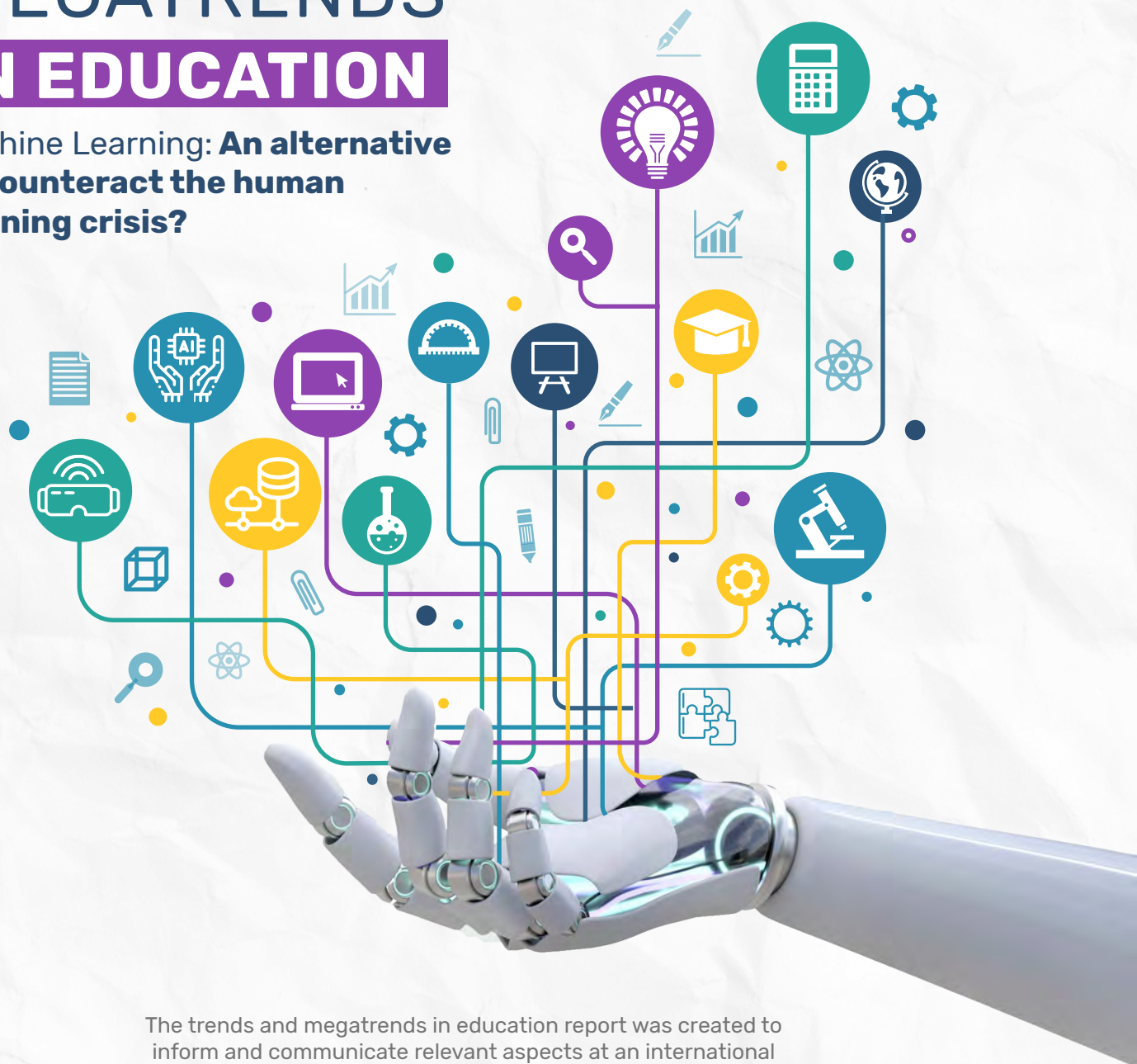# TRENDS AND MEGATRENDS
IN EDUCATION

Machine Learning: **An alternative to counteract the human learning crisis?**

The trends and megatrends in education report was created to inform and communicate relevant aspects at an international level regarding education and its impacts in Medellín.

Machine Learning: **An alternative to counteract the human learning crisis?**

At the end of 2022, the ChatGPT (Generative Pre-trained Transformer) was officially launched, an online tool that uses artificial intelligence, data science, Big Data, and other topics related to the Fourth Industrial Revolution. It has astonished the public with its eloquence, detail, versatility, and articulation of the responses it can construct. However, due to its nature based on the scientific method (trial and error), this tool is under constant development because of the vast range of responses it can generate depending on the data it is fed. Behind ChatGPT, there are algorithms of supervised and reinforcement learning, with which people have been interacting for years in applications such as YouTube, Rappi, Airbnb, Booking, Facebook, Instagram, Tik Tok, Waze, Uber, Spotify, among others. **In this sense, how do these technological tools relate to traditional models of education? Can artificial intelligence (AI) tools mark the end of formal education as it is currently known?** In order to approach the questions posed, an analysis of global education indicators is carried out to focus the discussion on the city of Medellín, as well as the challenges in the short and medium term that are envisioned for post-secondary education in the District of Science, Technology, and Innovation.

Figure 1 - Behaviour and projection of The Learning Poverty Indicator of World Bank.
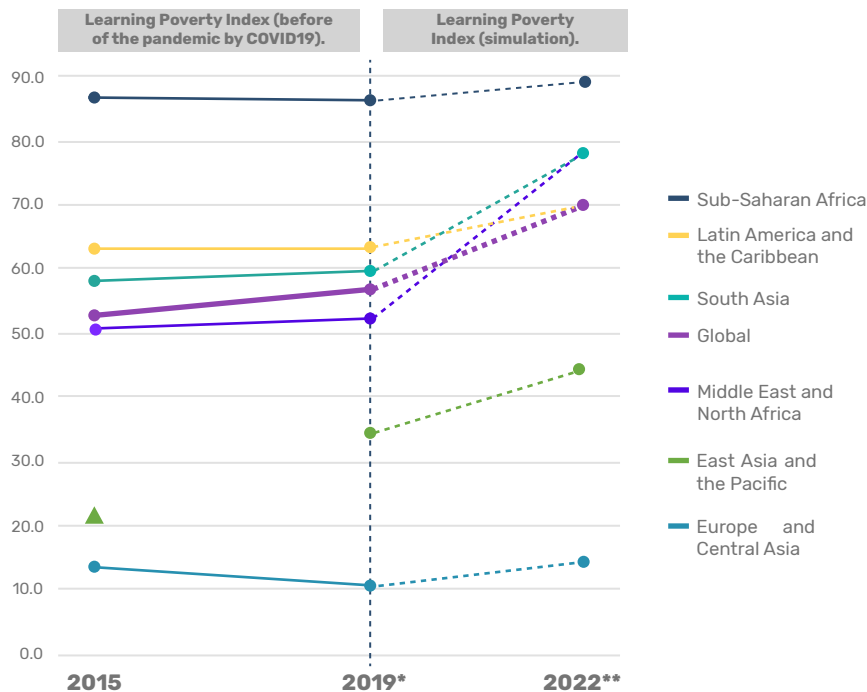
The Learning Poverty Indicator, developed by World Bank and the UNESCO Institute **for Statistics measures the proportion of children between the ages of 10 and 15 who are unable to read and understand a simple text.**
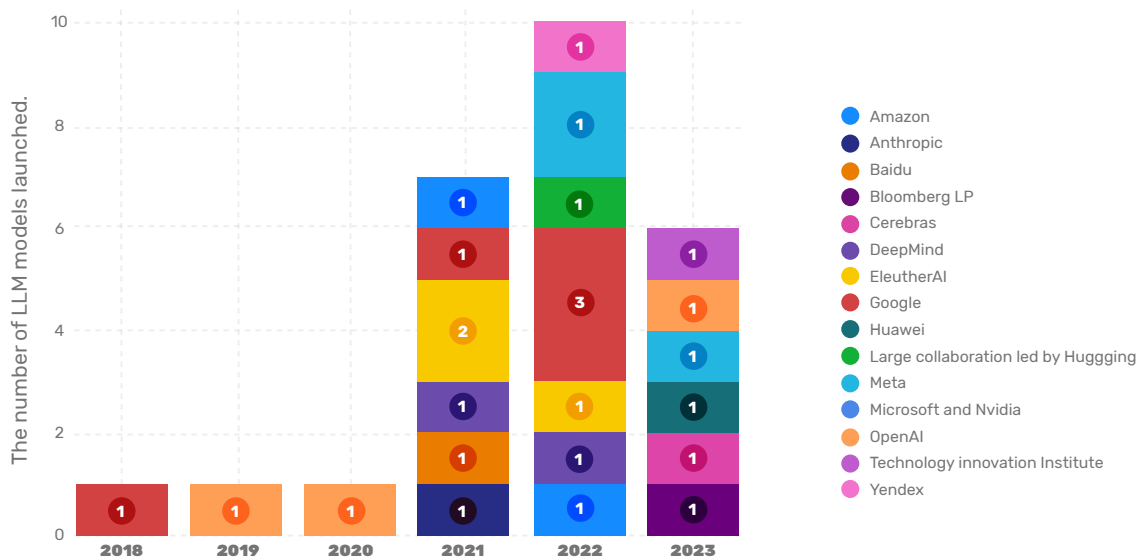
Source: Global Learning Porverty State 2022 - World Bank.

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According to the World Bank, "Since before 2019, it was clear that there was **already a global learning crisis.**" To corroborate this statement, the indicator measuring learning poverty, built by the same bank and the United Nations Educational, Scientific and Cultural Organization (UNESCO) Institute for Statistics, showed that in low and middle-income countries, the percentage of students affected by **learning poverty** amounted to 57% before the pandemic, which currently, following school closures and the digital divide, could reach 70% (World Bank, 2022). The previous data is relevant due to the loss of value that would impact on the lower generation of income throughout the lives of individuals who are currently being educated or were educated during this period of time. It is estimated that a combined total of USD$21 trillion in income could be lost from 2022 throughout their lives, which is equivalent to a 17% loss of global gross domestic product (GDP). In this regard, it is evident that the COVID-19 pandemic exacerbated problems that were already reflected in global indicators. However, the use of **digital tools** was amplified during this same period of time. As a result, traditional education systems had to migrate to **technological platforms** to continue providing services, platforms provided by Google, Microsoft, Amazon, Cisco, among others, served as alternatives to mitigate the consequences of the health emergency on educational aspects and student dropout rates (World Bank, 2022).

Despite the efforts, according to the World Bank's estimations, in countries of South Asia, Latin America and the Caribbean students lost an average of 273 days of class, among other reasons, due to the inefficiency of developing **the educational strategy through digital means**, negatively influencing the learning poverty indicator.

During this same period of time, the development of **language processing models** or "Large Language Models (LLM)" experienced an unprecedented boom in the technology industry.

This type of AI is based on processing large volumes of text using proximity algorithms and neural networks, which can provide eloquent and highly accurate responses to complex questions. The first known model of this kind was launched in 2018 by Google under the pseudonym BERT, which had over 340 million parameters. Then, in 2019, OpenAI released its GPT-2 with over 1.5 trillion parameters, showing increasing precision in human interactions. However, the real boom of this type of technology started to be evident in 2021 when 7 models were launched, and the growing trend continued in 2022, with 10 LLM tools being introduced to the market by companies such as Google, EleutherAI, Meta, Amazon, OpenAI, primarily. In that same year, the well-known ChatGPT-3 was launched, marking a milestone that highlighted the industry's interest in improving its tools for human interaction and the continuous human-machine feedback to enhance the depth of the responses these tools can generate. (During the first quarter of 2023, 6 LLM models have been launched, indicating that this year the growing trend will continue and strengthen).

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Figure 2 – History of LLM models launched in the market.

Source: Own development based on OpenAI.

The development of this type of technology contrasts with the **banning of ChatGPT in some schools** in New York, Paris, and Berlin. These institutions claim that this AI is capable of performing complex tasks, such as writing essays or solving mathematical exercises, which could potentially limit the development of human capabilities within the framework of traditional education (VOA News, 2023).

However, from the academic community, there are counterarguments to such hypotheses, and some even use the tool developed by OpenAI - ChatGPT - to build personalized learning models. An example of this is the research project conducted by Columbia University titled "Interfaces for Personalized Language Learning using Natural Language Processing Models." This project offers language learning plans based on the user's characteristics and interactions with the tool, such as writing style, most frequent grammatical errors, vocabulary acquisition, among other features. This usage **aims to bridge the gap between new**

technologies and traditional education systems and help counteract the learning crisis that has been increasing since before the COVID-19 pandemic.

It is important to emphasize that these technologies, characteristic of the Fourth Industrial Revolution are built from robust statistical, mathematical, and computational models that have been formalized or institutionalized in spaces facilitated by traditional education systems (Manning, 2022). Therefore, the integration of these **disruptive technologies** into traditional education systems must continue its process and even be strengthened, as proposed by leading research centers around the world. This integration becomes an alternative response to the dilemma between new technologies and the end of traditional teaching systems as we currently know them, under the premise that disruptive technologies are tools to enhance traditional learning systems. Hence, one of the significant challenges for the various actors in

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the educational ecosystem is to **develop competencies**, both in the use and in the creation of learning methodologies based on artificial intelligence solutions. This involves investing financial, infrastructural, and human resources to measure the impact of these technologies on generating new learning opportunities that help mitigate the current educational crisis. From the District of Science, Technology, and Innovation of Medellín efforts have been made to position the city as an international reference in both Human Talent development for these industries and the integration of disruptive technological tools into basic, secondary, and post-secondary education. As a proof of the integration between both perspectives (education and technology), **Ulúmina**, a video game, was developed. This game helps individuals discover their potentialities through a series of challenges they overcome within an interface that emulates the city of Medellín. In each of the challenges, the player makes decisions that allow the software to identify behavioral patterns and classify them into one of the four potentialities of Benziger: analytical, creative, efficient, and empathetic. The classification is achieved because the challenges in the video game are based on the Benziger Thinking Styles Test (4B For Beyond, 2019). Therefore, upon completing the journey, the player will receive a description of the potentialities they can develop through technical, technological, university programs, or short courses. This would increase the probability of successfully completing the chosen program or programs for their formation. In summary, it is essential to highlight the efforts undertaken from various perspectives in the city of Medellín to integrate technological tools into both traditional and non-traditional education systems. These efforts have contributed to strengthening the industry in the region. However, another pending challenge is the integration of language processing models (LLM) for the

formulation of **increasingly personalized learning strategies** at different stages of education. This integration can help counteract the learning crisis and even enhance regionally developed solutions and pilot projects that arise from there. On the other hand, it is essential to highlight that the debate surrounding the use of tools like ChatGPT is still in its early stages, and the diversity of perspectives, as well as criticism is crucial to establish the boundaries of artificial intelligence. In this regard, the ethical framework under which these technologies are developed and used is fundamental to prevent the deepening of the learning crisis and to avoid the misuse of this type of AI for purposes contrary to current social norms and agreements. Notably, industry leaders such as Sundar Pichai, CEO of Google, advocate for a pause in the construction of these technologies to allow global regulations to **set limits on existing AI solutions.**

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