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FUTURE OF WORK AND EDUCATION FOR THE DIGITAL AGE

The Means for Achieving Greater and Better Literacy: An Exponential Education Model in Support of the 2030 Agenda

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Abstract

A large percentage of children is still out of the schooling system. Curricula, education policies and partnerships seem stagnant and ill prepared to help our youth achieve the necessary literacy for the jobs and technological challenges of tomorrow. To combat these, we propose developing and implementing an Exponential Education model in which using new technologies (artificial intelligence, augmented reality, etc.) can effectively improve the quality and access to education. Our proposal discusses the need to establish aligned partnerships and catalyzing investments in human capital for the benefit of education and towards the timely achievement of the 2030 Agenda.

Challenge

Education represents a fundamental pillar for sustainable development for it strengthens democracies and fuels a nation's economy towards reducing poverty and enhancing opportunity. A common agreement on this prevails today, simply as evidenced by the existence of a dedicated Sustainable Development Goal on education (SDG4) and the extensive progress made over the decades in terms of access to primary and secondary education. There is still a large percentage of children out of the schooling system. Academic curricula as well as education policies and partnerships seem stagnant and ill prepared to help our youth to achieve the necessary literacy for jobs and technological challenges of tomorrow.

Some of the key challenges in education are:

- **Digital literacy as a key building block of cognitive development is generally absent from the education policy and academic curricula.** Exponential learning is characterized by its inclusive and collaborative nature as well as the use of technologies to effectively build relevant skills (critical thinking/problem-solving, creativity, computational thinking, among others) and facilitate life-long learning. This is important considering that work and employment are undergoing a redefinition derived from industrial and technological changes that will continue to modify the labor market and they will bring a new need to Education Systems: to change educational curricula in order to develop relevant competences amongst youth, so they can get opportunities for current and future (even un-created yet) jobs. Without the right type of education, the work force of the future will be both significantly reduced and less productive (Kim, 2018).

- **The persistent limited access to quality education widens the learning gap, particularly in developing countries.** The 2018 World Development Report signals that a key obstacle in access to education is simply the absence of schooling - about 260 million children do not attend school today. It is particularly alarming the gender gap amongst children's school attendance with 1 in 10 girls out of school compared to 1 in 13 boys[1]. The learning crisis is additionally embodied by the poor academic performance limiting the development of basic skills (World Bank; Kim, 2018).

- **The disjointed public-private collaboration is challenge of particular relevance hindering the delivery of life-long learning opportunities.** There is lack of strategic public-private partnerships and investments in human capital. The issue lies in that multiple actors have competing objectives, driving misalignment and incoherence in the education space. As Technology becomes exponential, more public-private collaboration is needed in order to deliver quality and relevant education.

Proposal

The G20 is the key Forum for tackling the above challenges, fostering innovation and strategic partnerships for greater impact. Engaging education as a key building block of human capital and employing new technologies to better interpret and enhance cognitive development is a pending task that we believe the G20 can successfully tackle towards a more dynamic, adaptable, and sustainable future in education.

Ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all (SDG4), is found at the heart of our proposal as the foundation in which to catalyze progress across all other SDGs. Fully engaging SDG4 is the means to systematically tackle poverty, hunger, health risks, and end inequality in all its forms - SDG10 (Didham and Ofei-Manu, 2015). Exponential Education is an opportunity to foster the rights of education, but at the same time, it is an opportunity to economic progress. It is an opportunity to leverage lifelong learning to students, at the time exponential technologies are promoted and used.

We define "Exponential Education" as:

A set of initiatives, projects and ventures that links exponential technologies

1 From an opportunity-cost consideration, when parents perceive that their children are not learning in school, a decision is made to cease schooling (World Bank, 2018). In this scenario, girls are amongst the first to stop attending school.

(augmented eality, artificial intelligence, internet of things, etc.) ***with educational strategies*** *(new ways of learning, use of technology in learning processes, etc.)* ***and resources*** *(public-private partnerships, specific country-wide projects)* ***so education becomes exponentially, cost-effective and sustainable developed where most needed.***

The exponential education model was conceptualized as a mechanism of inclusion which takes full advantage of new and evolving tech algorithms to better understand the learning capacity of our population and to deliver better education outcomes.

The following three-part exposition outlines the proposal to further develop and adopt an Exponential Education approach to foster the **skills and knowledge** aligned with tomorrow's challenges and jobs.

1. Relevant skills for diverse needs

Cognitive competencies in 'digital technologies' are becoming increasingly important in today's world. In different education systems, students are expected to develop reading comprehension, mathematical reasoning, and scientific observation as the basic competencies to build cognitive skills, problem solving, and critical thinking. Social and emotional skills such as perseverance, empathy and collaboration are additional competencies learned early in life (World Bank, 2018a). Relevant competencies of critical importance in addition include those in the digital space. These competencies, when developed at an early age, can serve as an extension of the learning ecosystem of each individual utilizing technologies for enhancing cognitive development. As with other learning competencies, a solid foundation in digital technologies and computational thinking (i.e digital literacy) will form part of the life-long journey of opportunities for each student. This is particularly true in today's technology driven world.

Computational thinking is already part of the education curriculum in 'digital technologies' across many countries today. Computational thinking is thought either as part of computer science courses or as a cross cutting concept in some or all curricular areas. Even though there is still little research on the cognitive or socioemotional impact that program learning causes, it is associated not only with critical thinking (mathematical, analytical and statistical), but also with heuristic thinking, expressed in the imagination, intuition, creativity and construction by approximation. A recent study concludes that computational thinking and the ability to break down a problem and developing an adaptive solution positively correlates with academic performance in any discipline and shows that it gives students a confidence towards programming particularly in girls (Lockwood, Mooney, 2017). As

a result, competencies in the digital space can help as an extension of a learning ecosystem, enhancing skills and knowledge.

While competencies in digital technologies are important, several low and middle-income countries still lack of curriculums in this area. Technological equipment and access have to be ensured; in other instances, digital competency must become a tangential skill rather than a complementary tool to basic cognitive development. Additionally, knowledge should be produced in order to incorporate technology into daily practice.

Challenge:
General absence of digital learning from policy and curricula. **"Without the right type of education, the work force of the future will be both significantly reduced and less productive" (Kim, 2018).** The right type of education in today's world must ensure digital learning.

Proposal:
We propose countries to adopt policies and curricula establishing digital literacy as a common area of importance for early childhood learning and development throughout primary and secondary education. The development and integration of digital technologies, particularly disruptive and exponentially growing technologies such as 'artificial intelligence', 'internet of things', 'virtual and augmented reality' and 'big data', have led to transversal transformations in the economy and society. The importance of digital literacy therefore cannot be underestimated. The incentives and rewards of prioritizing digital learning are clear, but there needs to be a push towards overall institutionalization of these policies and curricula to ensure that no one is left behind.

- **Policy** – evidence-based education policy must be considered essential to enhance schools and curricula effectiveness and for the achievement of inclusive and equitable quality education for all (SDG4). A comprehensive research agenda aligned with the growing trend in the use of digital technologies for education is therefore proposed to better understand the learning needs and teaching capacity for the coming decades. This will enable appropriate steps to be taken towards improvements in the education systems inculcating full digital [and inclusive] literacy.

- **Curricula** – Computational thinking, programming, computer science and robotics should all be considered as key digital competencies. To aid in the task, there exists a variety of open-access curricula and disruptive methodologies such as 'design thinking' available for teachers and educators as tools in their work. Additional research is encouraged on the ways in which

students develop cognitive skills; this, to better understand the potential of digital learning when applied across disciplines (see more on curricula in the next section).

By taking a deeper look at our education systems and its inherent interconnection with emerging technologies, we can foster a future in which our youth are well prepared for the challenges and the jobs of tomorrow.

2. Delivering an Exponential Education - where and how to learn (the extended classroom)

By taking advantage of the digital technologies' ubiquitous character, learning can be facilitated at any time and place and with few economic constrains (Pedró, 2012). Through digital technologies, children and young people can, for example, access the opportunity to learn from their homes or surrounding familiar spaces, minimizing long commutes and dangers along the way, while maximizing learning time. The use of education technologies in this manner may resemble, to some extent, what is known as 'homeschooling' which can be complementary or, when appropriate, entirely in lieu of the traditional schooling experience. Digital technologies, thus, open new and greater possibilities to address the challenges of learning while democratizing access and the opportunity to learn: they offer an extended classroom.

Challenge:
Persistent limited access to quality education.

Proposal:
We propose the formulation and adoption of an education model that employs emerging digital technologies as a complementary tool for extending the reach of literacy.

To achieve a significant reduction in the learning gap, which comes from the alarming rate of children not in school attendance, an extended classroom model of education is proposed. The extended classroom proposal should include the following fundamental elements in two key areas:

1. Curricular design - improving education quality:

A. **'Design thinking' and user-centric considerations** transversally cut-cross by the digital competencies[2]: student curricula and the tools for

2 What is User Experience and Design Thinking?
User experience involves a person's behavior, attitude, and emotions resulting from the use of a particular

extended access, at all education levels (primary school and beyond), must be designed with the user in mind in order to maximize results and foster a positive experience. Not only should the curricula be designed using these principles (design thinking and user centric design) but they should also form part of the teaching lessons, introducing students at a young age to new ways of problem solving employing digital technologies.

B. **Science, Technology, Engineering, Art, and Mathematics (STEAM):** The core STEAM competencies (with emphasis on technology) must continue forming part of the learning curricula and inculcated where absent. Curricula must be designed with an appropriate balance of the STEAM competencies.

C. **Context considerations (linked to user-centric design):** the curricula and the tools must be designed with local realities in mind, taking into full consideration the local relevant skills of value. For example, jobs of tomorrow for coastal or island communities, vocational curricula should include subjects related to the maritime industry, fisheries and aquaculture, sustainable tourism and alike.

2. Learning support system and technology access - improving education attainment:

A. **Digital technology kit**s: reliable access to a basic digital technology kit should be available for each family. A basic tech kit includes a mobile device for a maximum of 3 children per unit, access to weekly connectivity, daily if possible; content and exercise platforms; cognitive computing platforms for 'deep learning' in competences and other digital resources such as apps, transmedia, 'storytelling' and 'exponential technologies'.

B. **Extended classroom centers:** established within community institutions such as libraries and/or community public houses, the extended learning centers can offer expanded reliable access to the technologies needed to complement traditional learning at school.

C. **A collective participation program:** clear guidelines which describes the role and frequency of personal support for tutors, participation of students in collaborative spaces, the active role of the family and other key actors.

The delivery of an extended classroom model of education as proposed above should

product, system or service. It includes all the users' emotions, beliefs, preferences, perceptions, physical and psychological responses, behaviors and accomplishments that occur before, during and after use. Design thinking is a formal method for practical, creative resolution of problems and creation of solutions, with the intent of an improved future result. Design thinking identifies and investigates with both known and ambiguous aspects of the current situation in order to discover hidden parameters and open alternative paths which may lead to the goal.

be accompanied by evidence-based understanding of the education needs:

- How many hours are required to achieve learning objectives? The evidence of experiences type 'homeschooling', supported by digital technologies, would make it necessary to assume that close to one-third less time is needed than the employed at school.

- With the appropriate number of hours, how are learning achievements compared to the achievements of a child of similar context who goes to school?

- How much progress can be achieved in a mixed extended classroom setting where both schooling and complementary tech education is employed? What is the appropriate balance for each of these to avoid over exhausting a student while maximizing achievement?

A key initial task towards the above proposal is to encourage governments to upscale their investments in human capital so as to fuel early childhood learning in the right direction.

3. Dynamic partnerships and Investments in Human Capital in support of an Exponential Education

Education is the essential ingredient for a sustainable and prosperous society, catalyzing economic growth and supporting democracy. It has been projected that by achieving basic education and skills for all youth by 2030, middle and low-income countries can expect to see an increase on their GDPs by as much as 28% annually over decades to come (Hanushek and Woessmann, 2015). Likewise, it has been observed that universal access to primary education in low- and middle-income countries yields cohorts of adults that are well informed and are active in their democratic role (Kim, 2018). The task ahead is arduous but paying special attention to building the right partnerships and catalyzing long-term investments in education will be the most important move any country can make towards a sustainable and prosperous future (World Bank, 2018b).

Challenge:
The disjointed public-private collaboration for education.

Proposal:
We propose the active building of coalitions and alignment of actors/stakeholders for the benefit of the education system. As the driving axis of a sustainable 2030

society, education partnerships must be diverse in nature incorporating private and public interests while remaining nimble enough to change with time. Additional new initiatives in education must be accompanied by adequate resources and strategic public-private partnerships and alliances for greater impact. For these partnerships to work, roles and interests must be understood and well aligned to achieve a harmonious and effective collaboration and to make the whole system work for learning. Understanding each-other's interests can also incentivize harmonized investments towards a common goal - education. Some benefits of building effective coalitions between public and private partnerships will be: a) exponential technologies could be reached by schools, parents and students, without the risks of fast obsolescence; b) academic research and success cases could be rapidly deployed and replicated; c) innovation could leverage cost-effective projects; d) a common field of conversations, networking, knowledge, alliances and projects will bring strong synergies, needed more now than ever due to the exponential technology changes.

The fundamental purpose of the above three-part exposition is to propose the development of an exponential education model that takes into full consideration the necessary policy, investment, and partnerships framework to ensure its success. The above proposal was also formulated with the timely achievement of the 2030 Agenda in mind so as to maximize the economic benefits that can be expected from an educated population.

To close, the future of work is one of the G20 priorities; however, it is almost impossible to think about the future of work without defining what is needed in education nowadays and putting private and public sector to work together. As technology changes become more exponential, education changes must become exponential as well. Otherwise, the future of work could be at a bigger risk.

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