The Blue Dot

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MULTIDISCIPLINARY SCIENCE & EVIDENCE FOR EDUCATION

TheBlueDot

ISSUE 14, 2021

THE BLUE DOT features articles showcasing UNESCO MGIEP's activities and areas of interest. The magazine's overarching theme is the relationship between education, peace, sustainable development and global citizenship. THE BLUE DOT's role is to engage with readers on these issues in a fun and interactive manner. The magazine is designed to address audiences across generations and walks of life, thereby taking the discourse on education for peace, sustainable development and global citizenship beyond academia, civil society organisations and governments, to the actual stakeholders.

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“Look again at that dot.
That’s here. That’s home. That’s us.

On it, everyone you love,
everyone you know, everyone you ever heard of,
every human being who ever was,
lived out their lives.
The aggregate of our joy and suffering
thousands of confident religions,
ideologies, and economic doctrines,
every hunter and forager, every hero and coward,
every creator and destroyer of civilization,
every king and peasant, every young couple in love,
every mother and father, hopeful child,
inventor and explorer, every teacher of morals,
every corrupt politician, every superstar,
every supreme leader, every saint
and sinner in the history of our species lived there-
on a mote of dust suspended in a sunbeam.”

CARL SAGAN
PALE BLUE DOT: A VISION OF THE HUMAN FUTURE IN SPACE

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Education: *The Science of Learning*

Welcome to the 14th edition of the Institute’s flagship publication, The Blue DOT. In this edition, we bring to you news of the International Science and Evidence based Education Assessment (ISEE Assessment) that the Institute embarked on about 18 months ago. In September 2019, at the introductory workshop in Montreal hosted by the First Chief Scientist of Quebec, Rémi Quirion, a group of experts from a diverse disciplines gathered to discuss the utility of undertaking such a global assessment on education.

Immediately, confusion arose among the various experts. The majority of experts mistook the exercise to being similar to studies on student learning assessments such as the Programme for International Student Assessment (PISA) and Trends in International Mathematics and Science Study (TIMMS), among others. However, this Assessment on education was designed along the lines of some of the global environmental assessments such as the Intergovernmental Panel on Climate Change (IPCC) and The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) that were conducted for climate change and biodiversity, respectively.

The ISEE Assessment was designed to bring to fore the latest research on education and learning and to assess with confidence what we know worked, identify the gaps and assess why the envisaged goals and targets were not reached. The Assessment was to cover the literature not only from the traditional educational sources but also from disciplines such as neurosciences, cognitive sciences, and psychology, among others, which had important findings to improve the learning process and therefore education in general. The experts gathered at the introductory workshop agreed that the time might be right for a global assessment on education. A majority agreed that the UNESCO Delors report (1996) was visionary but lacked detail on how to achieve the vision the report expounded. Although the report highlighted the role of science in education, the report itself was not supported by science and evidence. The group agreed that the Futures of Education initiative initiated by UNESCO could be further strengthened if supported by such a scientific and evidence-based assessment of education and learning.

A conceptual framework was developed to facilitate as well as provide a working structure to undertake the work for the Assessment. This was published recently in the npj | Science of Learning in 2021.

In addition, some initial publications were published on major areas explored in the ISEE Assessment such as ‘human flourishing’ and ‘what evidence-based education means’, amongst others, which are available under UNESCO MGIEP’s Research Brief Series.

Although COVID-19 hit us very soon after the initiative took off, the ISEE Assessment has attracted over 250 authors from over 40 countries to contribute their respective knowledge to the study. It is the first of its kind for education. Not surprisingly, the path has not been easy. Organizing a collective effort in writing an Assessment involving authors who come from very different disciplines and who have never worked together before is a herculean task by itself. Compound this with evaluating a highly complex system such as education and the intricacy of human learning and we have what many might call an impossible task especially taking into consideration the onslaught of COVID-19. What is even more challenging is to produce the results in time to feed into the Futures of Education initiative that UNESCO’s Assistant Director-General for Education, Stefania Gianni, highlights in her message in this edition.

But here we are with an exhaustive assessment, with extremely valuable results for policymakers to seriously reflect on, rethink and hopefully reimagine our present education. Preliminary results suggest our present education might actually be perpetuating the unsustainable trajectory the world finds itself.

The ISEE Assessment also provides policy relevant but not policy prescriptive recommendations that might actually produce learners with mindsets that see the world as one and embrace the thousand-year-old Sanskrit proverb, “Vasudhaiva Kutumbakam” (the world is one family).

ANANTHA KUMAR DURAIAPPAH

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Abstract

Education is indispensable for the flourishing of people from all backgrounds and stages of life. However, given the accelerating demographic, environmental, economical, socio-political and technological changes - and their associated risks and opportunities - there is increasing consensus that our current educational systems are falling short and that we need to repurpose education and rethink the organization of learning to meet the challenges of the 21st century. The United Nations Educational Scientific and Cultural Organization (UNESCO) "Futures of Education" initiative was formally launched at the United Nations General Assembly in 2019 to provide such a vision of education for the future. The International Scientific and Evidence-based Education (ISEE) Assessment synthesizes knowledge streams generated by different communities and stakeholders at all levels and scales and will thereby essentially contribute to re-envisioning this future of education. The overall aim of the ISEE Assessment is to pool the expertise from a broad range of knowledge holders and stakeholders to undertake a scientifically robust and evidence-based assessment in an open and inclusive manner of our current educational systems and its necessary reforms. In this commentary we discuss the aims and goals of the ISEE Assessment. We describe how the ISEE Assessment will address key questions on the purpose of education and what, how, where and when we learn, and evaluate the alignment of today's education and theory of learning with the current and forthcoming needs and challenges and to inform policymaking for future education.

Not many would argue with the claim that education matters, for people of all stages of life. However, there is less agreement on the purpose of education. Should it be to improve the human condition, or should it be directed toward meeting the demands of the workplace to promote economic growth? Is prosperity, as presently measured by Gross Domestic Product (GDP), positively related to the state of education systems?[1,2]. Moreover, the flourishing of today's societies is challenged in different ways than was the case 300 years ago, when systems of mass schooling developed in tandem with the emergence of modern nation-states[3]. Climate change, uncertain job markets, growing social inequality, and pandemics such as the ongoing Covid-19, are the challenges we currently face. Our future more than ever depends on how we, as a global society, build our education systems to ensure continued human advancement and flourishing.

We start by asking two fundamental questions: are our education systems still serving the right purpose? And are they equipped to address the pressing challenges we face? To answer these questions and provide guidance on ways forward, an assessment is needed of the current state of knowledge on education and learning, encompassing their entire complexity: goals of current education systems and their alignment with today's societal needs, the sociopolitical as well as education-specific contexts in which education is embedded, and the state-of-the-art insights into students' learning experiences drawn from both the education and learning sciences including new insights from neuroscience. The challenge is to bring together different streams of knowledge that have been generated by different communities working on common areas, but yet have not drawn and built on each other's work.

Addressing these key questions and challenges is exactly the aim of the International Scientific and Evidence-based Education Assessment (ISEE Assessment), where we take a multi-perspective, multicultural and multidisciplinary approach to advance rethinking the education agenda. The ISEE Assessment will contribute directly to the United Nations Educational Scientific and Cultural Organization (UNESCO) global "Futures of Education" initiative which was launched at the United Nations General Assembly in 2019.

The term "Assessment" here refers to a critical evaluation of the state of existing knowledge on education and learning by a team of independent experts drawn from a broad range of relevant disciplines and from across the world, interacting with key stakeholders in education. This knowledge will primarily be drawn from peer-reviewed scientific literature, but will also include credible grey literature. Importantly, the assessment will achieve a synthesis across disciplines by ongoing deliberative discussions across the team and stakeholders throughout the project, and by addressing overarching key questions and translating these answers into policy-relevant recommendations. In addition, this exercise will highlight gaps in knowledge and identify potential future research agendas.

To be clear, the ISEE Assessment is of a very different nature than international largescale student assessments such as the Programme for International Student Assessment (PISA). Assessments like the one we propose here have proved extremely fruitful in other domains 4 to synthesize information available from a wide range of disciplines. This has never before been performed for education.

EDUCATION:
An Integrated Approach

1st Developing a conceptual framework is an essential first step in approaching an assessment of this nature[4]. The conceptual framework presented in Figure 1 captures the key inter-linkages within the education system which will be assessed, and will guide the assessment.

We assess what we learn and its implications for education and learning (Box 4 in Figure 1). We will evaluate:

(i) If there is purel a focus on knowledge acquisition - the cognitive or intellectual dimension of learning or broader to include the social and emotional dimensions. Emerging insights from the learning sciences, including neuroscience, emphasize the inherently inter-connectedness across the cognitive and the social, emotional and embodied dimensions of development and learning[5, 6, 7, 8];
(ii) How contextual factors (e.g., cultural, political, environmental, technological) have influenced what we learn or need to learn (Box 2 in Figure 1); and
(iii) If what we learn in our current education systems will be sufficient to meet the challenges of the 21st century.

2nd We assess how we learn and its impact on education and learning. Education studies have long established the importance of forms of pedagogy for learning[9], recognizing the centrality of the pedagogic device[10] and children's learning to learn[11].Recently, pedagogy has evolved with many new methods such as gaming and learning through social interaction and play, as well as through contemplative practices that enhance sensual, emotional and mental awareness[12]. Furthermore, over the last two decades, a rich body of information has been produced about how learning happens at the brain and behavioral levels, including individual differences and environmental influences on learning[13,14]. The educational implications of claims derived from research from these various disciplines have yet to be evaluated in an integrated manner relative to the learning experiences and practices that exist.

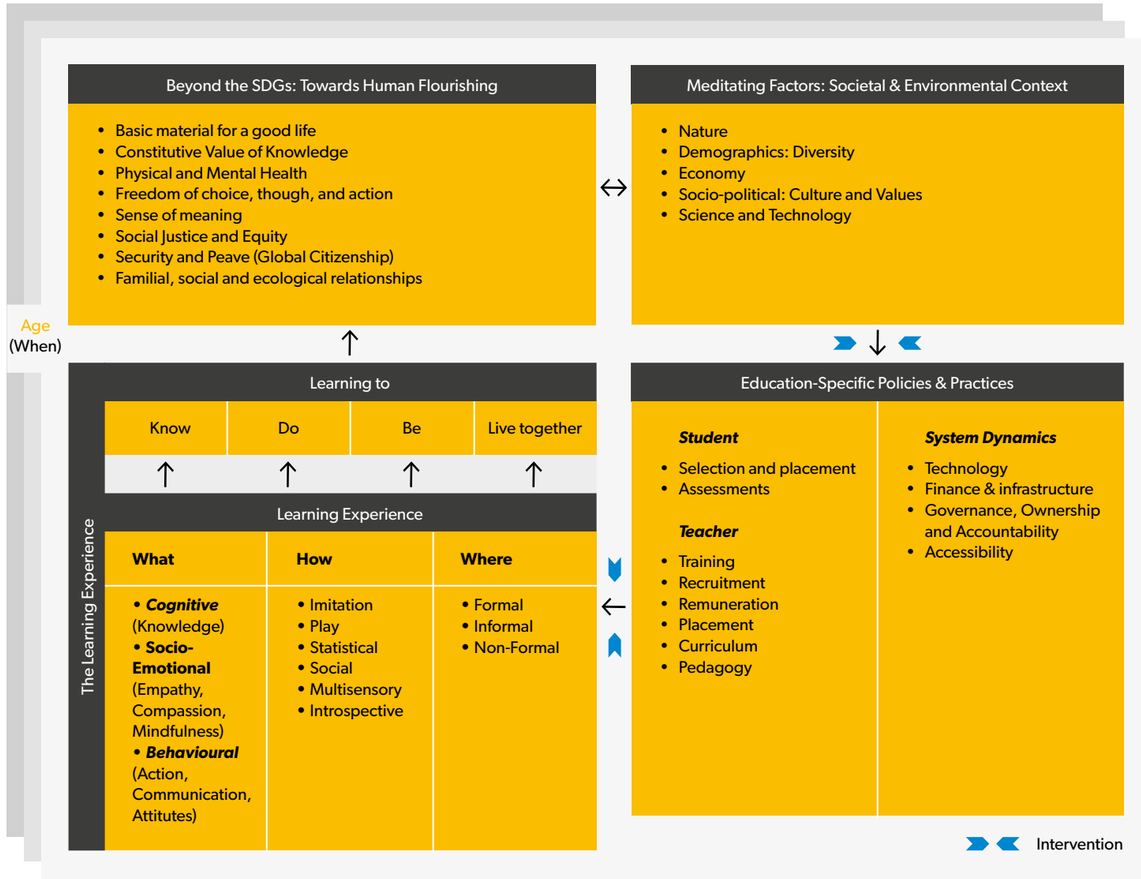
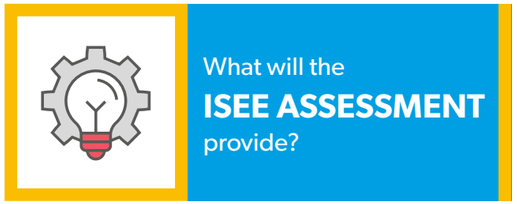


Figure 1: The ISEE Assessment Conceptual Framework of Lifelong Learning

3rd We assess where we learn and its impact on education and learning. We evaluate the interplay between the formal (e.g. at school), non-formal (e.g. at work) and informal (i.e. unintentional such as via peer interactions) learning settings, face-to-face and online learning and the impact it has on learning. An urgent example is the recent shift to online learning forced by the Covid-19 pandemic and its implications. But also the increasingly significant phenomenon of 'shadow education' (or private supplementary tutoring) in many societies, its causes and its implications for formal schooling, the learningexperience and social inequality are important to assess [15].

4th We will assess when we learn and its impact on education and learning. Debate over the correct timing for formal education is longstanding, as is concern over the capacity of formal age-based schooling to accommodate diversity amongst learners. Studies from developmental psychology and neuroscience have revealed how the ease of learning varies with age, from infancy to old age [16,17]. Being offered the right inputs at the right time may improve learning, but at the same time,

schooling conditions and (cultural) contexts may cause great variation in what is being taught when (Boxes 2 and 3 in Figure 1). What implications might such insights have for the timing of interventions and design of school curricula? These are key questions many policy makers need answers to when redesigning their educational and learning policies.



1st It will provide an understanding of how our social, economic and political systems influence and are influenced by our education systems (the inter-dependent link between Box 2 and Box 3 in Figure 1). We will examine how these contextual factors arerelated to diverse conceptions of the purpose of education (the inter-dependent link between Box 1 and Box 2). For example, the assessment will report on how economic policies, labor market pressures, and politics have influenced curriculum development, approaches to student assessment [18], and competition for credentials across various global contexts.

2nd We will use the four pillars of education: i) learning to Know, ii) learning to Do, iii) learning to Be, and learning to Live Together [19] as benchmarks to analyze how contextual factors have influenced and been influenced by the educational aims and practices that these pillars encompass (the inter-linkages between Box 3 and Box 4 in Figure 1). At the same time, we will assess the relationship between the "What", "How", "Where" and "When" of learning and the pillars of education in the light of state-of-the-art evidence from the science of learning, and studies of the socio-economic, environmental and other challenges we face today.

3rd We will assess how the pillars have contributed towards the conception of human flourishing and the interdependencies across the "What", "Where", "How" and "When" towards these pillars of education (inter-linkages between Box 4 and Box 1).

Conclusion

There is an increasing recognition by policymakers that education and learning policies should be guided by science and evidence. The recent New Educational Policy released by the Government of India is a case in point. By synthesizing the state of existing knowledge on education and learning across disciplines and regions of the world, the ISEE Assessment will generate the information and recommendations needed taking into account what works, what does not and where more research is needed to guide and support policy-making beyond the 2030 education agenda. Moreover, the assessment comes at an opportune time when the world is reeling from the devastating impacts from the coronavirus that has as of March 2020 put about 1.53 billion children out of school. The sudden shift to online and digital technology poses many questions to educators and policy makers. Many questions that this assessment addresses will be useful guides in future crises and challenges.

Acknowledgements & Disclaimer

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Anantha Duraiappah and Nienke van Atteveldt jointly wrote the paper and share first- authorship. All other authors are listed alphabetically and contributed to the Conceptual Framework during a scoping meeting, and/or to writing and editing earlier drafts of the paper (Stanley Asah, Gregoire Borst, Stephanie Bugden, J. Marieke Buil, Oren Ergas, Stephen Fraser, Julien Mercier, Juan Felipe Restrepo Mesa, Alejandra Mizala, Yoko Mochizuki, Kaori Okano, Christopher Piech, Kenneth Pugh, Rajiv Ramaswamy, Nandini Chatterjee Singh, & Edward Vickers).

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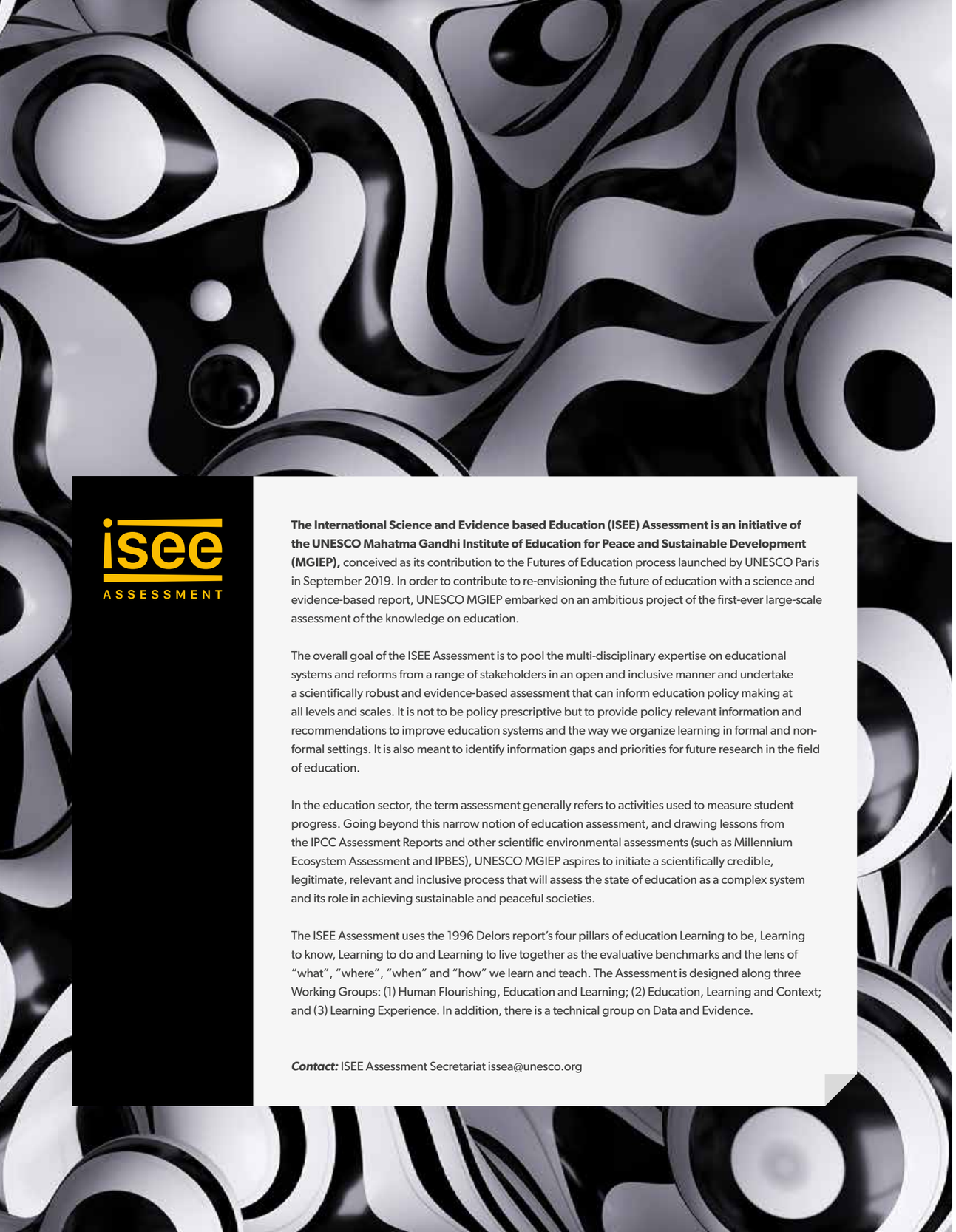

isee ASSESSMENT

The International Science and Evidence based Education (ISEE) Assessment is an initiative of the UNESCO Mahatma Gandhi Institute of Education for Peace and Sustainable Development (MGIEP), conceived as its contribution to the Futures of Education process launched by UNESCO Paris in September 2019. In order to contribute to re-envisioning the future of education with a science and evidence-based report, UNESCO MGIEP embarked on an ambitious project of the first-ever large-scale assessment of the knowledge on education.

The overall goal of the ISEE Assessment is to pool the multi-disciplinary expertise on educational systems and reforms from a range of stakeholders in an open and inclusive manner and undertake a scientifically robust and evidence-based assessment that can inform education policy making at all levels and scales. It is not to be policy prescriptive but to provide policy relevant information and recommendations to improve education systems and the way we organize learning in formal and non-formal settings. It is also meant to identify information gaps and priorities for future research in the field of education.

In the education sector, the term assessment generally refers to activities used to measure student progress. Going beyond this narrow notion of education assessment, and drawing lessons from the IPCC Assessment Reports and other scientific environmental assessments (such as Millennium Ecosystem Assessment and IPBES), UNESCO MGIEP aspires to initiate a scientifically credible, legitimate, relevant and inclusive process that will assess the state of education as a complex system and its role in achieving sustainable and peaceful societies.

The ISEE Assessment uses the 1996 Delors report's four pillars of education Learning to be, Learning to know, Learning to do and Learning to live together as the evaluative benchmarks and the lens of "what", "where", "when" and "how" we learn and teach. The Assessment is designed along three Working Groups: (1) Human Flourishing, Education and Learning; (2) Education, Learning and Context; and (3) Learning Experience. In addition, there is a technical group on Data and Evidence.

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International Science and Evidence based Education Assessment

Foreword

NAJAT VELLAUD-BELKACEM
FORMER MINISTER OF EDUCATION, HIGHER EDUCATION, AND RESEARCH, FRANCE

Najat Vallaud-Belkacem is ONE France's Director. A graduate of Sciences-Po Paris in 2000, Najat began her career in a law firm at the Council of State and at the Court of Cassation. Between 2012 and 2017, under President François Hollande's mandate, she became Minister in charge of Women's Rights and was the spokesperson of the government from 2012 to 2014, then Minister of National Education, Higher Education and Research, from 2014 to 2017.

The ongoing pandemic has disrupted education at an unprecedented scale. The World Bank projects that up to 10 million children may not return to school.

If these projections hold true, the COVID-19 pandemic will have effectively reversed decades of global progress on education and put the dream of a "good education" out of reach for millions of the world's most impoverished children.

Governments around the world should heed global calls to increase education spending and develop strong policy frameworks to scale up quality inclusive and accessible educational technology. The pandemic has indeed shone a spotlight on the growing role of technology in education. It is now clear that digital technologies will be critical in shaping education's future. It is also becoming evidently clear that a lack of clear policies for the use of such technologies pre-COVID-19 meant that most governments were woefully underprepared for the mass deployment during the COVID-19 pandemic. As Former Minister of Education in France, I am acutely aware of the challenges of making effective decisions in times of crisis and with sharp economic contractions. But in such times I would urge governments not to sacrifice the cause of education and to keep learning alive. That's what Leadership is about.

UNESCO MGIEP's ambitious project, the International Science and Evidence Based Assessment (ISEE Assessment), contributes to re-envisioning the future of education to build more resilient and sustainable education systems that can weather crises such as the one we are currently faced with.

When I first learned about this project to assess the state of knowledge on education as a basis for reimagining education for humanity and the planet, I was excited to be part of it as a Co-Chair of the Advisory Board. After more than two years, I am pleased to see that the first ISEE Assessment report is nearing its completion at a time when the world needs, more than ever, visions for a future that must be more sustainable, resilient, socially just and fair.

What has drawn me in particular to the ISEE Assessment is its interdisciplinary nature.

The role of education in shaping such a future is unquestionable.

What has drawn me in particular to the ISEE Assessment is its interdisciplinary nature. The ongoing COVID-19 pandemic has shown that most education systems around the world are not prepared to face the global pandemic and other future impending crises such as climate change. Diverse disciplines and sectors must join forces to address grand challenges we face. The pandemic and its consequences are threatening to undo the progress made on ensuring access to education over the last decades and seriously jeopardizing the chances of achieving the Sustainable Development Goals (SDGs). UNESCO MGIEP derives its mandate from SDG 4 on quality education and especially from SDG 4.7, which urges governments to equip all learners with "knowledge and skills needed to promote sustainable development".

There is no doubt that the kinds of knowledge and skills required today include not simply classic "job ready" skills but also skills to navigate the rapidly changing, uncertain, and multicultural world, including empathy and emotional resilience. **The pandemic provides an opportunity for us all to rethink the purpose of education and reorient curriculum and pedagogy to shape societies where all beings—both human and more than human life—can flourish.**

Together with the Advisory Board members, I sincerely congratulate the ISEE Assessment Panel for undertaking this first-of-its kind assessment at such an unprecedented time. I highly commend over 200 authors for joining forces and boldly illuminating fundamental challenges confronting education today. I hope it inspires policymakers' and educators' own efforts to address these challenges in the years to come. ▸

Transform Education to *Meet the Challenges of Tomorrow*

REMI QUIRION, LOUISE POISSANT

Professor Rémi Quirion is the inaugural Chief Scientist of Quebec and the President of the three Board of Directors of the Fonds de recherche du Québec since July 1st, 2011. A McGill Full Professor, Psychiatry and outgoing Scientific Director at the Douglas Mental Health University Institute. Prof. Quirion was the inaugural Scientific Director of the Institute of Neurosciences, Mental Health and Addiction (INMHA) until March 2009.

Louise Poissant, PhD in philosophy, is the Scientific Director of Fonds de recherche du Québec – Société et culture since 2015. She is the author of numerous books and articles in the field of media arts published in various international journals. She is also a member of the Royal Society of Canada.

Who would have thought, when the Fonds de recherche du Québec hosted the Global Education Assessment in September 2019, bringing together some thirty researchers invited by UNESCO MGIEP, that many of the issues discussed at that time would be thrust to the forefront by the COVID-19 pandemic? This virus has been a great eye-opener and a catalyst, leading numerous countries to adopt the very measures that can be found on the list of essential elements to be assessed by UNESCO for the "Futures of Education": how much importance should be given to digital technology, to distance learning, to lifelong learning, to shadow education, and above all, how to take into account the spectrum of social inequalities with which teachers must contend?

The reflections of researchers in education, cognitive science and neuroscience, psychologists, philosophers, ecologists, computer scientists, linguists and economists collected in this issue of The Blue DOT lay the foundation for the assessment of policies and practices in order to better inform and equip decision-makers, policymakers and curriculum developers. As Chief Scientist and President of the International Network for Government Science Advice (INGSA), **I would like to commend the initiative taken by UNESCO MGIEP to launch the International Science and Evidence based Education Assessment (ISEE Assessment), bringing together these researchers from around the world and recall the importance of diplomacy and science advice for ministries of education.**

The ISEE Assessment is in line with several issues currently being addressed by the Fonds de recherche du Québec, notably in the context of our work on the University of the Future, commissioned by the Ministère de l'Enseignement supérieur du Québec, which gave rise to a vast consultation. We have also launched the Children's Health and Education Observatory (OPES) to better understand the impact of the pandemic, promote appropriate and innovative approaches, and inform decision-making.

That said, as an agency that supports excellence in open-access peer-reviewed research, we have built up, over time and through our interactions with other granting agencies, a set of principles and criteria that have guided us for decades in selecting the researchers and teams we fund. But today, given the major societal issues and the urgency of the changes humanity is facing, we are led to rethink our criteria and to question our basic principles, which are centred on the notion of excellence.

Now new questions arise. Can the research we fund be qualified as excellent if it does not consider the diversity of the social fabric and the principles of equity and inclusion (EDI), both in the composition of funded teams and in its methodological approaches? Can it be conducted without regard for the Sustainable Development Goals (SDGs)? And what about disciplines and themes that are not clearly in line with these SDGs? Should we stop funding them at the risk of seeing them decline or disappear in the foreseeable future? Or focus on their fundamental nature, which is less immediately applicable and generates more diffuse benefits on the longer term?

These new requirements, which are both urgent and legitimate, add to the pressure from various quarters to orient training and research towards labour needs and economic expectations, an issue that motivated the reflection initiated by the ISEE Assessment. A new layer of complexity has been added to the balancing of labour market needs for skills and expertise with college and university curricula. We do not know what tomorrow's jobs will be and we are aware that we are entering an era of accelerating change and urgency. What is the future of our training and research infrastructures in a world undergoing profound social and environmental transformation? And as a research funding agency, how must we rethink and adapt our programming to better support the research community and ensure collective social well-being in a sustainable environment?

In other words, we expect a lot from the work of this ISEE Assessment group set up in Montréal in 2019 to inform our choices as a research funding agency and to document and guide policy decisions all over the world. The pandemic has confirmed the importance of free and accessible education for all, across the globe, from elementary school to university. The most precious asset of any State is its next generation, on whom our collective future and the future of our planet depend. It is essential that we provide them with the right conditions to thrive, and promising prospects for the future. ▸

Message by Stefania Giannini

STEFANIA GIANNINI
UNESCO ASSISTANT DIRECTOR-GENERAL FOR EDUCATION

Ms Stefania Giannini was appointed UNESCO Assistant Director-General for Education in May 2018, becoming the top UN official in the field. In this position, she provides strategic vision and leadership in coordinating and monitoring the implementation of the Education 2030 Agenda, encompassed in Sustainable Development Goal 4.

Twenty-five years ago, UNESCO launched a report which came to be recognised as a seminal text in the field of education, Learning the Treasure Within. This report, popularly known as the Delors report (1996), was put together by the International Commission on Education for the Twenty-first Century, and articulated the four pillars of education: Learning to Know, Learning to Do, Learning to Be, and Learning to Live Together. In the face of the ongoing COVID-19 pandemic, as well as impending environmental crisis, alarming illiberal trends and widening social inequalities within and across countries, the need for reimagining education to shape the future is even more relevant and urgent today. In 2019, the Director–General of UNESCO convened an independent International Commission on the Futures of Education to work under the leadership of the President of Ethiopia, Her Excellency President Sahle-Work Zewde.

The International Commission on the Futures of Education is going to release its much-awaited report at the UNESCO General Conference this autumn. The distinguished members of the Commission, including thought-leaders from politics, academia, the arts, science, business, and education, are catalysing a global debate on how knowledge, education and learning can and should be reimagined in a world of increasing complexity, uncertainty, and precarity. It is my strong belief that such debate needs to be informed by latest insights from scientific research and build on knowledge of diverse disciplines. Along these lines, in March 2019, UNESCO Director-General Audrey Azoulay, France's Minister of National Education and Youth Jean-Michel Blanquer, and then President of the National Education Scientific Council (France) Stanislas Dehaene opened the International Congress on Cognitive Science in Schools, entitled Cognitive Sciences in the Classroom, Building Bridges for Evidence-based Education, at UNESCO Headquarters. Co-organized by UNESCO and the National Education Scientific Council (France), this conference brought together some of the leading experts on the cognitive sciences to take stock of research results in areas such as brain plasticity and regulation of emotions and examine their impact on the future of schools.

I am excited by the initiative taken by the UNESCO Mahatma Gandhi Institute of Education for Peace and Sustainable Development (MGIEP) – the International Science and Evidence based Education (ISEE) Assessment – as a contribution to the re-envisioning of the future of education. This assessment is mobilizing multidisciplinary expertise in an inclusive and open manner. Such a comprehensive perspective is vital for compiling and connecting cutting-edge research and different knowledge streams around why, what, where and how people learn, informed by science and a multiplicity of local contexts.

The initiative is designed along similar lines as the Intergovernmental Panel on Climate Change (IPCC), the Millennium Ecosystem Assessment, and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), which have been able to galvanize policy on climate change and biodiversity by mobilizing thousands of scientists to assess the state of climate change and biodiversity and producing high-impact assessment reports.

This assessment is mobilizing multidisciplinary expertise in an inclusive and open manner.

UNESCO MGIEP has been well known for its unique and innovative approaches to education for peace and sustainable development to foster global citizenship. As the first and only Category 1 institute of UNESCO located in the Asia-Pacific region, UNESCO MGIEP over the last six years has established itself as a centre of excellence for research and practice for transformative learning. I am pleased that the Institute has taken on this challenge to strengthen the 'science-policy nexus' in the field of education and evidence-informed educational policy making. I look forward to reading the key findings and recommendations from the Assessment. ▸

OPINION

The Purpose of Education: *Moving From Human Capital to Flourishing*

OREN ERGAS, **TAL** GILEAD, **NANDINI** CHATTERJEE SINGH

Oren Ergas' (Phd) research focuses on philosophical, sociological, and psychological aspects of contemplative practice (focusing on mindfulness) in education. This includes mapping the development of this curricular discourse and its relation to social-emotional learning, exploring its philosophical underpinnings based on West/East philosophy of education, and explaining the pedagogical mechanisms of contemplative practices based on psychology and neuroscience.

Tal Gilead is a senior lecturer at the Seymour Fox School of Education, Hebrew University of Jerusalem. His research focuses on philosophical dimensions of educational policy with an emphasis on its relationship to economic thought and complexity theory.

Nandini is a cognitive neuroscientist and leads the Rethinking Learning programme at UNESCO MGIEP. She is passionate about translating neuroscientific evidence on learning and education from laboratory to classroom.

ABSTRACT

We argue that the purpose of education needs to be mobilized from building human capital to cultivating human flourishing. We consider recent evidence from social cognition and neuroscience, as well as emerging data that questions the relevance of current educational policies to address global challenges. We propose a curricular framework for education in, and for, flourishing and briefly point to its application within schools.

Education plays an important role in finding a good job. It is also argued that it can promote economic growth and development (Bell & Stevenson, 2006). **It is little surprise then that, in a political environment in which the guiding moto is "It's the economy, stupid", human capital theory, which is focused on the economic benefits of education, has captivated educational policymaking and thinking in the last decades.** While looking at education through an economic lens has some merits, it is becoming increasingly clear today that it also has severe drawbacks. For example, a focus on economics tends to promote an individualistic mindset that disregards environmental and social aspects and may well contribute to increasing socio-economic gaps (Baptiste, 2001). The stark lessons of our interdependence, brought forth by the COVID-19 pandemic, have confirmed that such an individualistic and economics-focused approach to education is conducive neither for us, nor for our planet to thrive. Another problem is that a focus on the economy narrows our understanding of what education could and should do. Clearly, there is much to be done about the economy but there are also technological, psychological, environmental and political challenges that education can help us face. Similarly, while getting a rewarding job can definitely make life better, this is only one aspect of our existence. **What we badly need today, then, is a broader understanding of what education can do that goes beyond the economy and considers the benefits of education more widely, and their potential for improving our lives.** The first working group of the ISEE Assessment focused on transforming the purpose of education from human capital to human flourishing. **The primary focus is to elaborate a comprehensive vision of education that is better designed to cope with the daunting challenges of our times and enables us to take full advantage of education's potential benefits. We henceforth advance education in and for flourishing.**

The notion of flourishing has many positive connotations but what does it mean? And what does education refer to? The concept of flourishing is almost as old as history and is found in countless wisdom traditions from all corners of the world. It is also prominent in many research fields, including philosophy, psychology, neuroscience, economics, and ecology (de Ruyter et al., 2020). Flourishing is multidimensional. It is about the optimal development of human and individual potential, about being engaged in meaningful relationships and activities, about holding our own values and humanistic values, about being satisfied with life, about living well as human beings (de Ruyter et al., 2020). Flourishing, therefore, cannot be satisfied merely by means of economic growth and job market skills. Countries can experience economic growth and many of their citizens can be highly proficient workers, yet they may continue to face the challenges of global warming, socio-economic gaps, inequality, racism, and the COVID-19 pandemic. In light of this, the axis of education must shift to reflect a far broader perspective on who we are as human beings. In a transformed vision for education, we advocate that the emphasis be placed on the importance of relationships and particularly human relationships within it.

"Human flourishing is both the optimal continuing development of human beings' potentials and living well as a human being, which means being engaged in relationships and activities that are meaningful, i.e. aligned with both their own values and humanistic values, in a way that is satisfying to them. Flourishing is conditional on the contribution of individuals and requires an enabling environment."

The concept of flourishing has also significantly advanced from a scientific perspective, providing new insights into its role in human development. For example, research in neuroscience has demonstrated the human brain's potential for neuroplasticity. Neuroplasticity is the malleability of the brain to change in structure and function based on training. This powerful capacity of our brains to develop new and more efficient pathways for transferring information enables physical, mental, and even spiritual development throughout an individual's life (Goleman & Davidson, 2017). Two important messages from scientific research have been that flourishing can be cultivated and that it is dynamic and malleable; these factors must be addressed during implementation in education systems (Immordino-Yang et al., 2019).

To ensure that the concept of flourishing is promoted in education systems, it is important to incorporate it in the design of educational frameworks. This highlights the need to discuss education in its broadest sense, as both an institution and a process. A framework consistent with this treats education as a complex dynamic system that varies from place to place and is constantly changing (Davis & Sumara, 2014). Underlying this framework is the premise that

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education both is, and ought to be, influenced by environmental, social, cultural, and political contexts, and works in reaction to top-down policymaking as well as to bottom-up individual characteristics. In the face of this complexity, the cultivation of human flourishing at the individual, social, and environmental levels is based in an interdisciplinary perspective; namely, the need to embrace all fields of knowledge in order to contribute to the formation of a framework for human flourishing.
The main framework for education in and for flourishing posits relationships as central. Education is viewed in terms of a range of human relationships, such as teacher–student, teacher–classroom, and student–student, yet no less important are individual relationships with the environment, technology, and disciplinary knowledge, as well as relationships with our very own selves. Based on this perspective, a curricular framework in and for flourishing is proposed that elaborates six domains alongside six learning trajectories through which education can contribute to flourishing (see Figure 1).

In conceptualizing the six domains, an attempt is made to consider key contemporary challenges faced, as well as areas crucial for an education in and for flourishing (Ergas & Gilead, 2021). An elaboration of the framework is beyond the scope of this essay and can be found in the full ISEE Assessment report, however, we highlight the interpersonal and personal domains as significant additions to recent understanding of curriculum. Grounded in insights from social and affective neuroscience, these domains point to the crucial need to cultivate capabilities such as self and social-awareness, emotional and attentional regulation, and compassion as foundations for nurturing and sustainable relationships (Chatterjee Singh & Duraiappah, 2020).

It is not sufficient for education to stay at the level of frameworks, curriculum design, and policy. In order to improve lives and build peaceful societies, it must be put into practice. The final chapter of the section on human flourishing discusses flourishing inside the educational system, particularly in schools. It combines research data, insights, and recommendations about how flourishing can be enhanced in schools. It examines the effects of different school relationships, such as student–teacher, and student--knowledge content, on flourishing. It highlights how essential social emotional

		Environment	Culture	Society	Technology	Interpersonal	Self
		Curricular domains for flourishing in education					
Education as relationship		Nature	Past and present knowledge, achievements	Society (e.g., norms, job market)	Internet, social networks, AI, etc.	Others	Oneself (body, mind)
***Learning** trajectories*		Learning to know and think, Learning to do and evaluate, Learning to learn, Learning to become, Learning to live together, Learning to live with nature.					
Flourishing aims and manifestations	***Conditions***	Sustainability, (needs elaboration from experts), etc.	Preservation and innovation, scientific progress, etc.	Economic growth, peace, social justice, etc.	Ethical vision-based development, value-driven entrepreneurship, etc.	Inclusion, tolerance, dignity, etc.	Freedom, mobility, actualization, etc.
	Capacities	Sensitivity, environmental responsibility, awareness, etc.	Appreciation, cultural literacy, innovativeness, critical thinking, etc.	Literacy, numeracy, citizenship, human capital (job-market skills), etc.	Digital literacy critical thinking, innovativeness, etc.	Empathy, perspective taking, communication skills, etc.	Agency, mindfulness, executive functions, self-regulation, growth mindset, etc.

learning is for flourishing (Schonert-Reichl, 2019). It also examines the role of teachers, their education, and their own sense of flourishing. The message is clear: a change of direction is urgently needed. If people are to flourish, the system of schooling must shift from one based on competition, efficiency, and accountability to one that emphasizes social, emotional, and psychological aspects of life. From a system grounded in economic aspiration to one aimed at flourishing. While these two aspects are not mutually exclusive, there is a clear need for focus. Rather than asking how will such a system yield economic growth, we should ask, how can we put into action education that can achieve Sustainable Development Goal 4, target 7, namely building peaceful and sustainable societies.

In conceptualizing the six domains an attempt has been made to consider key challenges with which the contemporary world is faced as well as key areas that are believed to be crucial for an education in and for flourishing.

We hope that the transformed vision of education advanced in the report is compelling for students, teachers, parents, policymakers, and politicians around the world. The report offers a general direction and some specific insights into the direction education should take. To make it operational, more work is, of course, needed. We sincerely believe that now is the time (and the pandemic has made it more pressing) to pause, reflect, and embrace a new trajectory for education that can make all of us, well, more flourishing.

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Understanding Education in Context - *the Inescapability of Complexity*

EDWARD VICKERS, **THOMAS** KLOSTER-JENSE MACINTYRE

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What is context, why does it matter in education?

If we agree with Mary Catherine Bateson that 'context is everything', assigning one Working Group to analyze it hardly seems sufficient. A concept so broad always presents problems of definition, and to those of us involved in the ISEE Assessment's Context Working Group, it has become apparent that colleagues hold quite different conceptions of what we are about. These differences shed important light on both the difficulties of interdisciplinary collaboration, and the reasons why it is vital to informed educational debate.

The remit of ISEE Assessment Working Group 2:

Taking account of debates over fundamental aims (e.g. as expressed in the 'pillars of learning' outlined in the Delors Report), analyse how a range of contextual factors (political, social, cultural, institutional, environmental, technological…) influence interpretation of the diverse goals of education, and the capacity of education systems to meet these goals.

What do we mean by 'context'?
"Knowledge is linked inextricably to the cultural, social, environmental and institutional contexts in which it is created and reproduced. … Learning is a multifaceted reality defined by the context. What knowledge is acquired and why, where and how it is used represent fundamental questions for the development of individuals and societies alike." (UNESCO, 2020, First meeting of the International Commission on the Futures of Education, p. 16)

For many laboratory-based scientists or quantitatively-minded social scientists, used to thinking in terms of equations, 'context' typically means factors that either produce or obstruct a given process or phenomenon. For example, what explains Finnish students' excellent literacy? Could it be teachers' status and conditions? Or the distribution of educational resources? Or the pine-scented freshness of Finland's air?

Factor analysis of particular educational phenomena is important, if extraordinarily difficult. But there is far more than this to 'context' and its relationship with education and learning.

Education systems, and learning within and beyond them, are fundamentally social phenomena. We all know this, or think we do. We recognize that education is not just a matter of acquiring 'skills' of literacy and numeracy (although this is crucial), but is also about helping young people become responsible, engaged, and fulfilled members of society.

But while most of us will endorse this statement of education's socialising function, we seldom pause to consider what this actually means. How does society shape our education systems, and how does education in turn shape society? How do politics, culture, or vested interests condition how we think about education and its purposes in the first place? Given its embeddedness in hugely diverse social contexts, how much can we expect education to change society? Or should we be thinking more of changing society in order to change education?

Education systems, and learning within and beyond them, are fundamentally social phenomena.

Such questions do not readily lend themselves to quantification or factor analysis. Answers are likely to be highly complex and hotly contested. But this only underlines the importance of confronting these big, intractable problems.

Animated by its humanistic vision, UNESCO has traditionally been highly concerned with the social and cultural context for education. Despite its title, Learning: The Treasure Within, the 1996 Delors Report placed considerable emphasis on the external, social dimension of learning. **Delors asked 'What kind of education is needed for what kind of society in the future?', In answer, it affirmed that 'choice of education means choice of society'.**

Today, UN agencies issue increasingly urgent calls for 'transformative change'. Citing the perils of climate crisis and poverty, in 2014 the UN called sweepingly, if vaguely, for change in social and economic policy, and 'in our relationship with our one and only planet'. The same year, foreshadowing its vision of 'Education for Sustainable Development' (ESD), UNESCO emphasized that 'to create a world that is more just, peaceful and sustainable, all individuals and societies must be equipped and empowered by knowledge, skills and values as well as be instilled with a heightened awareness to drive such change'.

But when considering its relationship with our social, political, or environmental context, we need to remember that education is not simply a toolbox of 'solutions', but also potentially a Pandora's Box of problems. Too often, public debate reflects the naive assumption that education is a store of remedies for social ills; that it is always intrinsically 'a good thing'. But from the unsustainability of our economies, through the insane competitive intensity of our societies, to the fostering of intercommunal and international hatred, education is profoundly implicated in the dominant pathologies of our time.

'The Political Factor'

That this is so should come as no surprise if we remind ourselves that education systems do not, and cannot, stand apart from or outside their social context, but will always tend to mirror it. They thus reflect prevalent cultural and ethical assumptions regarding the ordering of society. More fundamentally, they are shaped by what Delors called 'the political factor': the distribution of power amongst vested interests. When we ask what purposes education serves, we also need to consider whose interests. Who is in control, and how does their agenda shape (or warp) education?

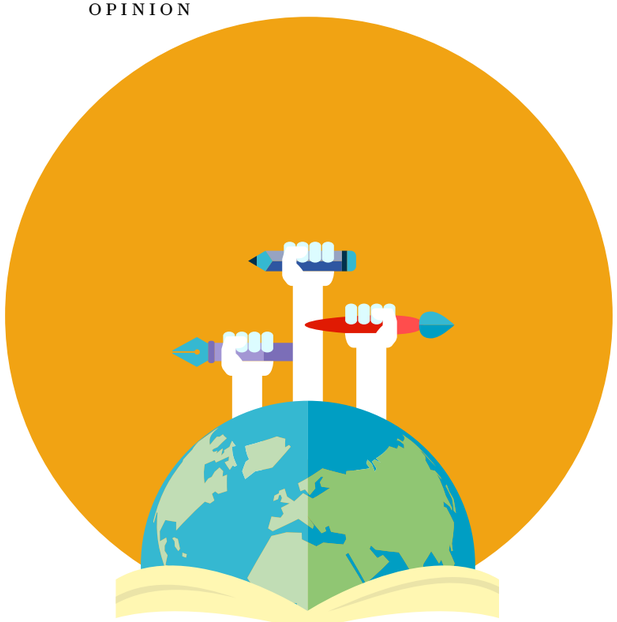
For decades now, successive UNESCO reports have propounded an idealistic vision of education as a source of human liberation, fulfilment, and empowerment. But we seem as far away as ever from realizing this. Is this simply because such a vision is intrinsically unrealizable or impractical? Or is it because entrenched vested interests are wedded to an alternative vision that is profoundly antithetical to these humanistic ideals?

Trends in 'global educational governance' since the 1980s have been premised upon an essentially instrumentalist conception of education's purposes. **Education is seen as a tool for maximizing 'human capital': the individual or collective stock of productivity-enhancing 'skills'. The mantra of 'employability' dominates educational debate, variously accompanied by talk of 'global competencies', 'social and emotional learning', and (often) 'patriotism'.**

Meanwhile, we are encouraged to think that all aspects of the learning process should be subjected to ever more precise quantification and measurement. Access to 'quality education', calibrated and monitored through such metrics, is represented as a sufficient guarantee of social justice.

But who is promoting this vision, and why? Whose interests are ultimately served? As Daniel Markovits writes in The Meritocracy Trap (2019), life in America has been transformed over recent decades into a 'massive, multistage meritocratic tournament'. In China, the rapid recent abandonment of the one-child policy has failed to reverse declining birth rates, largely because of the crippling burden of coaching children for an even more extreme version of the same 'tournament'. For their part, South Asian elites spurn public schooling, instead promoting a reliance on the private sector that minimizes their tax liabilities and maintains their privilege. Around the world, we see a widening gap between those able to prep their children for an intensifying educational rat-race, and everyone else. In the process, children themselves are commodified: as packages of 'skills' or entrepreneurs of their own 'human capital'.
Spiralling credentialism not only contributes to escalating social inequality, alienation, and discontent; it is also implicated in the global rise of populist nationalism. Immigrants, minorities and external foes are useful foils for elites seeking to distract from the structural and political causes of socio-economic dysfunction. By ramping up 'patriotic education', and portraying depression, stress, and alienation as problems of individual maladaptation rather than societal failure, vested interests seek to shore up an unjust status quo.

On their own, pedagogical tinkering, or more sophisticated metrics, cannot solve these problems; if they come



with intensified pressure for 'accountability', de-professionalising and demoralising teachers, they may even make the situation worse. Reducing educational debate to a discussion of 'what works', while ignoring the political, social and economic context, legitimates a narrow, depoliticised vision of learning that entrenches injustice. **Promoting the idea that education can painlessly solve our societal malaise has become a tactic for preventing, or deferring, critical debate over vital but politically intractable problems, for example those involving taxation, welfare, labour rights and the impact of technological change.**

Understanding the complex ways in which educational ideas, systems, and practices are embedded in the social context leads us to ask whether we should be talking less about education transforming society, and more about society transforming education. To appreciate the importance of context is not to despair of the prospects for educational improvement. But it is to appreciate the limits of education's capacity, on its own, to bring about desirable social transformation. If we truly believe in the intrinsic value of learning, we should first seek to create social conditions for experiencing education less as a tool for securing material wealth or positional advantage, and more as a central component of a fulfilling life.

An Urgently-Needed Multidisciplinary Conversation

Adopting this broad definition of 'context', the ISEE Assessment's Working Group Two ranges widely in its attempt to bridge the discussion in our first and second working groups, on 'Flourishing' and 'The Learning Experience' respectively. We begin with chapters examining the educational implications of the global environmental, political and socio-economic context, before analyzing particular challenges posed by diversity and conflict. There follow chapters focusing, in turn, on technological change and developments in educational neuroscience, areas that have aroused much public interest in recent years. Finally, we conclude with chapters analyzing how our societal context shapes, and is shaped by, key institutional features of our education systems: curriculum, assessment, and the teaching profession.

Across the working group, scientists and social scientists collaborate on these various chapters, ensuring a multidisciplinary conversation. This is important for both disciplinary 'camps'. At a time of rapid and, in many ways, unsettling technological change, it may be tempting for social scientists (especially older ones) to resist or ignore calls to engage with new scientific developments. But while informed scepticism is healthy, ignorance or denial threatens the credibility of social scientific research on education in the eyes of key stakeholders.

At the same time, there is perhaps an even more pressing need for laboratory-based scientists studying learning to engage with research that looks at education in context. Many scientists are well aware of how their work can be misrepresented by naive techno-optimists, but may be tempted to dismiss this, so long as the research funding keeps flowing. What is often lacking is awareness of how science itself is 'a social thing', conditioned, like any other human activity, by culture, politics, and vested interests.

Why, for example, has money poured into 'brain science' since the 1990s, while the social scientific study of education has been increasingly starved of funding? The answer does not lie in revolutionary improvements to education stemming from neuroscientific research; its appeal still rests largely on future promise. Rather, focusing on the brain aligns with the notion that education is all about adapting individual learners better to a given social, political and economic context. Unlike critical social science, educational research-as-brain science is thus likely to be seen as profoundly unthreatening to those invested in the socio-political status quo. While other fields of educational scholarship are also prey to vested interests, its very aura of scientific objectivity ironically makes neuroscience especially prone to manipulation and distortion.

This is precisely why bringing scientists and social scientists together to critically analyze education in context is so urgently necessary. **If we are to transform education and society in a direction that is both sustainable and humane, then scientists and social scientists need to understand the forces pitted against such a transformation.** . This extends to greater awareness of the ways in which history, politics and culture shape our assumptions about what sort of transformation is desirable in the first place. Ambition and hope must be tempered by humility and caution - and an honest recognition of complexity.

The learning experience: ***Insights and gaps in current research***

ADRIANO LINZARINI, **REBECCA** MERKLEY, **MOHSEN** SAADATMAND

After a bachelor's degree in biology and a master's degree in neuropsychology and cognitive psychology, Adriano completed a PhD in cognitive neuroscience. His thesis mainly focused on the development from childhood to adulthood of executive functioning, a series of cognitive skills that are strongly associated with quality of life, academic achievement and mental health. Among others, he worked as a scientific consultant for the UNICEF's project « Measuring What Matters » (Office of Research Innocenti), and as a neuroscience workshop instructor in the private sector.

Rebecca Merkley is an Assistant Professor in Cognitive Science at Carleton University in Ottawa, Canada. She has a PhD in Experimental Psychology from the University of Oxford and an EdM in Mind, Brain, and Education from Harvard University. Her recent research projects have included research-practice partnerships investigating whether educators benefit from learning about findings from the science of learning and implementing them in their classrooms.

With a background in educational technology, Mohsen's research focuses on technology-enhanced learning and online education. After completing his PhD dissertation on MOOCs at the University of Helsinki, Finland he continued working on digital educational games for STEAM Education as part of his postdoctoral research. Mohsen's research integrates a variety of learning technologies with different methods in designing, implementing, and evaluating online/blended learning solutions

Working Group 3 of the ISEE Assessment explored how the learning experience is influenced by multiple and intersecting factors, including genes, brain development, language, culture, place, cognitive abilities, and social-emotional skills. We defined the learning experience as: all interactions between the learner and teachers, peers, and environment influenced by neurobiological, psychological, emotional, social, and cognitive factors, which takes place in a variety of ways and settings, whether formal educational contexts (such as schools and classrooms), informal learning settings (groups, communities), and non-formal learning environments (outside-school situations). We took an integrative, transdisciplinary approach (Youdell et al., 2020) and assessed current research on what, where, and how we learn. Authors across many different disciplines, including educational research, psychology, sociology, and neuroscience, contributed to each chapter. Here are the key insights emerging from the Assessment.

First, human development is dynamic and individual differences in learning experiences arise from complex interactions between biological, psychological, and scoiopolitical factors.

First, human development is dynamic and individual differences in learning experiences arise from complex interactions between biological, psychological, and sociopolitical factors. It has been long debated whether 'nature' (genes) or 'nurture' (environment) has a greater influence on human development. We now know that human cognition and behaviour arise through complex interplay between nature and nurture (see Mitchell & Frith, 2019 for a concise review). Human brain development is a continuous, non-linear process that begins during the first weeks of gestation and lasts until early adulthood. Findings from multiple disciplines highlight that development is dynamic, with bi-directional interactions between biological features (e.g., DNA, brain structure), and environmental factors (e.g., economic forces, cultural influences, relationships). Yet, much research is still influenced by the framework of biology and culture as competing forces. This false dichotomy between focusing on the variables at the level of the individual (as in psychology and cognitive science) versus the variables at the level of institutions (as in educational and sociological research) can distract researchers and policy makers from studying how the two interact. For example, developmental psychology researchers have often assumed that individual differences in cognitive skills influence differences in academic outcomes, but have only more recently begun to investigate how education in turn shapes cognitive development (e.g. Morrison et al., 2019; Peng & Kievit, 2020). Academic and cognitive skills gained in a variety of contexts have direct reciprocal interactions with each other over the course of education and development, and these interactions facilitate mutual growth. Assessing students' learning throughout its course, rather than only at the end of a learning module, can help identify where children are at and target feedback to help them progress (Jeltova et al., 2007). Curricula and learning assessment methods should be developed to acknowledge diverse ways in which children can progress through learning trajectories and demonstrate their knowledge.

Second, the importance of contextual factors for learning are increasingly being recognized and psychological definitions and measures of cognitive skills are becoming more culturally sensitive. There are a variety of contextual factors that affect the learning experience, including social-emotional, cultural, physical, temporal, and economic contexts. It is contended that race, colonization, region, gender, and income can influence access to learning opportunities as well as learning experiences. For instance, in many indigenous cultures, perspectives on social and emotional learning (SEL) are often different from psychological perspectives on the subject (e.g.,Herring, 2011). Psychological accounts of cognition, mindset, character and executive function are all moving in the direction of more culturally sensitive conceptualizations to reflect the interaction of students' cognitive processes with environments (for example, executive function, see-Obradović & Steyer, 2021). Learning is inherently social and emotional and SEL practices and policies should be responsive to context and culture. Moreover, the "where" of learning (i.e., natural spaces, built spaces, and digital spaces) influences the "what" of learning, and "how" it is afforded through various learning environments. However, current evidence-based knowledge that could inform education is still very contextual and culture-specific. Most research analyzes local or culturally specific realities, and the generalizability of such knowledge to different educational systems and societies is unclear. In the ISEE Assessment full report, we have included representative data from global populations where possible, but acknowledge that samples in the majority of psychological science and educational research are drawn from the Global North, and represent a minority of the world's population (e.g., Henrich et al., 2010; Nielsen et al., 2017). The development of systematic and large-scale studies producing comparable data across countries would strongly benefit education policy and practice by allowing for a better understanding of global and local realities, while ensuring the applicability of such data to specific educational needs.

Third, there are still large communication gaps between reserachers, practitioners, and policymakers.

Third, there are still large communication gaps between researchers, practitioners, and policymakers. These communication gaps hinder not only the integration of research evidence in education policy and teaching practice, but also the production of knowledge relevant to current educational challenges and societal issues. Several factors contribute to this lack of translation of research in policy making and education practice. For example, academic researchers are not often incentivized to write for general audiences, nor do they receive training in science communication (Lewis & Wai, 2021) . Evidence-based research in education is often presented in formats difficult to understand for non-experts and disseminated through channels inaccessible to stakeholders outside academia (Cain, 2015). Moreover, policymakers and educators are not usually trained in understanding scientific discourses and evaluating evidence. In most countries, few channels exist between academic research and governmental institutions, leaving little space for dissemination of relevant, localized state-of-the-art research findings in education. Research studies are rarely designed with practical implementation strategies in mind and it can be difficult to determine which research is most useful for practice and policy (Lewis & Wai,

2021). The rush to implementation is especially problematic for highly-debated topics, such as teacher effectiveness, when school leadership and policy makers have used research to advance their own views while omitting evidence in favour of opposing perspectives (Darling-Hammond, 2016; Thomas et al., 2019). Addressing gaps in knowledge requires more multidisciplinary and international research that is driven by the needs of learners and teachers. Insights from research on how children learn should be better communicated to teachers and policymakers and more work is needed to determine efficient ways of translating findings from research to practice (Thomas et al., 2019)

Recommendations from various fields tend to highlight the importance of changing practices and interventions based on current knowledge. For example, there is a large evidence base supporting the implementation of SEL interventions adapted to learner's contexts to support and facilitate students' SEL development (e.g, Immordino-Yang et al., 2019). Moreover, children are better prepared to learn when they have adequate nutrition, sleep, and exercise and schools can help support this. Research has helped identify important precursor skills to acquiring literacy and numeracy, including early language and counting. Assessing these skills in all students can help set students up for success and identify children at risk for learning difficulties. Teachers should therefore be trained to recognize and support the development of cognitive and social emotional skills that are essential for learning. Taken together, the findings from Working Group 3 caution against narrow policy or practice interventions that focus on a single assumed causal factor. Interventions that act on the cognitive psychological level of the individual alone are unlikely to lead to large increases in children's education attainment, and broader societal changes at the institutional level are also needed (Lewis, 2019). **Educators and policy makers should be mindful of the complexity of human development and the interactions with contextual factors when making decisions to support all learners. Flexibility should be built into education policy and practice to support each student's flourishing based on their individual capabilities and potential.**

Educators and policy makers should be mindful of the complexity of human development and the interactions with contextual factors when making decisions to support all learners. Flexibility should be built into education policy and practice to support each student's flourishing based on their individual capabilities and potential.

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Improving Policymaking and Practice Beyond *"What Works" in Education:*

OBTAINING EVIDENCE OF **RELATIVE EFFECTIVENESS, ASSESSING UNCERTAINTY OF RESEARCH RESULTS AND MAKING PREDICTIONS OF EFFECTIVENESS** IN LOCAL CONTEXTS

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Introduction

The goals of education are based on values and policies (Brighouse, Ladd, Loeb, & Swift, 2018). Identifying, prioritizing, and setting these goals through public policymaking is a political process that requires conflict, negotiation, the use of power, bargaining, and compromise (Anderson, 2011), since not all goals can be realized. Practice, on the other hand, consists of identifying and prioritizing the means to achieve these goals, because of limited time and resources. Empirical research is the most reliable source of information to assess if goals can be realized with existing means in policymaking, and to assess the relative benefits of some approaches over others in practice. However, common misuses of research include choosing evidence supporting a subjectively preferred claim, or not completing the proper analysis of a body of literature for a given educational issue. In other words, one should not choose evidence and the evidence must be analysed so that the best options are clearly and objectively identified. To enhance policymaking and practice by avoiding those pitfalls, there is a need for a more complete reasoning based on more types of information, according to the three following questions.

How do we know what works best?

It is important to consider that evidence of effectiveness is always relative. The effectiveness of a given intervention is always relative to the effectiveness of other comparable interventions. **Evidence of relative effectiveness allows practitioners and policymakers to answer the question: given all the possible interventions available to me, which is most likely to yield success?** Evidence for relative effectiveness takes the form of an empirical rank-ordering of extent interventions with respect to their established effect on target outcomes.

Evidence of relative effectiveness allows practitioners and policymakers to answer the question: given all the possible interventions available to me, which is most likely to yield success?

Evidence repositories such as the What Works Clearinghouse (https://ies.ed.gov/ncee/wwc/) and the Educational Endowment Foundation (https://educationendowmentfoundation.org.uk/) summarise vast quantities of research findings and help us determine whether a programme or approach is likely to be the best bet for solving our specific policy or practice challenge. They simultaneously help to avoid the risk of over-reliance on a single study, allow to understand the extent to which the feasibility of an approach has been tested in real-world conditions, and help bypass the time usually required to generate and synthesise complex research findings.

How do we establish the level of confidence of a given body of evidence?

Decisions are often made on the basis of incomplete and imperfect information, and the uncertainty around

Decisions are often made on the basis of incomplete and imperfect information, and the uncertainty around quantitative results is one of the key factors at play.

quantitative results is one of the key factors at play. As the eventual implementation of interventions may have positive or negative impact on learners, understanding uncertainty of impact estimates must be an integral part in educational practice and policymaking. In particular, the consistency or variability of effect sizes across studies of similar interventions is critical to support how their desired outcomes generalize to populations and contexts (Borenstein, 2019). Effect sizes[1] (with confidence intervals) provide a better indication of impact than significance testing (p-values) and should be discussed in all cases. This rationale implies moving away from a dichotomous interpretation of statistical significance as the means to gauge the effectiveness of an intervention.

How do we remain faithful to the evidence, whilst making it fit our context?

Using the best evidence as outlined above still offers no guarantee of success, because this evidence describes what has worked, rather than what will work. In addition, experimental results, even aggregated and recalibrated through meta-analysis, are always context-dependent and interventions are never implemented in the same context (Smets & Struyven, 2018). Effectiveness predictions (Joyce & Cartwright, 2020), on the contrary, is the prediction that a given intervention, documented as the most effective, will work concretely within the multi-faceted characteristics of a given context of application. Effectiveness predictions emphasize evidence regarding how a particular context is likely to provide the necessary conditions for anticipated benefits to occur. Thus, this type of evidence is very different from evidence related to the generalization of experimental studies. Yet, it focuses on the same key aspect as evidence of relative effectiveness, that is, causality between interventions and outcomes. This causality is further explored through an emphasis on mechanisms, which formalize causal processes (Caswell, Maidment, Ross, & Bradbury-Jones, 2020) hinging on structure, culture and agency (De Souza, 2016).

This last step, by focusing on adapting the context of implementation, avoids the circular reasoning involved in adapting the best possible intervention to a given context: an intervention not implemented as tested will likely yield unknown outcomes, because the causal link between an intervention and outcome depends on the permanency of the intervention and of the outcome; you change one or the other: the prediction does not hold.

Conclusion: how to remain up to date in obtaining and applying evidence?

The methodology to obtain evidence of relative effectiveness in education has been recently updated. Reaping its benefits is a massive undertaking consisting of systematic literature search, followed by appropriate meta-analysis followed by systematic literature reviews for predictions of effectiveness. Once completed in any pertinent educational domain, this work should be turned into a living review, in which the initial framework is used to integrate new studies as they get published. This integrative scholarly work is frequently overlooked. Nevertheless, it seems that it is the essential final step in using research for policymaking and practice in education. Governments, universities, and partner NGOs should collaborate further to gather the resources and expertise to pursue this international endeavor.

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[1] An effect size is an indication of the magnitude of differences between groups or the intensity of the relation between variables.

Rebooting our relationship to technology: *Insights from psychology into how we think about AI and EdTech in the aftermath of Covid-19*

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Abstract

In this article, we explore whether it is time we reconsider our relationship to technologies in education, both as individuals and societies. Multiple generations have now experienced different forms of digital devices and the functions and roles they play in society and education, layered upon traditional models of the role and function of education institutions. Over the same time period, we have learned a great deal from psychology about how human's reason, make decisions, and learn. In this article, we review recent and emerging AI and

educational technologies. Throughout we discuss novel ideas about how psychology might help us think differently about the way we develop new technologies and their influence in educational contexts.

Transforming education with technology: Are we in a perfect storm?

A confluence of forces, what some refer to as a perfect storm, are converging to produce an EdTech- and AI-driven transformation of education. In The Blue Dot, Issue 9, Luckin (2018) used this exact metaphor, saying: "AI has gained traction recently because of the 'perfect storm' brought about by the availability of large quantities of data, powerful computer processing with large clouds of cheap, accessible storage and AI algorithms that can learn."

This confluence has the potential to transform the educational ecosystem. But this prognostication has been heard before.

The claim of the transformative influence of technology on education is well over 100 years old. Consider claims made about communication media such as telephones, broadcast televisions, film, and video, which can be experienced but are not interactive. Consider claims about content delivery systems such as the desktop, micro, and laptop computers as well as the internet and world wide web. These have been lauded as breakthrough transformative technologies. But teachers and the institutions of education are conservative, change resistant communities. Disruptive, sustainable change does not easily or quickly emerge from without, but rather from gradual, grassroots efforts from within (Cuban, 1986; Reich, 2020).

Why might this time be different? Several additional forces have emerged that may change this conservative dynamic. First, digital technologies themselves have matured. Our personal, commercial, governmental, and social institutions are immersed and dependent on devices, apps, and cloud-based storage. Second, ease-of-use continues to improve. Early computing devices required computer programming or sophisticated training to master simple operations. Nowadays preschool children can successfully play games on a tablet, often guided by computer and robotic agents that mimic human interactions (Graesser et al., 2014). Third, the revenue generated by these two forces has had an economic impact, reducing cost and expanding access across the world. While universal access has not yet been reached, the commercial technology industry benefits from wider and broader markets of users. It is in their interest to make technology affordable, accessible, and easy to use.

First, we learned the vulnerability of continuing to rely solely on an in-person infrastructure. Second, we learned that EdTech, while not universally acclaimed, had sufficiently matured to help fill the gap.

This brings us to a fourth force, namely large investments in the EdTech sector. As the headline claims "US Edtech Raises $803M in First Half of 2020 As COVID-19 Forces Learning Online" in venture capital (Wan, 2020). This trend is beyond the game industry, Google, and university research grants. A complex dance of competition and cooperation exists between commercial and non-profit research and development. The research sector includes open-source content (e.g., freeware and shareware on github.com). Technology experts move freely between public grants and private ventures that produce and generate a complex web of knowledge, human capital, and products.

The catalyst solidifying this new dynamic is the ongoing global pandemic. The sudden closing of schools worldwide has provided two early lessons. First, we learned the vulnerability of continuing to rely solely on an in-person infrastructure. Second, we learned that EdTech, while not universally acclaimed, had sufficiently matured to help fill the gap. Teachers around the world quickly adapted and learned how to use videoconferencing, learning management systems, and other EdTech. They may have preferred in-person teaching, but their professionalism and care for their students overrode their reluctance to change. School administrations also adapted, re-aligning budgets to increase remote access for vulnerable low-income and rural families. Families restructured their work–family relationships and environments to accommodate having their children out of school.

This positive response was by no means universally applied or accepted. Absent or inadequate access to devices or broadband internet remains widespread. Disengagement and student absenteeism is widely reported. Parents and caregivers were unprepared for the personal and economic stress of stay-at-home parenting, with a mass exodus of women from the workforce. There is a strong backlash from teachers and parents about the inadequacy of remote learning. But the necessity of education for all is driving new investments in technological solutions and infrastructure in places previously satisfied with the status quo.

Emerging AI and EdTech trends

We expect there will be some backsliding to conventional, in-person teaching when schools are fully open again. But as Darvasi (2020, citing McCluhan) noted, "technologies do not disappear in obsolescence, but are absorbed and live concurrently with their successors". The term 'hybrid' has already been adopted to describe this new amalgam of remote/in-person, and technology-augmented instruction. We can still ask questions about some of the current and emerging AI-augmented EdTech that will transform education as we have traditionally known it. Our focus is on AI rather than conventional advances in videoconferencing, distance courses, and learning management systems.

Adaptive Instructional Systems (AISs) include any instruction designed to accommodate individual differences by offering alternative approaches and strategies to achieve learning goals (Lee & Park, 2005). Self-learning and improving AISs are driven by AI, natural language processing, and data mining to improve their effectiveness (Hu et al., 2019). AISs are driven by the singular goal of optimizing effective and efficient learning of knowledge and skills in a domain. Data mining enables the identification of individual difference patterns in large datasets that previously could not be detected in smaller datasets.

One example of a commercially available AIS is Duolingo (https://www.duolingo.com/), which helps learners build foreign language skills. Another well-researched system is MATHia® (formerly called the Cognitive Tutor), which trains middle school students on mathematics topics in thousands of schools in the US by applying Anderson's ACT-R model of cognition (Anderson, 2007) and the Knowledge-Learning-Instruction framework (Koedinger et al., 2012). Early warning systems (Hu et al., 2019) identify at-risk learners who may be dis-engaged, unmotivated, bored, or frustrated. Judicious sampling of data is important because there may be biases in algorithms that disadvantage individuals or groups (Baker, 2020).

Intelligent tutoring systems (ITSs) are a class of adaptive systems that traditionally have focused on STEM (Science, Technology, Engineering, Mathematics) subject matters. Some ITSs have computer agents that simulate humans with spoken language, facial expressions, discourse moves, and sometimes body movements (Graesser, 2016; Johnson & Lester, 2016).

These Intelligent tutoring systems have shown learning gains over comparison conditions, with meta-analyses reporting a mean effect size between 0.35 and 0.76 (Kulik & Fletcher, 2015).

Educational Games and Simulations continue to grow in sophistication and effectiveness, some with AI components. Instructional games and simulations attempt to enhance motivation and thereby encourage students to spend more time on the material and improve learning (Mayer, 2019). Zeng et al. (2020) identified evidence that educational games stimulate learning motivation, improve learning outcomes, enhance learning environments, and promote transformative learning methods. Gamification describes the use of gaming elements to enhance any or all of the above attributes.

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Challenges and gaps

While an accelerated R&D process is advancing and refining promising technologies, there are also areas that are lagging, frustrating and potentially delaying positive impacts.

Teacher training and support:

The promise of EdTech has included saving time for teachers while improving instructional quality and effectiveness—but realizing that goal is debatable. Teacher training, authoring of instructional content, and interpreting students' results can be characterized as primitive and exhausting for teachers. Developers build a variety of pedagogical and motivational scaffolds and supports for students. However, their teachers are often treated as super-human information processors, both in the complexity of the tools they are expected to master, as well as in the information about student process and product data they are expected to interpret. So far, AI and EdTech has not lived up to its promise to make teaching easier, more productive or rewarding.

The complexity of too many choices:

So many EdTech and AI systems are being researched, developed, and deployed that it is impossible for us all to keep up as informed consumers. Each product or service claims it is better than another or solves every imaginable educational problem. Each requires startup costs in learning, training, and re-inventing learning environments. AI can be viewed as helping to simplify this situation by offloading some complexity to agents, driven by algorithms, natural language processes, and data mining. But this choice runs the risks of human deskilling as we offload knowledge and skills to AI algorithms. There is a call for transparency in AI algorithms, but who will have the time to review the information?

Gaps and future directions:

The leading edge of AI in education is in STEM areas, including computer programming, in post-secondary education. The researcher community, though interdisciplinary, has been led by engineers and computer scientists—thus STEM domains are areas in which they are expert. Agencies like the National Science Foundation are significant funders of STEM education. There are multiple conveniences afforded by working with adults versus children in or out of school. However, the list is growing to include automated natural language on ill-defined topics, personality, socio-emotional learning, social practice, and culture. We are also encouraged by the growing interest in early warning systems for struggling or disaffected learners and traditionally disadvantaged groups. But greater investment and interest in non-STEM R&D across early childhood, elementary, secondary schools, and adult education are all needed.

Concluding thoughts

We close with a few thoughts about the term AI as 'artificial' intelligence and the notion of rebooting our relationship to technology and AI. What have we learned about human intelligence from history and psychology research? As a species, we are weak in formal reasoning and statistical inference, and have built in biases and prejudices that, while adaptive for fast thinking and decisions, degrade our decision making in many important ways (Kahneman, 2011). Computational machines can perform many of these operations more reliably, consistently, and precisely. Humans are also overly influenced by group think, not always to the benefit of sound, rational, or ethical decision making. We humans built technological systems to help us address these gaps in our own intelligences.

While the original notion of artificial may simply have meant made or produced by human beings, it has come to connote a contrast to human intelligence. What makes AI artificial—the absence of human flaws or biases? What about other common perceptual (eyeglasses, hearing aids) and cognitive tools (writing systems, mathematics) that support our lives? Are these artificial because they aid or augment our abilities? Perhaps we should drop the term 'artificial' into the recycle bin or permanently delete. Maybe replace it with 'aspirational' intelligence—the notion that our human intelligences may be currently flawed, but together with our technologies we can hope to achieve noble, more beneficent goals in education—ones worth aspiring to in the future. We can all aspire to this form of intelligence, despite our human status, biases, and flaws.

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How Learning Essentially Changes the Brain ***and Why this is a Good Thing***

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Nienke van Atteveldt received her PhD (cum laude) in cognitive neuroscience from Maastricht University in 2006. After diverse postdoctoral research positions, e.g. at Columbia University in New York (2008-2011), she currently works as Full Professor at the Vrije Universiteit in Amsterdam where she leads the Lab of Learning (www.laboflearning.com). Her lab investigates the developmental interplay between students' academic self-concept, their functional brain networks (e.g. for error and feedback processing), and their learning trajectories and well-being in school. Moreover, they investigate how neuroscience interacts with society, and how we can optimize the educational value of developmental cognitive neuroscience research.

One important feature of learning is that it changes the brain. Whenever a child (or an adult) learns something new, some slight changes occur in the chemical and physical properties within the responsible neural networks. Which changes occur exactly depends on which neural networks are being used. Connections between neurons that are used a lot become stronger and faster, and this is how we learn. Following from this, teaching can be seen as evoking such changes in the brain. **Now, while working in the interdisciplinary team of UNESCO MGIEP's International Science and Evidence based Education Assessment (Duraiappah et al., 2021), I have come to realise that this feature of learning – its material basis if you will – is not as straightforward as I assumed with my neuroscience-mindset. This is also called brain plasticity, as the brain's organisation is not fixed but malleable.** In fact, framing learning in this way can be perceived as concerning, and this makes the dialogue between educational neuroscientists and the 'critical neuroscience' perspective extremely important. In this article, I will try to explain how understanding the neuroscience of learning can be useful for teachers and learners, either directly or more indirectly, and I hope to take away some misunderstandings, to facilitate this constructive dialogue.

A clear example of how learning changes the brain comes from the work of Stan Dehaene and colleagues on how learning to read transforms the brain. By comparing the brains of literate and illiterate people, they showed how profoundly the brain changes with reading instruction, both in visual and in language-related neural mechanisms (Dehaene et al., 2015). A relevant question is how such insights can be used to improve learning and teaching, and foster child development towards flourishing.

A main challenge is that the conditions under which most neuroscience studies take place are not naturalistic, but rather, situated in artificial laboratory environments and tightly controlled to measure an isolated process.

An example of neuroscience studies useful for education are neuroimaging studies that show a better prediction of learning difficulties, and of which treatment is effective for whom, over and above behavioural indicators (Gabrieli, 2016). Moreover, neuroscience can contribute to our knowledge about what are optimal learning conditions, for example in terms of sleep, nutrition, etcetera (Thomas et al., 2020). More indirectly, insights in how the brain learns and develops can influence beliefs and attitudes. For example, a better understanding of protracted adolescent brain development may stimulate teachers to provide more guidance with planning or simply to be more patient and understanding. Similarly, a better understanding of individual differences (i.e., diversity) and learning disabilities may reduce stereotypes and negative attitudes.

Clearly, there are also many challenges. **A main challenge is that the conditions under which most neuroscience studies take place are not naturalistic, but rather, situated in artificial laboratory environments and tightly controlled to measure an isolated process.** In other words, most studies suffer from low 'ecological validity', making it hard to translate the findings to real-life learning situations. Different approaches are being taken to include more realistic contexts in neuroscience studies (van Atteveldt et al., 2018). For example, developments in portable neuroimaging devices, such as mobile

Electro-Encephalography (EEG), enable measuring neural processes in naturalistic contexts such as working classrooms. Another approach is to embrace input from diverse stakeholders and disciplines, creating a new, transdisciplinary science (Youdell et al., 2020) which is much better able to increase understanding of learning and development by including different angles to address the same questions.

Another challenge is the abundance of misunderstandings and 'neuromyths'. Much has been written about neuromyths (e.g., Howard-Jones, 2014), so I will be brief. It is a fact that there are many persistent misconceptions about the brain (e.g., we only use 10% of it) and about brain research (e.g., a brain scan can show whether a child is gifted, has autism, etc.). An underrepresented side of such misconceptions are the more sceptical ones. One misunderstanding I would like to counter here is that educational neuroscience is essentially a reductionist effort. Most of my neuroscience colleagues would agree that child development cannot be reduced to one level, but rather, multiple complementary levels of change are equally important and dynamically interact during development (van Atteveldt et al., 2021). Importantly, interactions across levels can lead to emerging properties that are missed when these levels are considered separately. The brain is just one of these levels, one piece of the puzzle. Neuromyths and more sceptical misunderstandings can be harmful as they can promote overly optimistic as well as overly pessimistic views about brain research and its potential contributions.

Why is changing the brain a good thing? Old habits die hard; if school is the place where children learn the skills needed to live in good standing with each other and with nature, the gains can be high.

A constructive dialogue and more interdisciplinary collaboration, including a range of stakeholders, are important to prevent such negative side effects of miscommunication.

Let me come back to the second part of the title. **Why is changing the brain a good thing? Old habits die hard; if school is the place where children learn the skills needed to live in good standing with each other and with nature, the gains can be high.** Children have this learning potential because of the high plasticity of their young brains. But this is by no means the same as letting schools "sculpt" or "control" children's brains – the reality is far too complex for this to happen. Instruction during lessons at school is only a fraction of daily-life experiences and biological maturation processes that are continually ongoing in children. As mentioned above, **child development and learning are the result of a complex interplay of changes at a range of levels, from the weight of neural connections to the social environment and cultural norms in which a child's life is embedded.** Moreover, as has been a longstanding realization, development is shaped both by 'nature' (e.g., genes) and 'nurture' (e.g., environment). This complexity shows that it is an illusion that we can unlimitedly "sculpt" children's brains. An overemphasis on malleability is referred to as the "nurture assumption" (Sokolowski & Ansari, 2018), in which the biological basis of individual differences is largely ignored, leading to inflated expectations of interventions to improve learning ability. Still, even with tempered expectations of the possibility to sculpt brains, it is wise to have an ongoing dialogue on ethics, especially with the rise of commercially available tools to train and stimulate brains (Williamson, 2019).

Child development and learning are the result of a complex interplay of changes at a range of levels, from the weight of neural connections to the social environment and cultural norms in which a child's life is embedded.

To conclude, sculpting brains into an ideal mould is not something that educational neuroscience strives to achieve. Rather, we aim to solve a piece of the complex puzzle. **By aligning the goals of schooling with what we need for a better world, skills and attitudes can be scaffolded for, hopefully, a majority of children to build not only cognitive but also social and emotional competencies, and the attitudes and values needed to take care of others and of our planet.** As long as we have a constructive interdisciplinary dialogue, knowledge from neuroscience can contribute to reimagining education for the future, as one out of multiple levels of understanding child development in a complex world.

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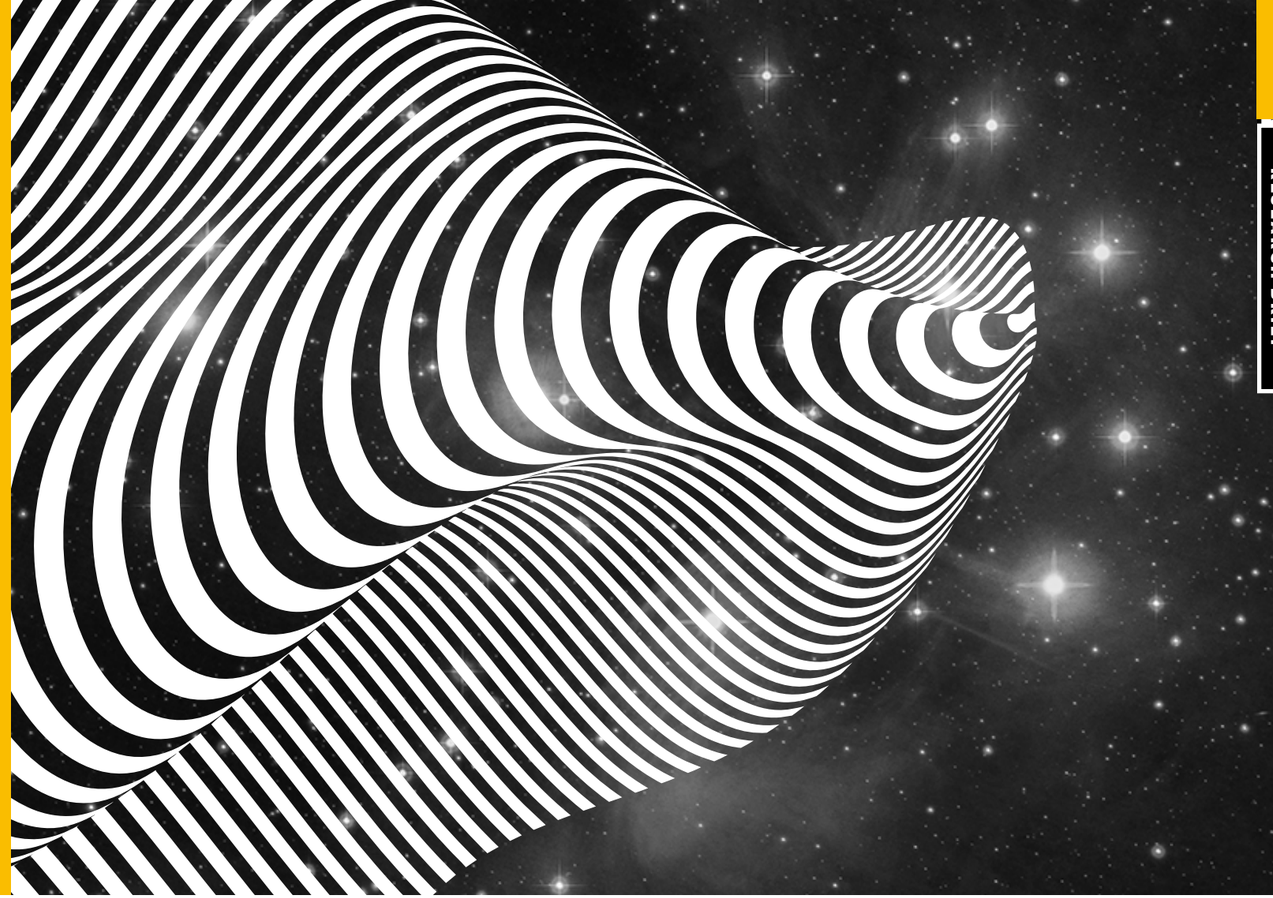
From ***Casual Ascriptions*** *to* ***Relative Effectiveness Generalizations*** *and* ***Effectiveness Predictions***

A RESEARCH BRIEF BY THE INTERNATIONAL SCIENCE AND EVIDENCE BASED EDUCATION ASSESSMENT
AN INITIATIVE BY UNESCO MGIEP*

JULIEN MERCIER, **IRIS** BOURGAULT BOUTHILLIER



RESEARCH BRIEF

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Introduction

To more reliably achieve educational goals based on values and policies (Brighouse et al., 2018), quantitative and qualitative traditions should complement each other to strengthen the quality and impact of empirical research under the broad banner of evidence-based education (EBE). And since human learning and development are the cornerstones of educational goals, the domains contributing to educational research rest on a vast number of areas, including in the following fields: learning sciences and cognitive science (psychology and neuroscience [behaviour and brain processes]); computer science (computer-based learning systems, learning analytics); economics; and social sciences (the learner and their broader context).

* The first author is Co-Chair of the ISEE Assessment Data and Evidence Group. The second author is a lead author on a full chapter on the present topic, which is to be part of the ISEE Assessment. The authors thank Stephen Fraser, Anantha Duraiappah, Yoko Mochizuki and Clara Cardona for their reviews, comments and inputs on earlier drafts.

Introduction: "What works" is not enough

This research brief identifies three overarching problems in educational practice which a different approach to EBE can help solve.

Problem 1

There is a need to apply a high minimum standard for what counts as evidence of improved learning. From the perspective of EBE, decisions about which practices to use in a given learning context should ideally be based on evidence (Slavin, 2020). Evidence begins with a demonstration of the effect of a treatment on a defined outcome (Connolly et al., 2018) and, more broadly, empirical support that a policy works generally or in a specific context (Joyce & Cartwright, 2020). However, it is not enough to simply know whether a given intervention works or not. As important as that is, we should expect a higher standard: that is, to know whether an intervention will work better than what we are already doing, compared to a control group, and after eliminating as many sources of bias as possible.

Problem 2

Before the need for additional evidence in the form of new interventions, we argue that there is a need for what we call "relative evidence." Relative evidence arises from the combined results of multiple studies, meta-analysis, and thorough comparisons of multiple extant interventions. Such comparisons enable an assessment of all pertinent interventions with respect to their effectiveness against specific outcomes, allowing practitioners to answer the question: Given all the possible interventions available to me, which is most likely to yield success in my specific context? The consistency or variability of effect sizes across studies of similar interventions is critical to support assertions regarding their general effectiveness. However, there is a lack of relative evidence in extant literature regarding a majority of educational issues: new

interventions are being tested against a control group (business as usual) and well-documented interventions are rarely compared and aggregated through proper meta-analytic approaches.

Problem 3

There is a need for strong assertions about how the local context in which the evidence is to be applied ought to affect our expectations of impact. An effectiveness prediction (Joyce & Cartwright, 2020) is the prediction that a given intervention abstracted across causal ascriptions and general effectiveness claims will work within the specific constellation of variables of a given context of application. Effectiveness predictions are generally either absent from implementation efforts, or tackled through biased, non-scientific reasoning, such as beliefs, peer pressure, marketing, etc. In education, it is possible to be a lot more efficient in implementing best practices by applying a rationale increasingly used in other fields.

In this research brief, we are concerned with the information and reasoning needed to address three questions that jointly determine the best course of action for obtaining the best educational outcomes: What works? What works best generally? Will it work "here," tomorrow, in my classroom? We provide an overview of the nature of scientific evidence in education and suggest a framework—the EBE3 framework—that: 1) encompasses current efforts related to the development of educational knowledge; and 2) posits the overall progress of educational research in a dialogue between theory-building and validation. Thus, the framework will be of practical use for educational researchers, policymakers, and practitioners.

Theory-building and theory-testing in educational research: Divide, Compromise, or synergy?

In addition to the levels of scientific evidence that emphasize empirical demonstration, theory—the conceptual model used to explain phenomena—is another essential aspect of educational research (National Research Council, 2002). We place limited emphasis on the grand theories that generalize theoretical understanding and focus instead on mid-range theories that attempt to account for social aspects and particularities of situations. Mid-range theories consist of representations or abstractions of aspects of reality that can be approximated by conceptual models, which can then be empirically tested. Such conceptual models drive the research question, the use of methods, and the interpretation of results (National Research Council, 2002).

Theory is indispensable in educational science, allowing researchers, decision-makers, and practitioners to consider both the application of interventions in specific contexts and to understand the underlying causal mechanisms. Research contributes to theory in two main ways: theory-building and theory-testing (validation), which are not mutually exclusive. In some fields, the more an article contributes to theory, whether it builds it, tests it, or both, the more impactful it tends to be for the scientific community.
A taxonomy by Colquitt and Zapata-Phelan (2007) captures many facets of the theoretical contributions of an article. The taxonomy is built on two axes, theory-building and theory-testing. According to its authors, the disadvantage of this taxonomy is that it only depicts what empirical studies are intended to do without capturing how well they actually do it. Many other important factors could be added to this taxonomy: how interesting a new construct is, how much a new relationship adds to a literature, how rigorously a theory is tested, and so on.

What is working best generally?

We consider purely causal ascriptions to be limited in their capacity to inform the implementation of EBE. Consequently, we begin our discussion of the necessary ingredients of an empirical demonstration of effectiveness with the notion of general effectiveness claims. Insofar as applied research improves professional practices in education, and given the impact of these practices on learners, it is desirable to be able to judge the relative value of available research results relevant to practice, following a set of considerations pioneered by Cochrane (1972). For each aspect of the role of the teacher or professional, it must be possible to determine either an absence of research, the presence of poor-quality research, the presence of quality research, and possibly the accumulation of relevant and converging research.

From an interventionist perspective that follows a basic premise, namely that the best information for practice is of an applied and causal nature (Joyce, 2019), it is necessary to arrive at unambiguous inferences between an intervention and its effect on the learner. In this regard, the most consensual criteria on which these causal inferences can be established, and taken up across a majority of applied fields emanating from the human sciences, are brought together through levels of scientific evidence.

In light of the cumulative nature of empirical evidence, the levels of scientific evidence are operationalized domain by domain, by grading the internal and external validity of the available evidence. Also, employing a standard benchmark of effectiveness—the most common being effect size—is essential when merging evidence about relative effectiveness across increasingly broader educational areas of intervention in order to prioritize intervention among them.

Table 1: Levels of evidence applied to educational research and practice

Range	*Level*	*Sources of evidence*	*Main limitations*
Probative: provide effectiveness generalizations	1	Mega-analysis, meta-analysis, narrative literature review, evidence-based review	Abstracted, decontextualized recommendations
Scientific: provide causal ascriptions	2	Experimental studies	Do not provide effectiveness generalizations
	3	Quasi-experimental studies	Internal validity
	4	Correlational studies, quantitative case studies	Impossible to verify causality
	5	Expert committees, clinical experience from experts (teamwork reports)	Opinions subject to political or personal influences
	6	Qualitative research, single-case protocols	Lack of generalizations
Pseudoscientific and non-scientific: beliefs not related to solid observation or reasoning	7	Poor-quality research (qualitatice or quantitative)	Improper methodology
	8	Absence of research, practice reports, trends	Lack of systematic empirical observations

Levels of pseudoscientific and scientific evidence

Table 1 provides a classification of the pseudoscientific and scientific evidence applied to educational research. This proposal of criteria concerning the efficacy of a given intervention seeks to extend prevalent hierarchies of evidence to encompass the various types of evidence created and disseminated, including inadequate, pseudoscientific evidence (e.g. Burns et al., 2011; Evans, 2003) and allows us to distinguish 1) information of a pseudoscientific or non-scientific nature, 2) the results emanating from a scientific approach, and 3) probative evidence concerning the relative convergence and divergence of the integrality of available research results. The terms "probative," "scientific," and "pseudoscientific/non-scientific" are used for clarity in relation to the common language of education researchers, practitioners, and policymakers. They are used to provide clear benchmarks to classify sources of evidence, and should not be seen as exclusive or unrelated. Hansson (2009) defines a pseudoscientific assertion using three criteria: (1) it pertains to an issue within the domains of science (in the wide sense); (2) it is not epistemically warranted; and (3) it is part of a doctrine creating the impression that it is epistemically warranted. "Scientific," in the context of applied educational research, is meant to provide limited empirical indications about the efficacy of a given intervention. "Probative" is understood as the ability of evidence to make an assertion more or less true, in this case the assertion pertaining to "effectiveness."

In short, the levels of evidence are useful in guiding the decision-making process of policymakers and practitioners to improve learning outcomes. Furthermore, levels of scientific evidence, as an index of "readiness for application," are mostly useful for consumers of research to guide educational practice regarding the effectiveness of interventions; they are not an indication of innovation. From a research production perspective, to foster innovation, it is always necessary to have evidence moving across/up the hierarchy for different topics/research questions, and having evidence at every level of the hierarchy is essential to the ongoing development of knowledge in a given field. This distinction helps debunk the impression of superiority and inferiority of the different levels—each in its own right is essential for innovation in research. Furthermore, it is important that we continually seek to move innovative knowledge from one level to the next—towards sound application—thereby accumulating the necessary evidence for responsible practice.

Table 2: Levels of contextual fitting applied to educational research
[1]"Arbitrary" includes, but is not restricted to, epistemological biases, personal preferences, emphasizing the latest research, and more generally acting without the required information

Range	Level	Evidence required	Main limitations
Probative	1	Realist review	
Scientific	2	Qualitative research during implementation work	Correspondence between studied population/ context established for the target population, but without taking into account all contextualized elements from the literature
	3	Qualitative research during experimental work	Correspondence between studied population/ context established only from the population studied
	4	Exclusive reliance on general effectiveness claims	Correspondence between studied population/ context unestablished
Pseudoscientific and non-scientific:	5	Exclusive reliance on causal ascriptions	Based on arbitary[1] choices among "what works"

Theory-building and theory-testing, and the need to move up and across levels of scientific evidence in educational research

Although the evidence-based trend is relatively widespread in education, its application has been the subject of numerous criticisms targeting the external validity of the studies constituting the best evidence. Internal validity is the extent to which an empirical study establishes and clearly explains a relationship between an intervention and its outcome and external validity refers to the possibility of applying the conclusions of an empirical study outside the context of the study.

The main limitation of the hierarchy of scientific evidence is the external validity of the evidence (Joyce, 2019). Higher-level evidence aims to increase the internal validity of studies to better demonstrate the effect of an intervention, but the external validity of these studies remains limited (Orr, 2015). In psychosocial fields, including education, such similarities between entities are more difficult to demonstrate. Therefore, interventions are more likely to produce different results in groups, contexts, etc. Even meta-analyses are likely to introduce biases concerning the external validity of a body of research since they pool studies carried out in several contexts that are not necessarily comparable (Parkhurst & Abeysinghe, 2016).

Higher-level evidence can be very useful in determining the effects of an intervention at the practical level (Slavin, 2020), but many other levels of evidence are needed from a context-specific policymaking perspective. Particularly in an area like education, where practice is policy-based, aspects such as popular opinion on practices, social determinants of target groups, and other contextual variables are important to consider (Parkhurst & Abeysinghe, 2016). It is the accumulation of appropriate evidence at different levels that supports the use of an intervention; higher-level evidence is not always sufficient support due to lack of external validity. These criticisms can be addressed by stronger theory-building and theory-testing.

Will it work here and how?

Answering the question "Will it work here and now?" amounts to demonstrating how the local context affords a causal pathway through which the intervention can make a positive contribution. While local effectiveness predictions will never be certain, incorporating this information in the reasoning supporting the implementation of evidence-based practices can improve them (Joyce & Cartwright, 2020). Ultimately, we do not just want to know if an intervention works, we want to know if it will work in the specific context for which it is intended to be used. This question implies a shift towards a context-focused approach to EBE (Joyce & Cartwright, 2020).

Proponents of EBE generally attribute the gap between research and practice to shortcomings in the way tasks are performed on one or both sides of the gap (Joyce & Cartwright, 2020). To the contrary, we argue that a major part of the necessary reasoning in EBE has been overlooked and not appropriately formalized. With this in mind, what appears to be lower-level evidence in the context of establishing what works generally becomes higher evidence in the context of establishing a fit with a local context. Such evidence, which includes ethnographic approaches or evidence from local surveys, is thus also needed to assemble a body of evidence that supports the utility of an intervention in a specific context (Parkhurst & Abeysinghe, 2016).

A realist approach to the review and synthesis of evidence from the literature and to the evaluation of a given intervention's implementation seems particularly useful in answering the question "Will it work here?" A realist synthesis is a narrative summary focused on interpretive theory that applies a realistic philosophy to the synthesis of primary study results that affect a single research question. It uses an interpretive inter-case comparison to understand and explain how and why the observed results in the studies included in a literature review occurred (Wong et al., 2012). Realist evaluation provides a framework for understanding how the context and underlying mechanisms affect the outcomes of an intervention (Ericson et al., 2017). These methods were originally developed by Pawson and Tilley to evaluate complex intervention policies in health and social services (Pawson, 2006; Pawson et al., 2005; Pawson & Tilley, 1997). In a realist approach, data are collected and analyzed to determine context–mechanism–process effect configurations (Haynes et al., 2017). An explanation and understanding of the interaction between the context, the mechanism, and the impact of the intervention is then produced (Wong et al., 2012). This joint focus on context, mechanism, and process effect should overcome one crucial limitation of quantitative research: authors have argued that traditional study designs such as randomized controlled trials, and non-randomized and prospective cohort studies, although useful, overlook a key element, namely being able to identify contextual information that is useful when replicating the results in another context (Graham & McAleer, 2018).

In other words, the success of an intervention depends on how participants interact with it in local contexts (Haynes et al., 2017), and a realist approach should uncover these processes. The working hypothesis behind a realistic synthesis is that a particular intervention (or class of interventions) will trigger particular mechanisms somewhat differently in different contexts. In realism, it is the mechanisms that trigger change rather than the interventions themselves, and realistic reviews therefore focus on "families of mechanisms" rather than "families of interventions" (Pawson, 2002, as cited in Wong et al., 2012, p.94).

Levels of contextual fitting

Table 2 provides a classification of the contextual fitting of effective interventions based on scientific evidence. Akin to the previous levels of evidence, this proposal of criteria allows us to distinguish 1) information of a pseudoscientific/non-scientific nature, 2) the results emanating from a scientific approach, and 3) the probative level at which the relative convergence and divergence of results is uncovered based on a thorough literature review. The facts needed to improve the level of contextual fitting come from empirical research, observations, and credible theory.

Theory-building and theory-testing, and the need to move up and across levels of contextual fitting in educational research

Effectiveness predictions are obtained through the identification of contextual influences (Joyce & Cartwright, 2020). We specify this as a process of disaggregation of contextual influences. We also suggest that this process cumulatively leads to an increase in what we call levels of contextual fitting, which hinges considerably on theory-building—making increasingly reliable predictions about what might work for their school, their district, and their students, and how it might do so (Joyce & Cartwright, 2020).

Conclusion: The framework and its implications

The three cumulative questions underlying the EBE3 framework imply a repositioning of sources of evidence, some of them traditionally considered the best (i.e. experimental studies) but now considered as a first step towards more powerful evidence. On the other hand, others previously neglected in EBE (qualitative research at large) are taking a prominent role. Indeed, articulating the two additional main ingredients posited in this research brief—general effectiveness claims and effectiveness predictions—in an effort to go beyond "what works" leads to a new articulation of applied empirical research within a given educational field, as demonstrated in Figure 1.

A striking realization is that sources of evidence that leave something to be desired in terms of scientific evidence are among the best sources of evidence in terms of contextual fitting. Moreover, higher levels of evidence are largely

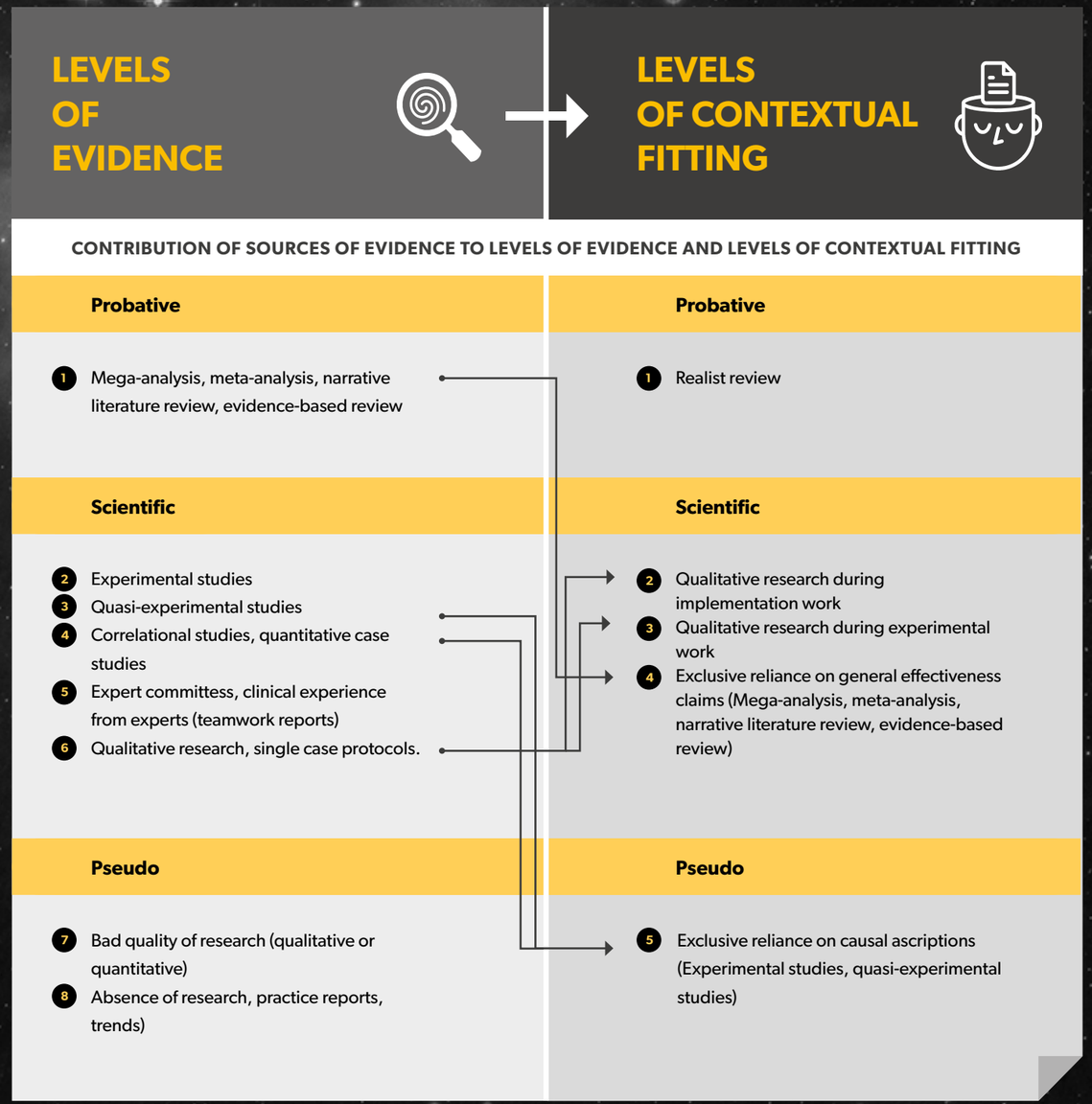

Figure 1: Contribution of sources of evidence to levels of evidence and contextual fitting within the EBE3 framework

insufficient in terms of contextual fitting. Finally, qualitative research, traditionally considered anecdotal in EBE, occupies a crucial role in improving the contextual fitting of the best evidence emanating from the highest levels of evidence. The proposed articulation of causal ascriptions, effectiveness generalizations, and effectiveness predictions generated by empirical research in education in the form of the EBE3 framework has implications for future research, policymaking, and improving educational practice.

With regard to the orientation of applied scientific research, the framework in Table 1 may shed light on the need for specific kinds of quantitative studies, meta-analyses, and synthetic work, as well as qualitative implementation work. Thus, it may help to bridge the perceived divide between quantitative and qualitative research in education by suggesting a sound integration of quantitative and qualitative methodologies around a common applied goal: to provide the necessary information to improve educational intervention. By reviewing and integrating the state of the art in EBE, it is clear that quantitative and qualitative research leverage each other to achieve the cumulative steps necessary for better intervention in a given domain.

In light of the importance of meta-analyses and systematic reviews in the need for effectiveness generalizations, it should be noted that the realist review process presented as a method for establishing effectiveness predictions can be reused to facilitate the automation of meta-analyses and enable living reviews of evidence. Indeed, realist reviews can be key in standardizing coding frameworks for studies, with common coding of cohorts, intervention delivery mechanisms, and core components. In addition, the framework presented in Table 2 helps to: focus research efforts in building local effectiveness predictions; outline various kinds of information that can improve predictions; and encourage the use of methods that are better equipped to acquire that information.

The framework presented in Tables 1 and 2 may contribute key ingredients to the mechanisms identified by Langer et al. (2016) that facilitate research use by policymakers. By insisting on a more complete scientific demonstration of efficacy, from causal ascriptions to effectiveness generalizations and effectiveness predictions, the framework may provide the materials for interventions that facilitate access to research evidence and build decision-makers' skills to access and make sense of evidence.

With regard to organizations and systems, the more complete scientific demonstration of efficacy outlined in Table 2 may help identify the right information for the right people, thus underlying the design of interventions that foster changes to decision-making structures and processes. Notably, an increased focus on core components, that is, mechanisms that represent active ingredients in interventions, can help policymakers avoid a-priori biases towards scientific disciplines that may seem compelling but do not provide the best explanations about how and why interventions work. The consequences of evidence-based reform operationally refined in this research brief could be profound. If educational policies begin to favour programs with clear evidence, publishers, software developers, university researchers, and entrepreneurs of all kinds will have an incentive to engage in serious development and evaluation. Governments, witnessing the cumulative impact of such research and development, might provide substantially greater funding for these activities in education.

Finally, practice should be greatly improved by a widened view of the necessary evidence in the implementation of so-called best practices, especially regarding effectiveness predictions. Effectiveness predictions help frame the practitioners' reasoning with regard to the match between general, abstracted evidence and their own specific and idiosyncratic context around a specific kind of inference that is amenable to analysis and testing in the context of day-to-day practice.

Evidence brokerage is also crucial to bridge the gap between research and practice (Langer et al., 2016). Because the EBE3 framework identifies the reasoning and supporting information for next-generation EBE, it could be used in information design to enhance the structure of evidence repositories and other resources. Langer et al. (2016) also concluded that interaction among professionals can build a professional identity with common practices and standards of conduct, thereby fostering EBE. Using social influence and peer-to-peer interaction as catalysts, districts may be able to use support specialists (e.g. curriculum specialists, program specialists), and schools may be able to use onsite personnel, including literacy facilitators, or highly effective general or special education teachers (peers) as coaches. The focus could then be on those teachers who need follow-up support instead of providing the same support for all teachers across all professional development activities.

In sum, the EBE3 framework presented in this research brief may be one of the most integrative with respect to research traditions and the different roles (teachers, researchers, policymakers) involved in EBE. Future work should appraise the implications of such an integration—conceptually, operationally, and organisationally.

KEY MESSAGES

The results from a collection of **high-quality studies comparing an experimental group given a target intervention with a control group (usually receiving business-as-usual teaching) has been the cornerstone of EBE for decades under the label "what works." It is the main, but not a sufficient, building block of EBE, and there is a need for a higher minimum standard for evidence of improved learning.**

For a given educational issue, what is needed is a complete inventory of available interventions, rank-ordered in terms of relative efficacy to answer the question **"What works best generally?"**

An EBE initiative is not complete without solid indications that a specific context of application will enable the intervention that is working best overall to yield the expected benefits, which will answer the question **"Will it work here?"**

KEY RECOMMENDATIONS

The potential of the EBE3 framework to go beyond "what works" will be fully realized by:

- Emphasizing effectiveness generalizations through the production of meta-analytic work as soon as there are enough published experimental studies on a given issue;
- Emphasizing effectiveness predictions by undertaking qualitative work regarding effectiveness predictions in given contexts as soon as meta-analytic results are available.

The potential of the EBE3 framework to augment the cohesion of applied empirical work on a given issue will be fulfilled by:

- Focusing on theory-building and theory-testing in empirical studies, despite the applied nature of educational research;
- Aligning the goals/research questions in quantitative and qualitative research with the maturity of a field, in order to optimize outcomes with respect to sound application in educational intervention.

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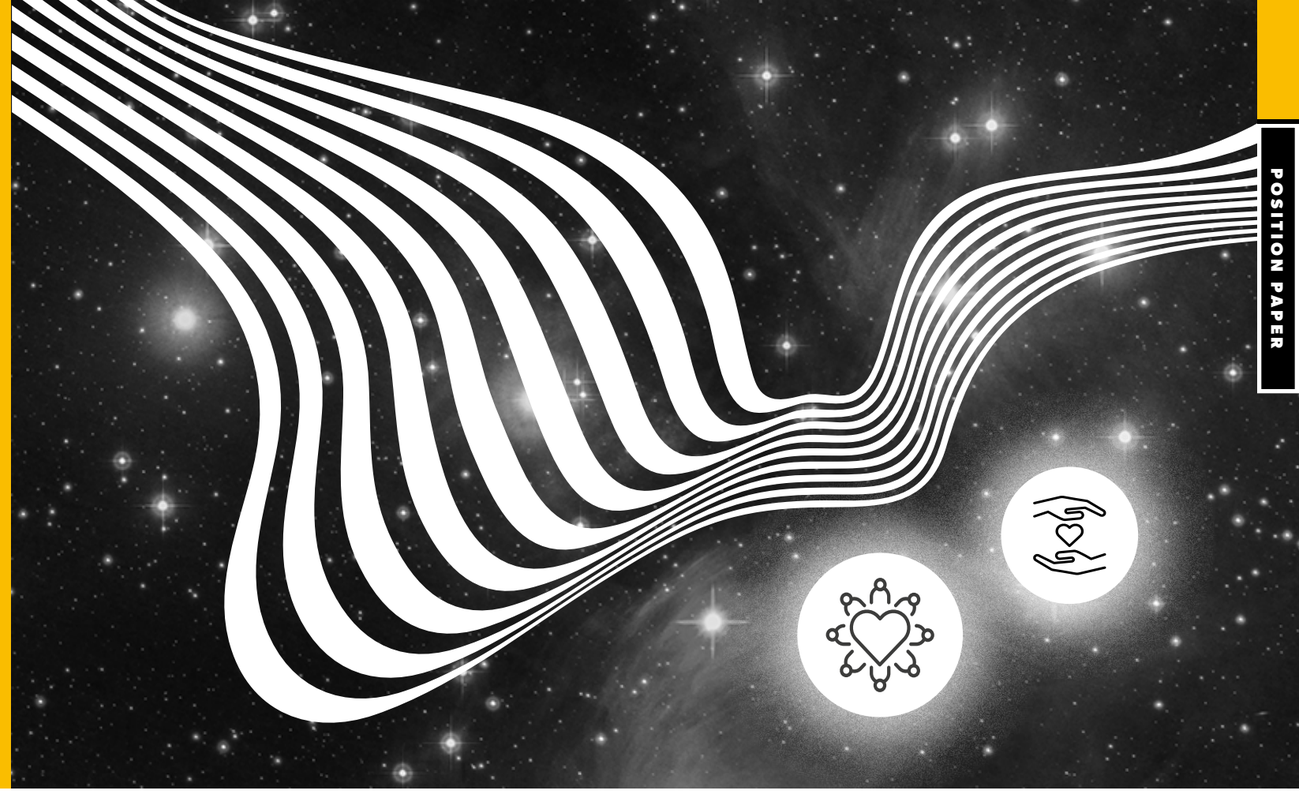
Note: This text rests on many more academic shoulders than the references listed above. The research brief is a summary of Chapter 1 from the ISEE Assessment Data and Evidence Group. The ISEEA Report will be published in 2022, with more than 100 references.

*A **Curriculum** for **Education** in and for **Flourishing***



POSITION PAPER

A RESEARCH BRIEF BY THE INTERNATIONAL SCIENCE AND EVIDENCE BASED EDUCATION ASSESSMENT
AN INITIATIVE BY UNESCO MGIEP*

OREN ERGAS, **TAL** GILEAD

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Introduction

This Research Brief presents the fundamental principles that guided the conceptualization and formation of a framework for an educational curriculum in and for flourishing. The Brief is part of the International Science and Evidence based Education Assessment (ISEE Assessment) and draws on research that was conducted in other parts of the Assessment (see Research Brief 1). The Brief begins by discussing some general features of education and then presents two theoretical frameworks for education in and for flourishing: 1) a general framework; and 2) one focused on curricular domains. The latter is divided into six domains and features six learning trajectories, which expand the pillars of education set forth by the Delors report (UNESCO, 1996). The frameworks proposed are not meant to be prescriptive; rather, they offer a grounded and broad perspective that can help develop informed ways to orient education toward flourishing while practicing sensitivity to the variety of social-cultural- political contexts within which education takes place worldwide.

* The authors serve as Working Group Co-Chairs of the ISEE Assessment Working Group 1 on Human Flourishing. The authors thank Nandini Chatterjee Singh and Anantha Duraiappah for their reviews and comments on earlier drafts.

1 *Education is a dynamic system:*

Namely, it cannot be fully understood by reducing it to its constitutive parts. For promoting flourishing, this implies:

A. Systemic approach to change:
The promotion of flourishing should be multi- scalar and advance from micro to macro, i.e., from the level of the individual student and teacher to that of policy, and vice versa. Interventions that are limited to one level (e.g., students only) are unlikely to create sustainable change if not supported by a systemic approach.

B. Sensitivity to context:
It is essential that education for flourishing be sensitive to the context in which it takes place. Successful models and best practices might not be easily emulated if flourishing is the aim. Local conditions and culture need to guide the adaptation of interventions in order to increase the chances of success.

C. Interdisciplinary approach:
No field exhausts the understanding of human beings, social systems and flourishing. Diverse disciplines and fields are necessary as different entry points for promoting as well as overcoming hindrances to flourishing.

2 *Result of education in and for flourishing:*

Education for flourishing should have three main end results:

A. Capacities, capabilities & propensities:
Education should provide individuals with a range of mental, physical and practical capacities and capabilities that increase their ability to choose and follow their own path towards a flourishing life. Education should also allow individuals to develop the propensity to act on these spontaneously, by will or as an acquired habit.

B. Interpersonal flourishing:
Each individual has the power to affect his/her own flourishing and that of others. Education should bring individuals to contribute to flourishing in widening interpersonal circles (e.g. through acts of caring or enabling others to develop their own agency).

C. Conditions of flourishing:
Education should encourage individuals to contribute to the creation, maintenance and enhancement of the conditions (e.g. environmental, political, economic, cultural) that facilitate flourishing (e.g. protecting the environment).

Figure 1: A framework for education in flourishing

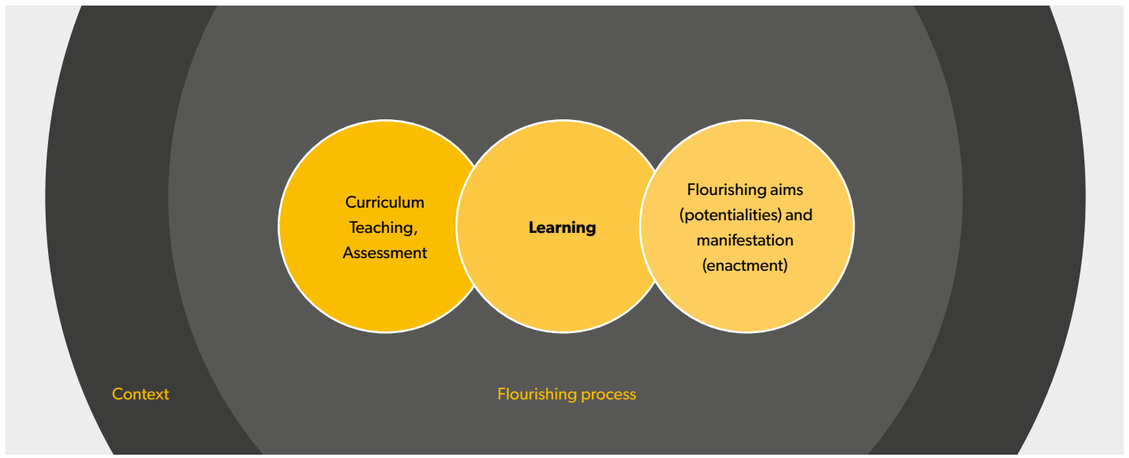
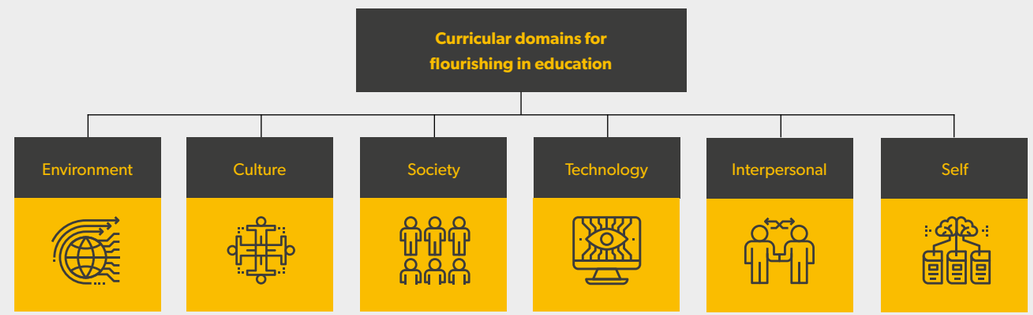


Figure 2: Curricular domains for flourishing in education



3 *Framework for education in and for flourishing:*

Curriculum, teaching and assessment should all be coherently oriented towards generating learning that is conducive to promoting flourishing in order to reach the three end results listed above (Figure 1).

4 *Curricular framework for education in and for flourishing:*

To promote flourishing, it is recommended that the curriculum encompasses the following six domains (Figure 2). Each domain can be viewed as engaging an individual in a relationship with a different aspect of the curriculum. The curricular domains are:

A. Environment:

Learning to live harmoniously with the environment, to appreciate it and to be able to enjoy it. In addition, protecting the environment and potentially even restoring it has become essential for our ability to live a flourishing life. The curriculum must provide us with the capacities and capabilities needed to conserve the environment as well as the drive to put this into practice.

B. Culture:

By bringing people to engage in a relationship with culture (e.g., humanities, arts, leisure), education makes an indispensable contribution to flourishing. It opens avenues for developing potentialities, finding meaning, strengthening a sense of belonging and new forms of pleasure. Moreover, the cultural domain bears the potential to strengthen interconnectedness in a globalized world. The significance of engaging with culture for flourishing should not be overshadowed by instrumental and economic considerations.

C. Society:

Education should prepare students to integrate with the political and economic aspects of social life. To effectively promote flourishing, education should go beyond preparing students for existing social arrangements. It should also teach them to think critically about these, formulate proposals, exercise agency and strive to improve them. In addition, education should go beyond the state and the economy and deal with the global and the communal aspects of contemporary life.

D. Technology:

Education must deliberately engage with technology and help learners progress from a level of familiarity with technology, through acquiring digital literacy skills to having the ability to become active agents in shaping technology toward ensuring that it will be in service of human flourishing. This demands that students learn to engage with technology ethically.

E. Interpersonal:

Education should enhance the abilities of individuals to conduct themselves wisely and considerately in relationships with others. It should contribute to developing the cognitive, emotional and social capabilities needed for promoting relationships that contribute to the flourishing of oneself and others. Education should also strive to inculcate tolerance for different cultures and drive equity in learning environments while remaining sensitive to sociopolitical contexts.

F. Self:

Individuals are in a relationship not only with what is external to them but also with their own bodies and minds. This has far-reaching implications for individuals' sense of flourishing. It is therefore essential that education for flourishing provide individuals with inner capacities that enable them to affect their physical and mental experiences (i.e., by means of a variety of practices that direct attention deliberately into their first-person experience).

5 *Flexibility in the curricular framework:*

A. Adding domains:

The above six-domains framework provides a starting point from which to think about education for flourishing. Other domains can be added to it. It is recommended, however, that after adjustments have been made to the local context and conditions, education for flourishing touches at least upon these six domains.

B. Combining domains:

We recommend using the domains both as ways to design curricula within the particular domains and dissolve the boundaries between the domains by combining them (e.g., cultivating environmental sensitivity through digital literacy).

6 *Learning trajectories:*

The process of a students' encounter with the curriculum domains will be oriented towards six learning trajectories, which reflect the individual's development through various modalities, experiences, and processes of learning:

A. Learning to know and think:

Knowledge acquisition, understanding and critical thinking.

B. Learning to do and evaluate:

Developing skill and dexterity and cultivating an ability to evaluate their undertakings.

Figure 3: Flourishing aims and manifestations (Conditions and capacities are illustrative. They do not exhaust the matter, nor are they always strictly associated with one curricular domain alone)

Education as relationship		Nature	Past and present knowledge, achievements	Society (e.g., norms, job market)	Internet, social networks, AI, etc.	Others	Oneself (body, mind)
***Learning** trajectories*		Learning to know and think, Learning to do and evaluate, Learning to learn, Learning to become, Learning to live together, Learning to live with nature.					
Flourishing aims and manifestations	***Conditions***	Sustainability, (needs elaboration from experts), etc.	Preservation and innovation, scientific progress, etc.	Economic growth, peace, social justice, etc.	Ethical vision-based development, value-driven entrepreneurship, etc.	Inclusion, tolerance, dignity, etc.	Freedom, mobility, actualization, etc.
	Capacities	Sensitivity, environmental responsibility, awareness, etc.	Appreciation, cultural literacy, innovativeness, critical thinking, etc.	Literacy, numeracy, citizenship, human capital (job-market skills), etc.	Digital literacy critical thinking, innovativeness, etc.	Empathy, perspective taking, communication skills, etc.	Agency, mindfulness, executive functions, self-regulation, growth mindset, etc.

C. Learning to learn:
Becoming a self-regulated learner as well as a group collaborator.

D. Learning to be and become:
Taking care of physical and mental health, finding meaning.

E. Learning to live together:
Developing social-emotional capabilities, communications skills and compassion.

F. Learning to live with nature:
Becoming knowledgeable about and caring for the environment.

7 *Flourishing aims and manifestations:*

The curricular domains and learning trajectories lend themselves to improved external conditions and inner capacities, which reflect aims and manifestations of education in and for flourishing (Fig. 3).

Conclusion

The proposed framework for an educational curriculum in and for flourishing builds on conceptions of flourishing, developments in the science of flourishing and theories of education as a complex system while considering the immense challenges that the contemporary world faces. The six curricular domains and the six learning trajectories seek to capture the diversity of individual and collective life and interests. At the same time, the framework aspires to present an operational approach that can inspire policy makers, curriculum developers and teachers to bridge between abstract ideals of flourishing and the actual work of day-to-day education. That said, this operationalization of education in and for flourishing intentionally remains at a level that enables ample room for interpretation so as to cater to the diverse social-cultural-political-environmental contexts characterizing the contemporary world.

Note: This text is a summary of Chapter 4 of the ISEEA Report, to be published in 2021. The chapter contains 180 references which reflect the many academic shoulders over which it stands.

FELLOWS' VOICES

— **JOANNE** MARIEKE BUIL, ISEEA FELLOW

— **ANYA** CHAKRABORTY, ISEEA FELLOW

— **THOMAS** KLOSTER-JENSE MACINTYRE, ISEEA FELLOW

— **REBECCA** MERKLEY, ISEEA FELLOW

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— **MOHNSEN** SAADATMAND, ISEEA FELLOW

— **RONGXIU** WU, ISEEA FELLOW

— **JULIETTE** DIEBOLD DE MELLIS, ISEEA INTERN

— **KAVYA** BHARDWAJ, ISEEA VOLUNTEER

— **TSERING** YANGDOL, ISEEA VOLUNTEER

An *Eye-Opening Experience*

JOANNE MARIEKE BUIL, ISEEA FELLOW

Joanne studies social-emotional learning (SEL) and the influence of peer- and teacher-student relationships on children's social, emotional, behavioral and neurobiological development in kindergarten and elementary school. In her research she focuses on how teachers and peers can stimulate children's SEL in order to help children to be active and engaged students equipped to become critically and creatively thinking citizens in the ever-changing, global-oriented 21st century.

My name is Marieke Buil. I'm from the Netherlands, Europe, where I obtained my PhD in developmental psychology at the Vrije Universiteit Amsterdam with my studies on the interplay between personal endowments and the school environment in the development of child and adolescent externalizing problems. With my PhD study and the research projects I managed thereafter, I showed that negative school- and classroom contexts, and negative teacher-student and peer-relationships, predict a variety of adverse social, emotional, behavioral and neurobiological outcomes in elementary school children, emphasizing the importance of the school-environment for children's development.

Thus, it is without a doubt that the school-environment is of tremendous importance for children's healthy development. After ~10 years of (intervention) research into teacher-student relationships, student-student relationships, and social emotional learning, resulting in many recommendations for educational practice and policy published in scientific papers, I felt I could do more to actually reach those people who matter most: the teachers, the policymakers and the students. **Like many researchers' experience, I felt trapped in the research-to-practice gap, where study findings of my peers and me remain 'stuck' in my little science bubble of fellow researchers.** When I received an invitation to apply for a position of postdoc research fellow, working on the Summary for Decision Makers of the International Scientific and Evidence-based Education (ISEE) Assessment, I was more than happy to apply and I was even more happy when I got the position!

It has been an absolute pleasure and honor to work on this project, re-envisioning the future of education based on scientifically robust, evidence-based findings from a broad variety of disciplines. Never before have I had the opportunity to work together with so many different people, from so many different cultures and so many areas of expertise. Input for the ISEE Assessment comes from educationalists, (developmental) psychologists, neuroscience, economists, philosophers, psychiatrists, sustainability

Like many researchers' experience, I felt trapped in the research-to-practice gap, where study findings of my peers and me remain 'stuck' in my little science bubble of fellow researchers.

and environmental scientists and many more scientific areas. I have the pleasure to collaborate with all these researchers from various fields, but also with international government advisors, entrepreneurs, jurists, politicians, engineers and more. Where I thought before that I was doing 'interdisciplinary science' when working together with e.g., a medical doctor and someone from the local government, this project by UNESCO MGIEP showed me what true international, interdisciplinary collaboration means.

It's an eye-opener and worthwhile to experience that people from various backgrounds can have wildly different opinions about and insights in what for example 'education', 'curriculum', 'assessment', 'flourishing', and 'learning' entails.

Although at times challenging, it has been and is a very important learning opportunity for me to learn to understand 'education and learning' from all these different angles and to come to a shared meaning, vision and mission and I'm very happy that I can collaborate in this project!

Activating the Ingredients for ***Education's Path to Human Flourishing***

ANYA CHAKRABORTY, ISEEA FELLOW

Anya's research work spans different aspects of social and behavioural neuroscience across cultures and in neurodevelopmental condition namely Autism Spectrum Condition. One of her current research interests focuses on the implementation of mental health education in India. She is also passionate about studying and playing poker and MOBA games.

A complete learning experience comprises both rewarding and challenging lessons. My journey as an ISEEA fellow in that regard has been a successful and fulfilling one. The ISEEA project is incredibly ambitious in its complex interdisciplinary approach involving over a hundred academics in the natural and social sciences (see Duraiappah et al., 2021). As an early career cognitive neuroscientist and the only fellow with neuroscience expertise in working group 2 (WG2) centred around the importance of 'context' in education, it has been a considerably challenging path to navigate from the start. So how did I get here?

One of my primary motivations to join the ISEE Assessment was the opportunity to learn about how science and evidence can help inform policy and decision making in education. My doctoral work in the UK involved investigations into the 'self' in Autism Spectrum Condition (ASC) in different cultural contexts using behavioural and neurophysiological measures (Chakraborty & Chakrabarti, 2018; Chakraborty & Chakrabarti, 2015). During this period, I had the opportunity to interact with several individuals with lived experiences of different mental health conditions, including ASC, anxiety, depression, attention deficit disorder and global developmental delay. Following my doctorate, I returned to India and continued my work in mental health through community and personal interactions in the field but realised the need for more evidence-based assessment in mental health in different regional contexts. Mental health is estimated to be one of the significant challenges of the 21st century (Vigo, Thornicroft & Atun, 2016), yet our current population underestimates its significance. One way to correct this deficit is through proper mental health education for children and young adults through restructuring school curricula, pedagogy and increasing community-based learning of mental health. My long-term goal is to integrate my experiences in research, participant and practitioner interactions, and lived experience with a mental health condition to structure and introduce mental health education in the school curriculum and pedagogy. **I viewed the ISEEA fellowship as a great stepping stone towards achieving this aim with its opportunities for learning how to integrate different levels of evidence from across multiple disciplines to lead educational outcomes towards human flourishing.**

One of the most challenging, and consequently one of the most exciting, aspects of the ISEEA project is the coming together of academic experts from different fields of study. From the start, WG2 exemplified this interdisciplinary workforce through the area of expertise of co-chairs, Fellows and authors of WG2, including mastery in comparative education, curriculum, teaching, sustainable development, educational and cognitive neurosciences, to mention a few. **The access to new forms of knowledge and the opportunity to collaborate and discuss ideas created a stimulating environment. This was particularly true for my interactions with coordinating lead authors (CLAs) of different chapters. CLAs, experts in their fields, were open, kind, empathic and collaborative in their academic interactions.** They were keen to include my understanding and expertise in neuroscience to integrate evidence from natural and social sciences to unravel the contribution of context on the development, maintenance and growth of education systems. The abovementioned activating ingredients acted as motivators and facilitators for me; they spearheaded me towards thinking, researching, and working hard to achieve this aim. I ended up as a contributing author across several chapters of WG2, delineating the possible promises and interactions that the brain has with different contextual factors that influence education. This experience reaffirmed what evidence has shown regarding the learning environment and how positive environmental factors can act as external motivators to improve executive functions and overall learning (Chapter 5, WG2). Since we hope to achieve lifelong learning and human flourishing from schools to workplaces, it is essential to activate a collaborative and supportive learning environment as one of the critical ingredients in education.

Work by WG2 members shows that education's path to achieving human flourishing is a complex one and will most likely depend on the context in which it is placed. ISEE Assessment has done a commendable job of identifying and reviewing the different 'active ingredients' at economic, social, political, cultural and neural levels needed to craft education systems that promote human flourishing. However, to further understand which ingredients in education work for whom, to what extent are they universal or context-dependent and why UNESCO and participating nations should continue with this work by drafting research directions to operationalise the findings in real-world settings.

I viewed the ISEEA fellowship as a great stepping stone towards achieving this aim with its opportunities for learning how to integrate different levels of evidence from across multiple disciplines to lead educational outcomes towards human flourishing.

While the interdisciplinary nature of the ISEEA provided an enriching learning environment, the differences in personality traits and ideologies can sometimes led to tensions within WG2. Interdisciplinary work is always an ambitious undertaking and one that is necessary considering the challenges we face today. Still, differences in opinion should never take away from mutual respect for colleagues and different fields of study. I found this to be sometimes lacking in WG2, and going forward, it would help if the Assessment co-chairs take a more active role in the dealings of the working groups. Further participation of Assessment co-chairs might have helped streamline the academic discussions and ensure academic integrity is always maintained. I would also recommend that such novel projects that bring together a wide range of academic expertise and 'personalities' delineate a code of conduct for all members in line with UNESCO's core values and principles. ISEEA did an impressive job in upholding these core values in place. As we learn and move forward, continuous monitoring and discussion on how different personalities and ideologies can coexist harmoniously can enrich our work experience further. Such harmonious coexistence would ensure the fellows or junior researchers can voice their opinions and ideas without inhibition, intimidation and exclusion in all instances. A clear protocol on how to address these rare incidences of impropriety in an unbiased manner, and a conflict resolution mechanism with members external to the issue put in place. Notwithstanding these sparse but solvable conflicts, I would like to recapitulate that the support of ISEEA leadership, CLAs, fellow fellows and in particular Professor Kenneth Pugh made my participation in this project a gratifying, stimulating and learning experience, one that I would cherish immensely.

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A contextual rabbithole: ***A fellow's reflections on the ISEE Assessment***

THOMAS KLOSTER-JENSEN MACINTYRE, ISEEA FELLOW

Thomas Macintyre is project leader at the Colombian Foundation Mentes en Transicion, after recently finishing his Ph.D. in Education and sustainability at Wageningen University, the Netherlands. Thomas lives and works on his agroecological farm in the coffee region of Colombia. His Transdisciplinary research activities are based on community learning and action research among grassroots initiatives in Colombia, in the areas of agroecology, food sovereignty, eco-tourism, and local sustainable development. Thomas is committed to learning and working on practical projects with individuals, communities and organisations dedicated to upending the status quo, transgressing unsustainable norms, and bringing about a more just, enjoyable and regenerative world.

From the book Alice in Wonderland, going down 'the rabbit hole' is a metaphor for entering the unknown in a somewhat bizarre and surreal manner. Having sniffed around the academic rabbit hole during my master thesis in a Ukrainian ecovillage, where I ended up writing a fairytale narrative involving the people I was studying, I had become increasingly interested in researching other 'alternatives to development' (Escobar, 2018) being enacted around the world. This brought me to the bio-cultural mega-diversity of Colombia, South America, and the visions and practices of "buen vivir"—an alternative cosmology roughly translated as the 'good life.' Slipping and sliding, I eventually lost my cognitive and rational footing as 'a doctoral scholar' and nose dived into the rabbit hole of community-based learning in indigenous, afro and peasant communities, where 'silent knowledge', 'spiritual cleansing,' the 'pluriverse' made me realise that I really knew very little about the many worlds within and around me. Representing this ignorance as a Living Spiral learning metaphor earnt me a Ph.D. (Macintyre, Chaves and McGarry, 2018; Macintyre, 2019), and with a diploma in hand, I stuck my head out of the rabbit hole, and took a deep reflexive breath.

Having lost myself in highly contextual plural worlds, with an admittedly small academic audience, I felt myself becoming more and more interested in "seeing the light" of a bigger educational project with wider reaching impacts. Like strong arms pulling me out of the rabbit hole, **the ISEEA Fellow position provided a great opportunity to be part of an evidence-based assessment of education from around the world (see Duraiappah et al., 2021). I became part of Working Group 2 (WG2) of the assessment, looking into the role of context in education—just my thing.**

At first the work seemed much like the cognitive part of my Ph.D. **I thrived in the interdisciplinary environment, carrying out literature research, coordinating with lead authors, and writing about curriculum and pedagogy, conflict and the climate crisis.** But differences began to appear. The ISEE Assessment Panel began highlighting the need for recommendations and key messages for "policy makers" in clear, concise bullet points. **I had never written for policy-makers in my doctoral work, instead focusing on the unique experiences of place and self, rather than universal claims based on what Law (2011) might call the one-world-worldview.** So it was all getting a little confusing: how were we to simplify the narratives of our Working Group when, in the words of one of the WG2 Co-Chairs, context is about 'making a simple story complicated.' I realized I needed to carry out some research.

Delving into UNESCO's humanistic vision, it was interesting to note that the more idealistic and humanistic visions of UNESCO reports do not generally have a great influence on educational policies, compared to the more technocratic reports of organisations such as the World Bank (Elfert, 2015). Furthermore, while openings towards decolonization, and other ways of 'being' in the world can be read into UNESCO documents, Silova et al., (2020) note that UNESCO represents a form of "Re-westernisation" (see Mignolo, 2013) through the reaffirmation of the liberal western model of universal. This contrasts to the "decolonial trajectory" which has encapsulated by own research, which seeks to 'delink' development to western forms of knowledge, especially the universality of only one way of knowing. So there was definitely a tension going on in our Working Group. On the one hand, making policy relevant guidelines whereby context could provide universal recommendations as an external backdrop to educational outcomes, based on UNESCO's universal and 'core non-negotiable' principles such as human rights and gender equality. On the other hand, context as a process whereby knowledge is recontextualised into education curricula in local manifestations, based on history, culture, economics and power structures, resisting attempts for universalisation.

Yet much like Alice on her adventures, I am not alone in addressing these tensions. **A strength of the ISEE Assessment project has been to involve a wide variety of people including my fellow fellows, Assessment and Working Group Co-Chairs who are experts in their fields, the main authors of the different chapters, and the ISEE Assessment Advisory Board.** Together with the Co-Chairs, we ISEEA Fellows are undergoing an iterative process of writing, editing, and transforming the required recommendations from our Working Group into clear messages for policy-makers, stating how focusing on context can translate into human flourishing. It still seems a little fantastical to reduce the complexity of education into simple language, but this project is teaching me that the larger picture needs to some extent generalisations.

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Challenges to connecting ***the science of learning*** with ***international education policy***

REBECCA MERKLEY, ISEEA FELLOW

Rebecca Merkley is an Assistant Professor in Cognitive Science at Carleton University in Ottawa, Canada. She has a PhD in Experimental Psychology from the University of Oxford and an EdM in Mind, Brain, and Education from Harvard University. Her recent research projects have included research-practice partnerships investigating whether educators benefit from learning about findings from the science of learning and implementing them in their classrooms.

Two years ago, I wrote a post for the Blog on Learning and Development (BOLD) in response to their prompt: "What is the greatest challenge when seeking to foster children's and adults' learning in the 21st century?" I wanted a classroom teacher's perspective and asked Corey Gaber, a fellow alumnus of my Master's program in Mind, Brain, and Education, and 6th grade ELA teacher in Baltimore City Public Schools. He pointed out that researchers in developmental psychology and neuroscience often fail to consider socio-political factors and inspired me to write about how developmental scientists need to study more diverse populations and better account for the role of socioeconomic factors and education policy in our research (Merkley, 2019). Since writing that post, I have been trying to put those words into action in my own research. **Working on the ISEE Assessment as a postdoctoral fellow has given me opportunities to learn much more about the complicated relationships between multidisciplinary research and international education policy.** Here I outline three major challenges we experienced while working on the ISEE Assessment: 1- a scarcity of representative data from global populations; 2- differences in terminology use across disciplines; 3- a lack of communication with teachers. I am now more convinced than ever that we need more diversity in research and stronger connections between research, policy, and practice in education.

We Need Better Evidence

The vast majority of research in the learning sciences includes participants from the Global North and samples are not representative of human diversity (Henrich, Heine and Norenzayan, 2010). Despite increasing attention to this issue and the failures of generalising findings to the majority of the world's population, this bias remains persistent: over 80% of studies in developmental psychology sampled children growing up in North America and Europe, yet fewer than 10% of the world's children are born there (Nielsen et al., 2017). This posed an enormous challenge to finding representative data for the ISEE Assessment. Throughout the assessment, we have highlighted where more research is needed to investigate whether findings from psychological science hold up in different countries and cultures. There is a particularly large absence of evidence on effective education approaches for children with disabilities (Kuper et al., 2020) and a need to collect both quantitative and qualitative data on the learning experiences of children with disabilities globally. Participatory action research approaches could help amplify student voices in directing research agendas and interpreting findings.

Working on the ISEE Assessment as a postdoctoral fellow has given me opportunities to learn much more about the complicated relationships between multidisciplinary research and international education policy.

Lost in Translation

A second challenge is that terminology is used in different ways in different sectors and even across research disciplines. I have come across this problem in my own interdisciplinary research in cognitive development and math education (Berch, 2016; Bruce et al., 2017), but the problem was magnified with all of the different perspectives included in the ISEE Assessment. For example, I learned that researchers in early childhood studies, critical feminist theory, and cognitive neuroscience have different interpretations of the term 'foundational skill'. However, despite some miscommunications, we found many places where evidence from different disciplines converged on common insights and recommendations. Researchers have debated which academic discipline is best suited to inform education policy, but these debates are misguided as multidisciplinary research offers the best chance at meaningful application to education (Thomas, 2019). If researchers are willing to find common ground and a shared vocabulary, they may be able to work together to solve education's greatest challenges.

Teachers' Expertise is Crucial

Teachers are instrumental to students' success yet are often left out of conversations around education research and policy. Therefore, a third challenge when reviewing evidence from education research was the lack of teacher perspective on what works in different classroom contexts

One key factor influencing teacher effectiveness is subject content knowledge and pedagogical knowledge – the more of these skills teachers have, the better their students learn (e.g. Kelcey, Hill and Chin, 2019; Voss, Kunter and Baumert, 2011). Moreover, understanding general principles of how students learn, based on learning science research, can help teachers adapt their instruction (Willingham, 2017). Throughout the ISEE Assessment, recommendations were made for improving teacher education and continuing professional development. However, even when research is shared with teachers, the way research is communicated does not always convey the importance of teachers' professional judgment in applying research in their classrooms (Cain, 2015). Researchers "need to listen and learn more from teachers" (Hanford, 2020) if they want to improve translation of research to practice. Efforts should be made to increase teachers' knowledge of the science of learning and include them in conversations around how to apply it in the classroom.

Taken together, the findings of the assessment have revealed that much more work needs to be done to connect research, policy, and practice in education. I am grateful for the opportunity to collaborate on the ISEE Assessment with many people with different disciplinary and cultural perspectives who challenge my own ways of thinking. It has been reassuring to meet so many others who share the goal of building connections across research and education policy and practice. I believe these connections can be strengthened with increased multidisciplinary and inter-sector collaboration.

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An Exercise in *Eclectic Approaches to Assessment in Education*

MOSES OLADELE OGUNNIRAN, ISEEA FELLOW

Moses holds a Ph.D. in Comparative and International Education (Educational Leadership and Policy) from Beijing Normal University, Beijing, China. He holds an M.Ed. in Educational Management, Economics of Education and Statistics from the University of Ibadan, Nigeria.

Overview

Looking back on my involvement in the ISEE Assessment, I feel very fortunate to have had the opportunity to work with so many great thinkers from around the world, people who have shaped my ideas and experience. The positive interactions of academics and educators strongly supports the concept of 'town' and 'gown' and the benefits of this intersection. It is here, in this nexus, that the goal of education is realized.

Background

I was fortunate to be included in this group as a postdoc just weeks after completing my PhD. My PhD was an immense achievement, rivalled only by joining the UNESCO MGIEP as a postdoctoral fellow. This work has provided me a unique opportunity to develop skills in research writing and to embrace multidisciplinary and interdisciplinary approaches to educational research. **The work is eclectic and immensely satisfying, giving me great insights into the broader contextual influences on education. I have learned so much from the co-chairs of Working Group 2, Edward Vickers, Kenneth Pugh, and Latika Gupta.**

I have been assigned to three different chapters, each focusing on economic policy of education, assessment in education, and the teacher, respectively. Each has broadened and deepened my knowledge, and I have gained a wealth of experience from working with my group and learned so much from the work produced by others (Working Groups 1 & 3). In particular, I must mention the collaboration with my Co-Fellows, Anya and Thomas. In partnership with them, I developed a significant understanding of teaching methods and educational practices across different regions that will stand me in good stead in my future career. Our work together has been a positive and rewarding experience based on sharing knowledge, collaboration, and cross-fertilisation of ideas.

My special thanks also go to Anantha Duraiappah (Co-Chair of the ISEE Assessment panel). I learned so much from

Anantha's leadership skills and styles. He has been an invaluable mentor and an inspiration to an early career researcher.

Knowledge Gained and Insight

I have particularly benefitted from exposure to new ideas and concepts that extend the focus of my PhD. My research topic was human capital theory (HCT) and how skills mismatch contributes to graduates' unemployment. As part of my thesis development, I explained HCT as a (theoretical) anchor for my criterion (variables). HCT assumes that individuals are consumers who see the commodity of (higher) education as an investment. The decision to consume rests on the cost–benefit principle. One of the chapters in this project discusses human flourishing theory, which expands my work on HCT beyond the idea of education as cost–benefit investment, placing it in a broader education and economics context.

Beyond my particular research interest, my experience as an ISEEA Fellow helped me to gain a profound understanding of the idea of education. As a group we critically explored several contextual factors on education, including, neuroscience, economics, politics, diversity, social justice, conflict, technology, curriculum, assessment, teacher, and so on. These factors inter-dependently influence engagement in education in several countries (Leicht et al., 2018; Turner, 2015). Our extensive review of these factors relative to the diverse goal of education gave me much greater insights into the determinants of unemployment, providing me with the opportunity to understand the issue from the lens of human flourishing theory as an alternative to HCT (UNESCO, 2015).

Moreover, as part of my work, I was asked to examine assessment issues in the education system, including how assessment operates at both national and international levels. My findings were shaped by the work of the OECD's PISA study and its contribution to the global education policy debate (Sjøberg, 2015). There is a need to find level ground for measuring knowledge and abilities, both from

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a positivist and normative perspective. Hence, while the need for general standards for assessment cannot be ignored because of their capacity to provide international comparison, I argue that assessment must also be context specific.

Challenges

One of the most significant challenges has been the obstacles introduced by the COVID-19 pandemic. Apart from being unable to meet face-to-face with colleagues and mentors, it has been difficult to follow up on commenters due to some technical challenges. The pandemic has highlighted problems associated with infrastructure issues, in my case, poor internet network and power supply, which have caused additional stress. Despite these constraints, my experience has been deeply enriching, especially in providing me with policy-based knowledge that I can adapt to the developing education system of my country.

Suggestion

I firmly believe that an exercise of this kind should not be a once-in-a-lifetime experience. Instead, it should be ongoing, since knowledge develops on a trajectory, and becomes most meaningful when the past and present connect. I recommend that past participants or fellows be included in the working groups so that they can continue to contribute to issues of significance to educational policy and practice.

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Sharing the Passion and Contribution to *Global Education Improvement*

MOHSEN SAADATMAND, ISEEA FELLOW

With a background in educational technology, Mohsen's research focuses on technology-enhanced learning and online education. After completing his PhD dissertation on MOOCs at the University of Helsinki, Finland he continued working on digital educational games for STEAM Education as part of his postdoctoral research. Mohsen's research integrates a variety of learning technologies with different methods in designing, implementing, and evaluating online/blended learning solutions

In the past few years, I have been in a shift in my career from academia to public and business sector. Part of this shift has been motivated by my conviction to work in an international context such as for the United Nations (UN) and UNESCO to learn about and to contribute to the development of education at a global level. When I came across the possibility of being involved in the ISEE Assessment by UNESCO MGIEP, I embraced the opportunity as I thought I could bring forth my expertise and enthusiasm to contribute to the Futures of Education. Apart from digital learning and online education as the main areas of my expertise, my experience in multidisciplinary research, educational development, and interest in global education were what got me involved with the ISEE Assessment, enabling me to continue and develop my knowledge in these subjects further.

As an international education specialist, I am interested to learn about the accessibility of education provided to children at all levels and within all contexts, as well as how educational opportunities are designed and delivered to meet the demands of all who are in need. In particular, I am curious to learn how emerging technologies can facilitate all these processes within associated contextual factors. Although the use of digital technologies in teaching and learning have created new forms of education and pedagogies, their potential in promoting education accessibility and improving learning experiences are still to be fully realized (Livingstone, 2012; Selwyn, Nemorin, Bulfin & Johnson, 2018).

As a result of COVID-19, education systems globally are facing unprecedented challenges (Ali, 2020; Karalis & Raikou, 2020; Pokhrel & Chhetri, 2021). In order to understand and get a clear picture of the global education situation and the challenges we face, we need a comprehensive and systematic approach to assess relevant data and evidence from different contexts to deal with local policies and practices, pedagogies, inter-sectoral communication and cooperation, and transferring scientific knowledge to policy and practice. I think the ISEE Assessment has been a timely initiative in doing so, although whether it has been successful

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in collecting diverse evidence and covering global populations is a separate question.

The ISEE Assessment has made it possible to gather a pool of experts from many disciplines to bring together evidences from different contexts (although with all its limitations) which provide a base for understanding the research and educational practices at an international level. The ISEE Assessment afforded the possibility for me to interact and cooperate with researchers and experts from various disciplines which helped me better understand the complicated nature of human learning and development and broadened my view on learning experience; that is multifaceted and influenced by multiple factors including biological and neural aspects, cognitive and social-emotional conditions as well as socio-economic contexts. Working as a Fellow for the ISEE Assessment also revealed to me the complexity of multi- and interdisciplinary collaboration, reconciliation of multiple scientific perspectives, and especially extrapolating on the research results to come up with recommendations for policy and practice. Through the multiplicity of disciplines and stakeholders of the ISEE Assessment, a few major challenges and outcomes, amongst others, were also realized as follows:

Firstly, the ISEE Assessment has faced the challenge of representing sufficient data, research, and evidence from diverse global contexts despite its aspirations to do so. Experts and perspectives from the so-called 'global south' were underrepresented in the ISEE Assessment, reflecting the overall state of knowledge production on education and learning dominated by the 'global north'.

Secondly, what we can construe from the ISEE Assessment and what I have learned personally from my work with Working Group 3 reveal a gap between research, policy, and practice at all levels of education. This means that there are no effective channels of communication between the scientific community and those in policy making to enable soliciting the needs of the education sector and to transfer the scientific knowledge to practice. It was also felt challenging for academic scholars to conveniently extract policy-making recommendations from the scientific knowledge and appropriately communicate them in comprehensible language to policy decision stakeholders.

Overall, my experience of working with the ISEE Assessment has been a combination of challenges and fulfillments: communication and interaction with different stakeholders, and a learning journey and development of exchanging ideas and collaboration with fellows and other people in the Working Groups. I am contented to have had this opportunity to be connected to many experts from different disciplines, and to share my passion for the common causes of educational improvement particularly to contribute to the UN's SDG 4- Quality Education.

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My first step ***out of the Ivory Tower***

RONGXIU WU, ISEEA FELLOW

Rongxiu's research focuses on large-scale data assessment in various disciplines, for instance looking at how institutional contexts affect the groups of individuals with methodology HLM (Hierarchical Linear Modeling), especially how school contexts affects the students' performance in reading, math and science. Her study also involves methodology of Rasch, Item Response Theory in scale validation and SEM (Structural Equation Modeling), CDM (Cognitive Diagnostic Modeling) in data analyses.

Working as a Postdoc Fellow in the ISEE Assessment UNESCO MGIEP has proven to be an invaluable experience on my journey towards an academic career. The interdisciplinary team is diverse, providing opportunities for early career through to established researchers. Everyone on the team has a platform from which to exchange ideas in a way that is truly collaborative.

My research background is in international large-scale assessments (ILSAs). This aligns well with my work on a chapter on Assessment in Context in Working Group 2 and for engaging in the Summary for Decision Makers (SDM) group. **Working as a part of the ISEE Assessment team has expanded my knowledge of theories and forms of assessment, and in turn my capacity to contribute has grown.** I have also developed a much greater awareness and understanding of the implications of assessment, with my thinking about learning assessment now encompassing the broader contexts of globalization and the knowledge economy. As a trained quantitative researcher, I have been able to contribute my particular skills and knowledge around data to support and strengthen our decision making. In turn, I am benefitting from a greater understanding and application of both cross-sectional data and longitudinal studies and how their results are used in practice. There is great satisfaction in working together in our shared responsibility to move the research forward with both qualitative and quantitative approaches.

The way the ISEE Assessment Group operates promotes an active space for researchers to exchange ideas and collaborate. Through monthly online meetings with Assessment Co-Chairs, Working Group Co-Chairs, and fellow Postdocs on the ISEE Assessment Panel, I have access to researchers from different areas in education globally. Through specific tasks assigned to me, I have learned invaluable skills in how to be flexible and adapt to different ways of working in various sub-groups and to challenge myself to learn new knowledge. I have grown professionally through collaborative work with senior

Learning Experiences while ***Contributing to the ISEE Assessment***

JULIETTE DIEBOLD DE MELLIS, ISEEA INTERN

Juliette Diebold de Mellis is a Masters student in International Economics and Development at Paris – Dauphine University. Her interests include education and health for development, microeconomics and fencing. She will be supporting ISEE Assessment till end of June 2021.

writers on the assigned chapters, as this work involves developing and engaging in networks that include all levels of researchers around the world, and includes scheduling and leading the meetings where needed. I believe working in a diverse team has equipped me with a broad set of skills for success both professionally and academically—to be open-minded, proactive, collaborative, and committed.

The practical experience I have gained working with my team aligns closely with what I have learned in my PhD study. The work has been a wonderful stepping-stone to launch my career. I am particularly grateful that I am working in a research environment built on trust, respect, and the energetic pursuit of the highest standards, based on the freedom to explore and express our ideas. Even more so, I appreciate that this work can continue in this

For me personally, it has been a life-changing opportunity as my first step out of the 'ivory tower'.

difficult time, in which the COVID-19 pandemic affects every aspect of our lives. Together, we are confident in our achievements, and excited to present the ISEE Assessment report to the world next year. I believe it has the potential to encourage educators to rethink education from many diverse perspectives. **For me personally, it has been a life-changing opportunity as my first step out of the 'ivory tower'.**

While undertaking an internship at the UNESCO MGIEP, I had the opportunity to get involved in the ISEE Assessment. **As a development student, I feel very close to subjects related to education issues and thanks to the ISEE Assessment, I had a unique chance to develop my knowledge about it. In particular, the multi-disciplinary approach allowed me to understand in a wider way how education should be rethought in order to meet the challenges of the 21st century and the sustainable development goals.**

By assisting the ISEE Assessment Secretariat, I was assigned to work on a large set of chapters, which made me understand better the aim of this evaluation. **By taking a multi-disciplinary approach but also a multi-perspective and a multi-cultural one, involving the expertise of a broad range of writers and knowledge holders, I grasped the complex way the ISEE Assessment addresses education issues around the world.** Starting with the purpose of education and the explanation of human flourishing it assesses after the issues that educational programmes and teachers face in the world. I really appreciated the contrast the assessment provides, for instance, chapters on the role of education in conflict areas or chapters on diversity at school, underline the different states of education but also make us understand how education has evolved and what are the next challenges of our century.

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The ISEE Assessment - *An Evidence Based Multidisciplinary Approach*

KAVYA BHARDWAJ, ISEEA VOLUNTEER

Kavya is a Researcher-Practitioner, Mental Health Professional. She uses a multidisciplinary approach to study and improve preventive health measures. Her work experience has spanned different client categories and age groups, focussing on providing psychosocial support to people from diverse cultures, abilities, backgrounds, and sexualities. She has passionately worked on suicide prevention among the youth and their outreach for mental health services.

COVID-19 has massively changed the way we think about education. More than ever before, the world is realizing how digital pedagogies are evolving at a fast pace. We are also realizing worldwide, how digital pedagogies desperately require regular updates. This pandemic has taught both teachers and students alike new ways of learning digital tools. And, at this unique juncture in history, there is a need to systematically evaluate if today's education and theories of learning are in sync with the current and future needs and challenges of the education system. This inquiry is essential to inform policy making across nations. **Certainly, one cannot deny that there is an urgent need to address questions such as "are our education systems still serving the right purpose?** And are they equipped to address the pressing challenges we face?" (Duraiappah et al., 2021). These significant enquiries are the key questions that ISEE Assessment's team of multidiscplinary independent experts are addressing.

It is hard for educational systems to apply the latest research findings in practice. Additionally, context be it, cultural, political, technological, social and geographical is vital in planning policies and discussing topics such as 'Digital pedagogies for future educational agenda'. **As a part of the ISEE Assessment's team, I was delighted to work with experts to help fill these gaps. I am often intrigued by the focus on evidence-based approaches during discussions, team-building exercises and presentations.**

Certainly, one cannot deny that there is an urgent need to address questions such as "are our education systems still serving the right purpose?

My experiences of working with the team have been heart-warming. As this Assessment would offer 193 UNESCO Member States an evidence-based assessment of education, I have been pleased to play a role in this great initiative. As a researcher and a mental health professional, this opportunity is unique for it allows me to interact with and contribute to a great range of experts on educational systems. **It is humbling to know that in a post-COVID-19 world, the results of the ISEE Assessment would be an integral knowledge to inform policy making and future research objectives.**

As a part of the ISEE Assessment's team, I was delighted to work with experts to help fill these gaps. I am often intrigued by the focus on evidence-based approaches during discussions, team-building exercises and presentations.

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Flourishing through *Education*

TSERING YANGDOL, ISEEA VOLUNTEER

Tsering is a Tibetan born in Agling, Ladakh, a remote Tibetan refugee settlement in India. The Mind and Life dialogues inspired her to learn the workings of human brain and psychology. She pursued her education in Psychology with a Masters degree in psychology from NYU. Currently, she is the Mental Health Program Coordinator, Department of Health, Central Tibetan Administration based in Dharamsala.

Being a part of the ISEE Assessment has not only widened my perspective of the world but reaffirmed my universal identity as a citizen of this world. **My journey as a part of the ISEE Assessment has introduced me to global community of experts from diverse backgrounds coming together to make this world a better place with a healthier future focusing on the potential of humans to flourish through education.** To flourish- for all sentient beings on this mother earth not by following a blind faith but through utilization of human's greatest tools that are reasoning and imagination (Harari, 2014, pp. 22-36).

His Holiness the 14th Dalai Lama (2011, pp. 93-97) emphasizes modern education as the only way to ensure a future world of peace and understanding. An education especially, of the hearts and minds. Socio-Emotional Learning or SEL stems from this wisdom focusing on cultivating inner values such as compassion and loving-kindness. For me, the ISEE Assessment works towards the same direction and operates on a larger scale.

Being a part of this project has given me opportunities to undertake inner sojourns, reflect on my encounter and understanding of education and the very purpose of my life. Human flourishing is a term I first heard in being a part of the ISEE Assessment. Despite its novelty to me, the meaning of the term is familiar. Reading different theories and perspectives on flourishing resonates with my experiences of being a student of human psychology and having had witnessed myriad human experiences. Despite our secondary differences on the basis of colour, gender, political identity, etc., we are all human beings with similar 'needs' (Maslow, 2018).

Being humans, we all seek happiness and try to avert suffering and pain. To me, human flourishing relates to that basic tenet of humans' desire for happiness. **ISEE Assessment shows a pathway to achieving this goal, as individuals and as societies towards a collective global community.**

Moreover, my experience working on the ISEE Assessment spoke to my childhood having born into a refugee family, growing up in a remote refugee camp in Leh- Ladakh, India. Unlike many other refugees, I was blessed to have received an opportunity and access to formal education in a small village school called Tibetan Children's Village school. Back then, my purpose of education was for my country's freedom. We were constantly reminded of the invisible letter "R" (Refugee), having imprinted on our foreheads. Education to me then was scoring distinctions and getting prizes.

However, with time, opportunities, growth, and consequent exposure to the outside world, I realized that education is beyond scores and classrooms. It is what I do with the knowledge I have gained. It is how I perceive and relate to the world and the people around me in my thoughts, behaviors, and words. **My purpose widened as I met other individuals with their meaning of education and freedom.** I am surprised by how similar our purposes are. To me, this is a realization to witnessing the uniformity of Maslow's 'self-actualization needs'. As Paulo Freire (1972) beautifully described education as a tool to liberate one's potential than a mere deposition of information, the opportunity to be a part of the ISEE Assessment reinforced my understanding of education as a right and the only pathway to nourish human potential and self-expression. The robust scientific evidence for flourishing and education as tools to nourish human potential and self-expression helped me deconstruct my long-standing conceptualization of education from a concrete classroom setting with a rigid assessment/ evaluation system to a nuanced and a broader understanding of education.

The ISEE Assessment has given me an opportunity to reflect and exercise my universal responsibility in my day-to-day life. The Assessment has strengthened my way of communicating with others keeping in mind the viewpoint of "we, humans" and our ability to "flourish harmoniously".

In a nutshell, this project gave hope to many marginalized children like my friends and I, of a future, that cares for and matters to us. **This assessment has implications for individuals from all walks of life as well as governmental bodies, global organizations, and private institutions to undertake universal responsibility in shaping a better future.**

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An Interview by Rebecca Merkley *with Mary Helen Immordino-Yang*

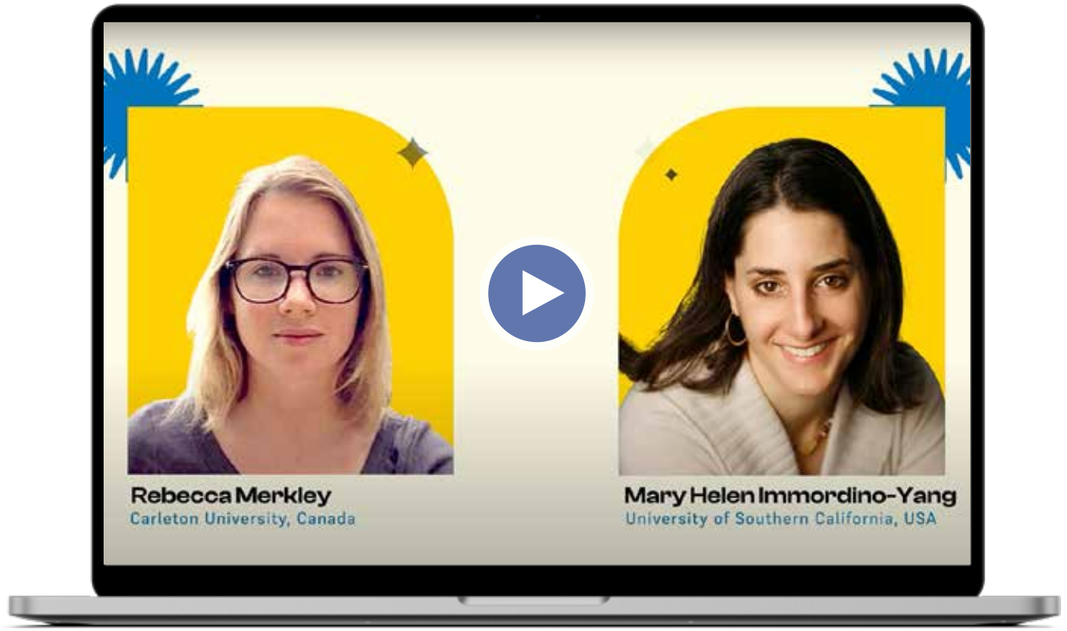
BY REBECCA MERKLEY

Mary Helen Immordino-Yang, EdD, studies the psychological and neurobiological bases of social emotion, self-awareness and culture and their implications for learning, development and schools. She is a Professor of Education at the USC Rossier School of Education, a Professor of Psychology at the Brain and Creativity Institute, a member of the Neuroscience Graduate Program Faculty at the University of Southern California, and Director of the USC Center for Affective Neuroscience, Development, Learning & Education (CANDLE).

Rebecca Merkley is an Assistant Professor in Cognitive Science at Carleton University in Ottawa, Canada. She has a PhD in Experimental Psychology from the University of Oxford and an EdM in Mind, Brain, and Education from Harvard University. Her recent research projects have included research-practice partnerships investigating whether educators benefit from learning about findings from the science of learning and implementing them in their classrooms.

Our ISEE Assessment Research Fellow, Rebecca Merkley, sat down to have a virtual conversation with Dr. Mary Helen Immordino-Yang, Professor of Education, Psychology and Neuroscience at the University of Southern California (USC), Director of USC Center for Effective Neuroscience Development Learning and Education and Advisory Board Member of UNESCO MGIEP's International Science and Evidence based (ISEE) Assessment.

Over a quick thirty-minute rendezvous, Rebecca and Dr. Immordino-Yang spoke about the importance of the ISEE Assessment, its multidisciplinary and evidence-based nature, the need for personalised learning, the requirement to re-look at standardised examinations and much more. Read the full interview below.



Rebecca Merkley

My name is Rebecca Merkley and I am a Research Fellow at International Science and Evidence-Based Education Assessment, which is being led by UNESCO's Mahatma Gandhi Institute for Education for Peace and Sustainable Development (MGIEP). And today I have the pleasure of interviewing Dr. Mary Helen Immordino-Yang who is on the Advisory Board for the Assessment and has kindly agreed to chat with us and tell us a bit about her experience.

So, Dr. Immordino-Yang what attracted you to the ISEE Assessment and why do you think it is important? Why did you want to be involved with the Assessment?

Mary Helen Immordino-Yang

Hi Rebecca. It is good to talk with you. **I think what is really important about an Assessment like this one is the need to connect around the globe around issues of child development and education.** Education is the gatekeeper. Educational opportunities are gatekeepers too. So, it is really important that we have conversations across nations, across borders around these really important issues that face our children and share what we are learning so that we can all benefit.

Rebecca Merkley

How do you think your research or even neuroscience broadly might have an influence on education and human development and flourishing?

Mary Helen Immordino-Yang

I think when we are studying a topic as complex and cultural and context dependent, as human development and flourishing, it is really important to bring to bear all the levels of analysis that contain the ways that we can learn about the complex system we call humans. In the last few decades, there has been a growing body of evidence around the understanding of the biological underpinnings of human development and flourishing and learning, and so it is really important to bring that evidence to bear when we think about how we design opportunities and support experiences for young people to be able to engage optimally in opportunities that the world will allow them to grow themselves over time in ways that are beneficial in the current modern world. I think all of the sources of evidence need to come together to a central conversation where we integrate and reconcile these different perspectives to be able to understand in a multi-dimensional way -what is going on and what that means and what we decide to do.

Rebecca Merkley

Great. Yes. I fully agree but it is not the easiest thing to do...

Mary Helen Immordino-Yang

No.

Rebecca Merkley

Your research of course is multi-disciplinary and trying to combine all these perspectives is a challenge and determining what kind of evidence is even best to inform education must be a challenge.

Mary Helen Immordino-Yang

Yes. One way to think about this is that everything we study with humans is always context-dependent. There is no such thing as something that you know, is devoid of the context that you are studying. So, what we really want to do is to develop methods and theories that allow us to align our experimental methods and our interpretations of data to the information about the context in which those data were collected and how those people are growing so we can start to understand the relationship between humans and their context. Because education is fundamentally, at its essence, about supporting that relationship.

It is about building environments that are conducive to certain patterns of mind that we think help people to flourish in today's modern world - and to be happy and productive and to be able to fully participate in the world that they see around them and to really understand how are educational opportunities can provide the support for that kind of development. We really need to understand how education shapes development.

Education is society's grand experiment to try to shape and tailor development to particular kinds of profiles and skills. We really need to understand how our young people's engagement with educational opportunities molds them over time and what that means for what we might want to do.

So it is difficult since it is very multi-disciplinary, which really involves understanding our data as context-dependent, as complex and multidimensional and even if you are focusing on only one process i.e. cognitive mechanistic process, you need to remember that you are doing that to hold a constancy and look at how the cognition varies given that emotions are constant.

But you always have to remember that what you discovered isn't a 'thing' in a person with all the rest of what's going on there. So how do we take these mechanisms and sew them back together without making a Frankenstein monster? For those who are not from the Western context and who don't know what Frankenstein is; Mary Shelley has this famous novel where she has a rogue scientist who takes dead people's parts and molds them together and creates a spark of life and makes this monster.

But how do teachers, school administrators, parents and communities use the information about these mechanisms when those mechanisms have been discovered and described in a context that is very controlled. What does it mean for these mechanisms to be playing out in various ways around the world, in various kinds of context taking into account human individual variability, cultural variability, variability in an emotional and social context? All of those kinds of really dynamic, situated questions are the key to being able to use evidence productively in education.

What I think adds an extra layer of complexity is that the science even when it's done incredibly carefully and well, can never tell us what to do. It can only help us to understand what might happen. For example – if we do this versus that or why certain things are coming out the way they are and then we as a society, as community members, as parents, and as children need to step back and think about it. So then given these contingencies, what would we want to do? What do we think is good and right? And that layer of value-driven interpretation is informed by science but is not directly given to you by science and so I think an Assessment like this one is really a nice way to demonstrate that fact that we are looking at these different sources of evidence from around the world and trying to really delve into what's known scientifically but then also to think about how does this play out in different ways in different places and what does that mean for what we want to do?

Rebecca Merkley

Right. And that's the huge challenge we've had in compiling this Assessment - as you said science can't really tell you what to do when it comes to making policy recommendations – and so one thing we kept coming back to was the importance of teacher and student agency in deciding what to do with this information.

I think when we are studying a topic as complex and cultural and context dependent, as human development and flourishing, it is really important to bring to bear all the levels of analysis that contain the ways that we can learn about the complex system we call humans.

I was just wondering how do you communicate this complexity in such a way that still makes it useful for people to know? I guess if you could tell everyone, all teachers and students and policymakers one thing about human development and education, what would it be?

Mary Helen Immordino-Yang

It would be that the subjective experience of the people is what actually drives the development at the end of the day.

So you need to really take seriously how the people in the system are experiencing the opportunities the system provides.

People grow themselves from the inside out. We are not just passive beings who get 'stuff shoved at them. We are not passive recipients, with teachers who hold knowledge and give the knowledge to us. And we may be like don't give (the knowledge) to us too fast as you are over-working our memory or don't give (the knowledge) to us slow as we will get bored. That is the wrong metaphor. It's still true but it is the wrong metaphor because it overlooks the really important fact that people are co-constructing the learning together.
Young people don't passively receive 'stuff'. They construct internal narratives that allow them to build schemas about how the world works and we need to take really seriously the ways we present opportunities to kids, facilitate them, iteratively constructing and deconstructing and reexamining the kinds of implicit sometimes, explicit narratives that they are constructing about how the world works.

Because ultimately it is those narratives and the factual and procedural information that substantiates those narratives that they take forward into the world as thinkers. So it really speaks to the need to shift the way we assess in education and here I mean like a more traditional, evaluative way of understanding and documenting what the kids know and can do to really also incorporate how people think and dispositions of mind and heart that they develop in our educational system and the ways those dispositions are framing their citizenship, their thinking, their productivity, their innovativeness and their cognition going forward. **And we can only understand such a complex system if we think about it from a multifaceted, multi-cultural, dynamic and complex way.**

So, what I would say is, it all boils down ultimately to the experience of the person and we need to find ways to take that seriously to evaluate it, to understand it, to probe it and then to support that. That's something that's difficult but not impossible to do and there are definitely school systems around the world that do this in an incredibly amazing way and have wonderful results.
But it's not easy and it really isn't efficient in the most direct sense. Development is not an efficient process. The administrative side of school can be an efficient process.

But the actual developmental process in which young people are constructing their own internal narratives and schemas and knowledge that's usable, that becomes part of who they are, that they can dynamically and flexibly adapt to different contexts and transfer and bring with them.

That process of constructing knowledge is not efficient any more than parenting children is meant to be efficient. I mean it takes time for your two-year-old to grow into a four-year-old and they have to go through all the two to the four old 'stuff' before they get to four years old. It's a process that we have, and **we need to have not just patience for that process but we need to relish that process in education because that kind of messy, dynamic, human side is what makes us, us.** It is where innovation comes from, that's where well-being comes from and is where the true citizenship comes from.

Rebecca Merkley

Do you have any concrete suggestions on ways to develop an assessment to be more culturally sensitive and define how kids are developing rather than just measuring what they already know?

Mary Helen Immordino-Yang

Currently we measure what people already know but we need to keep in mind that (when we measure), we are measuring what they know in a particular testing context. It's okay to do that so long as you're also trying to capture and support this messier and more dynamic situated cultural learning processes that people are doing and there are great models for doing this.

There's a model for example in the US in a Consortium of Schools in New York City called the Performance-Based Assessment Consortium Schools, which are public to standard public schools that enroll community kids from all kinds of backgrounds but they organise the curriculum around big theme-based questions - the kinds of questions kids can really sink their teeth into.

I once sat in a tenth-grade history class they called "democracy is an argument" and the whole course was teaching the history of the United States and the Western or Eastern worlds around the notion that there's this constant tension that's being negotiated between individuals' needs and society's needs. And when you frame it like that, it gives you something meaty to sink your teeth into so you deeply understand the history but you will also come away with dispositions and skills for noticing these patterns going into the future in situations you have never yet encountered. For example, if your democracy starts turning very authoritarian, how were you going to notice that? You need dispositions to notice that and nothing from your factual history class is going to help you unless you've actually developed this disposition to thinking historically and integrating those things into a bigger narrative that you can play out in a kind of time travel way into the future.

So I think, there are ways to do this and it really puts a lot of expectations on the level of training of the professionals in the system. We really need to elevate the teaching profession to assist teachers in a profession which is warranted, which many teachers do perform at but we really need to support them more systematically to be able to engage with something as complex as human developmental science. They need to understand the development they're promoting, they need to deeply appreciate the processes of growth that kids engage in to be able to build the development that they're promoting and then they need to have supportive cultural and administrative environments in which they are adequately supported in engaging community while building these opportunities for kids.

Another really great example; I sent my own daughter (when she was fifteen) to spend a year in a Danish after school. She had to learn to speak a lot of Danish as she was the only foreign kid in the school. The Danish residential programmes that they have for one year is where kids from all over the country (who have a similar set of interests) come together to meet a whole group of kids they have never known before. Together they deep-dive into some topical way of thinking – in sports, orchestra music. The one my daughter went to was kind of an interdisciplinary social studies school – it was about who you are as a citizen and how you can engage with that question in all those academic and the scholarly ways.

That was an absolutely pivotal turning point for her as a young person where she was suddenly engaging with these deep questions around her own scholarship.

Why am I interested in this? Am I done yet with this project? What have I learned here? Where am I in the process with other people? How can we leverage off each other's skills and talents in conversations to be able to build something more? Or are we done with this and do we move into something else?

For her, it was a huge shock coming from a standard American public school that is very high performing but it's very driven by these external metrics of achievements such as grades and test scores. And she flourishes on all that stuff so it was like "let's get out of here and let's go do something for real that actually engages with what you're interested in and think about what that would look like and what it would mean to really meet new people and think in ways that you've never thought before."

There's just one little evening phone call I had with her which really stands out and she said to me halfway through the school year, "Mom I'm realizing something about myself, I'm really embarrassed to admit this is true. You know those kids who just get a boyfriend or a girlfriend at school and it's not that they really love the person - it's just that they just kind of want to have somebody by their side all the time to eat lunch with and laugh at their jokes and tell them they look nice and say they're funny and pretty and stuff." And I said, "Yes." She was like "I realized that's grades for me."

It's not really the relationship that you will stay with for your life. You are not in it for the intrinsic value. They just did not have that in the after school. There is no such thing you know. Your teachers are there and they are learning with you. You're working with them and they just ask you are you done with this project yet or would you like to keep going?

Rebecca Merkley

Just like graduate school…

Mary Helen Immordino-Yang

That's right. It's exactly like that. It's like mini graduate school. It's like the graduate school orientation but for tenth graders. Another example would be my own son who attended an experimental school during middle school - what would be sixth to eighth grade in the US i.e. age eleven to thirteen. He went to a very small experimental little school that existed for just a few years in that form that was founded by Elon Musk, the owner of SpaceX. He went to this school that was very project-focused and they also engaged with deep conceptual content. I remember him coming home one day, again he had gone to a very nice standard community public school up to fifth grade and then he went to this school in sixth grade. As a child, he is not demonstrative - he is not a kid who is like "yay I got an A". I always had to ask him how he is doing or what's going on?

Six months into sixth grade and all of a sudden I see this math test stuck on the refrigerator in the kitchen with a 50 percent on it. For a person, who is not very demonstrative and has never put a test on the fridge – for him to put a test with 50 percent was quite surprising.

And so I asked him, "What is this?" And he was like "Yes, this is my math assessment. I got half of it right. I haven't seen some of this math. I didn't know and I had to figure it out and my teachers said there's a formula for that. I didn't really need to fold my paper fifteen times to solve this geometry, but I kind of got close to the answer."

And he was like so thrilled that he got half of it right because he scraped it together and he's like "next year I'm going to redo these things and I'm going to be able to do it using algebra instead of just scraping it together by folding a paper. But for now like my teacher said I've done a really great job trying to figure this out and look I almost got it right."

Why aren't all tests like that?

It really was a test of what you can think about and do on the fly and it took him six months to do so in a school without grades. He was immersed in this process-oriented culture where he was fully aware that this was just as a journey he was on in Mathematics and he could take some steps up on this big trail but he might have to learn how to use his hands and next year he would be able to get up to the cliff but that's okay because this is the fun part of climbing the mountain.

So, to summarize, there are ways to assess, there are ways to design for this and they're being done and it can even be standardized as in the case of Performance-based Consortium Assessment they developed in New York where a panel of teachers come together with community members and experts and engage with the (students) to figure out an ongoing project that they revisit over the course of the semester, a year or four years, depending on how much they love that topic.

There are standards describing the level of thinking that the young person is undergoing with that work and then **encouraging them to engage with more depth, with more complexity, with more clarity around the topic and to bring in the disciplinary knowledge they need along the way in a pull model instead of a push model that we usually have an education.** They set the kid up to pull the information in and they need it to understand what they're doing.

You can actually standardise the levels at which kids are producing thought-provoking work in domains and you can use those as ways to assess the achievement of the learning. But achievement learning in the service of what? In the service of the broader intellectual development of the person and not in the service of 'graduation'. It's very clear that you know you're on a journey and you might have accomplished a milestone and now that puts you at a place where you're ready to use it more or to incorporate it into something else or not to but just to have an appreciation of that kind of work.

Rebecca Merkley

You talked a lot about the individual student learning experience. I'm just wondering how you see this Assessment in supporting multidisciplinary science and evidence for education and how this information could then be used to help better support individual students' learning as you said – in different contexts and cultures?

Mary Helen Immordino-Yang

Right, so you don't need to reinvent the wheel everywhere. There's a lot that can be shared and learned and adapted to your own context. People need to build it for themselves even if you're building exactly what you have across town, you still need to build it for yourself to own it and to really understand it. You don't just adopt models in life to do what you're told. Well, you can but that's like "enforced mediocrity". That's better than nothing but it's not great and it will never be great. So, when an assessment when is well done can help give people ideas. it's a jumping-off point for conversation.

It's a source of integrated, synthesized and consolidated information about what's known, what's being done, how it seems to be working in which context and why we think that might be and they can take that and sit with it and figure out what might they be able to do and how might we know it's working? And what do we value and want for our young people and for teachers and how are we going to give them the opportunity to engage in a fully authentic way with that? So it's a source of integration of information for people, so they don't have to start from the drawing board every time. They can get ideas, they can borrow, they can learn and then they can sit with it and understand for themselves what it needs.

Rebecca Merkley

Great. Well, thank you very much for chatting with us today.

Mary Helen Immordino-Yang

Thank you for having me. It was my pleasure.

Reimagining education: *What stakeholders in education want?*

ADITI PATHAK, **MAHATI** KOPPARLA, **SONAL** CHANDRAKANT CHHEDA

Aditi has more than 12 years of experience in the field of Education for Sustainable Development, Global Citizenship, Teacher Training, Curriculum development and Programme Design and management. At UNESCO MGIEP, Aditi is currently managing online courses on Climate Change and SEL for middle school students.

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Sonal graduated from Teachers College, Columbia University with a degree in International Educational Development. She has five years of experience in the education sector as a high school teacher, program evaluator, curriculum developer, and policy researcher. In the past she has worked with WFUNA, UNICEF and ExpandED Schools, a New York-based nonprofit. At UNESCO MGIEP, she is working closely with the Head of Policy in identifying strategic entry points for engaging with the UNESCO Member States and support the implementation of SDG 4.7 in India and Asia-Pacific.

The education systems of today have emerged from the needs of the industrial revolution and have hardly evolved since then, or so it has been argued, while the world has moved from an industrial to a so-called 'knowledge society' and is transitioning to an 'intelligence-based' society. **In many places across the world, classrooms, curriculum, teaching, testing and the overall aim of education seem to remain a reflection of the past.** They might have been modified over time, but the foundations of education systems and how learning is organized seem to be largely unchanged and far from 'future ready'. The notion of an intelligence-based and AI-driven society has evoked, to some observers, a sort of dystopia familiar in science fiction. While the ongoing pandemic has made us all feel like we are living in a Sci-Fi film, it has made us see clearly that our education system is largely ill-equipped to shift to alternative means of instruction and cater to the needs of the learners in the face of the ongoing health crisis and impending apocalyptic scenarios of environmental crises.

The unprecedented disruption to education systems — which has affected more than 1.5 billion school students and youth worldwide — has given a renewed impetus to the urgency of reimagining education to shape our future'. Harnessing knowledge, education and learning for the future of humanity and the planet is surely one of the most important policy debates of our lifetime. To advance public debate on the futures of education, key stakeholders — students, youth, parents, and teachers — cannot be left on the sidelines. UNESCO MGIEP organized a series of virtual round tables, youth dialogues (TAG^e, see below), and an online survey to gather views of key stakeholders on the theme of 'Reimagining Education', in line with UNESCO's Futures of Education initiative and UNESCO MGIEP's International Science and Evidence based Education (ISEE) Assessment. In this article, we focus on the following three themes that key stakeholders deliberated:

In many places across the world, classrooms, curriculum, teaching, testing and the overall aim of education seem to remain a reflection of the past.

1. Purpose of education is defined here as the broader aim, meaning, reason and the end goal of education. Focusing on the "why" of education, participants were encouraged to think about why people go to school or college or get an education.

2. Learning experience is any interaction, content, curriculum, pedagogy, assessments, use of tools and technology and other aspects that constitute teaching and learning processes. Focusing on the "what" and "how" of education, participants discussed things they like and dislike about these aspects.

3. Learning Spaces are the physical or virtual spaces — be it the classroom, home, street, playground, online, etc. — where learning takes place. Focusing on the "where" of education, participants shared the realities they face and their hopes for what an ideal learning space is like.

How did we gather key stakeholder voices?

Virtual Roundtable

Based on the major themes identified, we prepared a survey and a semi-structured discussion protocol that were iteratively improved through consultation with external experts. We used a mixed-methods approach with the data collected using Focused Group Discussions and the Survey. Focused Group Discussions (FDGs) conducted with parents, teachers and students helped us gain an in-depth view of the various perspectives, while the survey provided a wider global outreach. The virtual FGDs were conducted between August and November 2020 in the five UNESCO regions with two discussions in each region for each stakeholder group. In total, 32 FGDs were conducted with 170 participants. Administered in English on Paperform from October to November 2020, the online survey was filled out by 556 respondents. It must be noted that selection of participants in the FGDs was limited by their familiarity with the English language and that qualitative nature of the study meant that data consisted of individuals' views and opinions and did not necessarily represent the educational realities of that region.

TAG^e

Talking across Generations on Education or TAG^e is a youth-driven intergenerational dialogue on education initiated by UNESCO MGIEP. It involves two phases: a month-long online discussion followed by a second phase where key insights from the online discussions are revisited in a live moderated dialogue bringing together selected youths and senior decision makers. During the online dialogue phase, more than 1,000 global youth from over 50 countries left close to 2,000 comments that drew out their experience and views on education. Limitations included over-representation from one region, namely South Asia (and especially India), and the use of English as the language for dialogue which prevented active participation from Latin America and Francophone Africa. Outreach was limited to only those having access to social media and internet, thereby excluding the most disadvantaged youth.

What key stakeholders say? Consensus and dissonance

Virtual Roundtables and TAG^e dialogues revealed that going to school or college has come to be seen as such a normative experience for all the stakeholder groups across the world—for many, an unexciting yet indispensable one to secure future financial security and fit into society. Yet, key stakeholders from children and youth to teachers and parents still shared strong faith in education as a key to holistic development, empowerment, and social and emotional well-being, as well as a frustration that the education system in its current form is not doing enough to achieve them.

While they all agreed that education needs to be reimagined, there were differences in their conceptions of education. For example, for teachers in Asia, Middle East and Africa, education was conceived primarily as a tool for empowerment; in Europe, North America, Latin America and the Caribbean, it was considered as a tool for social and environmental change. For female youth in Africa and South Asia, college was considered a symbol of freedom and source of respite from the restrictions put by their families—a journey from the "inward-looking" environment to an expansive and diverse one. Indeed, education can be a transformative force both at individual and collective levels—and the rude wake-up call of the COVID-19 pandemic gives us an opportunity to reorient education towards advancing well-being for all.

1 The purpose of education must be reimagined to allow it to impart relevant knowledge and skills:

There was a consensus view that the education systems are focusing more on academic skills. When asked about the reasons for going to school/college or sending their children to school/college, 48% of the survey respondents said that the primary reason was to gain knowledge and over 25% responded that it was to contribute to the society (see Figure 1). A deeper conversation has revealed that what

Figure 1: Why do we or our children need to go to school/college/university?

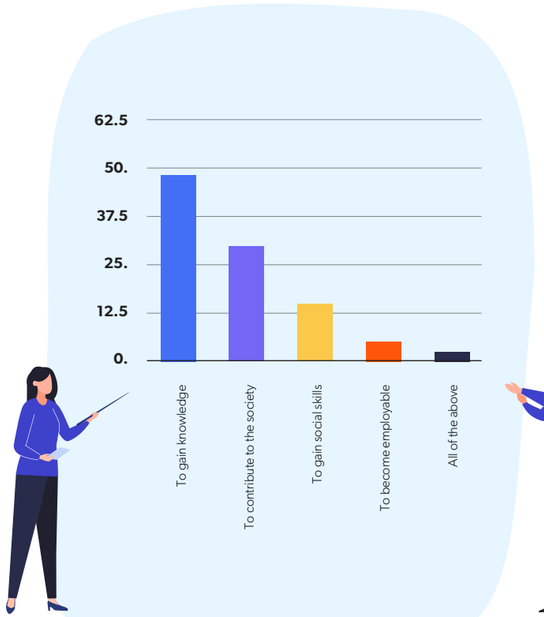
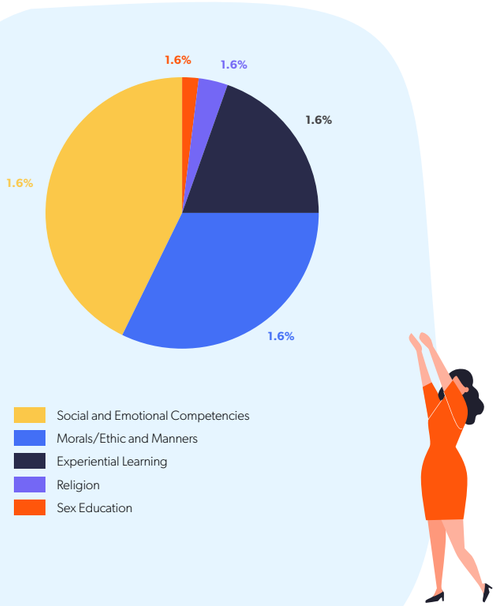


Figure 2: What should be taught in schools?



students and youth are seeking as "knowledge" does not necessarily align with what the schools/colleges are currently imparting. For example, about 43% of the survey respondents felt that social and emotional skills should be taught in schools and over 31% felt morals and ethics should be taught (see Figure 2). Youth in TAG[e] dialogues called for practical entrepreneurship and vocational education as suitable substitutes to college or university to gain relevant skills. In similar vein, 40% of the survey respondents answered that they would want schools to integrate real-life and practical topics such as taxes and financial literacy, cooking, career readiness, etc. in regular teaching and learning (see Figure 3). Students and youth would also want to have conversations about sexuality, gender, and world cultures among others, but most reported that schools or colleges were unable to address these wants in a meaningful way. Students and youth also wanted formal education to give them exposure to music, art and sports and to enable them to connect meaningfully to the world and parents felt the same way.

Most stakeholders embraced the role of a school or college in supporting socialization and fostering skills to navigate the changing society, asking for more explicit emphasis on building empathy, tolerance for diversity, and emotional and relationship management skills.

However, they were not confident that schools and colleges can support them to achieve their goals. Their disillusionment with the current form of formal schooling and its role in their lives was manifested in comments such as "we go to school or college because everyone does so".

Moreover, statements like "going to schools is a mindset passed from generation to generation" force us to re-examine the fundamental purpose of education. The common perception was that there is a mismatch between what students want to know and what formal education systems are set up to do.

Whereas there were concerted calls for making education more relevant and allowing them to keep pace with the changing needs of society, voices calling for education as a common good were not loud. Youths from lower socio-economic backgrounds from South Asia and Africa observed that college exacerbates structural inequalities through high tuition fees and other barriers. However, reflecting the fact the majority of participants in this type of exercise tend to come from the privileged sections of society, few stakeholders raised concerns about the role of education in reproducing social and economic inequalities. The failure of education in serving as a social equalizer or a democratizing force was largely unacknowledged.

2 Assessments must be reimagined to make educational experience less stressful and more meaningful:

When asked in the survey if they would like to change the examination system, over 75 percent of the respondents answered "Yes". In FGDs, several teachers from all five regions viewed assessments as essential tools to identify and address gaps, but they were unhappy that the education system had become test-centric and teachers, schools and even countries were evaluated based on students' scores. Some teachers cynically characterized the use of high-stakes exams by governments as an attempt to "create some sort of assurance to people outside that the education system is functioning well". As highlighted in figures 3 and 4, stakeholders felt that assessments in their current form need a serious rethink and teaching can be improved by incorporating experiential and interactive learning and learning about real-life and practical topics, rather than focusing on 'teaching to the test'.

There was a consensus view that matriculation exams and competition are causing enormous stress and anxiety for students and teachers, but there was divergent views on how much harm this does to students. Some parents from the Middle East and Asia Pacific were happy with the status quo, as reflected in comments such as "we turned out to be ok." Learners felt the pressure around assessments originated from adults and was imposed upon them, although many parents in FGDs did advocate for assessment tools that are "fun", "engaging", and maybe even "game-based" and include more observational and reflective aspects to give a holistic picture of learners' development.

There was also a shared sentiment that the focus on competitive examinations and standardized tests to measure learning and quality of education systems has made education impractical. Instead of such a one-size-fits-all approach, learners called for more individualized experiences that can shape their personal as well as professional lives. Stakeholders saw assessment and evaluation systems that measure and highlight learners' strengths and weaknesses and avenues for improvement as more fruitful than those comparing their test scores with others.

3 Learning spaces must be reimagined to foster student learning, engagement and well-being:

During the current pandemic, technology has enabled many learners to not only receive instruction but also remain connected with their peers. Reflecting the COVID-19 situation, stakeholders recognized that technology plays an important role in education, with the majority (over 56%) of the survey respondents answering it plays an "indispensable" role (see figure 5), and that it can enhance the teaching-learning process in innovative ways, with over a quarter of the survey respondents answering technology enriches learning (see figure 5) and over 13% responding that enhanced use of technology should be added to a learning space to support better learning. While technology has a great potential to provide opportunities for self-paced and self-directed learning and serve as an equalizing force, in FGDs, parents expressed concerns about increased screen time, lack of engagement between students and teachers and the resultant impact on student wellbeing and even data privacy. **Unsurprisingly, issues related to access — and what that means for learners in a competitive professional environment — were a grave concern for all stakeholders.** Yet, few have reflected on how the digital divide disproportionately disempowers learners from low income communities and countries not only in terms of access to digital infrastructure and online tools (known as 'first' digital divide) but also in terms of their use ('second' digital divide)[1], with evidence increasingly suggesting that new technologies tend to be accessed and used in ways that benefit privileged learners and widen socio-economic disparities.[2]

There was a consensus view that matriculation exams and competition are causing enormous stress and anxiety for students and teachers, but there was divergent views on how much harm this does to students.

Virtual Roundtables and TAG[e] dialogues revealed that the role of learning spaces in ensuring student well-being often remains unaddressed. Stakeholders called for physical learning spaces which are well ventilated and vibrant, with comfortable temperature, flexible seating, less noise and appropriate teacher to student

1. Attewell, P. (2001). The first and second digital divides. Sociology of Education, 74 (3), 252-259.
2. Reich, J., & Ito, M. (2017). From good intentions to real outcomes: Equity by design in learning technologies. Irvine, California: Digital Media and Learning Research Hub.

Figure 3: How can schools improve their teaching methods?

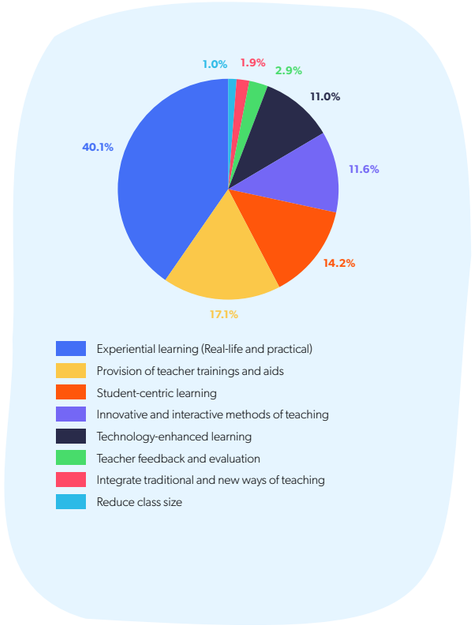
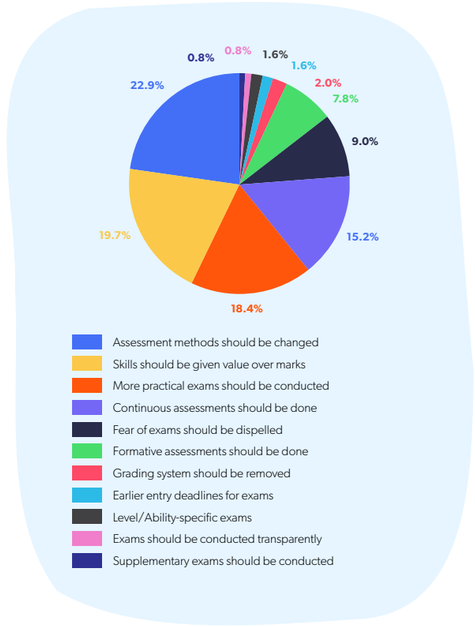


Figure 4: What would you like to change about the examination system?



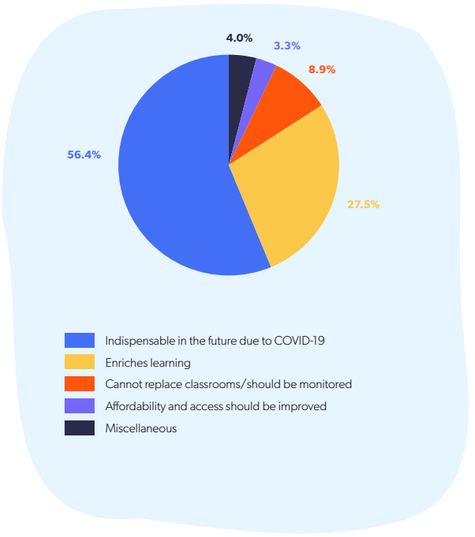


Figure 5: What is the role of technology in current and future learning spaces?

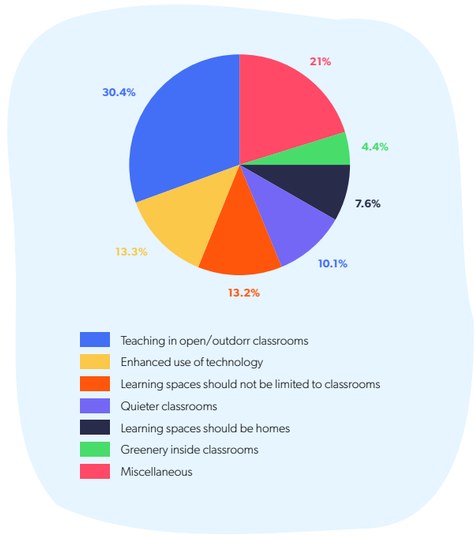


Figure 6: What would you add to a learning space to support better learning?

ratio. Stakeholders also highlighted that learning spaces must be 'safe spaces', where students can express themselves without any judgement and are able to interact and collaborate freely with their peers. Positive student-teacher relationship was also highlighted as an integral part of the learning spaces that helps students feel they 'belong' to the learning space. The importance of such relationship was also expressed through the high number of respondents who were dissatisfied with teachers' attitudes towards them. While technology may be taking the front seat right now, teachers are indispensable in curating learning experiences that have impact on learners beyond schooling and in the cognitive and social development of the learners. Negative comments and bias from the teachers can have a devastating effect on students' self-image and confidence.

Teachers, on their part, acknowledged the 'emotional well-being' of the students should be addressed but they felt they were constrained by an archaic system and lack of support that made it difficult for them to address individual student needs. There was a gap between learners' perception that teachers are indifferent to their needs and teachers' frustration with their inability to help students. This gap needs to be addressed through more dialogue between the two groups on the one hand, and education reforms which begin with the acknowledgement that teachers are overworked and need more pedagogical, psychological and other support on the other. Such support to teachers is especially important in the ongoing and post-pandemic context in order to allow them not only to use technology effectively and ensure lessons are engaging but also to manage their own emotions and develop positive relationship with students.

What key recommendations can be drawn from stakeholder voices?

Reform curriculum focusing on making learning relevant for the students and providing scope for the students to gain practical knowledge and skills, including social and emotional skills. Provide avenues for all-round development for all students.

Reform assessments to implement comprehensive and continuous evaluations so that they can support student learning, truly assessing learning gaps of students while reinforcing their strengths.

Invest in teacher capacity development to enable teachers to curate holistic, blended and transformative experiences for their students, as well as to enhance their own and their students' well-being.

Invest in school and college infrastructures, including technology-related ones, to create a more conducive and hybrid learning space, as well as **recognize non-traditional spaces and avenues of learning** as formal learning spaces.

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