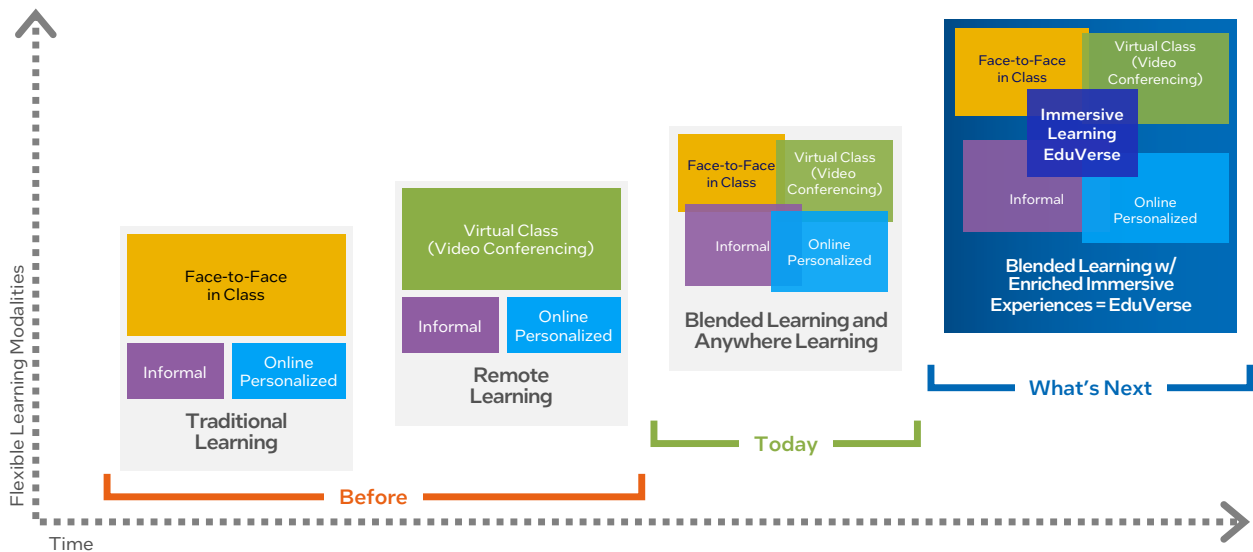


Figure 2. Learning modalities have changed over time.

learning continuity in the face of planned and unexpected changes. These newer, adaptable models focus school time on optimizing high-quality interactions and learning with teachers, while personalizing out-of-class learning.

It isn't only the "where" of teaching and learning that's changing—it's also the "how."

Many educators now are integrating skill-building, technology-supported lessons into everyday teaching to enhance learning—a stark departure from the traditional view of technology strictly as a mode of access to content. An activity in which middle-school students learn how to analyze a character in literature offers an example of how this works:

The activity, called Coding Macbeth, centers on the well-known play by Shakespeare. In a typical classroom environment, students might be asked to analyze a character in the play and write a paper. This technology-integrated activity extends the lesson by introducing coding and Natural Language Processing (NLP). To start, students are guided in a literary analysis of MacBeth. Through class discussion, they consider evidence suggesting that one of Lady Macbeth's character traits is controlling. Using a web application called Pencil Code, students modify a chatbot to respond to questions in a style that reflects Lady Macbeth's character. With this extension, the students gain experience with NLP, a type of AI & machine learning, as they learn about literary character analysis.

Such integrations are clearly not possible, or even desirable, in every subject or learning activity. However, integrating skill-building activities into the existing curriculum, where possible, bridges content and pedagogy for anywhere learning and future skills development. Educators find that it also saves them from having to dedicate independent curriculum time. Today, the ability to conduct virtual chemistry experiments, prepare digital files for digital fabrication, develop business models through computer games, and program simulated hardware electrical components has vastly expanded the range of possibilities for educational systems and educators looking to reimagine technology for education.

Rethinking Models of Teaching

Teacher shortages are another factor prompting innovative thinking about approaches to teaching. Some schools globally are revising the familiar "one teacher, one classroom" model and trying variations of differentiated staffing. In these models, adults work collaboratively to meet the needs of individual students, rather than asking one teacher to meet the needs of all students in a classroom.

Team teaching, with multiple classroom leaders for classes that are larger than average size, is one such approach. A team might include certified teachers, special educators, and/or residents from teaching colleges, drawing on each member's expertise to optimize students' learning experience.

Multiclassroom teaching is another approach, currently in practice in 55 school systems in 10 U.S. states. In the multiclassroom model, teachers with strong track records

of student growth are appointed as "multiclassroom leaders" who teach while mentoring teams of three to eight educators on how to design instruction, co-teach, coach, and analyze data on student learning. Results to date show that teachers on multiclassroom leader teams moved from producing 50th percentile student learning growth to 77th percentile, on average, equating to an extra half year of learning for students each year.¹¹

Individually, many educators are modifying their methodology to encourage engagement and meet students' needs. Some have shifted towards using facilitation methods more frequently, rather than instructional methods. Educators who have moved in this direction note that a facilitation-style approach encourages students to exhibit more self-directed behaviors. In terms of assessment, facilitation methods bring an added advantage. Shifting from a test or exam orientation to a more flexible and continuous assessment approach removes the high stakes nature of the experience that tended to encourage cheating.

Adapting the traditional model of teaching to meet students' and teachers' current needs offers the potential for addressing students' specific skill gaps more effectively while empowering and retaining skilled teachers.

Fostering Skills for Success in a Changing Workplace

What is the best way to prepare students for the workforce when many of the jobs they will do don't even exist yet? In a world of constant change, how can educators equip students with the skills to shape their society rather than simply react to it? Education leaders understand that building the right skills for the future in this environment calls for fostering new ways of thinking and collaborating through a combination of people, content, and technology.

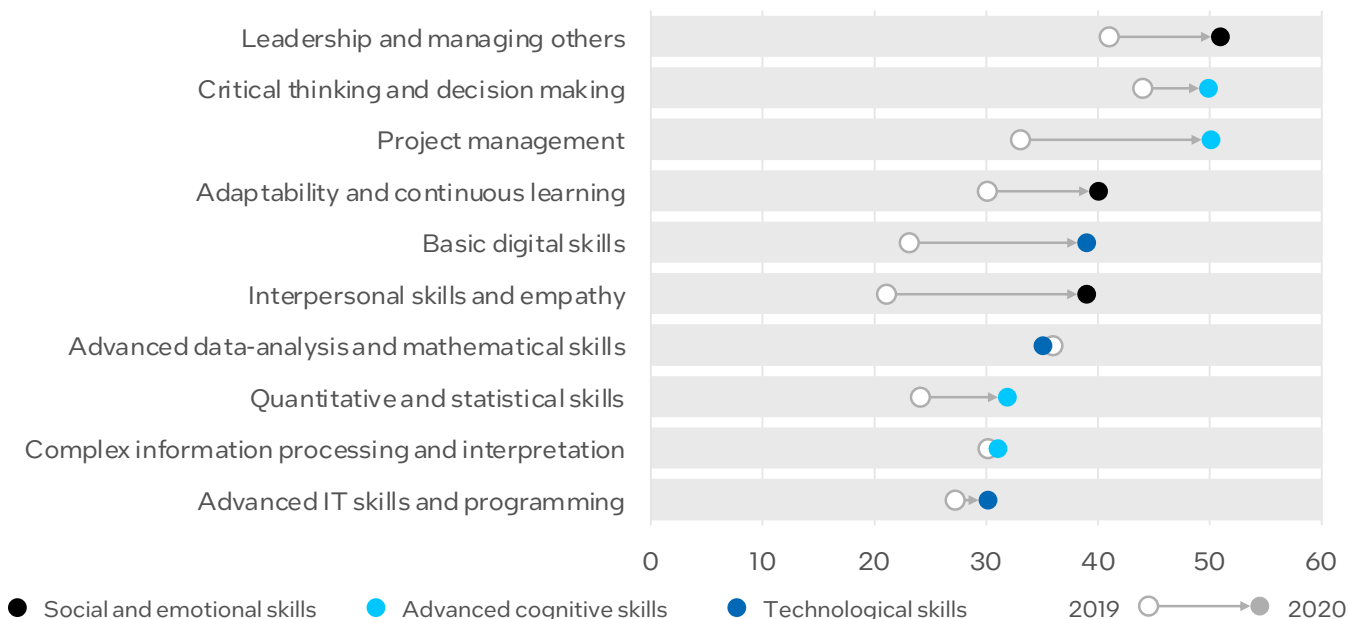
150 Million

new technology jobs
predicted in the next 5 years¹²

Going forward, successful workers will need to constantly learn and imagine new ways of responding to the challenges that come their way. As the results of a 2021 McKinsey & Company survey highlight, employers already prioritize higher-order cognitive and problem-solving skills among current and prospective employees.

**UNESCO's 2021 Call to Action,
recognizing the unique and crucial
role of education in improving
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Skills that companies have prioritized to address through reskilling¹
% of respondents



¹Out of 25 skills that were offered as answer choices; n = 700.

Figure 3. Companies are increasingly focused on developing employees' social, emotional, and advanced cognitive skills.¹³

Social-emotional skills such as emotional intelligence and cooperation are also more critical than ever as the world of work becomes more collaborative and project based. Today's students will need to be able to collaborate with team members in other countries and time zones, some of whom they may never meet in person. Finding new ways to empower teachers and learners to build these essential skills continues to be a top focus for education stakeholders worldwide.

Future Focus

Recent experience has demonstrated that technology alone is not the answer. While remote learning has provided a lifeline since the onset of the pandemic, it also has underscored the primacy of the human connection between teachers and students. Technology can function as a powerful tool to support that bond.

The global experience with remote learning also has shone a bright light on the critical role technology infrastructure plays in bringing high-quality education to all. For many students today, even those with devices of their own, a lack of reliable access to a learning platform remains an obstacle to building skills for tomorrow. Moving ahead, education decision makers are carefully evaluating infrastructure requirements, focused on building resilient systems that support multiple models for learning and provide safe, reliable access for all students.

Many in education—from educators on the frontlines to members of the European Commission to U.S. Secretary of Education Miguel Cardona—view the current moment a chance for a “reset.”¹⁴ But a reset means different things to different people. For a significant number of stakeholders, particularly those for whom the shift to remote learning was traumatic, the idea of a rollback to the established routines of teaching and learning before the pandemic is compelling.¹⁵ Others see opportunities to build on what has been learned as we move forward, using technology to support learning more effectively in the future. To be sure, there is no single view. People will come to diverse conclusions about how best to build an education system that is sturdy and relevant enough to meet future needs based on their own circumstances and priorities. Bringing these visions to life will require working together to ensure strong buy-in from all stakeholders and to develop an action plan.

We at Intel see a need for a two-pronged approach: first, building greater resilience in education systems and second, accelerating the skills development of students for the future workforce. One solution that addresses both needs is to reimagine the use of technology in education. The past few years gave us a taste of what is possible, as we witnessed learning continue in the face of massive disruption, enabled by leveraging the capacity of the network, the capability and agility of laptops, and the power of communication platforms. By learning from and expanding on our recent experiences, we can significantly strengthen resilience in our education systems. Further, by thinking in a holistic fashion, we can find opportunities to integrate skill-building activities into everyday teaching and learning.



Figure 4. Elements that create resilient education systems and help to build skills for tomorrow.

Technology plays an important role in this strategy, as the basis of the technical infrastructure and adaptable learning environments on which resilient education systems rely:

- A reliable, secure, and robust infrastructure, including connectivity, storage capacity, data security, and tools for manageability is essential to keep the teaching and learning experience as seamless and secure as possible.
- Ensuring that each person is equipped with the right device—with the right combination of performance and features—can take the stress out of anywhere learning, and keep teachers and students focused on teaching and learning, not on technology issues and troubleshooting.
- Technology can also help foster continuous connection and collaboration, not only for mental health, but for human connectedness and teamwork—important social skills now and in the future.
- Beyond these fundamentals, data-driven insights can help deliver a more efficient, personalized, and equitable learning experience and enable educators to develop better-informed strategies for increasing student engagement.
- Integrated learning management systems can increase educator effectiveness by helping make sense of data, allowing for more informed decision-making to support each student’s growth, and by streamlining communications and simplifying processes.

With the benefit of experience, it is easy to appreciate how critical infrastructure resilience is to ensuring safe, reliable access to learning. Less obvious, but equally important, is the role of resiliency in the learning experiences themselves.

Creating a structure for educators to become leaders of learning via professional development that supports their changing role enables them to handle different learning modalities and address their students’ future needs.

Classroom analytics can help educators teach more effectively by providing real-time support for class management and monitoring engagement.

Data-driven learning allows educators to track each student’s academic progress, discover early warning signs that may require intervention, and personalize experiences to ensure that students are learning as they developmentally prefer to learn.

Lastly, accessible and highly interactive learning modalities, combined with digital content for anywhere learning, maximize continuity and minimize learning loss during disruptions. This allows teachers to take maximum advantage of the opportunities that technology provides for project-based learning or future skills development, whether students are at school or at home.

All of these elements work together to help students build skills that they will need to thrive in tomorrow’s workforce.

How Intel Can Help

Intel envisions a world in which students learn, from anywhere, the skills to be innovators as they prepare for, imagine, and create jobs of the future. In order to support the transformation journey of education systems, Intel has introduced the **Intel® Skills for Innovation** framework that focuses on the development of mindsets and skillsets.

About Intel® Skills for Innovation Framework

Intel® Skills for Innovation Framework empowers today’s students to become tomorrow’s innovators. Using this framework, educators can integrate technology into their programs and plans to build skills of the future, and help students develop their cognitive, technical, and social-emotional skills.

The framework and its corresponding resource package include:

- A planning toolkit to help education decision makers understand new skill requirements, align stakeholders, and facilitate the creation of an action plan
- An activity starter pack that allows schools and educators to experience how technology can be used for curriculum-integrated skill-building activities along with resources to support the development of physical and virtual innovation spaces
- A series of professional development courses to develop educator competencies to facilitate higher-order skills development in their students.

Taken together, the **Intel Skills for Innovation** framework allows decision makers and educators to understand, experience, and implement the Skills for Innovation vision in their education system.

For more information, visit skillsforinnovation.intel.com.



Targeted Mindsets & Skillsets

Figure 5. Intel® Skills for Innovation framework focuses on the development of mindsets and skillsets.



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