COVID-19: ACCELERATING THE SHIFT TO ONLINE LEARNING

GIRLS AND STEM: CLOSING THE GENDER GAP

AI AND ROBOTICS: SURGE IN EDTECH INVESTMENT FOR SCHOOLS

EDUCATION AND POVERTY

IMPACT 2021

AN FII INSTITUTE PUBLICATION

CLOSING THE GAPS

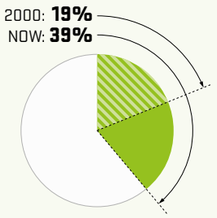
HOW TECHNOLOGY IS CHANGING THE FACE OF EDUCATION

FII INSTITUTE
Future Investment Initiative Institute
Impact on Humanity

FACTS AND FIGURES

WHERE WE ARE AND WHAT TO DO

(AS OF SEPTEMBER 2021)



HIGH SCHOOL RISING HIGHER

39% of young people worldwide are studying at high schools, universities or other institutions of tertiary education. In 2000, it was only **19%**.

SOURCE: WORLD BANK

EDUCATING THE WORLD

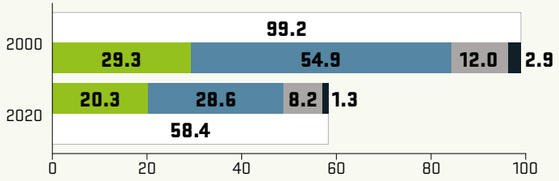
The UN Sustainable Development Goals have set a bold target for 2030: **free, equitable, and quality primary and secondary education for all girls and boys.** The world is getting closer to that target, but there is still a long way to go. While the number of non-schooled children has halved over the last two decades, there are still more than **50 million** children who don't attend school – most of them in low- and middle-income countries.

LEARNING POVERTY: STILL AN ISSUE

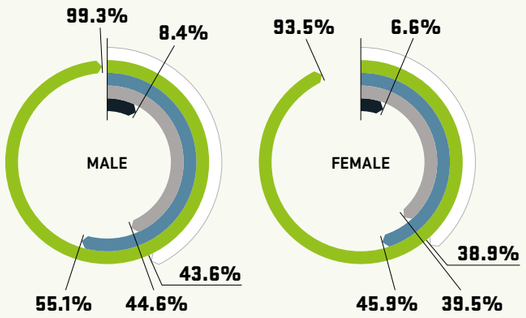
While schooling rates are going up, **schooling quality often remains poor**. "In low- and middle-income countries, various metrics show that roughly half of students are going through school without acquiring the foundational skills they need," the World Bank found. Its new **Learning Poverty Indicator** combines schooling and skills data – and shows major deficiencies, especially in low-income countries.

● LOW INCOME ● LOWER MIDDLE INCOME ● UPPER MIDDLE INCOME ● HIGH INCOME ○ WORLD SOURCE: WORLD BANK

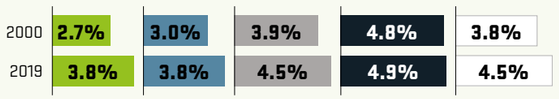
CHILDREN NOT IN SCHOOL (IN MILLIONS)



LEARNING/POVERTY RATIO (PERCENTAGE OF CHILDREN, 2019)



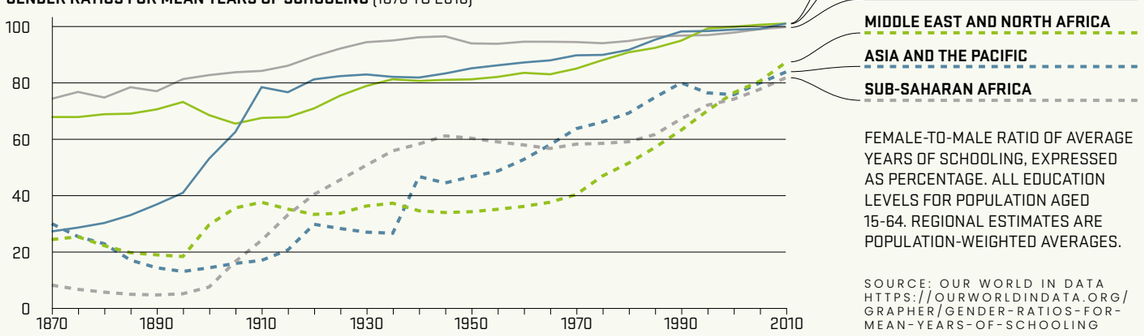
EDUCATION SPENDING (PERCENT OF GDP)



GIRLS CATCHING UP

In many parts of the world, girls still spend **fewer years** in school than boys. But this gender difference is shrinking fast.

GENDER RATIOS FOR MEAN YEARS OF SCHOOLING (1870 TO 2010)



FEMALE-TO-MALE RATIO OF AVERAGE YEARS OF SCHOOLING, EXPRESSED AS PERCENTAGE. ALL EDUCATION LEVELS FOR POPULATION AGED 15-64. REGIONAL ESTIMATES ARE POPULATION-WEIGHTED AVERAGES.

SOURCE: OUR WORLD IN DATA HTTPS://OURWORLDINDATA.ORG/GRAPHER/GENDER-RATIOS-FOR-MEAN-YEARS-OF-SCHOOLING

INFOGRAPHIC: JÖRG BLOCK

EDITORIAL

FII INSTITUTE Future Investment Initiative Institute | Impact on Humanity

BRIDGING THE FICTITIOUS DIVIDE EDUCATION FOR ALL

FII INSTITUTE publishes the fifth of our report series as millions of children remain without access to basic education.

The digital divide is growing wider between people and regions that have access to modern information and communications technology and those that don't. It cuts across class, race and national borders, leaving the 'haves' with the highest-quality education available, and the 'have-nots' with little or no access to quality education.

But breakthroughs in modern technology make it possible for many more children to have access to affordable, good-quality education to prepare them for the jobs of the future in both their respective environments and the world at large.

This report focuses attention on future trends and tendencies in education. Along with AI, robotics, healthcare and sustainability, education is the fifth pillar on which FII Institute plans to build a brighter future for all and with all. We embrace diversity, equity and inclusion (DEI), while advocating on behalf of learners, young and old, globally.

This is the moment to make real and sustainable change in the way we approach education. In the wake of the ravaging pandemic that we are still emerging from, the world saw that technology exists that could deliver quality education to millions more, but which isn't made accessible or affordable.

Join us as we explore how technology-based education and upskilling will not only improve lives, but also reinvigorate communities, break the cycle of poverty, promote social mobility and close the large opportunity divide separating so many young people around the world.

Richard Attias
CEO, FII Institute

COVER: MALAIKA PROJECT / ILLUSTRATION: ANJA JAGER/ SOOTHING SHADE

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FII: EDUCATION AND POVERTY IMPACT REPORT 2021 5

Page 48

FULL STEM AHEAD

The new STEM Barbie dolls help enable young girls at play to imagine themselves into careers as doctors, scientists or coders

Page 52

LEARNING BY KICKING

Sport's transformative powers have revolutionized how to lift homeless youth out of poverty and back into society through teamwork and learning

PHOTO: DANIEL LIPINSKI / HOMELESS WORLD CUP, MATTEL PR, GETTY IMAGES

Page 26

THE ONE WORLD CLASSROOM

In the post-pandemic world, AI – including machine learning, natural language processing, and optical and speech recognition – provides vital assistance for teachers

Young dreams

Rani, 16, and her friend walk to take a school exam. Two years before, Rani (in the blue scarf) was almost forced into child marriage but now dreams of becoming a doctor. Education for girls in Bangladesh after age 18 remains hard to access.

KHULNA

6 MARCH 2017

TOWARDS A DIGITAL FUTURE

Covid-19 exposed stark inequalities in students' access to education, and in some countries girls are still expected to marry young rather than study and have a career. But many students have transitioned successfully to online learning.

PHOTO: GETTY IMAGES; VCG VIA GETTY IMAGES

New reality

Chinese primary school students in Sichuan Province wear virtual reality headsets so they can participate in a 5G online course at their primary school.

CHENGDU

12 APRIL 2021

Fixing smartphones

Chilean student Tiberio Malaiu, 17, (top left) and his friends repair damaged smartphones and donate them to school students who need a device to be able to learn online during the pandemic.

SANTIAGO

30 APRIL 2021

Free Wi-Fi

Kharisma Anisa Putri, 14, uses her smartphone to study online using free Wi-Fi in her village. She is one of nearly 70 million children in Indonesia affected by school closures during the pandemic.

INDONESIA

28 SEPTEMBER 2020

PHOTO: AFP VIA GETTY IMAGES; GETTY IMAGES

THE MAGIC WAND: EDUCATION REFORM IS KEY TO ADVANCEMENT

History shows that countries which value educating their children do better. In this era of rapid technological and scientific advancement, this still holds true. Nations need to invest in learning, skills and innovation.

Education lifts both people and societies out of poverty - the better children learn, and the better they are taught, the better their social status.

PHOTO: LIGHTROCKET /GETTY IMAGES

WHAT CAN A COUNTRY do when it is poorer than its neighbors, has no mineral resources to extract, and neither high-tech nor industrial production? It can resign itself to eternal poverty, or begrudge the better-off countries around it. Or it can start to unleash the potential of the one resource it can rely on: its people. Its children. Its brains.

It has worked in the past. It works right now. And it will work in the future.

Let's journey into the past. It is 1867, more than 150 years ago. We start our trip into the power of education in, of all places, Hungary in Central Europe. There we meet an early adopter of this kind of education strategy: the novelist Joszef Eötvös. He had just been appointed education minister of the newly established Kingdom of Hungary, and saw himself as in a key position to improve the wealth of his nation: "Of all the factors that determine the welfare of citizens and the capacity of a nation, none is as important as the nation's education system."

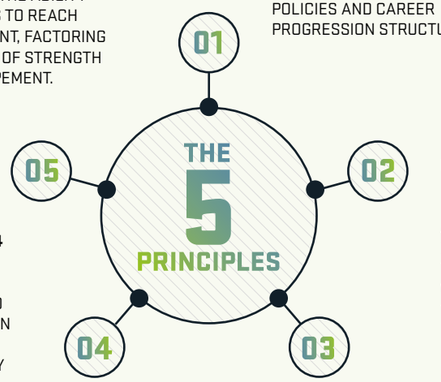
Eötvös' reforms invested in students – nine years of compulsory education for everyone – and in teachers, by founding 30 training centers for them. His reforms also invested in social mobility: civil and political offices that were formerly reserved for the upper class became accessible to every Hungarian. This became a powerful incentive: the better you learn, and the better you teach, the better your social status. Talented Hungarians moved upwards in society, and Hungary moved upwards in the league table of European countries.

SCHOOLING RAISES EARNINGS

We have come a long way since those days, but we are still on the same path. Education is like waving a magic wand because it lifts both people and societies out of poverty. "There are many benefits to investing in education," says Harry Patrinos. The manager of the World Bank's education global practice sees social, economic and financial benefits as much for those who study as for the society they live in. The most important impact for the students is ↘

HOW TO IMPROVE TEACHING QUALITY

Five recommendations from the World Bank



PRINCIPLE 01
MAKE TEACHING AN ATTRACTIVE PROFESSION BY IMPROVING ITS STATUS, COMPENSATION POLICIES AND CAREER PROGRESSION STRUCTURES.

PRINCIPLE 02
ENSURE PRE-SERVICE EDUCATION INCLUDES A STRONG PRACTICUM COMPONENT SO THAT TEACHERS ARE WELL-EQUIPPED TO TRANSITION AND PREFORM EFFECTIVELY IN THE CLASSROOM.

PRINCIPLE 03
PROMOTE MERITOCRATIC SELECTION OF TEACHERS, FOLLOWED BY A PROBATIONARY PERIOD, TO IMPROVE THE QUALITY OF THE TEACHING FORCE.

PRINCIPLE 04
PROVIDE CONTINUOUS SUPPORT AND MOTIVATION, IN THE FORM OF HIGH-QUALITY IN-SERVICE TRAINING AND STRONG SCHOOL LEADERSHIP, TO ALLOW TEACHERS TO CONTINUALLY IMPROVE.

PRINCIPLE 05
USE TECHNOLOGY WISELY TO ENHANCE THE ABILITY OF TEACHERS TO REACH EVERY STUDENT, FACTORING THEIR AREAS OF STRENGTH AND DEVELOPEMENT.

SOURCE: WORLD BANK

↘ in the improvement of their living conditions, and it is a very concrete and measurable one. Patrinos estimates that "every year of schooling raises earnings by 10% a year over a lifetime."

In the global fight against poverty, education is one of the most powerful weapons. And one that is used more and more frequently. Globally, the average length of schooling increased from only 3.2 years in 1950 to 7.8 years in 2010, and it is projected to reach ten years by 2050. That's a three-fold increase in just a century, although the pandemic could yet impact these figures.

In the developing world, growth rates for schooling are even higher. The low and middle-income countries tripled their average schooling years in the five decades from 1950 to 2000 (from 2.1 to 6.2 years). They are still narrowing that gap and closing in on the schooling rates of high-income countries. Patrinos says that the "education revolution" that started in the second half of the 20th century is equally shaping the first half of the 21st century.

Indeed, the fight isn't over – neither the one against poverty, nor the one for education. "Complete free, equitable,

Improvement is measurable - for every year that a child receives schooling, they have the prospect of raising their earnings by 10% a year over their lifetime.

PHOTO: VCG VIA GETTY IMAGES

53% of all children in low- and middle-income countries suffer from learning poverty.

and quality primary and secondary education for all girls and boys" is one of the United Nations' Sustainable Development Goals for 2030. But we're not there yet – not even close. Globally, 260 million children do not attend school and, of those that do, a large proportion are failing to acquire fundamental skills.

THE LOSS OF HUMAN CAPITAL

A World Bank study revealed that "53% of all children in low- and middle-income countries suffer from learning poverty." The World Bank's Learning Poverty indicator combines shortfalls in school access and learning in one simple question: "What share of children are not able to read a short age-appropriate text with comprehension around age ten?" Answers range from 1.7% in Vietnam to a depressing 98.7% in Niger.

The World Bank has even tried to quantify the loss of human capital that countries (and the world) suffer as a result of poor education provision: "By the age of 18, a child born today will be only 56% as productive as a child would be under the benchmark of a complete ↘

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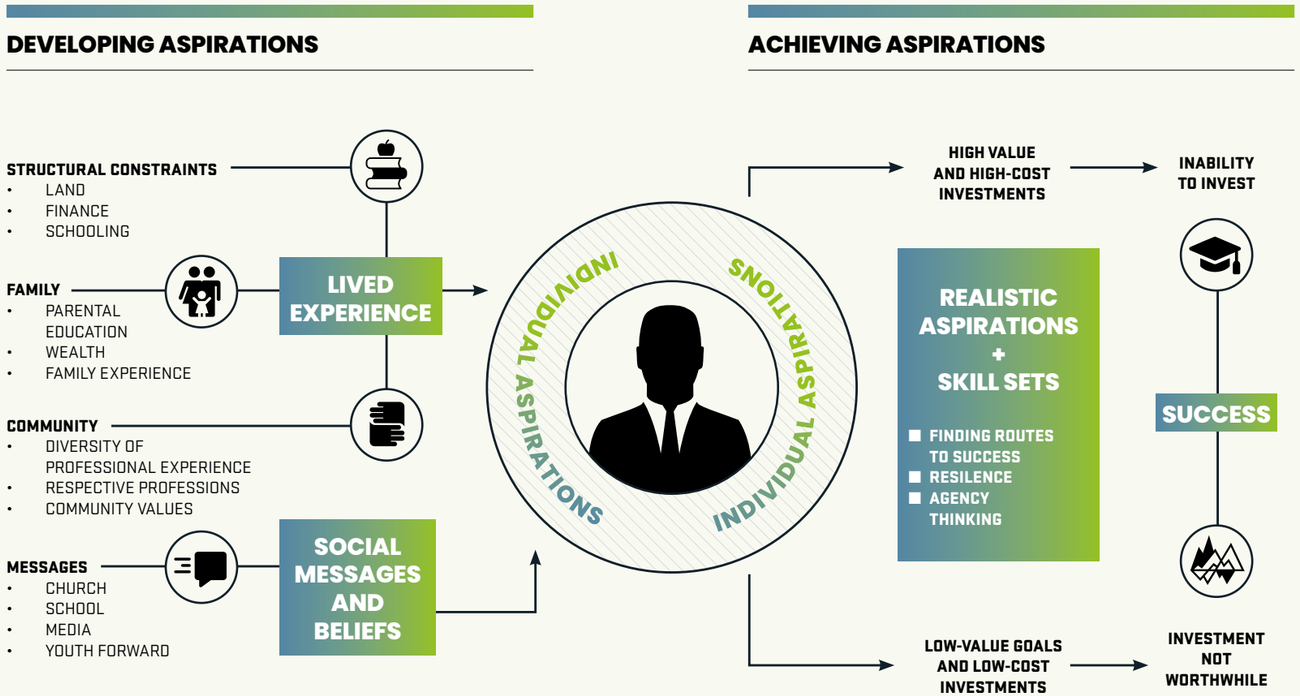
education and full health," according to the Bank's Human Capital Index. While the best performing countries, like Singapore or Japan, achieve 80% of their children's productive potential, the laggards, like Chad or the Central African Republic, reach only about 30%.

So, literacy and other basic skills should be the number one priority for education policies worldwide, the World Bank concludes. "They are foundational for all other education outcomes. And education is foundational for countries' growth, productivity, and development; for individual and family incomes and welfare."

BEST PRACTICE IN VIETNAM

But the huge number of nominally schooled but poorly educated children shows one especially severe issue to address: teaching. Going to school won't make any difference if a child doesn't learn anything there. The World Bank offers five recommendations for how to improve the quality of teaching (see graphic page 12), and its education practice manager Harry Patrinos cites a best-practice country – Vietnam.

"Primary school children in Vietnam learn about twice as much as comparable students in other developing, middle-income countries such as Peru." And according to the Learning Poverty data, Vietnam's education system even beats all high-income countries around the world. For secondary and tertiary education, technological progress has opened up another possibility to dramatically increase the quality of learning: online courses. Information and communication technologies have spread all over the world, to all age groups and all social classes. The rapid rise of the smartphone has brought the knowledge of mankind to even the remotest places – and it is accompanied by an equally rapid rise of programs, courses or apps that try to teach this knowledge to anyone who wants to learn. They open up windows of opportunity previous generations didn't even dare to dream of, and they offer a once-in-a-lifetime chance to leapfrog traditional education systems.



HOW ASPIRATIONS ARE DEVELOPED AND ACHIEVED

People's aspirations rise the more they have the opportunity to learn - whether in school or in life - coupled with the desire to make the world, and their home, a better place.

SOURCES: BOATENG AND LÖWE (2018)

> "Primary school children in Vietnam learn twice as much as comparable students in other developing countries."

HARRY PATRINOS

Education practice manager, World Bank

PHOTO: PRIVAT

Massive Open Online Courses (MOOCs) have revolutionized access to higher education in the last decade. The take-off began in autumn 2011 with a course on artificial intelligence at the University of Stanford, USA. It attracted 160,000 online participants; Stanford professors were brought to slum kids in Nigeria, and the slum kids to Stanford.

Even for more down-to-earth topics, such as vocational education, mobile and online courses are gaining traction. From apps that teach bookkeeping to IBM data analyst certificates at online course giant Coursera, there's an abundance in quantity. Quality may be an issue, though. Drop-out rates at MOOCs are high, often above 90%, and globalized content may not always be appropriate for local needs.

Karishma Banga, senior research officer at UK-based think tank Overseas Development Institute (ODI) has looked into digital vocational education courses in South Africa, Ethiopia and Kenya. She sees an advantage in non-traditional education, especially for out-of-school youth, marginalized sections of society and adult learners. But to be effective, "funding needs to go to accredited and flexible courses that are aligned with employers' needs."

Susan Njambi-Szlapka, a research colleague of Banga at ODI, brings up another model for non-traditional education: children teaching themselves. "In Africa, where technical and vocational education training institutions lack adequate facilities or equipment to provide young people with practical knowledge, 'makerspaces' can provide an avenue for increasing young people's employability."

Collaborative peer-to-peer learning between makerspace users has proven to be a very efficient tool to "plug the skills gap in Africa" and to connect the makers with the international community.

COGNITIVE SKILLS

The focus of education policies is mainly on the supply side – schools, teachers, textbooks, curricula – but the wealth impact of education depends on the demand side. Does someone need what you've learned? What is it good for? Not all education investments work like a magic wand. A study in Germany found that some university majors can even reduce their students' average future earnings. Ironically, German language studies yielded the highest negative return on university investment, while dentistry showed the highest positive return.

Judging education by its usefulness is a highly controversial issue in education science. To give an example, vocational education that makes you fit for a specific job is sometimes seen as a solution (as it integrates students into today's labor market) and sometimes as a problem because it de-emphasizes cognitive skills. For the World Bank's Patrinos, "those are precisely the skills that are needed to improve one's chances of obtaining a good job that is less likely to be prone to automation."

Lack of skills needed for employability is one of the major obstacles for sustained growth in young, upward-striving countries. India's National Employability Report for Engineers offers just one example, for one of the most important disciplines in a country with more than a billion inhabitants. Only about 40%

FII: EDUCATION AND POVERTY IMPACT REPORT 2021 17

↘ of all engineering graduates in India gained any kind of practical experience during their studies; just one in 25 graduates is employable in software-related jobs at start-ups, and only one in 30 engineers possesses new-age skills in areas such as AI, machine learning, data engineering, and mobile technologies.

Formal education prepares students for academic professions and, although these are needed too, progress often means "getting things done," not "getting things thought."

When high formal education collides with low employability, conflicts arise. The aspirations model developed by ODI researchers Ethel Seiwaa Boateng and Alexandra Löwe (see graphic page 14) describes how the blessing of education can become a curse. The more you learn in life and in school, the higher your individual aspirations: You want to make the world – and your home – a better place. But when these higher aspirations cannot be realized, you get disappointed. Lower goals don't seem to be worth your time, so you might just end up in a spiral of waiting, hoping, desperation and revolt.

This is why ODI researchers Karishma Banga and Susan Njambi-Szlapka insist on the need for demand-side inputs, such as customized training from employers, assistance for young entrepreneurs' start-ups, or government-funded innovative training programs. Bringing the markets and their demands into the education game is a bad idea when it's only about young children and basic skills. But the closer you get to the end of the educational path, the better this demand idea gets.

WASTED TALENT

Just like the supply side of education, the demand side is also prone to globalized solutions. For most talented youths who can't achieve their aspirations near home, there is a better labor market somewhere out there. Educated, skilled people will be better able to build their own perspective, whether as employee or entrepreneur, in the military or in public service, in or outside their country. European countries lament their "skills gap," because for at least the next two decades their younger genetration cohorts are not big enough to replace the retiring baby boomers. At the same time, there are millions of people whose talents are going to waste in poorer countries. There must be a better solution.

Let's look again at the education history of that small country in central Europe, because precisely that kind of self-built global perspective happened in Hungary a century ago. Droves of highly educated young Hungarians left the country in the 1920s and '30s. Two generations after Joszef Eötvös' reforms, the link between education and status was broken by a law that limited the number of Jewish students to 6% of all students in Hungary. Some of the country's most promising scientists left and turned to a country without limits to aspiration – the USA. There they became key figures in high-tech areas like computer science (e.g. John von Neumann) and nuclear physics (e.g. Leo Szilard or Edward Teller). Sure, this time there's no need for migrant scientists to build the new equivalent of the hydrogen bomb. But the planet has thousands of problems that need cool solutions, wherever these may come from. And isn't this the kind of globalization that we want and need? If we, as a world, manage to grow the global talent pool, then we, as a world, will be able to make use of it. ■

PHOTO: MALTE JAEGER/LAIF, PRIVAT

"The more you learn in life the higher your individual aspirations."

ETHEL SEIWAA BOATENG AND ALEXANDRA LÖWE

Researchers at global think tank Overseas Development Institute (ODI)

There is a need for demand-side inputs such as customized training from employers, and government-funded innovative training programs

The markets' demands in the education game is a bad idea if the focus is only on young children and basic skills.

CALL TO IMPACT

1 Basic skills first: A sound foundation of solid reading skills for every child is the sine qua non of every education policy.

2 Invest in teaching quality: The better the teachers, the better the education. Raise the status – and the pay – of your teachers.

3 Learning for doing: The closer you get to the end of an education path, the bigger the importance of employability. Focus on skills that will be needed in the labor market.

4 Trust in your youths' own initiative: Not every educational project has to be developed and guided by institutions. Especially when it's about new technologies, the chances are high that the kids know better than the teachers how to make productive use of it.

COVID, EDUCATION AND POVERTY

Moving lessons online during the pandemic has accelerated the use of new tools and workflows

AS OFFICES, shopping malls and airport lounges emptied out in March 2020, the pandemic was described as a "great leveler" for the world. City centers became ghost towns, supermarket shelves were stripped bare, and people retreated into their homes. This sense of a global collective moment was most keenly felt in schools, colleges and universities. From Saudi Arabia to Sri Lanka and the US to Uganda, the world's 1.5 billion young people in education found the gates to their institutions and future prospects temporarily closed.

Wherever you resided, online learning came to the fore. However, it was wrong to assume that something that affected everyone did so in the same way. The pandemic underlined stark educational fault lines between high- and low-income countries. No nation in the world was immune to the coronavirus and its consequences, but those with better resources were largely more resilient.

Moving lessons online gave a huge fillip to the educational technology (EdTech) sector. New tools and workflows that might have taken years to push through were adopted in a matter of months.

Lessons were conducted and received from beds, sofas and kitchen tables. Harassed parents, used to haranguing their children's educators, developed a newfound respect for the profession as they juggled home-schooling and working from home. Teachers transformed themselves into "entertainers" as they fought for the attention of their students on a live stream. Less than 18 months later, the ramifications of closing our schools are still being assessed. Catch-up classes, the mental well-being of pupils, and the training of teachers are all on the agenda – set against the backdrop of recessions and financial demands from other sectors and industries.

REFASHIONING EDUCATION

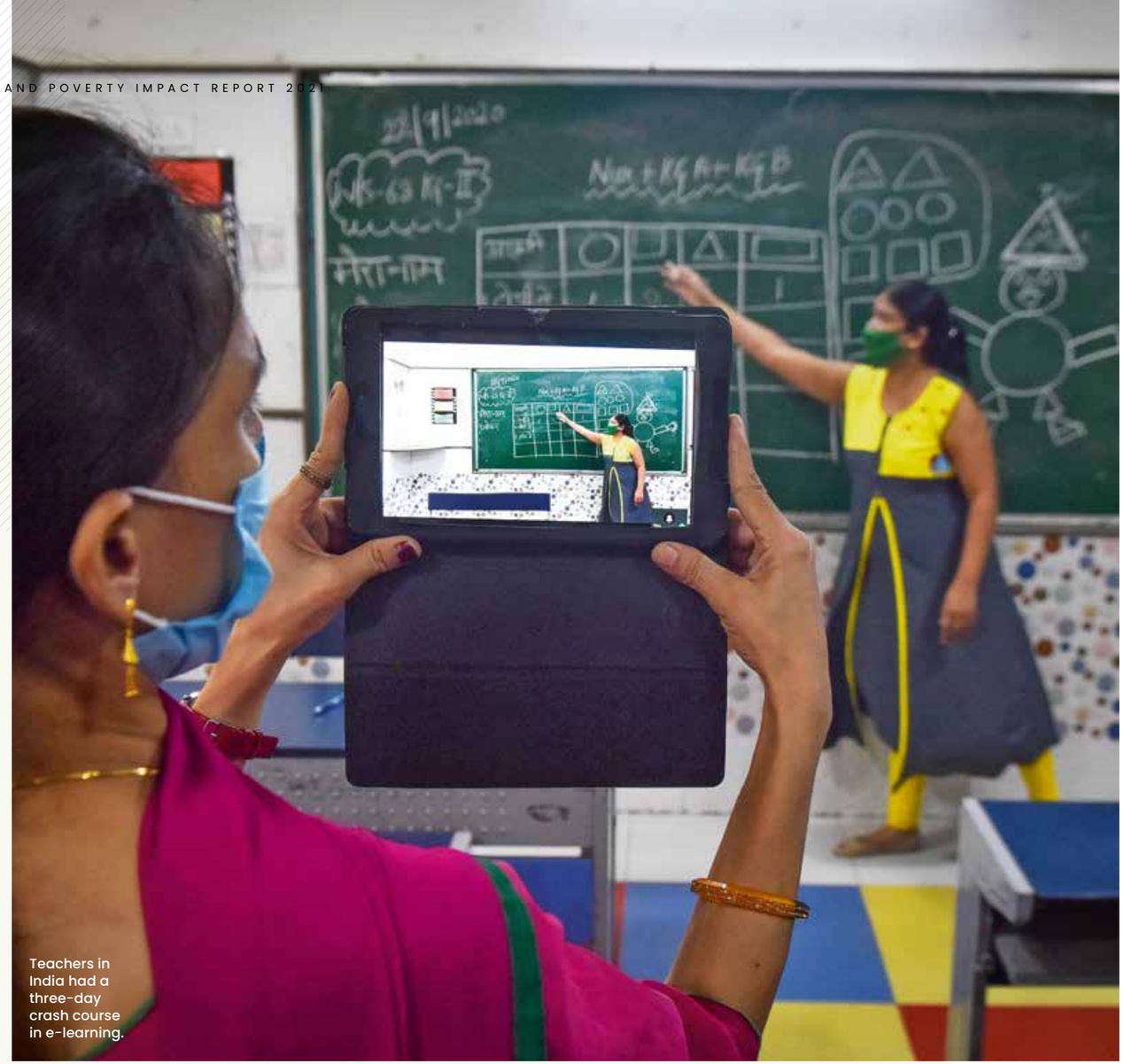
Whether one is pessimistic oroptimistic, the question of how global education can be refashioned post-pandemic will be one of the main talking points for policy-makers over the next 12 months and beyond.

Save Our Future, a coalition of hundreds of organizations worldwide, is calling on donors, multilateral development banks, and philanthropists around the world to maximize aid for education. It is estimated that, post-pandemic, low- and lower-middle-income countries could face an annual financing gap in education of $178 to $193 billion over the next ten years.

In a white paper published in October 2020, the campaign group states: "Education systems were already in crisis even before the pandemic and are now facing the likelihood of drastic budget cuts. If governments and development partners do not act immediately, this crisis could turn into a catastrophe from which millions of children may never recover."

It's incredible to think how quickly the teaching profession moved at the start of the pandemic. Mandakini Dasgupta, who has taught for 14 years in the Indian state of Assam, says she and her colleagues were provided with a "three-day crash course in e-learning ... and transitioned quite effortlessly" when the first nationwide lockdown came to India."Prior to the pandemic, most of our tech training was largely limited to executing basic functions pertaining to assignments and creative analysis," Dasgupta says.

"The pandemic taught each of us some major life lessons – one of them being the imminent need to become tech savvy, particularly in the field of education where innovation and creativity is the order of the day."



Teachers in India had a three-day crash course in e-learning.

PHOTO: GETTY IMAGES/ HINDUSTAN TIMES

Steve Busfield, a teacher for three years, works at a state-funded school in inner London. By UK standards, most children at the school do not come from privileged families. Asked how his school prepared for such a moment, he explains: "I can't remember doing any training in virtual learning before. Then again this was a situation none of us, in any walk of life, had had to deal with before. We worked it out as we went along. Teaching online shares the basics of teaching in person: you need to work out what are the most important elements of the learning and how you can best help the children understand them. We cut our PowerPoints to the minimum and focused on the essentials. But how do you ensure everyone understands? How do you stretch the most able?"

Busfield and Dasgupta, both teaching teens, found that keeping children engaged became a big challenge.

"The pupils could see me," Busfield says, "and I would sometimes entertain them by changing the background so it looked like I was on a beach. All teaching is a performance in a sense, but the most important element was to focus on the key learning."

> "The pandemic taught some major life lessons, including the need to become tech savvy."

CALL TO IMPACT

1 The profession has shown itself to be adaptable, but teaching exclusively in remote settings has taken a mental toll. Policy-makers and educators must take stock of what virtual and remote tech has worked during the pandemic – and what kind of teaching is better suited to physical, in-person interactions.

2 With a huge global funding shortfall, it is time to renew calls on donors, development banks and philanthropists to address the education financing gap before we lose a generation of children to the pandemic.

3 Exhausted teachers don't want to put on extra classes – they want governments to fund smaller class sizes, give them the right training, and respect their profession. Teaching is a calling – and it is generally one you get better at the longer you do it. Paying teachers a fair wage would massively encourage job retention.

Dasgupta asks: "Have you ever tried to communicate with a toddler? Things are no different with the teenage students I teach! Students would be repeatedly asked to keep their cameras switched on and be more interactive."

Policy-makers tasked with cultivating the skills of educators also need to think about how they can be energized and incentivized to streamline these tech skills into their teaching.

Busfield feels that, while technology can help education in many ways, "online learning misses too many important elements of the interactions" that go on in classrooms. "There is nothing better than face-to-face," he declares.

Dasgupta is an enthusiastic adopter of tech who "would choose e-learning over a physical classroom teaching any given day."

ESSENTIAL TOOLS

She lists Kahoot (a game-based learning platform), VoiceThread (a presentation and storytelling tool), ReadWriteThink (a lesson planner) and eduClipper (a social learning platform) as tools she "could not live without."

UNESCO has calculated that 11 million girls might not return to school because of Covid-19, "threatening decades of progress made towards gender equality" and putting "girls around the world at risk of adolescent pregnancy, early and forced marriage, and violence."

A report by Ethiopian news outlet Addis Zeybe said the country's Ministry of Youth and Girls had blocked 500 cases of underage marriage in rural parts of Ethiopia in May 2020 as pandemic lockdown took hold.

However, EdTech Hub, a global non-profit research partnership, found that when barriers were removed and female students were given access to technology-enabled education, "girls were likely to respond with a high level of engagement." Dasgupta agrees. "With the advent of e-learning, schoolgirls can now brush shoulders with their male counterparts and be on the same page in learning and development."

StudioBlended is a non-profit foundation that develops resilience capacity in teachers. It currently works in southern Europe and South America, training college lecturers and professors in course design, well-being and professional development. StudioBlended founder Tikvah Breimer has more than a decade of experience in teaching and training teachers herself. "In my country, the Netherlands, lecturers at university often haven't had teacher training, or even have a qualification. This is very different – at least in my country – from secondary schools."

EMERGENCY EDUCATION

In the past, college students may have been required to attend all their lessons in person on campus. Blended learning, according to Breimer, offers flexibility where lecturer and student can have real-time, synchronous interaction online. The student then completes self-based work and assignments in their own time. Naturally, the learning experience gains extra depth with real-life, teacher-student interaction.

Breimer describes blended learning as a "thoughtful integration of online and real-life learning" that requires a complete redesign of education curricula. "When the pandemic happened, everything went online. This was not blended learning but 'emergency education.'"

Breimer adds: "There is so much conversation about student well-being, but we need to think about our lecturers too. We believe our methodology will greatly enhance the health and well-being of teaching staff, reduce the risk of burnout, enhance retention of technically highly qualified staff, and allow lecturers and trainers to enjoy a lifelong path of growing and teaching.

"Our training includes technique and pedagogy. One Brazilian professor told me she didn't realize her own well-being was so important. This highly respected professor described the training as 'therapeutic' and 'healing,' and said she had rediscovered her joy of teaching as a result."

The pandemic has underlined huge global disparities but has also given educators the opportunity to hit the reset button. Where should governments and policy-makers target their limited resources?

"Given the number of billionaires taking joyrides into space I would say that there is plenty of money," says Busfield. "Let the rich pay their fair share of taxes and put the money into public services, including schools.

"Reducing class sizes would work infinitely better than extra classes. How many children do you know who want more school? Paying teachers more to encourage job retention would be infinitely more useful. The number of teachers who quit before five years is horrifying – especially when it is a job that gets better the longer you do it and the better you know the pupils." ■

"Blended learning is a thoughtful integration of online and real-life learning."

TIKVAH BREIMER
Founder of StudioBlended

When barriers are removed and girls get access to technology-enabled education, they respond with a high level of engagement

Moving lessons online has boosted the EdTech sector.

Teachers say online learning tools have become essential.

PHOTO: PICTURE ALLIANCE / ROBIN UTRECHT, GETTY IMAGES/ SOPA IMAGES

OPENING UP THE WORLD OF EXECUTIVE TRAINING

We are in an era of rapid transformation. For business and individuals, it is essential to adapt to continuous change by learning and developing new skills. Das Narayandas, the Edsel Bryant Ford Professor of Business Administration at Harvard Business School, talks about the changing principles of learning and the opportunities provided by the growing EdTech sector.

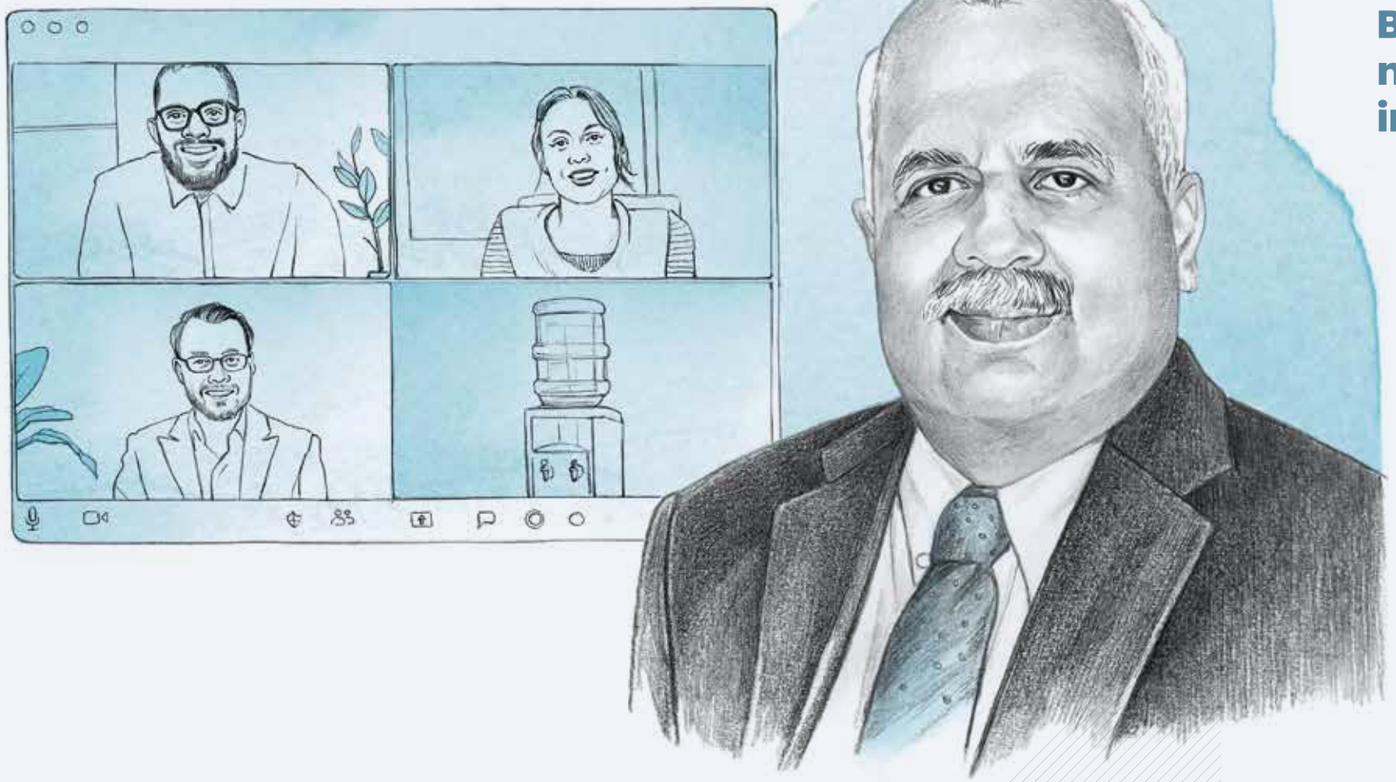


ILLUSTRATION: ULI KNÖRZER

What are the key differences in how we acquire different types of skills?
→ Das Narayandas: We generally divide skills into hard skills and soft skills. An accountant needs to understand financial ratios and bookkeeping – well-defined skills, easily tested because there are clear-cut right and wrong answers to most questions. Hard skills can be learned on an individual's own terms and then tested and certified. With soft skills, on the other hand, success can only be monitored when they are applied on the job. That's because soft skills are all about interpersonal communication. Whether we interact in the physical world or online, human interaction remains a critical success factor. But we are not born with these skills, they must be learned. In the past, these skills were taught to an extent in the liberal arts and at business schools. But generally they were learned on the job – often, the hard way. Today, with digital communication changing the way we interact, this challenge is growing. You need to know how to have a water cooler conversation on Zoom.

What are the shortcomings of traditional learning practices?
→ Traditional academia moves at a glacial pace compared to business. A lot of time is invested in research, validation and publication before that is turned into actual teaching. It's simply not fast enough to keep up with the pace of technology. In the world of skills training and education, we therefore need more lean and agile development and on-the-fly testing. These are the keywords that define progress. We must become nimbler.

> "We need more lean and agile development and on-the-fly testing."

What are the new channels, formats and technologies underpinning learning?
→ Today people can draw on Massive Open Online Courses (MOOCs) and other easily accessible training and development ecosystems to deliver interactive online content. They can build their own personal learning cloud (PLC). Personalized learning tailored to an individual's learning style is one of the main characteristics of this, also social learning for a more collaborative approach. Businesses can track progress and ensure that learned skills are transferred within an organization. In the future, I see blockchain technology being used more and more to authenticate acquired skills and qualifications. Distributed ledgers ensure trackable verification of achievements. The technology spreads data across different sites, avoiding centralized proprietary platforms. Blockchain is commonly associated with cryptocurrencies, but in the EdTech sector it can be the basis for a system of micro-credentials used as an alternative to traditional degrees and certificates.

→ These technologies are already in use in other sectors, and we are now in the process of adapting them for training and education. Schools need to adapt fast. The move to digital formats is accelerating because of their technical possibilities, as well as the hunger for knowledge. Last year, for example, the Harvard Business School offered online programs for alumni on crisis management. We received up to 10,000 sign-ups. People signed up even if it meant attending courses at night. The amount of investment money that has been pumped into the EdTech space is enormous. With access to readily available low-cost capital, we will see a lot of innovation in this area.

Has the Covid pandemic accelerated change?
→ The pandemic had a huge impact on the establishment of digitized communication and learning. What I thought would develop over a decade happened in just 18 months. Talent development programs have been turned upside ↘

> "Businesses need to invest in people"

DAS NARAYANDAS
is the Edsel Bryant Ford Professor of Business Administration at Harvard Business School and Senior Associate Dean at Harvard Business Publishing. He holds a BTech in Engineering from the Institute of Technology, Bombay, a post-graduate Diploma in Management from the Indian Institute of Management, Bangalore and a PhD in Management from Purdue University, USA. He is the co-author of the forthcoming book The Future of Executive Development.

Today's employees increasingly turn to Massive Open Online Courses (MOOCs) run by academia to access learning and training in their own personal learning cloud

↘ down. We have to take into account that people may need more time to adapt, but we also need to ask whether what we taught yesterday is still relevant today. At Harvard Business Publishing we are developing new programs based on what we call "learning sprints". We are responding to clients who recognize that change must happen faster and at a much larger scale than ever before, via a medium they are not familiar with. Prior to Covid, we used classroom formats supported by some digital tools. Now we are transferring to digital formats. It is vital to deliver relevant and curated content at the right time and the right format to provide an optimal learning experience.

Is the world of work moving entirely online?

→ I don't think so. I read a study suggesting that people who regularly communicate with their superiors in the physical world get promoted more readily than those who predominantly work and communicate remotely. Last July, Wall Street was in the news because managers were insisting staff return to their offices. It's an evolving situation. Amazon employees will only return to their offices in January 2022. The question of how you lead and manage is changing dramatically with blended online/offline work. We are dealing with so many complex issues: globalization, digitization, diversity, inclusion and inequalities.

How do you measure success?

→ Some years ago, we had a client who wanted to measure the success of an executive education program I was involved in. We didn't have a way of calculating the return on investment, so we decided to develop one. The training program was for people with high potential. We decided to teach a defined set of concepts, then, after a time, we conducted interviews with their colleagues to evaluate if knowledge transfer had taken place. We asked their direct superiors questions referring to specific learning content we had taught. Subsequently we investigated if these learnings had led to better outcomes. The big question to answer was whether investment in such a program is justified by positive behavioral change. You can't establish a direct causal link between learned and transferred skills and positive outcomes. There are several degrees of separation: skills are displayed in behaviors, behaviors impact actions, and actions lead to outcomes that can be measured.

ILLUSTRATION: ULI KNÖRZER

> "It is vital to deliver relevant content at the right time and in the right format to provide an optimal learning experience."

Are you seeing a growing demand from individual learners?

→ Yes, people are hungry for knowledge. Why? Look at the figures – 40% of employees are considering switching employment in the coming year. From the individual's perspective, you need to ensure that your skill sets are relevant in an increasingly digital world. You constantly have to reinvent yourself. It is a global phenomenon. In developing markets, the hunger may be even greater, as we see in countries like China and India with their emerging middle classes. People see a world of opportunity and understand they need to invest in themselves to fulfil their ambitions. The concept of lifelong learning is now commonplace. This applies to all generations – boomers, millennials and the generations in between.

What does that mean for business?

→ Increased opportunity means companies are dealing with larger percentages of their workforce leaving. This leads to a war for talent, forcing companies to offer more incentives. So there is more investment in people, fostering a world of continuous learning and driving a change in the role and status of HR. Since access to human capital determines success or failure, you need your best people in HR to develop employees, recruiting, training and inspiring the best people.

Will we all be learning for life?

→ Lifelong learning is here to stay, not just for a few at the top but for all employees of an organization. To maintain a competitive advantage, businesses need to invest in people, train and develop them, and to prepare their people for tomorrow's challenges not just today's requirements. Opportunities are being democratized and knowledge is freely available to all now. The rewards for someone who is willing to learn in a knowledge economy are limitless.

FII: EDUCATION AND POVERTY IMPACT REPORT 2021

ONE-WORLD CLASSROOM

The pandemic has provided a huge stimulus to new methods of knowledge transfer. As a result, AI technologies are now a major tool in providing poorer countries with access to education and work.

IN THE LAST CENTURY, every few years brought a new communication marvel. Now, amazing developments in knowledge storage, transfer and retrieval are appearing on an almost daily basis. Because of the pandemic, they are being adopted on an unprecedented scale. Many experts predict that the results will be permanent – education will never be the same again.

Educationalists know that online learning is more effective than "talk and whiteboard." On average, students retain 25% to 60% of material this way, compared to only 8% to 10% in a classroom. Individual learners can move faster, especially if assisted by self-paced e-learning, because there is no one to slow them down.

Now, fast-evolving applications of AI, including machine learning, natural language processing and their offshoots optical and speech recognition, are taking that one stage further. They allow the teacher to learn from the student – to identify their needs and gaps in their knowledge and to create unique learning programs. There is no more use for one-size-fits all textbooks. And just one human can cater to far more students than in a physical classroom – in fact, classes can run into hundreds, or even thousands. Because of the pandemic, the drive to innovate has led to a global investment spike in communication. Demand for mainstream video conferencing platforms and meeting tools have surged in educational settings.

Online learning is more effective as research shows students retain more information this way than through traditional methods.

PHOTO: GETTY IMAGES

> "Demand for mainstream video conferencing platforms and meeting tools has surged in educational settings."

EDTECH INVESTMENT SURGING

Globally, EdTech investment has been surging since 2010, which recorded a total of $0.5 billion, but the pandemic has seen three to five years' worth of new technology adopted in just over 12 months. At the half-year point for 2021, global EdTech investment already stood at $10 billion, compared to $16 billion for the whole of 2020. There were 27 EdTech "unicorns" at the half year – that is, start-up companies with a valuation of more than $1 billion.

In the worlds' wealthiest economies, secondary and adult education will never return to its pre-Covid norm. Hybrid learning will gain sway, with intelligent tutoring systems (ITSs) such as Carnegie Learning's MATHiaU used to provide individual coaching and personalize teaching, marking and grading, ↘

to supplement conventional lessons. Traditional education will be around for a long time, but it is clear that online forms of learning are becoming more and more important. "They will become part of learning at all levels, from school to university," says a report by Stanford University, "facilitating more customizable approaches to learning."

Brainly is a Polish education technology company based in Kraków and headquartered in New York. With a claim of 350 million users, it provides a peer-to-peer learning platform for students, parents, and teachers, answering their homework questions, all over the world. Brainly employs machine learning algorithms to evolve its knowledge base. The platform uses elements from the world of gaming, in the form of motivational points and ranks.

IMPORTANCE OF SOFT SKILLS

Also serving schools and colleges around the world, US-based charitable foundation OpenStax specializes in creating adaptive, open-sourced textbooks. AI programs create online books with smart content that can adapt to the knowledge and progress of specific learners. OpenStax was initially part-funded by the Bill and Melinda Gates Foundation.

It is estimated that, out of nearly 5 billion people of working age on the planet, 2 billion are unemployed, in vulnerable employment, or trapped in extreme poverty. The nature of work is changing. Thanks to automation and digitization, job roles requiring manual labor are declining. In this new world, the so-called soft skills of good written and verbal communication, collaboration and problem-solving are becoming increasingly important.

Economies and learning institutions have yet to catch up, but there is a positive side to the equation. In poorer countries, access to tablets and laptops may be limited, but mobile phone ownership is extremely common. A worldwide survey of 11 developing countries by the Pew Research Center found that the majority of adults owned, or had access to, a smartphone. Service industry jobs are no longer geography-dependent. A company based in the EU or the US, for example, may employ a large proportion of its workforce overseas, not just for its customer-facing call centres but also in financial, legal and manufacturing roles.

The largest companies increasingly outsource recruitment to businesses with a global reach that use AI-driven talent management software to match candidates with positions. But what of the soft skills gap? Founded by Sallyann Della Casa, GLEAC (see page 34) is an online business that has found a valuable recruitment specialism. It uses algorithmic methods to assess and coach soft skills worldwide, thereby matching the needs of economically developed countries with a vast global labor market.

Online adult education is expanding exponentially across the world. It is effective because the need for face-to-face interaction is less important for adult students than children. And it is more cost-effective than the traditional alternatives. In an era when some conventional universities are threatened with closure, virtual programs can cut students' tuition fees by up half.

The latest AI-driven voice recognition software can transcribe lectures into bullet points and translate the voices of lecturers and their texts into new languages, providing access to courses for international students. It is in the developing or emerging world, where a traditional educational infrastructure may not be fully evolved, that AI has the greatest potential to achieve large-scale social change.

In poorer countries, access to tablets and laptops is limited but mobile phone ownership is very common.

PHOTO: SOPA IMAGES/LIGHTROCKET / GETTY IMAGES, PRIVAT

THE RISE OF MOOCS

Promoted as an important international development mechanism by the UN and the World Economic Forum, Massive Open Online Courses, known as MOOCs, have been in the vanguard of providing global access to learning since the mid-2000s. MOOCs evolved from pioneering initiatives led by computer geeks to provide open-source programming and knowledge. The first MOOC, on AI, was offered by Stanford University in 2011.

Often connected to universities, MOOCS have now expanded far beyond their IT roots to offer multiple courses on the arts, humanities and sciences. Some are free to access, others run on a commercial basis. By 2019, the MOOC network was catering for 120 million learners, excluding China. The world's largest, based at Stanford University, Coursera has more than 150 university partners and provides more than 5,000 online courses. After the US, its greatest number of students are in India, China, Mexico and Brazil, while the fastest learning markets are Bangladesh, Thailand and Kazakhstan. Courses are free, with a small fee for a certificate of completion.

Using techniques pioneered by the US non-profit Educational Testing Service and British-based Pearson Education, many MOOCs, including EdX, Coursera and Udacity, depend on AI to design courses and mark assignments. Last year, as part of its global Covid-19 pandemic response, Coursera launched CourseMatch. This AI-enabled tool allowed universities whose degree programs had been suspended to access equivalent courses from Coursera's extensive catalogue. The Khan Academy is another pioneer not-for-profit MOOC provider, whose mission is to provide "free, world-class education for anyone, anywhere." It was founded in the US in 2006 by former hedge fund analyst, Saul Khan. Khan had been inspired by the

> "GLEAC uses algorithmic methods to assess and coach soft skills worldwide."

SALLYANN DELLA CASA, GLEAC

Founder of GLEAC

Machine learning programs can predict the likelihood of a student getting their next math problem wrong.

PHOTO: GETTY IMAGES, KHAN ACADEMY PR

↘ huge popularity of the maths tutorials that he was giving to his cousins, using YouTube. The academy's website now has 48 million users in 190 countries. It offers free personalized courses, backed by YouTube videos. At the cutting edge of algorithms and IT, the academy has devised a machine learning program that can predict the likelihood of a student getting their next maths problem wrong – a perfect tool for plotting their unique learning path.

FLIPPING THE CLASSROOM

Khan believes that supplementing traditional classroom education with AI technology and videos can greatly improve the effectiveness of human teachers, freeing them from traditional teaching and grading, giving them more time for one-to-one instruction and catering for individual needs. He calls this process "humanising" or "flipping" the classroom. One of the first applications of this approach in a school was in 2011 for fifth and seventh grade pupils in the Los Altos school district in California. It was a huge success and Khan Academy tutorials are now used to supplement conventional teaching in more than 200 US school districts. Technically, the Khan Academy delivers self-paced or differentiated, peer-to-peer learning. But it also helps many children who are outside formal education. Khan says, "Imagine what it does to a street kid in Calcutta who has to help his family during the day, which is why they can't go to school. Now he or she can spend two hours and remediate or get up to speed and not feel embarrassed about what they do or don't know ... Now imagine what happens if that street kid in Calcutta can tutor your son, or your son can tutor him. I think what you'll see emerging is the notion of a 'global, one-world classroom' and essentially that's we are trying to build." He adds: "Teachers are the unwavering centre of schooling and we should continue to learn from them every day."

Specialist technical skills are also desperately needed as the world digitizes and many of the next generation of programmers, data scientists and software engineers will come from developing countries. MOOCs and the universities of the Americas, Africa and Asia Pacific are an important part of this story, but there are also smaller, country-based projects, for young and adult learners, some of which are part of international networks.

> "What is emerging is the global, one-world classroom."
>
> **SAUL KHAN**
>
> Founder of the Khan Academy, a pioneering non-profit MOOC provider

A good example is coding school 1337, based in Khouribga, close to Marrakesh. It is part of a worldwide network run by a Paris-based organization called 42, founded by French telecoms billionaire Xavier Niel. The 1337 school was the first to provide free IT training in Morocco. It is open to anyone between 18 and 30. There is an online logic test, but numeracy, literacy or IT entry requirements are not demanded. The school uses a project-based, peer-learning approach. Attempting to get away from the dusty image of computing, it encourages creativity in its students.

WILL ROBOTS TAKE OVER?

The school's website says: "To train the future coders of tomorrow, we had to rethink learning. We had to make IT something fun, exciting and at odds with the restrictive vision that the general public may have about it." As the digital or information age gathers pace, assisted by machine learning (which means computers teaching themselves) it generates user data exponentially (crowd sourcing), which makes the progress curve even steeper. In other words, the rate of progress is constantly speeding up. AI and machine learning will revolutionize virtually every area of human activity. In the learning field, organizations such as the Society for Learning Analytics Research (SOLAR) and forums like the Learning Analytics and Knowledge Conference and the Learning at Scale Conference are refining the use of data analytics to develop educational technology.

So will robots take over? Machines have knowledge but they do not currently have experience, wisdom or charisma. Most experts believe teachers will never be replaced by machines, but instead be assisted by them to become better at their jobs. On the other hand, robots are evolving very quickly. It would be rash to make too many predictions. ■

> "Machines have knowledge but not experience or charisma."

CALL TO IMPACT

1. AI-assisted learning is best seen as an adjunct to traditional teaching, not a replacement. Saul Khan, founder of the Khan Academy says, "teachers will never be superseded."
2. By helping to shift knowledge and access to employment from the developed to the developing world, AI applications will help to rebalance the world economy.
3. They are useful in countries at all levels of economic development. In G7 or OECD countries, AI can assist classroom teaching and home learning.
4. AI-learning is also a human re-balancer. If can level out and compensate for the disadvantages of children and adults with special needs.
5. It is good for individual learners, but it is also extremely effective in communal settings, in which learners can assist each other and share their experiences.

THE SKY IS THE LIMIT FOR LEARNING – HOW EDUCATION TECHNOLOGY MAKES THE WORLD A WISER PLACE

WIDENING EVERY HORIZON

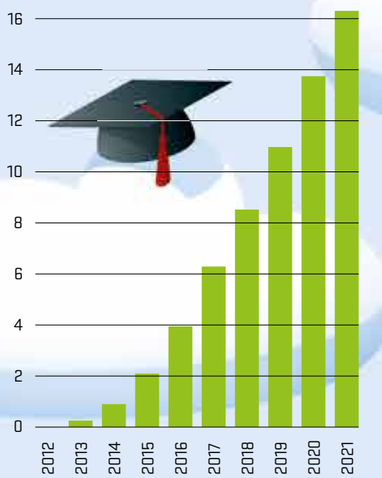
You can hold the whole knowledge of humankind in your hand – and even the things we don't know.

You can listen to the world's best teachers and scholars –without ever needing to leave your room.

You can exchange thoughts, data, opinions with fellow students from all over the world – even collaborate and co-learn across borders and continents.

GROWTH OF MOOCS

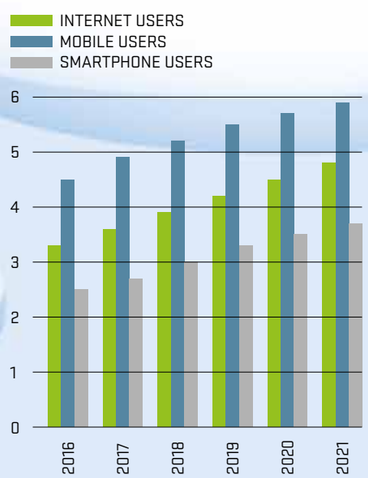
(number of courses in thousands)



SOURCE: CLASS CENTRAL HTTPS://WWW.CLASSCENTRAL.COM/REPORT/MOOC-STATS-2020/

ONLINE ALL OVER THE WORLD

Global users (in billions)

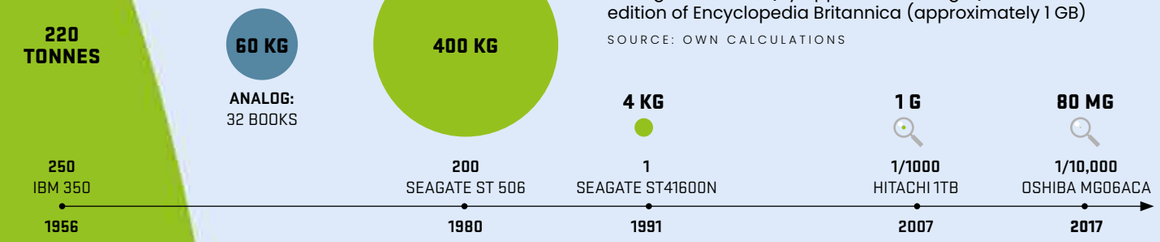


SOURCES: ITU, STATISTA, ERICSSON MOBILITY REPORT

DECREASE OF STORAGE SPACE

Storage hardware (by approximate weight) needed for one edition of Encyclopedia Britannica (approximately 1 GB)

SOURCE: OWN CALCULATIONS



UNLEASHING EVERY POTENTIAL

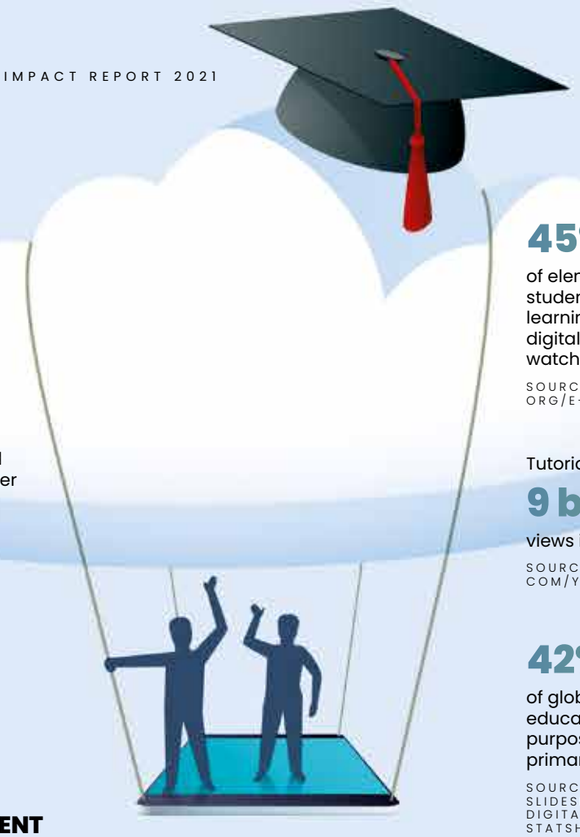
You can find out better than ever what you really, really want to do.

You can find out better than ever what you need to learn to get this done.

The world can find out better than ever what your potential is.

The world can find out better than ever where you can best apply your capabilities.

Even though the process to match your potential and the world's needs is better than ever, there is still room for improvement. That's what technologies are for.



EMPOWERING EVERY STUDENT

Education was

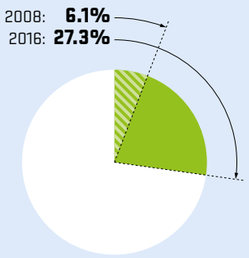
a **centralized** decision about specific knowledge (textbook) taught by a specific method (school) and a specific person (teacher). Education was the "**Nuremberg Funnel**".

Education is now

your very **personal** decision about what you want to learn, how and from whom. Education is your **individual** window to the world of wisdom.

RISE OF ONLINE-ONLY STUDENTS

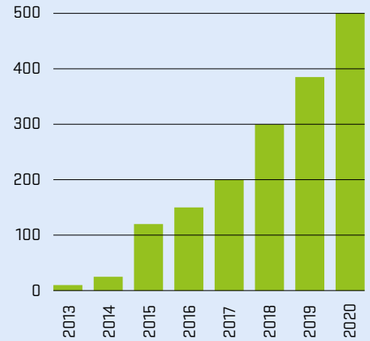
Percentage of graduate students taking entirely online degree programs



SOURCE: HTTPS://E-STUDENT.ORG/E-LEARNING-STATISTICS/

DOWNLOADS OF LANGUAGE LEARNING APP DUOLINGO

(in millions)



SOURCE: HTTPS://WWW.BUSINESSOFAPPS.COM/DATA/DUOLINGO-STATISTICS/

45%

of elementary school students said their favorite learning methods are playing digital learning games and watching online videos.

SOURCE: HTTPS://E-STUDENT.ORG/E-LEARNING-STATISTICS/

Tutorial videos on YouTube had

9 billion

views in 2020.

SOURCE: HTTPS://BLOG.HOOTSUITE.COM/YOUTUBE-STATS-MARKETERS/

42%

of global Internet users name education and study-related purposes as one of their primary online activities.

SOURCE: GWI, 2021, HTTPS://WWW.SLIDESHARE.NET/DATAREPORTAL/DIGITAL-2021-JULY-GLOBAL-STATSHOT-REPORT-V02

US$

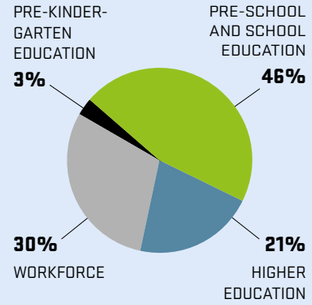
50 billion

is the projected revenue of the global corporate e-learning market by 2026 – one of the biggest drivers of the e-learning industry.

SOURCE: HTTPS://E-STUDENT.ORG/E-LEARNING-STATISTICS/

EDTECH START-UPS

Education sectors the 800 most innovative EdTech startups focus on



SOURCE: HOLONIQ GLOBAL EDTECH 800, HTTPS://WWW.HOLONIQ.COM/TOPICS/GLOBAL-EDTECH-800

INFOGRAPHIC JÖRG BLOCK

USING AI TO MAKE US MORE HUMAN

GLEAC founder and CEO Sallyann Della Casa explains how digital micro-learning is changing the traditional model of education and transforming lives.

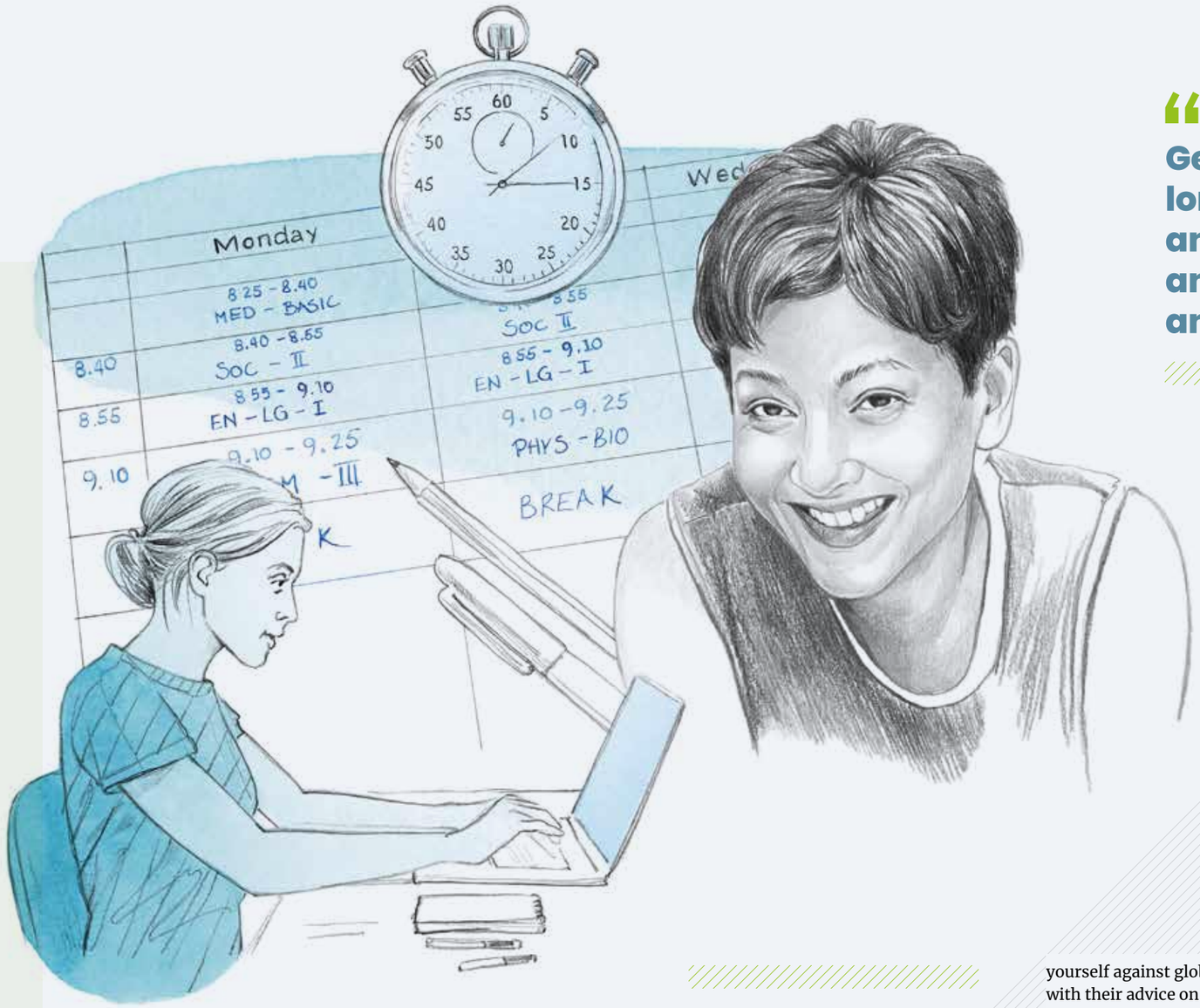


ILLUSTRATION: ULI KNÖRZER

GLEAC IS USING AI to help millions of people worldwide develop their soft skills for current and emerging jobs in just ten minutes a day with the support of mentors. By signaling an individual's skill set to potential employers, GLEAC links jobs with talent in a transboundary job market where remote working is becoming the norm.

Impact: Why do you believe we need a new approach when it comes to tackling education and poverty?

→ Sallyann Della Casa: If the purpose of education is to make us independent citizens who can contribute to society through our jobs, why are so many people in poverty due to underemployment or unemployment? That said, Covid has totally disrupted the traditional education model, replacing it with fast emerging new approaches such as corporates like Walmart and Target agreeing to pay for employee education. Micro-credentialing through digital badges and blockchain are also replacing traditional qualifications while challenger universities and other educational models enable you to take apprenticeships to get to the front of the line for a job. These are all good signs for lowering the poverty metrics. Everyone now has access and it's affordable and inclusive.

How can GLEAC succeed where more traditional approaches to education have failed?

→ GLEAC firstly shortens the distance for anyone accessing a mentor's quality of thought in situations and their networks. Evaluating yourself against global experts with their advice on how to improve is priceless. Then, having direct access to them through our talk shows helps unlock jobs and opportunities, as 85% of jobs come from your networks. GLEAC also allows you to actually practice job roles using your skills. Finally, GLEAC flattens the diversity and inclusion curve giving you visibility like never before in the job market. With the GLEAC signaling system you can share and show transparently how you apply your skills compared to a Nobel Peace Prize winner. Imagine if you are from a slum and your quality of thought is just as good as the CEO of Microsoft, how powerful is that when applying for a job?

Why have you chosen to focus on soft skills?

→ If I were to ask anyone about the most difficult situation in their lives and how they overcame it, what skills would they name? Grit, perseverance, ability to communicate, my judgement and decision-making, my leadership etc. Human skills matter most and often we have to learn those skills the hard way. With GLEAC you learn human skills the easy way.

How does a person with developed soft skills hope to get a job living in an area where there is no employment?

→ Geography no longer matters in a post-Covid world. We are living in a gig economy with the majority of us never returning full time to offices. It means anyone can work ↘

> "Micro-credentials such as digital badges and blockchain are replacing traditional qualifications."

> "Geography no longer matters – anyone can work anywhere, anytime and for anyone."

SALLYANN DELLA CASA is one of 4% of women globally with a patent-pending method as a sole inventor. She is a published author and a Harvard alum with degrees in law, organizational behavior, and urban planning. She spends her days obsessing over human skills at her tech company GLEAC. Sallyann also runs the Growing Leaders Foundation, which delivers human skills to at-risk youth. In 2016, she served briefly as Creator of Culture and People at Careem, which was the catalyst for her creating GLEAC.

> **For every person to remain relevant, we all need to upskill in digital and human skills or we will be displaced”**

↘ anywhere, anytime and for anyone. GLEAC’s team consists of content developers in Nigeria, software developers in Pakistan and India, behavioral scientists in Switzerland and community engagement officers in the US, and we are sitting in Dubai.

Why have you put the support of mentors at the heart of the GLEAC learning experience?
→ Career teachers are not equipped to teach workplace skills. Also, for years content has ruled learning but today we learn in the wild and experts can be anyone and everyone. Just look at the explosion of Clubhouse.

Who are the users of GLEAC?
→ We have a number of core groups. The first are high-potential women in usually very male-dominated sectors like the fertilizer and oil and gas sectors where you don’t usually expect women to be leading. We also focus on getting young and old students job-ready with their signaling. This can be through schools, universities, LMS platforms, and job portals. We literally supplement traditional methods with our micro-apprenticeship and high touch model. We also focus on frontline workers of large enterprises. These are people in sales, customer service, and management.

What proportion of your users fall into this displaced category?
→ How many of us are not displaced today when you think about it? Most of our jobs are or will be automated. A degree in our parents’ time had a 30-year career shelf life. Today we are lucky if a degree has any value by the time we graduate. So, for every single person to stand a chance and remain relevant, we all need to be upskilling primarily in digital and human skills or we will be or already are displaced.

Do you need a technological infrastructure to access your training?
→ We deliver synchronous learning for low-tech communities in, for example, parts of Africa and India on WhatsApp groups. Our other delivery methods are through SaaS and our app. Then there is the high touchpoint through our Slack and Zoom communities. I think many forget hi-tech requires high touch and we keep this as our focal point. Our engagement levels are over 75%, 90 days in on GLEAC. That’s super high.

What do you mean by the term “micro-learning”?
→ It is an apprenticeship, but online in bite-size pieces. You also get the same feedback and guidance as you would as an in-person apprenticeship, but even better, with a global pool of mentors. So, the model is ten minutes a day with different degrees of difficulty and a feedback loop just like an Olympic coach. It’s the same science behind habit-building.

What impact has Covid had on the skills-based economy?
→ It has accelerated the changes we have been talking about for two to three decades in a span of 12 months. Finally, we are getting somewhere and it’s happening really fast.

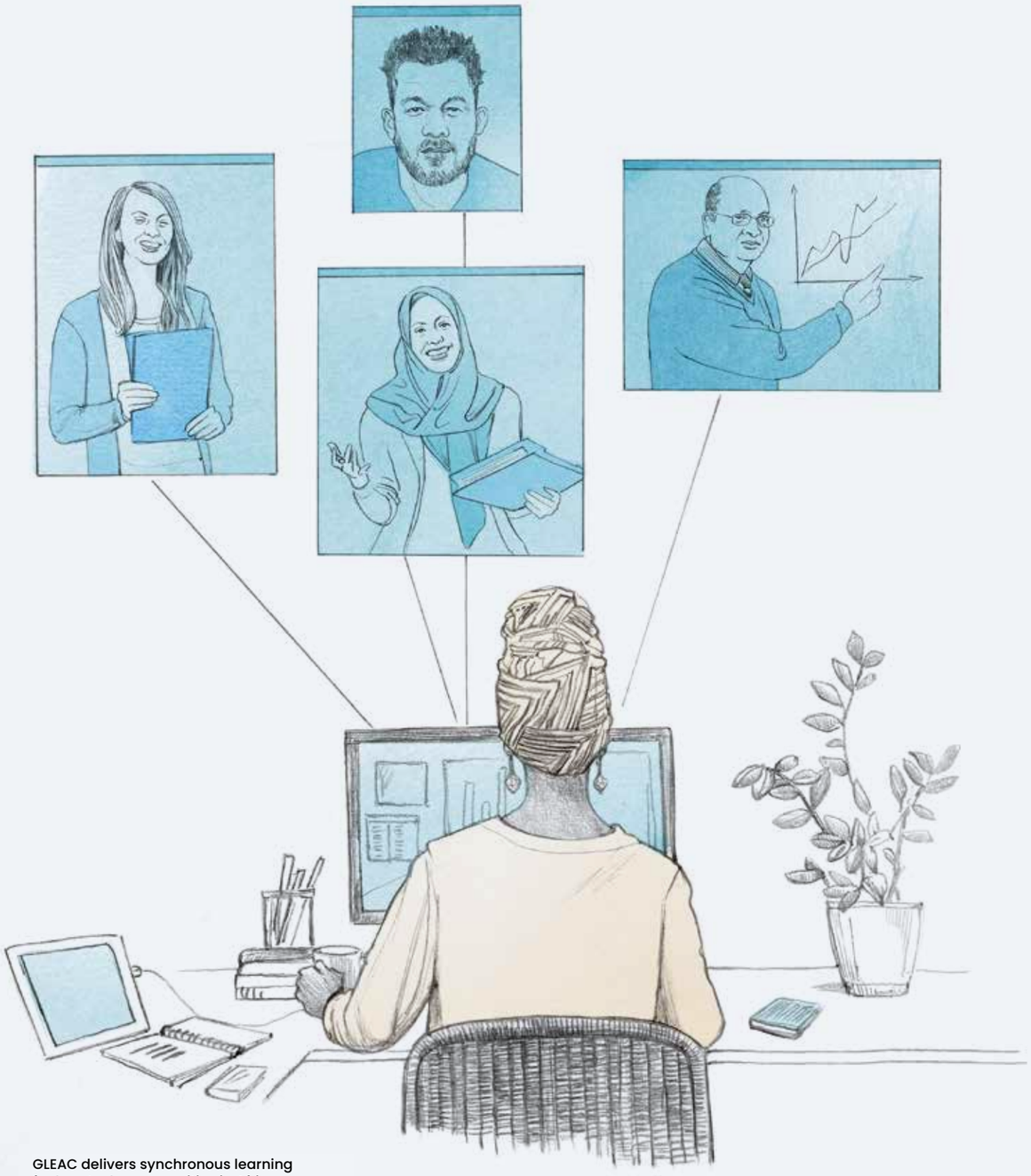
How will you measure the success of GLEAC?
→ GLEAC will allow everyone a fair and transparent opportunity. In our vision of the future, someone looking for a cybercrime specialist who possesses skills like critical thinking, creative thinking, and judgment would use the GLEAC deep link to find a 65-year-old flower shop owner as your top candidate. You dig further and discover he is a Syrian refugee who came to the Caribbean. You then discover that in his past life he was a scientist. His human skills make him the ideal candidate for the job and he could easily get upskilling in the hard skills needed. This is just one story of success under GLEAC. ■

CALL TO IMPACT

1 Skills learning must be based on frequent engagement, increasing difficulty and regular feedback.

2 Minimize technical barriers to accessing learning to ensure reaching communities most in need.

3 Focus on micro-learning to achieve maximum impact.



GLEAC delivers synchronous learning for low-tech communities in Africa and India via WhatsApp groups, SaaS, apps, Slack and Zoom

ILLUSTRATION: ULI KNÖRZER

TAKING STEPS TOWARD EDUCATION INCLUSION IN SOUTH AFRICA

Martin Hall charts South Africa's transition from an education system run on the divisive lines of apartheid to one transformed by technology to be truly inclusive for all the country's schoolchildren.

SOUTH AFRICA FACES multiple challenges in ensuring that everyone gets fair and equitable access to education. The 1996 Constitution, which formalized the transition to democracy under Nelson Mandela's presidency, is clear:

"Everyone has the right (a) to a basic education, including adult basic education; and to further education, which the state, through reasonable measures, must make progressively available and accessible"

Twenty-five years on, South Africa is a long way from achieving this objective. Measured in terms of household income, it is one of the most unequal countries in the world, with a Gini Coefficient of 63. Unemployment, exacerbated by the Covid-19 pandemic, hit a record 34.4% for the second quarter of this year. Schooling is further complicated by the country's 11 official languages and a policy that requires children in public schools to be taught in their mother tongue up until the end of Grade 3 (age 8–9), after which the medium of instruction changes to English. The Progress in International Reading Literacy Study (PIRLS) measures reading ability at the end of Grade 5, a year after the switch in the medium of instruction. South Africa is consistently ranked last in the PIRLS comparison of 50 countries.

How, then, can digital technologies address these structural inequalities and widen equitable access to education? One approach, of course, is to look to improving South Africa's – and Africa's – access to the Internet and complementary technologies required for digitally enabled learning. This issue has received considerable attention. For example, in early 2020, Africa as a whole had an Internet penetration rate of just 39.3%, in comparison with 87.2% for Europe and 94.6% for North America. Internet affordability has been benchmarked at 1GB of mobile prepaid data costing 2% or less of average monthly income. Using this measure, only ten out of a set of 45 countries in Africa were able to meet this affordability standard. And while about three-quarters of the population of sub-Saharan Africa has a mobile connection of some kind, only one-third of these have a feature phone that is suitable for access to education resources.

MEASURABLE OUTCOMES

A complementary perspective is to address the challenges from the ground up, looking at interventions that are succeeding against the odds and asking what they have in common. This approach seeks to establish a theory of change that focuses on measurable outcomes, such as the levels of educational attainment that are quantified in the PIRLS studies. I have been directly engaged with these three examples: a targeted intervention to assist primary school children to read with meaning in English; an intervention to get key performance data into schools and at scale; and the prototype for an online high school that turns many long-held conventions about teaching and learning on their heads.

More than 90% of children in schools in South Africa navigate the switch from learning in their home language as they enter Grade 4, after which time they are taught in English. The Click Foundation addresses this challenge through a tightly focused intervention. Using specialist applications such as Reading Eggs, children build vocabulary and grammar, working towards the competence levels benchmarked by projects such as PIRLS. Through this, they also acquire information technology skills. Children work at their own pace, allowing teachers and assistants to focus closely on those in need of support, an important consideration where there may be more than 50 learners in a class.

A key feature of this project is its partnership with the education departments in five of the country's nine provinces. This has allowed the work to go to scale. Before the interruption forced by school closures during Covid lockdowns, Reading with Meaning was active in five provinces with almost 100,000 learners. Based on statistically valid A/B sampling, the project was reporting an average 10% improvement in literacy.

EFFECTIVE MONITORING

The data on learner improvement in literacy that is assembled through the Click Foundation's work is well aligned with the second example: the Data Driven Districts (DDD) initiative led by the New Leaders Foundation.

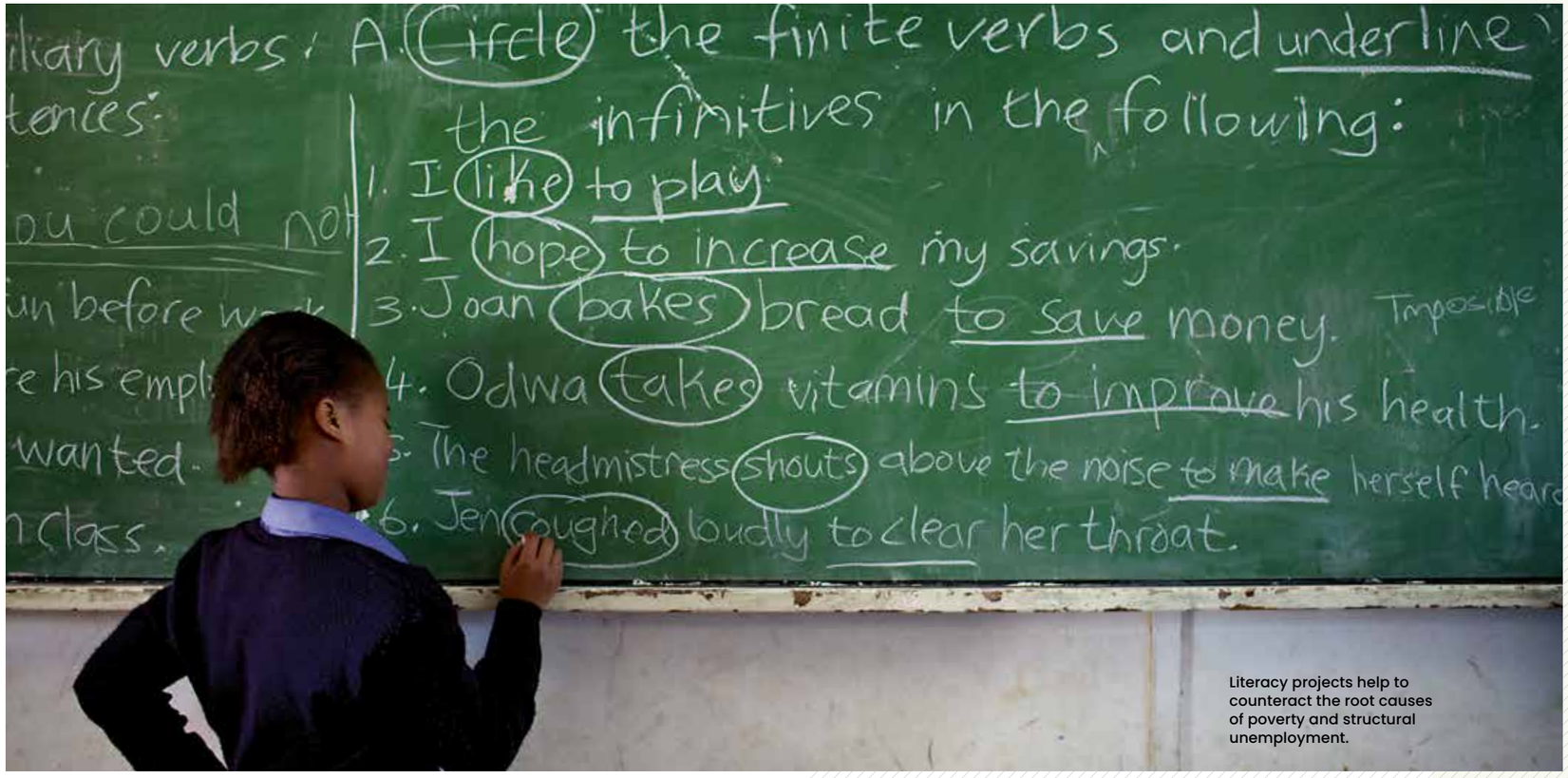
The theory of change that underpins the DDD program is that the provision of accurate, real-time data to school principals, local and regional education administrations and provincial education authorities will enable effective ↘

South Africa is working to improve access to both the internet and complementary technologies required for digitally enabled learning.

PHOTOFRICA MEDIA ONLINE/LAIF, PRIVAT

MARTIN HALL
is Emeritus Professor at the Graduate School of Business, University of Cape Town. He specializes in education, social and economic transformation, and digital futures, and is an advisor on learning and well-being analytics for Jisc, the UK's information technology service for higher and further education.

> "How can digital technologies address South Africa's structural inequalities and widen access to education?"



Literacy projects help to counteract the root causes of poverty and structural unemployment.

PHOTO: AFRICA MEDIA ONLINE/LAIF

↘ monitoring and evaluation processes that will focus, direct and measure improvements in learning. In economically advantaged countries, this kind of administrative infrastructure has long been established. In South Africa, schooling and the provision of educational infrastructure was deeply compromised by apartheid legislation. In essence, the DDD project uses digital technologies to leapfrog this infrastructure gap.

The kernel of the DDD program is a digital dashboard of key learning indicators: learner attendance, grades, pass rates, progression and teacher attendance. The design of the dashboard is intuitive, allowing visualization in detailed and summary views in ways that are appropriate for different levels in the education hierarchy, from the granularity of individual learner achievement to summary overviews for school administrative districts. Standardized reports can be downloaded as key resources for school administration. This digital infrastructure is currently being offered in eight of South Africa's nine provinces and has to date been adopted in 22,843 public schools, mostly in low-income communities, many of which are in rural areas.

> "The digital dashboard been adopted in 22,843 schools, mostly in low-income communities in rural areas."

THE POWER OF ANALYTICS

The third example is an ambitious new initiative that combines digitally enabled learning and the power of analytics with a new conceptualization of the school as an institutional form. The Valenture Institute's model of an online high school starts with redefining the role of the teacher. Rather than being expected to provide comprehensive learner support, the teacher is now freed to become a focused subject expert, located anywhere in the world, and providing compelling expertise online. Co-curricular guidance and support is provided by trained mentors. Learners and mentors come together in micro-schools, embedded in communities and equipped with digital technology and online access. The Valenture Institute's most recent partnership is with the University of Cape Town (UCT), whose Online High School will open in early 2022 with an initial enrollment of 5,000 learners.

The UCT Online High School is based on a successful prototype launched in partnership with the Western Cape Provincial Education Department at a high school in Mitchells Plain, a sprawling township on the outskirts of Cape Town. Launched just before the initial Covid lockdown in April 2020, the Beacon Hill prototype was one of the very few education institutions that was able to provide uninterrupted schooling to low-income communities throughout the sustained disruptions to education caused by the pandemic. Students benefited from both peer-to-peer support and face-to-face mentoring in the context of their local community, and the benefits of learning from highly rated and expert teachers who came to them online. Close attention was given to costing, economic sustainability and a secure basis for schooling, and the UCT Online High School is able to provide tuition at the same cost that is allocated by government departments per pupil in state schools.

What can these three examples tell us about how digital technologies can enhance access to education in the face of economic inequality and poverty?

IMPROVED LITERACY

First, carefully defined and focused projects can break through the blanket assumptions of the digital divide. Conventionally, factors such as access to bandwidth, affordable data and digital devices are mapped in broad geographical swathes; whole countries are coded in forbidding colors as digital deserts. But as each of the projects described here shows, carefully designed and focused interventions can generate impressive results: the verified improvements in literacy for Grade 4 children; accessible real-time data and analytics for principals in isolated rural schools; uninterrupted learning, defying Covid-19 in a Cape Town township.

Second, partnerships with state education authorities may often be the key requirement for taking such digital innovations to scale. While boutique projects may generate impressive case studies of what can be done with new technologies, the record shows that few are able to make the critical transition from prototype to scale. The success of the work by both the Click Foundation and the New Leaders Foundation is based on their partnership agreements with provincial education authorities, with the potential of adoption of pathbreaking digital resources by large numbers of learners, and of schools, in the country's poorest areas. Similarly, the Valenture Institute's online high school prototype has been developed in partnership with the regional education authority, in a public school, and benchmarked to government per capita education allocations.

Third, when these principles are followed, the potential for transformative disruption is real. The improvements in literacy achieved through the Reading with Meaning project has lifetime implications for individual beneficiaries, getting to the root cause of poverty traps and structural unemployment. The Data Driven District dashboards provide in digital form aspects of the basic educational infrastructure that was denied to the large majority of schools in South Africa because of segregated schooling. And the UCT Online High School model replaces a legacy of schooling that has been dominant since Victorian times.

Overall, the Covid pandemic has accentuated the digital divide, disrupting the educational journeys of children and young adults everywhere. Those in affluent communities have had access to online alternatives and will be able to recover rapidly. Those in low-income communities have a less favorable prognosis. The cases that I have described here, though, show that it is quite possible to succeed against the odds, and to break through the digital divide. ■

CALL TO IMPACT

1. Redefining the teacher's role will aid online learning.
2. Countries should look at best practice beyond their own borders to implement new teaching methods.
3. Big data is key to pinpointing where educational inequality lies and can be used to redirect resources.

CLOSING THE GENDER GAP

There is a huge gender disparity when it comes to access to education, exacerbated by poor infrastructure, religious and cultural discrimination, outdated teaching practices, and more. But the potential of education to lift girls – and entire communities – out of poverty is immense.

In Asia, 80% of school-age girls currently not in school will never experience formal education, compared to just 16% of boys.

PHOTO: AFP/GETTY IMAGES

WORLDWIDE, ALMOST 130 MILLION GIRLS are out of school, says UNICEF – 32 million of primary school age, 30 million of lower-secondary school age, and 67 million of upper-secondary school age – and these rates are double in conflict zones. Fewer than half of countries worldwide have reached gender parity in education.

What's more, 16 million girls may never even set foot in a classroom, says UNESCO – twice the number of boys – with women accounting for two-thirds of the estimated 750 million adults who lack even basic literacy skills. According to the agency's 2017 eAtlas of gender inequality in education, in South and West Asia 80% of school-age girls currently not in school would never experience formal education, compared to just 16% of boys, while in sub-Saharan Africa, 9.5 million girls would never enter a classroom – again, almost double the number of boys. Overcoming the discrimination and poverty that "stunt the lives of girls and women from one generation to the next" is key to achieving the Sustainable Development Goals, says UNESCO Director-General Irina Bokova.

The challenges include – but are far from limited to – cultural and religious discrimination, early pregnancy, child marriage, and gender-based violence. Girls who marry very young are far more likely to drop out of education, while poor families might favor boys when investing the little money they have to spend on schooling and associated costs like textbooks or transport, leaving the girls to do household chores or look after family members. Girls also skip classes when menstruating, still a taboo in many developing countries.

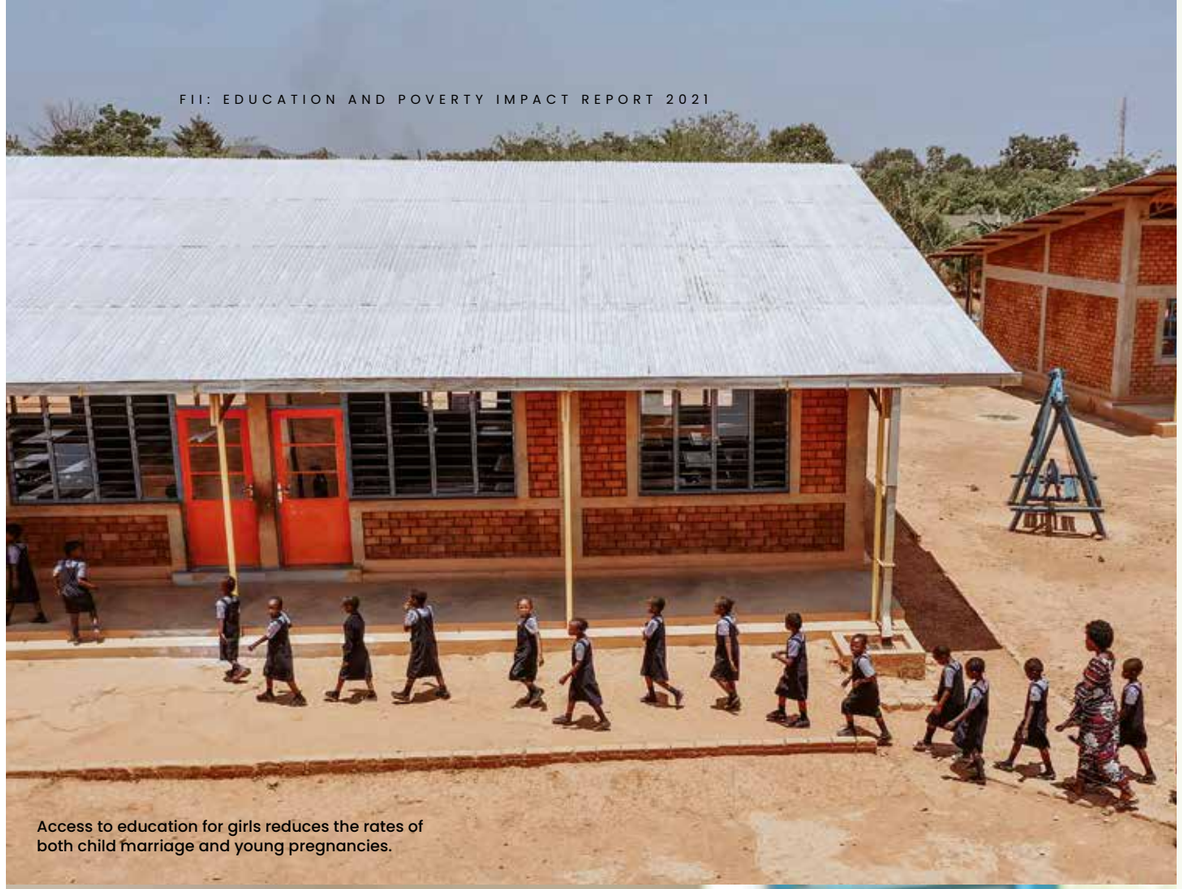
In many cases schools may simply be too far away, and a long walk there puts ↘

↘ girls at increased risk of gender-based violence or sexual exploitation. "There's the lack of teaching materials, qualified teachers, school infrastructure and dangerous school environments, as well as complementary services – food, health services and safety to and from school," says Grant Kasowanjete of the Global Campaign for Education. "But also the problems of quality, curricular adaptability and curricular stereotypes, plus the unwillingness of parents to invest or take an interest in girls' education." Or it might be the case that insufficiently gender-responsive teaching practices are leading to gaps in skills development. "The fight against stereotypes and prejudices requires teacher training that is sensitive and responsive to the rights of girls and women," he adds.

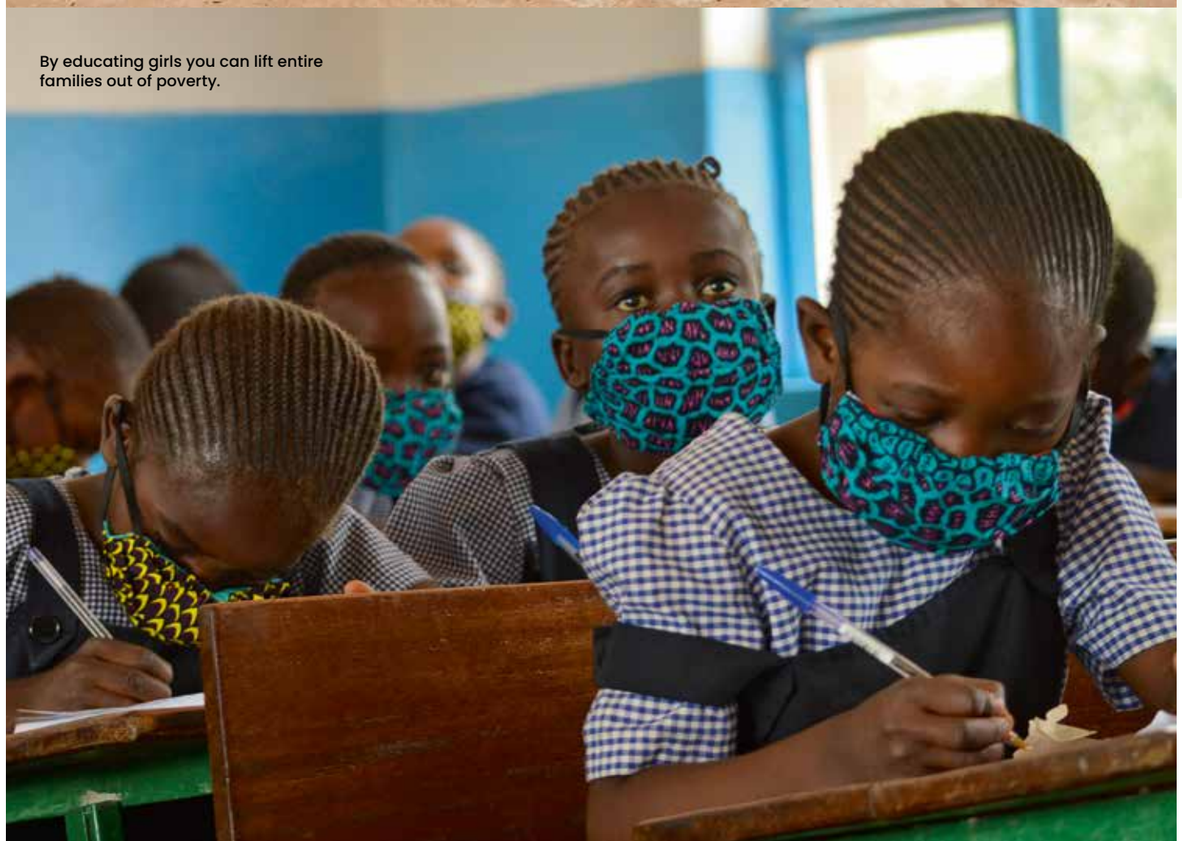
CHANGING A FAMILY'S FUTURE

But when action is taken, the rewards are dramatic – an extra year of secondary schooling for girls can increase their future wages by 10–20%. Improving access to education for girls reduces the rates of both child marriage and young pregnancies and linked child and maternal mortality, while drastically improving the health chances for women and their children. A child born to a mother who can read is 50% more likely to survive past the age of five, and women with post-primary education are also five times more likely than illiterate women to be educated about HIV/AIDS. "By educating girls, you can lift entire families out of poverty," says founder and CEO of Inspired Minds, Sarah Porter, whose organization grew out of the ADA-AI project to reduce inequities in access to education – specifically in tech and AI. "Combined with maternity services and sexual and reproductive health, you can change the course of an entire family's future."

However, working in environments where people are "steeped in tradition about girls' education" is just one of the challenges in trying to improve educational opportunities, says Noella Coursaris Musunka, founder and CEO of the Malaika project in the Democratic Republic of Congo (DRC). "According to the UN, less than 15% of women complete their secondary school education in DRC," she says. "And building a school is not sufficient if girls are going home to a community that's not educated, if they're not properly fed and their health is not taken care of. I wanted to give power to girls and strengthen their communities. My team and I started by sponsoring a few orphan girls, then we built a school, and then Malaika grew – it's been operating for 14 years now and has completely transformed a community."



Access to education for girls reduces the rates of both child marriage and young pregnancies.



By educating girls you can lift entire families out of poverty.

PHOTO: MALAIKA PROJECT

> "If you educate a man you educate an individual, but if you educate a woman you educate a family (nation)."

LOCAL STAFF ARE KEY

The transformation in the girls has been amazing, she says. "From the moment they arrive in Malaika they are physically and mentally stronger, they have ambition, it's incredible." Once in school they are quick to adapt and develop their self-confidence, adds Malaika's head of education, Sylvain Koj Tshikut. "I can see daily progress – they had so little, they didn't have a lot of self-confidence. Thanks to education, they grow so much, they evolve. They have access to opportunities that they would otherwise never have had."

One of the strengths of the project is that it's an ecosystem – and a model that can easily be replicated elsewhere. "It's been used to show other teachers and schools what can be done in one school to change the whole development system, and what can be done to help children become more focused and resilient and capable of competing in the modern world," says Malaika's country manager, Sarah Kalumba. The school now delivers training for teachers from all over DRC, but ultimately the key is relying on local staff and local people. "Solutions to a community's problems should primarily be designed with them," says Musunka.

Educating girls helps them fill their potential and also help to create more stable societies, making it a target for groups that are bitterly opposed to ↘

gender equality and actively want to undermine it. Girls' education may also be seen as a vehicle for "foreign" ideas; high-profile examples include the abduction of almost 300 schoolgirls by Boko Haram in Nigeria, the shooting of Malala Yousafzai in Pakistan, and acid attacks on schoolgirls by the Taliban in Afghanistan.

UNESCO's Education Under Attack report stated that a key motive for attacks on education in Afghanistan was a belief that the curriculum had come under Western influence. Some 60% of the estimated 3.7 million children out of school in Afghanistan in 2021 are girls – a situation that is likely to get far worse now that the Taliban has taken over the country again. Porter's organization had been building a school, but said before the Taliban's resurgence that "Afghan women and girls have made considerable progress in recent years in and it's a political and human rights travesty that they're now being abandoned." It remains to be seen whether Afghan girls will now be forced out of education.

FOCUSING ON STEM

Existing problems have been worsened by the impact of Covid-19. UNESCO estimated in 2020 that a staggering 11 million girls may not return to school as a result of the pandemic – something that has led to a 20% spike in teen pregnancies in countries like Uganda. A 2020 report by anti-modern-slavery organization The Freedom Fund, meanwhile, found that the pandemic had left young girls in many areas more vulnerable to child marriage and child labor. "For those who in normal times had access difficulties, the doors have now been closed – and those who were already out will find new barriers," says Kasowanjete. Porter adds: "Tech that enables home learning could help, but ultimately girls need the safe haven of a physical institution to escape the risks that being at home presents them with."

Tragically, the pandemic meant Malaika losing three girls to other diseases that could have been prevented by its health program – had they been in school. "These are sad, tough times and it shows the importance of the work we're doing," says Musunka. The project's post-Covid response has been to focus even more on its essential STEM (science, technology, engineering and mathematics) curriculum. "At a community level the pandemic can also be the opportunity to join forces and use people's talents to help each other," she says. "For example, our students learned how to use 3D printers to create protective visors, which were distributed to local hospitals."

One key focus of Malaika's STEM curriculum is coding, says Kalumba, with classes starting at kindergarten level, using games. "We want our girls to receive an education that allows them to be leaders in the 21st century. Our students have IT classes, access to computers and tablets, and receive remote training – we have to make them ready to embrace whatever career they would like to pursue, which nowadays is very likely to include IT or coding in some way or another."

But it's important not to lose sight of the bigger picture, says Kasowanjete. "Educational progress for women must be accompanied by public policies in labor, social, cultural and economic matters. We've seen examples of countries in which considerable progress has been made in educational access for women, and at the same time inequality has worsened."

"Girls' education is part of the solution, but development needs to be sustainable," agrees Musunka. "Ending poverty must go hand in hand with the development of economic and social rights. When women are educated, they tend to reinvest their potential in their community and this creates a circle of prosperity. We should increase the value of vocational training so that it's given its fair value on the job market."

So how optimistic are people that girls' access to education can be significantly improved? "All the statistical and documentary evidence shows progressive improvements in the schooling of girls in recent decades," says Kasowanjete. "Obviously, universal schooling will take many years to achieve, but it will come as patriarchal frameworks are broken, poverty is overcome and greater guarantees and opportunities are offered to women, including education financing."

The pandemic has left young girls more vulnerable to child marriage and child labor.

PHOTO: MALAIKA PROJECT

> "Girls' education is part of the solution, but development needs to be sustainable."

But huge progress has been made, he stresses. Along with Europe and North America, girls now have a lower out-of-school rate than boys in Latin America and the Caribbean, as well as in East and Southeast Asia. "In Latin America and the Caribbean, 9.9% of male children, adolescents and youth of school-going age are out of school compared to just 9.2% of females," with 83% of girls and 78% of boys going on to complete lower secondary education. In East and Southeast Asia, meanwhile, "there are 18.8 million boys and male youth out of school, compared to 13.8 million girls and female youth – 85% of girls here complete lower secondary education, compared to just 73% of boys."

"So much has already been achieved – the global education enrolment rate for girls has been increasing since 1995," agrees Musunka. "So there are some positive signs. I'm hopeful that if we keep educating people about the advantages of having educated girls and women, and if we put the necessary financial resources into this issue, the situation can only improve. We have to make them ready for the 21st century job market, and that means things like technology and AI." ■

> "The global education enrolment rate for girls has been increasing since 1995."

CALL TO IMPACT

1. Countries must set policies that will ensure they achieve gender parity in education.
2. Parents need to be encouraged to invest or take an interest in girls' education, instead of expecting them to do household chores.
3. Teachers need to be trained better to overcome ingrained stereotypes and be more sensitive and responsive to the rights of girls and women.

FULL STEM AHEAD
GIRLS AND STEM

Improving girls' access to STEM in education is key to improving the gender gap in STEM careers.

THE BARBIE DOLL has long been held up as a quintessential yet unattainable symbol of what girls should aspire to: a perfect face atop a perfect body, white skin, blond hair, and caring only about how they looked. But today, Barbies explore space and sit in parliaments. Their barrier-breaking careers match girls' abilities and dreams. The Covid-19 pandemic has provided new, inspiring role models in STEM for girls, a field that records a significant gender gap in science, technology, engineering, and mathematics.

Professor Sarah Gilbert, project leader for the Oxford-AstraZeneca vaccine, has been recognized for her work by having a Barbie doll created in her likeness, as have five other significant women following pandemic-related STEM careers. Helping girls to imagine themselves in these roles is important, because women's leaky STEM pipeline begins in early childhood, with the gap widening throughout education, and perpetuating in employment.

Hard-to-break cultural and socio-economic vicious circles, as well as troubled political and geographical contexts, decrease girls' opportunities and motivation for a STEM career at every step. Despite having achieved global numerical parity in all tertiary levels of study, women are still a minority in the STEM fields, according to UNESCO, with the exception, arguably, of life sciences.

There is no distinct regional pattern. Globally, women make up 34% of researchers, with only a percentage point of difference between developed regions, such as the EU (32%), and sub-Saharan Africa (31%), the 2021 UNESCO Science Report revealed.

THE BEIJING BLUEPRINT

In engineering, women account globally for 24% of the engineering workforce, according to the World Economic Forum's 2021 Global Gender Gap Report (GGGR). Azerbaijan, Kuwait and Malaysia have some of the highest ratios of female engineers – respectively 52%, 47.3% and 47.2%, compared with 37.4% in Latvia and 33.3% in Lithuania, the top-ranking European countries. In South Asia, women hold on average 32.6% of technical roles, with India at 29.2% and Pakistan at 25.3%.

In the US, the number of women with computer engineering degrees plummeted from 30% in 1980 to 12% in 2010, and to less than 3% for women of color. The overall figure now hovers at 15%.

The gender gap is also reflected in patent applications by female inventors in engineering at just below 20%, according to the World Intellectual Property Organization. Only 4% of women actually hold patents. The 1995 Beijing Declaration and Platform for Action is to date the most comprehensive blueprint for advancing girls' and women's rights and agenda. Any fresh review of its goals and measures should factor in a convergence of powerful global trends. Policy- and decision-makers need to act on how the new technologies are rapidly changing the way we work, produce, learn, and process our thinking. Some experts estimate that digital transformation accelerated five-fold in 2020–2021. The change is more about people than technology, though: the capabilities to confront epochal threats cannot just be bought.

> "Women's leaky STEM pipeline starts in early childhood."

The UN's International Telecommunication Union (ITU) forecasts that half of all current jobs will disappear by 2050, while sources quoted by UNESCO anticipate that as many as 75% of future jobs will be related to STEM fields. The resulting inequality of employment opportunities will disproportionately benefit those with superior skill sets. The lack of skilled workers is already evident in labor statistics, and the need is also emerging globally for leaders and entrepreneurs in fields such as data science, biotechnology, resource management and precision agriculture.

The pace of the change calls for a corresponding speeding up of the education of the next generation, who will be called on to future-proof not just the economy, but also social well-being and sustainable development.

There is thus an urgency, besides the moral imperative for equality and for ↘

PHOTO: ANDY PARADISE/SHUTTERSTOCK

Prof. Sarah Gilbert, project leader for the Oxford-AstraZeneca Covid vaccine, has had a Barbie doll created in her image, in recognition of her work.

CALL TO IMPACT

1 Encourage parents to recognize the value of a STEM education for girls, with exposure to female role models and addressing gender bias in learning materials.

2 Build private-sector partnerships that can address needs such as financial support for girls' STEM initiatives, providing devices and connectivity.

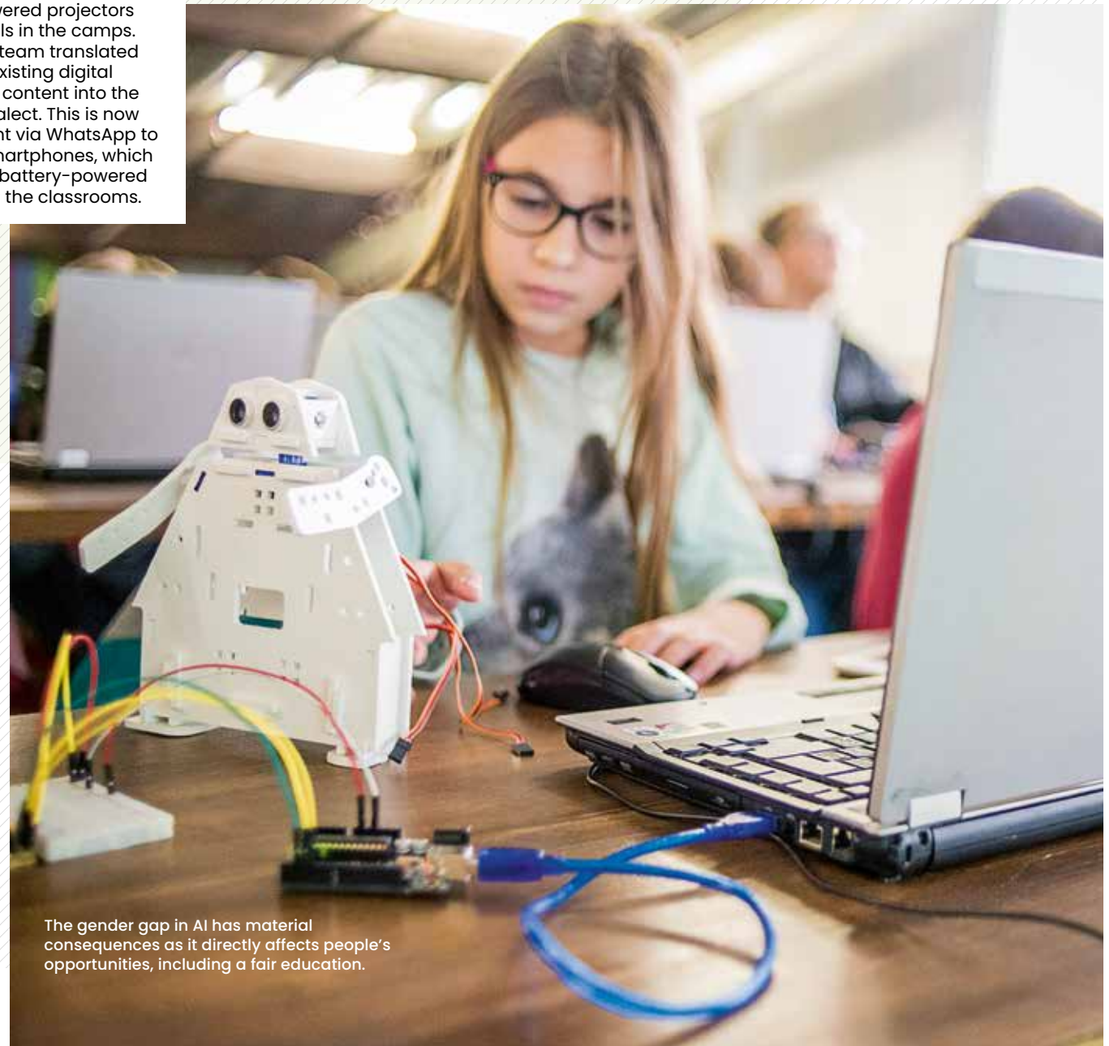
3 Reassess communication and education technologies that emerged during the pandemic and adapt them to the local context, always prioritizing hands-on and face-to-face learning.

Women currently make up just 32% of the global AI workforce.

THE GENDER GAP

Children on the Edge and Mukti are pioneering digital learning to overcome language barriers and deliver meaningful education for 7,500 Rohingya refugee children in the Kutupalong camp, Bangladesh. This won the education prize at the 2020 Tech4Good Awards.

Children on the Edge provided 75 smartphones and battery-powered projectors to the schools in the camps. Their digital team translated or dubbed existing digital educational content into the Rohingya dialect. This is now regularly sent via WhatsApp to teachers' smartphones, which slot into the battery-powered projectors in the classrooms.



The gender gap in AI has material consequences as it directly affects people's opportunities, including a fair education.

PHOTO: JALIL REZAYEE/EPA-EFE/ SHUTTERSTOCK, NURPHOTO /GETTY IMAGES

↘ progress towards the UN Sustainable Development Goals, to boldly begin leveraging women's perspective and contribution in STEM.

Artificial intelligence (AI), which might well become the most powerful technology of the 21st century, is a case in point. It is already impacting every field in research and all industries, from teaching to manufacturing, agriculture, health, etc., as well as many aspects of people's lives. In the overall data science and AI workforce, women have attained a 32% share, the GGR states. In academia, however, 80% of professors in AI in the US are male, the Stanford University AI Index reports, while the number of female AI doctorates has languished at 20% since 2010.

The gender gap in AI has material consequences, directly affecting people's opportunities, including a fair education. When processing credit applications, for example, if the data fed into the AI program reflects the biases of the programmers, who are over 70% male and white, the results are likely to consider women and minorities less creditworthy.

In sub-Saharan Africa, demographics intersecting with technology could morph into an opportunity. The world's three economies with the highest number of women business owners are in sub-Saharan Africa, the 2020 MasterCard Index of Women Entrepreneurs reports. The region has a similar potential for women in leadership and research. This is a remarkable feat, given that Internet access there is stalling at 18%, compared with 30% globally.

COMPETENT LEADERS AND TRAILBLAZERS

Connectivity and its multiplier effect could prove powerful in the context of a young digital native population and women who are proving to be competent leaders and trailblazers. Access to the Internet is critical if the region is to educate the pool of STEM professionals it will need to build and manage, with new solutions, more sustainable urban environments and climate and education challenges, among other things.

For the current improvements to be sustainable, today's girls cannot be allowed to miss out on or lose interest in STEM early on. Many initiatives have been taking shape worldwide, although it's worth noting that the smallest cannot count on adequate financial or policy support. In the most disadvantaged contexts, their success depends on resolute parents and organizers.

The World Bank's Decoding Bootcamps Program provides an overview of best practices for recruiting and retaining women in advanced technology programs, based on insights from 25 coding bootcamps and seven digital skills programs across 22 countries.

ADDRESSING BARRIERS

In India, Embibe has been successful in teaching students in Rajasthan to use computers, become self-sufficient and prepare for top pre-engineering examinations. The Malala Fund's network across eight developing countries supports local educators and advocates to address barriers keeping girls out of school. In Nigeria, Edufun Technick aims to stir up a passion for STEM in children and teens. The project's hands-on tech labs help them develop critical thinking, problem-solving, self-direction and self-assessment. STEM Like a Girl in the US empowers girls to develop their own STEM identity.

Girls learn robotics and coding in structured events or group meetings at courses and summer camps. Outstanding projects include Afghan Girls Robotic Team, Black Girls Code and Girls Who Code in the US. At the corporate level, BASF US organizes camps to introduce children to chemistry, while Accenture US is developing a virtual reality game to help teens explore future-proof STEM jobs. Girls Who Game is a Microsoft-Dell pilot program that uses the computer game Minecraft to strengthen girls' STEM skills.

Despite these initiatives, girls have scant exposure to role models strong enough to outweigh the stereotypes. This is coupled with a real lack of opportunities for girls who do encounter such role models. Odete Muximpua, Mozambique's first woman engineer, Pauline Munganyinka in Nigeria, Jacinta Okwako in Kenya and Fatoumata Thiam in Senegal are trailblazers undertaking cutting-edge STEM research. In India, Nidhi Mathur, founder of one of the world's top 100 AI start-ups, uses AI to detect cancer. Though underrepresented, women have forefront roles in STEM in many other parts of the world, too.

And this has actually been the case for decades, if not centuries, which leads us to conclude that the increasing participation of girls and women in STEM needs to gather a strong momentum.

In the 1950s, Katherine Johnson was a pioneer in mathematics at NASA. She solved calculus problems and for many years literally calculated, along with other female mathematicians, the trajectories of spacecraft – all while raising three daughters and facing racial discrimination. At school, to inspire this talented and curious girl to become a research mathematician, a teacher created a geometry class just for her. We now know that, without her supportive parents and teacher, the historic first flight of an American into space would have happened much later. ■

> "Outstanding projects include Afghan Girls Robotic Team and Black Girls Code."

FII: EDUCATION AND POVERTY IMPACT REPORT 2021

LEARNING BY KICKING

From soccer to a roof, to a job and back into society: Mel Young, Founder and President of the Homeless World Cup, explains how this annual street soccer tournament generates huge social capital for the marginalized.

THEY COME FROM ALL OVER THE WORLD to play soccer as part of a truly global event. They are proud to represent their country. Crowds turn up to applaud. The media appear in droves. Thousands watch online. And it is life-changing.

Some spectators have said that it is the best sporting event that they have ever attended. They talk about the fast-paced football and the wonderful goals, but more than anything they highlight the positive atmosphere and the smiles on the faces of the players.

What am I describing? People are surprised to learn that I am talking about the annual Homeless World Cup, held in different countries and cities each year, which involves homeless people representing their country in a week-long street soccer competition. Homeless people playing in the national costume of their country with hundreds cheering – that can't be right, can it? But it is true, and the stereotypical view of homelessness is destroyed in the process.

With one partner in each country, the Homeless World Cup Foundation works in over 70 countries. Each partner works directly with homeless people by encouraging them to get involved in their soccer programs. People who are homeless or living in extreme poverty suffer from low self-esteem and low confidence because of their exclusion and alienation from society. Soccer is a very simple game; anyone can take part, no matter what skill level they have. The partners work with homeless people by playing soccer. They begin to develop plans with individuals for housing, work, education, drug and alcohol rehabilitation, or whatever will help them back from homelessness into society. Everyone is different, but soccer remains at the core and homeless people develop a sense of belonging as they form relationships in their teams. Many describe it as like becoming part of a genuine family that supports them at all levels.

LIFE LESSONS

For many, education is described as sitting exams or gaining a university degree and while that is part of the education lexicon, it is much wider than that. Through the soccer initiatives, homeless people are learning simple life lessons – basic skills that many of us take for granted. Soccer is hugely positive in this regard. If nothing else, you can learn that life is never linear for anyone, regardless of who you are. Everyone has good and bad days. It is about how you cope with the bad days or, in soccer terms, how you come back after you lose a game. It's all about support and understanding that even if you lose today, you can always win tomorrow. It is a vital life lesson that helps to build self-esteem. It's not just kicking a ball – it's a re-entry into education for people that seemed to be out of reach for everything the education system has to offer.

In Melbourne, in 2008, the event also saw the hosting of the first ever Women's Homeless World Cup, won by Zambia.

PHOTO: GETTY IMAGES

> "Homeless people develop a sense of belonging as they form relationships in their teams."

Glasgow's George Square was converted into an outdoor street football venue for the event in 2016, with three purpose-built pitches and seating.

PHOTOS: ALAMY STOCK PHOTO, PICTURE ALLIANCE

↘ Once a year, a team is selected to represent their country at the Homeless World Cup. Eight players are picked to play in the street soccer competition, which is a four versus four match with a maximum of four rolling substitutes allowed during the 14-minute game. Teams play an average of three games a day during the week-long competition. The standard varies greatly, and the competition is structured in such a way that teams play at their own level. No one goes home if they lose. They end up in different positions in the table depending on their performance during the week and they all receive the same medal. There is both a women's and men's event. It is highly competitive but inclusive at the same time, and is an example of how sport should be played.

IMPRESSIVE STATISTICS

The annual event – first held in 2003 in Graz and since staged in cities including Rio de Janeiro, Cape Town, Amsterdam, Mexico City, Oslo, Paris and Santiago – receives massive plaudits. I urge anyone to attend if they get the opportunity. Since we started, we have impacted the lives of more than 1.2 million people who have been able to change their lives and find a home, start a job, get off drugs, reconnect with family and go on to further education as a result of being involved with the Homeless World Cup and its partners across 450 locations around the world.

The statistics are striking. Out of the players taking part in the annual event, 94% say it had a positive impact on their lives, 83% have improved relations with their family, 77% have changed their lives significantly and 71% continue to play sport. This is significantly higher than many initiatives aimed at tackling extreme poverty and homelessness, and proves how powerful soccer can be at changing lives.

Statistics about the value for society are impressive, too. At the Cardiff event in 2019, 90% of the spectators surveyed had a positive view toward homeless people as a result of attending the event, and 83% were proud that their city had hosted it. Meanwhile, independent research showed that the social return on investment for the 2019 event was $4.32 for every $1 spent. According to Pro Social Valuation, the Homeless World Cup Foundation created over $364 million in social capital through its event and the activities of its partners in 2019.

Today's obsession with data has an important place, obviously, but behind the figures at the Homeless World Cup Foundation are thousands of human-interest stories about people who have used the network to change their lives. They are the real heroes.

ENDING EXCLUSION

David was homeless in Glasgow, joined the program, played for his country, gained some certificates, returned as a volunteer, became the team coach, won the cup for Scotland, and is now running his own social enterprise, which employs 20 people.

Juliet from Kenya managed to get a job that helps pay for her brothers' education and she plans to go to college and set up her own business. Many have stayed in soccer and gained certificates that allow them to become coaches. Others have become qualified referees from a course run by the Homeless World Cup, which gives potential employment. But whatever they are doing – and they are all doing a huge variety of different things – the important point is that they have rejoined society. They are no longer excluded and are now making a positive contribution.

Simple education is in the DNA of everything we do, although it might not be recognized as such. In addition to our core activity, we have built certified programs and engaged with the formal education sector where appropriate. This has helped build the capacity of the network. We took part in an EU-funded Erasmus package, which involved our European partners in a three-year educational exchange, with each partner keen to learn from each other and immediately apply those learnings.

While we are pleased with our impact, we work against a backdrop of increasing homelessness across the world. Homelessness exists in every country, from the poorest to the richest. There is a system failure. In 2005, the United Nations estimated that there were 100 million homeless people and 1.6 billion people who lacked adequate housing. This situation has been made worse by the global pandemic and services are under strain. We have to continue to build our organization to help tackle these growing problems. It is imperative.

The pandemic meant that we had to cancel our 2020 and 2021 events, and this has caused many challenges. We are, however, resilient and we have been able to run effective online courses with our partners in order to maintain as much momentum as we can. However, it has not been easy.

We hope to return to our annual event next year, and we still have ambitious development plans to involve more countries in our network – particularly in Africa, Asia and the Middle East. Given how the Covid pandemic has impacted our organization, we are looking for donors and sponsors who can help us with our regional development plans. We are also keen to hear from any city that might be interested in hosting the event. The Homeless World Cup certainly brings kudos to cities, offering the potential for real legacy and the opportunity to act as a catalyst for creating real changes in the lives of many of the poorest of the poor across the world. ■

> **"We have impacted the lives of more than 1.2 million people who have been able to find a job and reconnect with family."**

MEL YOUNG
Founder, Homeless World Cup

CALL TO IMPACT

1 Sports activities can reach out to people that have dropped out of the fabric of society and can tread a path to reintegration.

2 Offering lessons for life is a good start in bringing education to the uneducated.

3 Cities that host the Homeless World Cup have the potential to create a lasting legacy for their poorest citizens, as well as earn kudos.

GOOD PRACTICE: BRIEF EXAMPLES OF NATIONAL AND REGIONAL INITIATIVES

TEKY

Schoolchildren in Vietnam are learning a wide range of digital skills through TEKY's Technology and STEAM program, which is based in Hanoi and in 2019 was teaching more than 2,000 students in eight academies around the country. The children learn how to use AI, robotics and other futuristic technologies, plus the digital literacy they will need to use them as adults earning a livelihood. Teky's YouTube and Vimeo channels are full of short videos of the children's projects, such as a robot vacuum cleaner for the home made from a Lego Mindstrom kit. TEKY, founded in 2017, also offers technology clubs at more than 30 international, private and public schools in Vietnam. TEKY has racked up an impressive number of awards and nominations, including the Rice Bowl 2017 Best Social Impact Startup award and Rice Bowl and the New Entrepreneur Foundation's joint award in 2018 for Best Life Helper & People's Choice. In 2017, the Australian government and University of Melbourne recognized it as one of the "top 10 projects in South East Asia that have the best influence on society". Building on this, TEKY plans to expand its EdTech platform and open 40 learning centers by 2023.

→ WWW.FACEBOOK.COM/TEKYACADEMY

Schoolchildren learn to make simple robots from Lego kits.

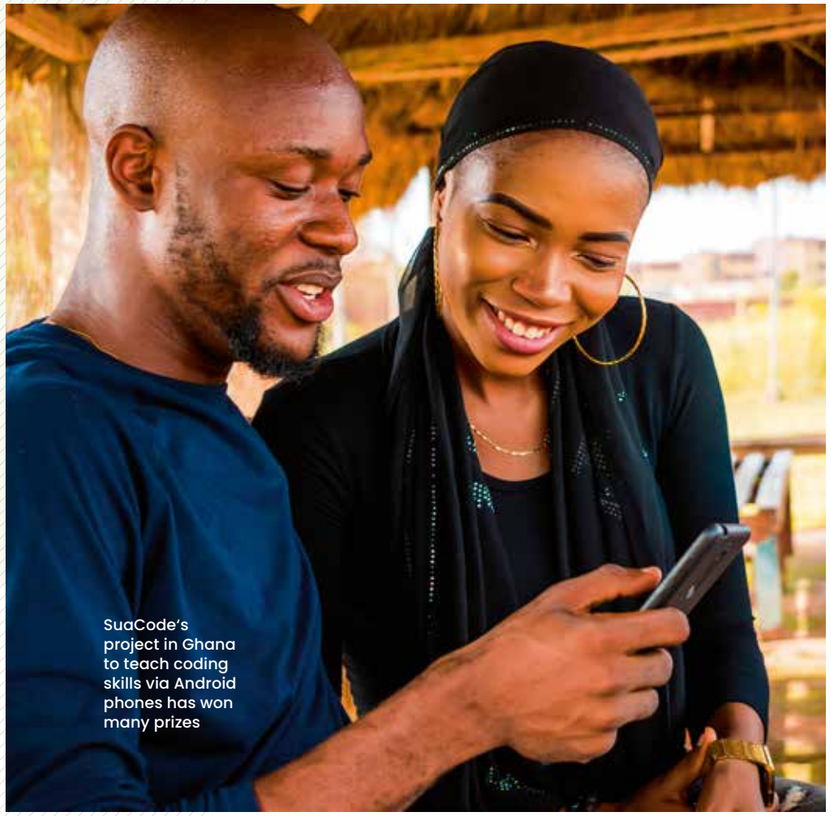
WOMEN IN AI

Founded in France in 2016, Women in AI (WAI) is a community-based project working across all continents and empowering women to work with AI to build an inclusive global society through research, events and education. WAI calls itself a "do-tank", educating women in data sciences and AI from an ethical and responsible perspective.

WAI's programs are open to women of all ages and backgrounds – it is currently operating in 140 countries and typically working with around 8,000 women at any time. It currently runs several projects. Wai2GO's participants get a basic introduction to AI then learn about its use cases, how to apply AI in a particular field and how to set up AI-based businesses. The WaiCAMP is an AI bootcamp offering a mix on online classes and hands-on practical workshops where women and girls can test out ideas for companies that may later offer them a job. Projects include developing machine learning to assess the risk of seismic shifts in mines and building a deep learning model that analyses objects in an image and automatically produces captions for them.

WaiMENTOR matches its alumnae with mentors in AI companies to further their careers. High-profile mentors include Julie Batch, Chief Customer Officer at Australian insurance company IAG. WAI also runs a business acceleration program, WaiACCELERATE, aimed at helping women who are innovating in AI, data sciences and machine learning to start their own profitable, ethical and competitive companies. There is an emphasis on linking the nine-month program with the UN's Sustainable Development Goals 2030, and participants learn through a mix of online tutoring and other initiatives.

→ WWW.WOMENINAI.CO



SuaCode's project in Ghana to teach coding skills via Android phones has won many prizes

SUACODE

Access to computers across Africa is very limited - only 24% of Internet use comes via a PC, but around 75% is through smartphones. Smartphone ownership on the continent has been estimated to reach 929.9 million smartphones in 2021. George Boateng, co-founder of SuaCode in 2017, saw an opportunity when organizing a STEM conference for young people in his home country of Ghana. There weren't enough laptops, but almost everyone had a smartphone. The groundbreaking SuaCode training program teaches coding skills in the software language Processing, a form of javascript. High school students joining the program need only an Android smartphone and a willingness to pick up the necessary skills.

SuaCode has won many awards since its launch, including the African Union Education Innovation Prize in 2019. The project was a finalist in the Princeton Africa Summit Venture Competition in 2020, and in 2021 George Boateng was shortlisted at the UK's Royal Academy of Engineering for its prestigious Africa Prize for Engineering Innovation award. Currently operating only in Ghana, SuaCode is now looking to expand across Africa and teach millions more how to code and cross the digital divide.

→ WWW.NSESAFOUNDATION.ORG/SUACODE

LEND WITH CARE

Based in London, this online-based microfinance initiative typically works in a dozen developing countries at a time to support small entrepreneurs to develop their business. These can range from increasing a pig herd in Vietnam, through helping a women's collective in Zambia to buy stock to sell in local markets, to helping a shopkeeper in Peru expand the type of products they sell. Funding comes from microinvestors in the UK. The majority of loan recipients are women, carefully selected by the charity's local partner. They must have a viable business plan. A loan of £500 could involve as many as 33 investors each investing £15 and being repaid at a rate of about £1.80 per month over 12 months. Research shows that as "change makers" in their household, women who can increase their income this way can "improve the health, nutritional and educational status of other household members, particularly children". For children, this can mean the difference between attending school, or getting no education at all. On average, a loan to one entrepreneur can result in an average four family members being supported.

In Zambia, Dalphine Makanya of Chitukuko women's credit group says microloans offer a fair interest rate and she can support her children

→ WWW.CAREINTERNATIONAL.ORG.UK

PHOTO: TEKY PR, GETTY IMAGES, SHUTTERSTOCK / I_AM_ZEWS, PETER CATONS MAC

ENGAGE WITH THE FII INSTITUTE
INFO@FII-INSTITUTE.ORG

LATEST NEWS FROM FII-I

EDUCATION IS NOW OFFICIALLY OUR FIFTH PILLAR.

FII-I has three pillars to deliver its mission: THINK, ACT and XCHANGE

1 FII-I THINK
Identify societal challenges and current inhibitors
Curate the brightest ideas to address societal issues

2 FII-I ACT
Catalyze innovation and initiatives by mobilizing partners and resources

3 FII-I X CHANGE
Create platforms for live discussions on the future of humanity. Share knowledge, stories and publications with different stakeholders

THE FII INSTITUTE

is guided in all it does by a strong purpose, vision and mission.

PURPOSE
"Enabling a brighter future for humanity"

VISION
"Empowering the world's brightest minds to shape a brighter future for ALL, and with ALL"

MISSION
"Curating and enabling ideas to impact humanity sustainably"

PHOTOS: ADOBESTOCK; FII INSTITUTE

THE FII INSTITUTE is excited to add education as the newest pillar to our existing pillars of AI, robotics, healthcare, and sustainability. At FII Institute, we believe that "By integrating what is desirable from a human point of view with what is technologically feasible and economically viable, we can create the solutions for a better world." Our mission is to empower the brightest minds for all, with all, to create a positive global community for all. This is the heart of our strategy, in that we do this through building a global momentum to bring about change, working with esteemed partners and building our thought leadership to ensure that we focus on impacting humanity positively.

EDUCATION MISSION STATEMENT

The age-old catalyst fueling prosperity, innovation, and an improved life quality for individuals and humanity, education is the most important topic impacting our lives every day. The FII Institute intends to enshrine education at the center of its mandate to drive impact on humanity. To that end, the institute promotes equitable, accessible, affordable, and quality education for all.

Areas of focus within education will include education to combat impoverishment, skill-based learning, life skills education, technology-enabled education, information dissemination tactics, and information authentication verification, among others.

In conjunction with our focus on ESG, we forecast education will play an important role in how individuals and entities are positioned to adhere to and advance ESG principles. ■

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JOIN US ON A JOURNEY OF INVESTIGATING HOW ACCESSIBLE EDUCATION CAN PROVIDE HOPE, FIGHT POVERTY, AND RESCUE LIVES.”

RICHARD ATTIAS

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