IFE Insights Reports

Generative Artificial Intelligence in Higher Education: An Objective Vision

Tecnológico de Monterrey

Institute for the Future of Education

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1. Prologue

Facing a horizon marked by the profound changes brought about by the rise of Generative Artificial Intelligence (Generative AI or GenAI), industries are going through transformations that have a direct impact on their professional work. In this context, workers are called not only to optimize their tasks with technology support, but also to develop a constant capacity for adaptation. Those who fail to adapt flexibly to the evolving labor market and new ways of working risk being left behind in an increasingly competitive and changing environment.

Generative AI, a technology capable of producing content such as text, images, music, or code through machine learning, is not, in essence, a novelty. However, the evolution of its applications and its progressive integration into everyday life represent a profound redefinition of how we conceive and execute various tasks. In this regard, it is critical that current and future professionals understand these tools and learn to use them strategically to address the challenges and gaps facing our society.

Reports like this have shown the benefits of implementing GenAI in universities. Beyond being considered a simple technological trend, this tool should be understood as a strategic and necessary resource for strengthening the competencies demanded by today's world, and which will be essential for new generations of professionals. However, its incorporation into educational settings requires careful and responsible analysis.

Higher education institutions, regardless of their size or level of technological maturity, are centers of learning and comprehensive training. They are references that

shape the knowledge and, above all, the values and principles of those who will build the future. Therefore, they have an ethical and social responsibility to provide a quality education that prepares students to enter a changing labor market, as well as to exercise conscious, critical, and committed leadership for the common good.

Today, more than ever, the world faces multidimensional, humanitarian, climate, economic, and even healthcare crises. These challenges require a new framework of thinking and action. To the extent that they foster critical thinking, empathy, ethics, and creativity, educational institutions will train individuals capable of devising real, sustainable solutions.

Thorough knowledge of the scope of Generative AI, its applications, limitations, and ethical risks is a must-have. Only from a clear, contextualized understanding will it be possible to make informed decisions that allow us to act responsibly in a volatile and changing global environment.

Education has always been the pillar on which societies are built. In this era of digital transformation, the role of education becomes even more relevant. Educational communities must be beacons of knowledge and reflection, spaces where the dialogues necessary to face the challenges of the present are managed and build a future guided by a deeper understanding of our shared reality.

- Michael J. L. Fung, Executive Director of the Institute for the Future of Education (IFE)

2. Preface

In response to the demands of the contemporary world, several universities have begun implementing strategies to integrate Generative Artificial Intelligence into their academic programs. These actions range from didactic activities aimed at understanding its functioning to its direct inclusion in the curriculum. Such initiatives reflect a growing commitment by higher education institutions to equip their students with relevant tools that enable them to perform more effectively today and to project responsibly into the future.

However, integrating this technology requires a critical, balanced approach. It is imperative to consider not only its potential benefits, but also the risks associated with its indiscriminate use. A rigorous evaluation of its relevance within the curricula, pedagogical methodologies, teaching approaches, and daily practices in the classroom are required; any decision in this regard must start from a clear reflection on its formative purpose so that its implementation truly contributes to the integral development of students and is aligned with the educational mission of each institution.

This report brings together the views of specialists from various regions of the world who work with Generative AI in real, everyday contexts. Through their testimonials, learnings, experiences, and best practices are shared that, despite the short time to assess their long-term impact, already provide valuable insights into the transformative potential of this technology. The participating professionals report how they have extracted significant learning amid uncertainty; they highlight the natural fears that accompany all innovation and emphasize how they have strengthened

the soft skills essential to their students' professional development. All this with a constant focus on the importance of preserving and reinforcing the human factor in each learning process.

The collaborations included in this report were gathered through interviews in which professionals shared experiences, approaches, and reflections that enrich this publication. Each intervention represents a valuable contribution not only to academic colleagues but also to all agents who make up the educational ecosystem and are confronted today by the challenges of an ever-evolving landscape.

This report seeks to provide an objective perspective of the current scenario by recognizing both the progress and doubts that persist around the use of Generative AI. The report also contains a cross-sectional element: the irreplaceable role of humans. Beyond what these technologies can offer, people's conscious, critical, and ethical intervention remains what delivers the true value of their application. Artificial Intelligence does not replace human judgment, but enhances it when used responsibly and meaningfully.

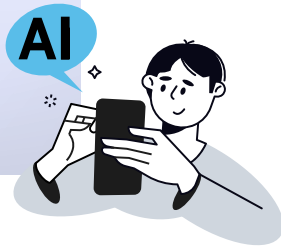
While technology is an essential component in the future of education, human collaboration remains at the core, as it ensures excellence and provides the solutions needed to meet the challenges that the future will bring.

- José Escamilla de los Santos, Associate Director of the Institute for the Future of Education (IFE)

3. Introduction

Generative Artificial Intelligence is an advanced branch of Artificial Intelligence distinguished by its ability to create original content, including text, images, audio, video, and other digital formats. This type of technology has gained global notoriety since 2022, driven by the proliferation of generative models such as text-to-image generators and Large Language Models (LLMs) (Calvino, 2025), which have produced surprising results previously requiring human intervention. Its application ranges from automating creative tasks to personalizing educational and business experiences, generating both enthusiasm and concern.

> *"I certainly wouldn't bet against the pace of advancement in AI, but I also think that it's important not to get too excited. [...] If everyone only focuses on Generative AI, then there will be a whole slew of methods lost that solve problems that Generative AI isn't trying to solve."*
>
> **- Ryan Baker, Professor at the University of Pennsylvania and Director of the Penn Center for Learning Analytics**



In this sense, Irving Hidrogo Montemayor, Director of Educational Artificial Intelligence at Tecnológico de Monterrey, explains that it is essential to understand that AI is profoundly transforming the various productive sectors, allowing not only the automation of processes but also the provision of services that were previously too expensive. This technology contributes to improving efficiency, expanding reach to new audiences, and offering more personalized solutions, which has a direct impact on productivity and the quality of the work done. As a result, structural changes occur within industries and sectors.

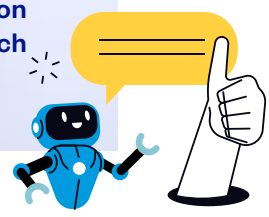
However, these advances also have important implications, such as the possible replacement of certain jobs. At the same time, new job opportunities emerge, as has occurred in past technological revolutions. In this context, institutions of higher education have the responsibility to train professionals capable of integrating AI into their work environments to deliver added value that technology alone cannot. If training is limited to simple automation tasks, those tasks will be performed by AI systems, making those human roles obsolete. For this reason, education must focus on developing complementary competencies that ensure the relevance of human work in an increasingly automated environment.

Despite the enormous transformative potential of Generative AI across industries such as education, medicine, design, and entertainment, its advancement also raises questions about regulation, equal access, its impact on employment, and ethical consequences. The accelerated disruption of this technology has exceeded the ability of many sectors of society to understand and adapt. According to Anna Forés Miravalles, Director of the UB-EDU Chair of Neuroeducation at the Universitat de Barcelona, this situation represents a new challenge for teachers at all educational levels, who must take responsibility for guiding their students in understanding and critically using these emerging tools.

Rose Luckin, Professor Emeritus of Learner Centred Design at the London Knowledge Lab of University College London and Director of Educate Ventures Research, notes that we are at a determining moment: the decisions we make today will directly influence future generations. R. Luckin underscores that, while technology possesses enormous transformative power, its development and distribution continue to present profound inequalities. Therefore, she makes an urgent call to focus

human efforts on inclusion and the construction of ethical frameworks that reduce the disparities caused by the deployment of AI, especially in the educational field, where she highlights the need to ensure that the implementation of these tools is transparent, accessible, and equitable.

> *"Everybody seems to be hyped up about the possibilities of growth, and nobody wants to be seen as not being innovative."*
>
> **- Rose Luckin, Professor Emeritus of Learner Centred Design at the London Knowledge Lab at University College London and Director of Educate Ventures Research**



In this context of accelerated transformation, it is imperative to establish informed, ethical, and critical dialogue about the role of Generative AI in contemporary society. In addition, R. Luckin expresses concern about the current landscape of the development and use of this technology, noting a significant imbalance of power, where large technology corporations have a disproportionate influence on key decisions affecting society. This concentration of power leaves little room for the intervention of other agents, particularly those with less influence. This situation highlights the importance of the role of education professionals in acting responsibly within the scope that can be controlled, promoting a proactive and ethical approach.

Although the system cannot be changed immediately or directly, it is possible to make a positive impact from educational practice to contribute to a critical understanding of technology and to foster the development of informed and empowered citizens. Thus, the challenge is not only to adapt to technological advances but to do so with a human-centered view, oriented towards social justice and sustainable development.

4. Generative Artificial Intelligence in Higher Education

Today, we are going through an extraordinary period of technological transformation, especially in the field of AI. Carles Abarca de Haro, Vice President of Digital Transformation at Tecnológico de Monterrey, explains that, unlike other sectors, such as automotive, where disruptions usually occur approximately every seven years, AI undergoes significant advances at intervals of just six months. This rapid evolution has created a highly dynamic and unpredictable environment, where it is almost impossible to anticipate the near-term future.

I. Hidrogo adds that it is essential to understand the current AI landscape from an informed perspective, as this will allow us to make more adequate decisions and avoid falling into erroneous interpretations or unfounded promises about its real capabilities. Knowing both the potential and limitations of this technology will help protect against misleading discourse that tends to overestimate what AI can achieve in practice. Rigorous knowledge becomes a key tool for responsible decision-making and proper training of students who will face an increasingly complex and changing technology environment.

Ryan S. Baker, Professor at the University of Pennsylvania and Director of the Penn Center for Learning Analytics, notes that, while the term "AI" is now primarily associated with Generative AI, much of the machine learning that has been used over the past ten years should also be considered AI. In his view, there are cases where machine learning from previous generations is more effective than GenAI, as each approach has its own advantages and limitations. However, he acknowledges that GenAI has had a significant impact on textual data processing, particularly in areas such as human mentoring dialogues, classroom conversations, and natural language-based mentoring; this has greatly facilitated work in these fields and generated a considerable increase in interest and investment in these technologies.

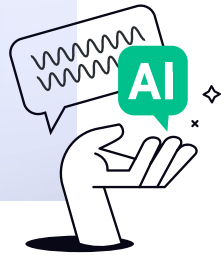
As for the interaction between a student and a user interface, R. S. Baker believes that Generative AI has not yet had such a remarkable impact on student modeling and data analysis. However, it has been useful in the automatic creation of problems and in the personalization of content; he also highlights that, although GenAI has brought significant advances, learning analysis continues to offer new opportunities from these technologies without completely transforming all aspects of the field.

Thus, the concept of hybrid intelligence has been used to refer to collaboration between humans and machines to improve learning. This context poses different levels of autonomy in relation to the interaction with AI, says Héctor Ceballos Cancino, Director of the Living Lab & Data Hub of the Institute for the Future of Education (IFE) of Tecnológico de Monterrey, who takes up the work of Sanna Järvelä and explains the relationship at three main levels:

- The **first level** is that of the "**operator**," where the human fully controls the process by requesting specific actions one at a time.
- The **second level** is "**collaborator**," where AI performs certain tasks and maintains a constant dialogue with the user.
- The **third level** is where the AI acts as a "**consultant**," initiating processes and addressing specific questions.

In addition, there are higher levels where AI operates with greater autonomy by reporting or requesting approval only at the end of the process. The choice of autonomy level depends on the nature of the task, and in many cases, the control must remain fully in the user's hands.

> *"But if I prompt the AI to 'generate the essay that I have to deliver for my task, here is the description,' I'm giving the AI total control, and I am getting out of the learning process."*
>
> **- Héctor Ceballos Cancino, Director of the Living Lab & Data Hub of the Institute for the Future of Education (IFE) at the Tecnológico de Monterrey**



H. Ceballos highlights these levels because, although AI can handle much of a task, it is still necessary for the user to review and, in some cases, edit the results, making the process a human-machine collaboration. However, there are tasks that can be delegated in their entirety, as the level of autonomy given to AI must depend on the type of task, as entrusting key processes can limit learning. Therefore, he suggests finding a balance that allows leveraging technology without replacing the essential parts of human development.

Paola Ricaurte Quijano, Professor and Senior Researcher at the Department of Media and Digital Culture of the Mexico City campus of Tecnológico de Monterrey and Associate Professor at the Berkman Klein Center for Internet and Society at Harvard University, observes that, due to the growing availability of AI tools for mass use, there has been a kind of "explosion" of possibilities in different areas. However, there remains a significant lack of empirical studies to understand the

real impact of these technologies, especially in higher education. In addition, she points out that, among teachers, high levels of stress and increasing work overload are perceived, along with new concerns arising from the incorporation of AI systems. Meanwhile, regarding the student body, she identifies an effect of insecurity and a lack of attention to the development and follow-up of higher-order cognitive skills.

P. Ricaurte argues that, while the adoption of AI in higher education can be valuable, it must be accompanied by collective processes of discussion, critical reflection, and rigorous monitoring. In addition, strong empirical research is needed to better understand the specific effects of these technologies on academic communities.

> *"AI opens the opportunity and poses the obligation to imagine new ways of conceiving and practicing education to respond more effectively to the challenges of access, quality, relevance, equity, and efficiency that continue to mark our education systems."*
>
> **- Juan Pablo Murra Lascurain, Rector of Tecnológico de Monterrey**

Beatriz Palacios Corral, Director of Educational Innovation and Digital Learning at Tecnológico de Monterrey, argues that the real purpose of incorporating technology into education should not be the mere digitization of universities, but the transformation of the educational model to offer more meaningful experiences and higher-quality activities for students. According to B. Palacios, various studies and

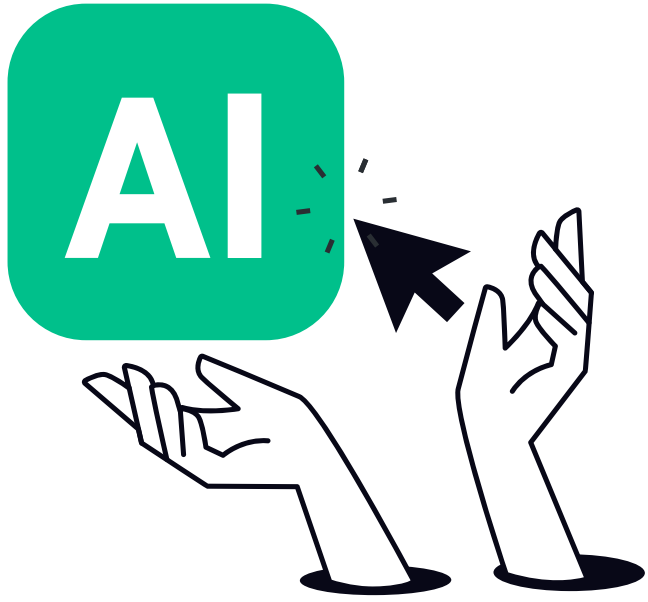
international organizations agree that the future of education is inseparable from the integration of AI; however, she warns that reducing AI to a simple technological tool limits its true potential. While its implementation can improve both educational and administrative processes, this does not guarantee a deep strengthening of educational institutions.

In her vision, AI should be understood as a philosophy that allows us to rethink how technologies are used to make an impact. It's not just about applying tools, but also about developing new behavioral, decision, and interpretation patterns that can transform processes, products, services, and mental models into diverse disciplines. Thus, education must play a central role in understanding and leveraging AI and, above all, in its responsible and critical development within society.

This is a complex aspect, especially considering the rise of AI and growing expectations around it. Sabur Butt, Research Professor at the IFE Research Lab, argues that AI has been surrounded by expectations for decades, not only as a result of its generative aspects, since over time, different branches, such as robotics, computer vision, or natural language processing, have caused moments of great interest, as occurred with the appearance of the iPhone, which incorporated multiple AI-based applications. However, S. Butt indicates that the emergence of Generative AI has intensified this phenomenon, sparking unprecedented global interest. From his perspective, in the coming decades, AI, and especially GenAI, will decisively influence power dynamics globally; countries that are able to access and master these technologies will have a significant strategic advantage.

Similarly, S. Butt warns that the global impact of AI will depend on how humanity decides to manage it: if an open, equitable, and collaborative approach is promoted, it could contribute to closing gaps between nations. Instead, if it remains a restricted-access technology concentrated in the hands of a few countries, its effects could be negative. He clarifies that, ultimately, humanity will determine the ethical and social scope of this technology.

In this regard, R. S. Baker notes that Generative AI is a real technology with high application potential across a wide variety of issues. He also mentions that GenAI tools are already being used in his lab effectively, which has allowed them to advance their understanding and learning about them. However, he cautions that GenAI will likely follow a similar trajectory to other emerging technologies, so it will face an initial surge of unrealistic expectations. According to him, it is common to see extremely optimistic discourse about it, including unfounded claims such as "in five years, all jobs will be replaced by Generative AI." R. S. Baker emphatically rejects these ideas and stresses that such predictions are unfounded; in fact, he states that the performance of some current Generative AI systems does not even exceed that of previous versions, which reinforces his critical stance against this type of exaggeration and underlines the need for its study and a critical view of the technology.



5. Incorporation of Generative AI Into the University's Educational Model

Incorporating Generative AI into educational models represents one of the most significant challenges and opportunities for higher education today. Its rapid evolution is transforming not only the dynamics of knowledge but also the demands of the labor market and students' expectations. Given this perspective, educational institutions must rethink both the content they deliver and the methodologies they employ to ensure relevant, up-to-date, and competitive training.

I. Hidrogo states that the speed of change in today's world is no longer a future projection, but a present reality. In this context, the main challenge for universities is to adapt to the accelerated pace of societal evolution to prepare students for the appropriate professional use of AI. He warns that if graduates do not acquire real skills in this area, they will not be competitive in the labor market.

I. Hidrogo distinguishes two key dimensions for integrating AI into higher education. The first, and most important, is the transformation of "what" is taught: ensuring students learn how to use AI tools applicable in their respective industries. This training should focus on understanding technology and being prepared to actively contribute to the transformation of production sectors through its use.

The second dimension corresponds to the "how" it is taught, that is, the use of AI to optimize teaching-learning processes. This includes the use of technologies such as adaptive learning, automatic content generation, or personalization of teaching. While this dimension improves educational effectiveness, I. Hidrogo clarifies that it does not, on its own, guarantee that students are learning to use AI for professional purposes. Therefore, he insists on prioritizing discipline training with AI as the central axis of educational transformation.

This reflection invites us to question the role that AI plays in its integration into the educational field and, in particular, in the context of higher education. R. Luckin warns about a central problem in this field: current assessment systems in higher education are not aligned with the challenges presented by AI. According to her, institutions are failing their responsibility to train students in those skills that AI cannot easily replicate, such as critical thinking, creativity, or ethical problem-solving. R. Luckin argues that this lack of adaptation not only increases the risks of inappropriate use of these tools, such as plagiarism or excessive delegation of cognitive tasks, but also prevents students from developing knowledge and skills complementary to technology. For her, if universities led this transformation, school systems would also move in that direction, creating structural change across the education ecosystem.

Similarly, C. Abarca emphasizes that, given the speed of AI's evolution, the criteria and objectives associated with its implementation must be continuously reviewed, making an important distinction between adopting AI as a fashion or technological investment and doing so based on deep strategic reflection. For him, before any technology acquisition, universities must clearly identify the problems they are

looking to solve and the indicators that will define the success of that implementation. AI, from his perspective, should not be an end in itself, but a carefully chosen means to solve specific needs in areas such as administrative processes, student accompaniment, or instructional improvement.

Rafaela Diegoli Bueckmann, Academic Vice-Rector of Tecnológico de Monterrey, shares this vision and emphasizes that AI should be understood as a tool to enhance human capacities, not replace them, since its greatest value lies in personalizing learning without losing the human dimension, which strengthens the relationship between students and teachers.

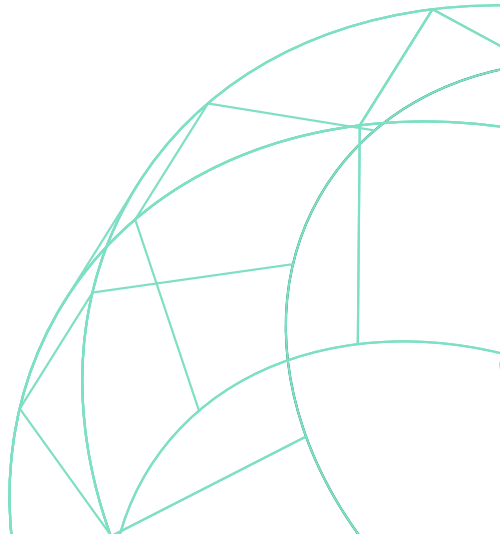
Thus, Dragan Gašević, Analyst and Professor of Learning Analytics at Monash University, highlights that students do not represent an obstacle to the adoption of AI; on the contrary, they tend to be open and enthusiastic about its integration into learning processes. In reality, he thinks the main obstacles are the teaching staff and the administrative structures of universities, which tend to show higher levels of resistance, often due to legitimate concerns about its impact on learning. However, he points out that students expect institutions to accompany them in the development of their digital literacy, especially since the labor market already values these skills.

Marina Kriscautzky Laxague, Director of Technological Innovation and Development-DGTIC at the Universidad Nacional Autónoma de México (UNAM), issues a criticism of the punitive approach that some institutions adopted in light of the use of AI by students, since she considers that prohibiting or pursuing its use is not only ineffective, but also counterproductive, in addition to deteriorating the relationship between teachers and students. Instead of operating out of suspicion and using surveillance technologies to spot traps, M. Kriscautzky suggests building a relationship rooted in trust and ethical learning commitments. Based on her experience, students should be considered as subjects capable of acting responsibly; it is the faculty's task to offer ethical and pedagogical models that guide the use of these tools in favor of comprehensive development.

However, its implementation should be carefully planned by clearly establishing the direction to be followed and accurately delimiting the ethical and pedagogical limits that should not be violated. Adriana Iñiguez Carrillo, Research Professor at the Universidad de Guadalajara (UDG), highlights the value of AI as a key tool to support teachers, especially in the generation of ideas for teaching, instructional design, and diversification of educational resources, as it allows content to be adapted and information presented in different formats, such as text, videos or games, which expands pedagogical possibilities. The establishment of clear use policies, specifying when, how, and what AI is used for, should not be neglected; this would encourage its ethical application without displacing critical thinking.

A. Iñiguez also emphasizes that its use should not be limited to "copy and paste," but should involve analysis, adjustments, and active learning by the user to become a means of strengthening critical judgment by evaluating the quality of the information generated and identifying possible biases or errors. She proposes three key axes for its responsible implementation: 1) having a clear regulatory framework, 2) promoting continuous training for the entire university community, and 3) ensuring equitable access to these technologies to avoid widening digital gaps.

These ideas align with what Paulo Blikstein, Director of the IFE Research Lab, expressed. From his perspective, the fact that a technology is novel does not guarantee its beneficial nature; in particular, he points out that technologies can be used for harmful purposes if they are not properly regulated. Therefore, he highlights the importance of governments lobbying for clear regulations and of technology companies acting responsibly regarding privacy, transparency, and ethical design.



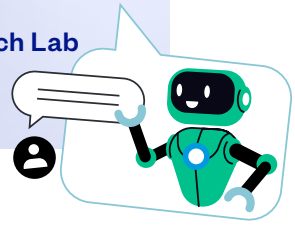
P. Blikstein emphasizes that AI has both great positive potential and significant risks; he warns that it should not be used in central educational functions, such as direct teaching, the development of curricula or the evaluation of students, since these activities must continue to be carried out by human teachers, who have the pedagogical criteria necessary to personalize teaching and maintain essential human contact in the educational process.

Just like A. Iñiguez, P. Blikstein explains that the line must be delimited: teachers can rely on AI for complementary tasks, such as searching for data, images, or making grammatical corrections, but they must still be the content authors and responsible for feedback to their students, because if teachers delegate to AI the correction of complex jobs, such as essays, they will lose ethical authority to demand students to not use AI for writing those essays. In his view, consistency should be maintained: if students are expected to do authentic intellectual work, teachers should evaluate that work with the same level of commitment.

P. Blikstein also questions the frequent narrative about the need for "disruption" in education systems. He argues that, although universities have problems, they are not "broken" or obsolete. For decades, these institutions have trained professionals who today support the economy, science, and government; therefore, he considers the discourse promoting their immediate replacement by unproven technologies to be exaggerated. Instead, he advocates a careful evolution, in which decisions about implementing AI in education are made by experts in pedagogy, not exclusively by technologists or entrepreneurs whose approach is more oriented to economic efficiency than to educational value.

Another problem he describes is the negative impact of turning teachers into vigilantes of the use of AI by their students, because instead of teaching, they are forced to use detection tools to verify if the texts have been generated by AI, which generates an environment of distrust in the classroom. Faced with this, he proposes redesigning academic activities to be more personal, significant, and complex, so that the use of AI does not replace the intellectual effort required.

> *"We need to make students conscious that learning is not just about the teacher. It's about having the responsibility of learning. You, as a learner, have the responsibility of being a kind of ethical learner."*
>
> **- Paulo Blikstein, Director of the IFE Research Lab**



P. Blikstein believes that tasks that involve a high level of intellectual processing, such as writing a text, constructing arguments, or synthesizing information from multiple sources, should be performed by students, as they are critical to learning. Instead, more mechanical tasks, such as correcting typographical or grammatical errors, can be delegated to AI without affecting the training process. Artificial Intelligence should be used to facilitate the creation of complex projects or the exploration of hypothetical scenarios impossible to experience in the physical world. Thus, students can simulate alternative worlds by modifying physical laws or scientific parameters, which enriches their understanding of the real principles that govern our environment.

Meanwhile, B. Palacios provides a structured and strategic vision on how the implementation of AI in education should be addressed and indicates that its adoption cannot be only technological, but requires a deep, interdisciplinary, and ethical understanding. In her view, something that is not understood cannot be properly implemented, and the risk of a surface tool operation without a strong conceptual framework is losing the transformative potential of AI and applying it improperly.

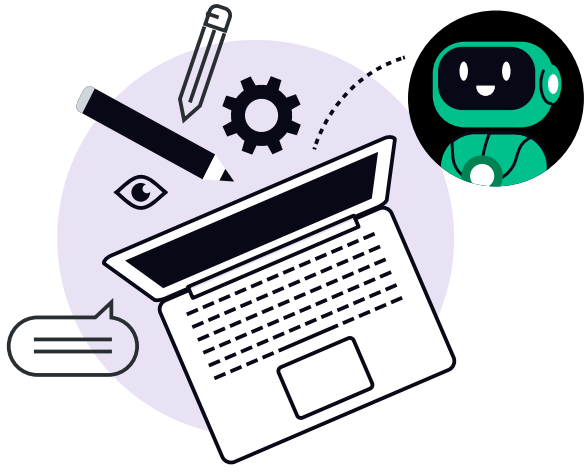
B. Palacios proposes a strategy of ten approaches with a progressive and coordinated application:

1. **Recognize the transformative potential of AI.** The first action is to understand that AI is not just another tool, but a broad and deep technological phenomenon that transcends Generative AI. This recognition should lead to strategic conversations within organizations.
2. **Redesign institutional policies and strategies.** Creating clear use frameworks and implementation strategies for AI across academic, administrative, and digital domains is critical.
3. **Integrate AI into teaching, learning, and research processes.** Institutions must train students not only to understand and use AI, but to be able to develop it and contribute to its evolution in the future.
4. **Leverage AI in administrative management.** Beyond the pedagogical, B. Palacios highlights AI's ability to significantly improve organizational productivity by automating processes and operational tasks.
5. **Incorporate AI into curricula.** Artificial Intelligence should be mainstreamed into curricula and promoted across various disciplines.
6. **Encourage learning personalization.** It is recognized that one of the greatest contributions of AI in the educational field is the ability to adapt teaching processes to the individual needs and characteristics of students.
7. **Train both students and teachers.** Training must be comprehensive, covering not only the use of tools but also the appropriation of technological infrastructure and the development of digital skills.
8. **Build and adapt technological infrastructure.** It is essential to have a robust technology foundation that supports the effective and sustainable implementation of artificial intelligence.
9. **Develop an ethical framework.** The application of AI must be guided by principles of ethics and integrity, both in the use of data and in automated decisions that affect people.
10. **Adopt a long-term institutional vision.** B. Palacios emphasizes that AI should be understood as part of a deep transformation that requires institutional leadership and a clear strategy, not just isolated initiatives.

Likewise, R. Diegoli provides a complementary vision focused on the continuous updating of curricular content and participatory academic governance. She explains that although the curricula have fixed components registered with the educational authorities, the design and implementation of each course are dynamic processes subject to constant improvement. This position relates to the proposal of Isabel Hilliger Carrasco, Professor and Assistant Director of Measurement, Evaluation, and Quality of the School of Engineering of the Pontificia Universidad Católica de Chile, who asserts that the use of AI in higher education should be based on an in-depth review of the curricular content and the level of AI literacy of students based on their academic trajectories. She advocates strengthening the link between institutions and cites his experience in international collaborative projects as a key strategy to share practices, solve common challenges, and build collective responses to the challenges presented by AI.

R. Diegoli stresses the importance of maintaining a balance between general and specific content, which allows educational programs to remain up-to-date and relevant. This update is achieved through flexible curricular spaces, such as elective blocks, thematic weeks, academic concentrations, and multidisciplinary activities, which allow the incorporation of new topics, including AI.

She presents the concept of "decreasing democracy," used by institutional leaders, to describe the process of building educational policies: it begins with a broad, open consultation where shared principles are synthesized and then adapted to specific contexts. Thus, a progressive, transversal, and flexible implementation of AI that respects disciplinary diversity and responds to the changing needs of the environment is sought.



A. Continuous Faculty Training

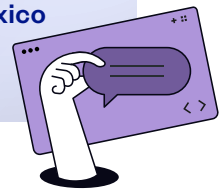
Within the framework of this broad and diverse discussion on the incorporation of AI in higher education, various reflections agree on a fundamental principle: the use of these technologies must be guided by clear and ethical pedagogical purposes, always subordinated to human development and the critical judgment of teachers and students, and the training and professional and personal development of educational agents must be prioritized.

R. Luckin highlights the importance of teacher training in AI before its implementation in the classroom, for which she proposes the motto “learn fast, act slower” and recommends that institutions prioritize teacher training so that the adoption of AI is guided by pedagogical objectives and not only by the capabilities of the tools. M. Kriscautzky complements this perspective by emphasizing the need to ethically and critically train both teachers and students, and highlights the importance of questioning from which worldview one works. Thanks to her experience at UNAM, she has observed a significant shift in the faculty’s critical attitude towards AI, which has overcome the perception of it as a panacea. She proposes that the use of AI by teachers and students together would not only eliminate mistrust and persecution but also enable the teaching of more complex skills, such as critical validation of AI-generated content. She also suggests that the collaborative use of these tools can foster a culture of questioning and autonomy instead of technological dependency.

> *“We can’t equip the students if we don’t equip the teachers.”*
>
> **- Rose Luckin, Professor Emeritus of Learner Centred Design at the London Knowledge Lab at University College London and Director of Educate Ventures Research**

Along these lines, she also highlights that the proper use of AI can be especially useful in time-consuming tasks, such as individualized feedback. However, she warns that this application only materializes if the teacher has a solid didactic training and controls the design of the tools, such as the creation of personalized assistants that respond to clear pedagogical criteria. This makes AI an ally to extend quality teaching practices to more students without losing depth or rigor.

> *"I believe that once technology exists, what is done with it will depend on people and what people have inside their heads. If you, as a teacher, behave like a machine, of course, they will replace you, but that is not teaching."*
>
> **- Marina Kriscautzky Laxague, Director of Technological Innovation and Development-DGTIC at the Universidad Nacional Autónoma de México**



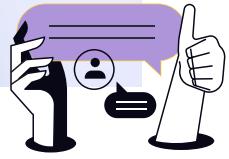
In this sense, taking up the subject of evaluation and in line with M. Kriscautzky, Tazin Daniels, Associate Director of the Center for Research on Learning and Teaching at the University of Michigan, suggests that AI can assist in the grading process, but should never replace the human being; aspects such as the creation of rubrics, the design of active learning activities and the monitoring of student progress require human judgment. Although tools can automatically apply rubrics, they tend to lose important nuances of student development, such as progressive improvement or the emergence of unforeseen skills. So, she advocates a mixed approach in which AI serves as support, but never as the primary authority in the assessment.

Angela Marocco, an Instructional Learning Specialist at the University of Michigan, adds that equitable access to AI tools should be a priority, not only in economic terms, but also in terms of technical and functional accessibility for users with different skill levels. She stresses the importance of having proven tools to ensure that all members of the college community can benefit equally from these technologies.

From an institutional perspective, Paul J. LeBlanc, visiting scholar and special advisor at the Harvard University, proposes a model that uses technology to scale

administrative and operational processes without compromising critical human interactions. In his experience, the most important jobs are those that require human contact, such as consulting or teaching. He proposes that, instead of eliminating jobs, it is necessary to retrain workers to assume more human tasks, since he affirms that AI offers the opportunity to redefine what jobs we value as a society and suggests that, in the face of the automation of many cognitive tasks, we should revalue those that involve human interaction, creativity and care, such as teaching in early education.

> *"What are the most important human interactions? Let's hold that ground sacred."*
>
> **- Paul J. LeBlanc, visiting scholar and special advisor at the Harvard University**



Sarah Thelen, Professor of Teaching and Learning Improvement (Digital Education) at University College Cork, said that the integration of AI in education must be variable and specific according to the disciplinary context; she also criticized the trend of wanting to apply technology to everything indiscriminately and mentioned the case of Massive Open Online Courses (MOOCs) as a previous example of excessive enthusiasm for technological innovation. She argues that, over time, stable standards and practices will develop that clearly define where and how AI is useful in education.

P. Ricaurte, from a critical and pedagogical perspective, insists that the use of any technology must be guided by a transformative educational vision. Inspired by Paulo Freire, she highlights that pedagogy must be a liberation practice that strengthens

student autonomy, as the mindless use of technologies can reproduce processes that strip agency and increase hopelessness among young people. She points out that it is essential to question not only the use of AI, but also the models of technological production that exclude large sectors of the population. Instead, she recommends empowering historically underserved communities to become technology creators and not just users by developing locally relevant, culturally sensitive, and social justice-focused technology solutions.

Finally, A. Iñiguez addresses the urgency of continually keeping faculty up to date in light of the rapid pace of technological change. She mentions that many universities already offer online courses on the use of AI in teaching, and proposes that curricula be reviewed each semester to accommodate advancements. She emphasizes that this work requires a joint effort between institutions and people, but that it is essential to assume continuous training as an inherent part of teaching.

B. Foundations for Critical and Strategic Adoption of Generative AI in College Education

Universities have a greater responsibility in integrating AI into education, not only in terms of using technology tools, but also in critical reflection on its long-term impact on society, ethics, and the future of teaching and learning.

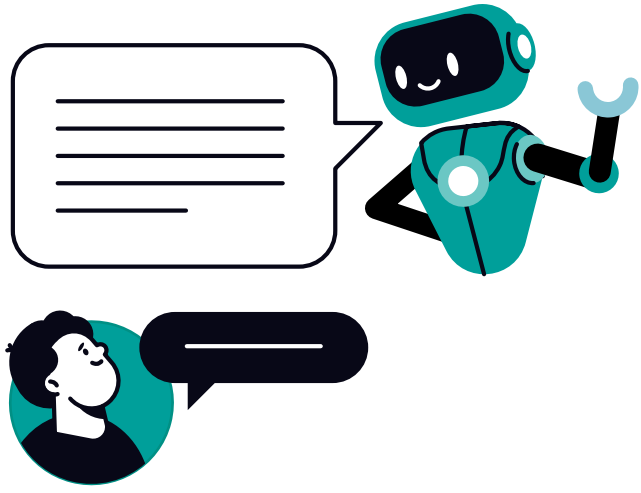
R. Luckin argues that universities are in a unique position to influence how AI impacts education and training; unlike schools and other sectors, universities have the autonomy to decide how to evaluate students and what is required for that process. However, she says many of them are not leveraging this capability, but rather are focused on AI-related surface solutions, driven by inter-institutional competition. According to R. Luckin, this has led to a lack of deep reflection on the need for radical reform in assessment systems. She argues that, while universities are not yet addressing this challenge effectively, it is necessary to reconsider the way students are evaluated, as many of the traditional tasks are now performed more efficiently by AI, making it unnecessary to evaluate skills already mastered by machines.

M. Kriscautzky expresses concern about the development of Generative AI and highlights that this technology was conceived without a clear educational purpose, but rather as a demonstration of human ability to create machines that simulate human processes. She views AI as a tool that, if used correctly, can complement and not replace human cognitive activity. This technology can facilitate learning by helping students improve their skills, such as writing. However, she warns about the danger of completely delegating intellectual work to the machine, which would be counterproductive. Instead of doing the work for students, AI should serve as an assistant, performing repetitive tasks and helping process large volumes of information quickly and efficiently. She also highlights that the challenge of maintaining control over technology is fundamental to ensure that humans continue to direct its use, especially in an educational context.

A. Forés, who agrees with the previous points, highlights that the introduction of new technologies in education raises doubts about their impact, either as a possible threat to the teaching role or a magical solution for all educational problems. According to her, technologies, including Artificial Intelligence, are not going to replace teachers or solve educational problems immediately or universally. What is needed is critical training on the use of AI in classrooms to understand its limitations and its potential to help educators focus on more meaningful pedagogical

tasks by reducing bureaucratic burdens. She also highlights the importance of human imagination and suggests that AI could be used to enrich the educational process through collaborative creation and creative experimentation.

Meanwhile, P. Ricaurte argues that the incorporation of AI in education must always be accompanied by a critical reflection, in which academic communities have a vote on how these tools are integrated into educational practices to avoid producing negative effects, such as the deepening of inequalities or the misuse of AI in contexts such as social control or surveillance. P. Ricaurte also emphasizes the importance of understanding the full life cycle of AI, from its design to its disposal, as well as the potential effects that its massive use could have on the environment and society. Her criticism extends to the ethical and social impacts of AI, especially in its implementation, which requires greater responsibility in its development and a regulatory framework to protect human rights.



C. Critical Thinking as a Basis for Learning

One of the most relevant aspects in this context is the development of critical thinking in students, because as AI-based tools become integrated into educational processes, it becomes necessary for students not only to learn how to use them, but also to acquire the skills necessary to evaluate, challenge, and analyze the information these tools generate. Critical thinking is positioned as a fundamental skill in navigating a data-saturated environment, where the ability to discern the truthfulness, reliability, and relevance of information is a fundamental competency.

In this regard, P. Ricaurte warns that while AI has enormous potential, it is also necessary to address the broader impacts of its use, not just focusing on how to interact with these tools efficiently. She emphasizes that universities should teach students how to handle AI and understand its ethical and social implications so that they can use it critically and consciously. This perspective coincides with the positioning of I. Hilliger, who states that it is essential to integrate scientific thinking into education, since it allows students to observe reality, formulate hypotheses, and look for mechanisms to contrast them with reliable evidence.

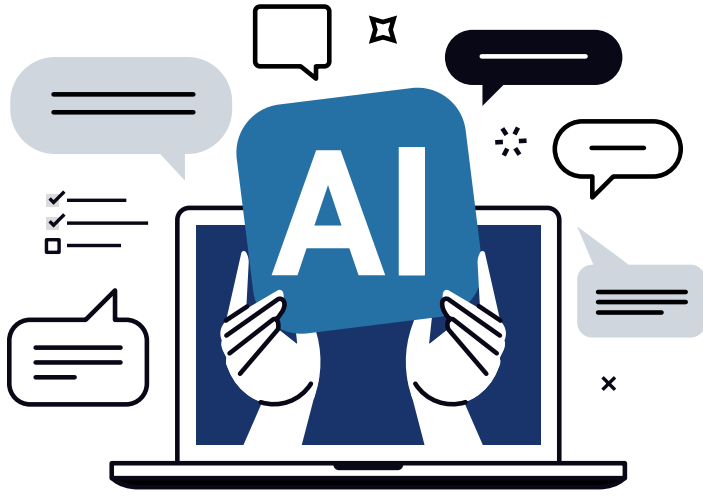
She assures that teaching students to question themselves and critically evaluate information is a fundamental part of education, because, beyond academic research training, the important thing is for students to acquire scientific skills that allow them to apply a method to evaluate reality, by comparing different sources and analyzing the reliability of each of them. R. Luckin calls this process "epistemic cognition," that is, the way in which students understand and construct knowledge.

R. Luckin states that, since the 1960s, studies like Perry's have shown that many students, even at elite universities like Harvard, have naïve beliefs about the origin of knowledge. Students often see knowledge as something that is simply provided to them, rather than an active process that requires questioning and construction. She emphasizes the importance of helping students develop sophisticated ways of thinking and questioning information, especially in a context where misinformation is pervasive. To this end, she suggests that universities, which have the brightest students, be responsible for teaching these skills, as they are the best place to develop robust critical thinking.

Professor Luckin also mentions the AI paradox: although it is often presented as a tool that simplifies life by making things faster and easier, this could lead to a decrease in human intelligence. With the advent of Generative AI technologies, the risk is that individuals will no longer develop cognitive and deep thinking capabilities. So universities need to adapt and modify their assessment systems, as well as the radical impact AI has on how students learn and process information. Rather

than making students dependent on these tools, it is emphasized that they should be used to enhance students' cognitive abilities and help them better understand themselves, question what is presented to them as knowledge, and improve their learning processes. The challenge lies in accepting that this moment demands a greater intellectual effort, not less, since it is essential to teach students to work more intensely in their cognitive and metacognitive development.

A. Forés reinforces this idea by pointing out that the main mission must be to teach students how to read, understand, and decode the world in order to transform it. In a context where informative manipulation is more prevalent than ever, critical thinking becomes essential. The ability to ask questions is one of the characteristics that sets us apart from machines, and therefore, the ability to ask good questions must be cultivated. A. Forés emphasizes that, to be critical, students must have prior knowledge that allows them to evaluate the veracity of the information, discern if they are being manipulated, and understand the underlying values of the information they receive. She clarifies that using AI without the necessary knowledge to perform prior analysis leads to a problem: if a student does not know how to summarize, prioritize, or analyze, and turns directly to AI, they may accept information without questioning it.

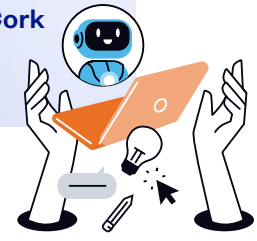


D. Teachers and Students vs. AI Advancement

Within these considerations, I. Hilliger states that one of the main risks of not teaching AI lies in the disconnect with technological reality and with the development of critical and scientific thinking that students need to face a constantly changing world. The omission of these elements implies not only a lag behind advances in industry and academia, but also a loss of educational opportunities for students to make conscious and responsible use of these tools. Similarly, she highlights the importance of students developing competencies that cannot be replicated by machines, such as understanding context, empathy, creativity, and the ability to generate localized knowledge. She considers it essential that teachers carefully select how to integrate AI into their practices, from administrative tasks to more complex uses such as virtual tutors or simulations. She emphasizes that the use of these technologies must be accompanied by reflection spaces that allow identifying which functions can be automated and which require human judgment and sensitivity.

S. Thelen agrees that prohibiting the use of AI does not solve the problem, but rather pushes students to use these tools without guidance, exposing them to formative risks. She also argues that the university has a responsibility to prepare its students for a world where AI is increasingly present, even if it decides to limit its use in certain contexts. She also signals concerns about losing key cognitive skills when students delegate critical intellectual tasks, such as writing, to automated systems. In her view, writing is thinking, and omitting this process causes the loss of a valuable instance of intellectual development.

> *"Look, making something forbidden and then just launching someone into a world full of it is not responsible."*
>
> **- Sarah Thelen, Professor of Teaching and Learning Improvement (Digital Education) at University College Cork**



She also points out that AI systems generate responses based on averages, which can limit creativity and reinforce structural biases, in addition to reproducing extractive and unethical practices. In this situation, Professor Thelen proposes to establish clear standards of ethical use, including recognizing, documenting, and citing the use of these tools. It is necessary to generate critical literacy on AI, understand its functioning, the impacts it has, and how it can be used responsibly, as well as foster transparency at all levels of the education system: from teachers explaining why a certain type of assessment is chosen, to institutions and companies justifying their decisions and policies.

For his part, H. Ceballos determines that, although all the negative effects of AI in the educational field have not yet been delimited, the greater goal is to move to-

wards a balance that allows its use as a learning support tool without replacing the essential training processes. He highlights five key competencies students must develop to properly manage AI: first, understand what AI is and how data works (what some call data literacy or AI literacy); second, possess critical thinking and judgment to assess the quality of responses generated by the tools; third, assuming ethical and responsible use, that is, recognizing that attributing work generated by AI without personal mediation constitutes a lack of academic integrity; fourth, recognizing that the human role is central, especially in creative activities; and ultimately, master specific tools based on one's professional discipline, whether in law, architecture or other areas. For H. Ceballos, these competencies allow AI to be an ally in learning, not a substitute.

Similarly, P. Ricaurte shares her experience in teaching research methodologies, in which she integrated the use of multiple AI tools within a critical and ethical framework. In her approach, it is imperative that students understand not only the technical operation of these tools but also their socio-political background, including issues such as data extractivism, environmental impacts, human rights violations, and corporate interests behind their development. She encouraged her students to explore the functionalities and limitations of AI tools using clear evaluative criteria, while driving them to develop their manual, analytical, and creative capabilities. The experience was positive in showing that only the master of a competency is able to detect errors or biases in the results generated by AI.

For her, the role of the teacher is to train critical subjects capable of evaluating what tools are useful, why they are useful, and under what conditions they can be used. She warns that if students do not develop these skills, AI will not only limit their cognitive development but also their job opportunities. Understanding what AI can and cannot do is key to maintaining autonomy and professional relevance in a technological world.

6. Monitoring of Implementation and Quality Assurance

Incorporating Generative AI into pedagogical strategies, academic activities, or curricular design requires continued evaluation of its effectiveness and potential to promote creativity in students. Only through constant monitoring and detailed review of the modifications that these tools undergo is it possible to accurately assess their impact and effectiveness, ensuring the maintenance of educational quality standards.

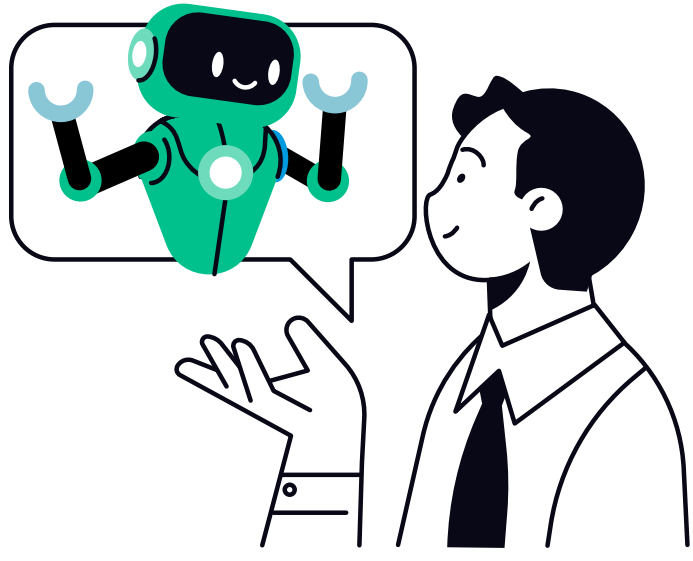
R. Luckin points out that the implementation of AI in the educational field is a challenge that revolves around people and not technology; in principle, it is about people and managing change adequately. Therefore, if decisions are not made properly, there can be serious consequences.

With the arrival of ChatGPT in 2022, it was logical that universities had no idea how to respond immediately, as they could not change their assessment methods so quickly. However, today, it is understandable that if a GenAI can make an assessment without difficulty, this single fact indicates that AI is not very effective, as these tools do not really understand the content, but only handle large amounts of information.

R. Luckin warns that while universities are leaders in AI research, they often do not innovate in their own education systems. Many academic institutions could consider ways in which students could stop using these tools, including banning them, but it is essential to understand that, as long as they exist, people will not stop using them.

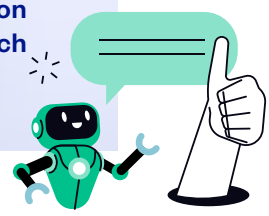
Therefore, this situation presents an excellent opportunity for researchers interested in overcoming the academic challenge of developing educational evaluation plans that do not pose risks to the academic integrity of students in terms of the use of these tools.

Professor Luckin recommends that universities rethink their assessment methods in such a way that AI cannot easily solve them and that their use is complete and clear. These methods would need to be able to reflect what the student actually understands (measure self-reflection, critical capacity, and how the student interacts



with these resources) and go beyond what AI systems can offer. In essence, teachers must not become spies or controllers, but must continue with their teaching role and be a guide that seeks a regulatory framework that invites coexistence and open dialogue, and not want to question the use of these tools.

> *"So I think it's about designing assessments that embrace the fact that students will use the AI tools whether we like it or not."*
>
> **- Rose Luckin, Professor Emeritus of Learner Centred Design at the London Knowledge Lab at University College London and Director of Educate Ventures Research**



Educational institutions need to question how they assess the extent of their students' understanding of what they are learning and also consider what they are actually learning in these spaces, which will equip them to address the needs of the labor market, which already integrates AI. Reflecting and challenging these new criteria will help institutions formulate assessments appropriate to the profiles required by the modern world. It will be necessary to discern the level of understanding students have of themselves, what they know and don't, as well as understand the best ways they learn and the ways they critically evaluate AI systems to drive those key skills that will be imperative in the near future.

For his part, C. Abarca expresses that Generative AI can be very valuable to improve teaching practice through the optimization of time in administrative tasks, where teachers will have a larger window of opportunity to serve their students, thanks to time savings. It is necessary to constantly remember that students go to

educational institutions for the purpose of being trained, not to allow these models to hinder learning and replace them.

However, according to B. Palacios, there are three fundamental barriers to the effective implementation of AI at the university level. Firstly, a significant constraint is the lack of infrastructure, as many institutions do not yet have the systems necessary to integrate these solutions into their learning ecosystems. Secondly, the ideas behind the strategy to adopt these tools are transformed day by day, which implies that universities must understand that it is not only about bringing technologies but also solutions with clear planning and objectives. In this sense, she emphasizes that one should not lose sight of what is truly important by focusing only on resolving urgent matters. Thirdly, she highlights the need to strengthen data protection to safeguard the privacy and security of personal information, such as voice, image, and other sensitive user data.

At the University of Michigan, T. Daniels agrees that they have discussed the risks associated with the use of AI, but they have also taken advantage of the benefits these instruments bring. From her perspective, AI is a tool of experimentation and curiosity, as well as a catalyst for productivity. Whether answering emails or summarizing large volumes of information, her team actively explores these resources to mentor those participating in their trainings.

When it comes to implementing AI in academic institutions, I. Hilliger highlights that there are different nuances to be evaluated according to the educational institution, but it should also be considered that universities are large organizations, which do not usually move in an accelerated way when it comes to these technologies. However, she considers that there is also a lag on the part of other institutions that do not have these capabilities, so it is important to understand the regional and national context in relation to the incorporation of these technologies. Therefore, even though there are opportunities to incorporate such tools, it is critical to understand exactly how they work and the implications of their integration into in-

stitutions in current contexts, and how the industry and the field of work are moving forward.

I. Hilliger points out that the existence of learning analytics and AI significantly benefits those courses that incorporate them, especially when it comes to today, where technology is changing. The advantage is that these tools can be used to improve higher education curricula quickly. This subfield of learning analytics is known as curriculum analytics.

At the Pontificia Universidad Católica de Chile, says I. Hilliger, in the context of undergraduate research, they have been evaluating the variety of existing algorithms, as well as various techniques to evaluate the best course sequences within the framework of the student body's curriculum. Based on that, she believes that those same advances related to artificial intelligence-based techniques should be questioned to choose what is relevant to teach and how it is taught.

Yet today, technology is advancing faster than ever, so it can be difficult for many universities to keep up, especially when they don't have the necessary economic resources. For this reason, taking into consideration local and global contexts with respect to technology will be critical to developing graduates' professional competencies.

Similarly, B. Palacios highlights the importance of incorporating AI into curricula, but she also clarifies that this entails an additional commitment by the faculties: teachers need to go one step ahead. Therefore, Tecnológico de Monterrey is implementing various initiatives such as workshops, trainings, and meetings to motivate teachers to design AI-based solutions, both in their disciplines and in their teaching methods.

Along the same lines, R. Diegoli adds that the university is offering internal certifications for the pedagogical use of AI, in addition to encouraging the participation of teachers in events and exchange communities. She stresses that many of the innovations arise from individual or group initiatives of teachers, who then share their

experiences with other colleagues. This collaborative learning based on practice, reflection, and outcome assessment is key to advancing effective AI integration into education.

Therefore, it is essential to rigorously monitor the implementation of new resources, because, although they are effective at the beginning, it is vital to ensure that the original vision and objectives are maintained. This involves ensuring the protection of personal data and the integrity of the learning process at all times to prevent any of these aspects from being compromised.

7. Technology Infrastructure and Financing

Once it is decided to integrate Generative AI tools into the pedagogical approach or directly into the curriculum, it is essential to assess whether the institution has the technology infrastructure and funding required to establish them. It is necessary to assess whether the systems implemented are technically sustainable (storage capacity, connectivity, and support) and whether the financial resources intended for their adoption and maintenance are viable. In addition, potential changes in costs or access policies to these technologies should be reviewed. Only through ongoing assessment of its technical and economic viability can an institution determine whether its integration into the classroom is sustainable over the long term and continues to add value to the educational process.

I. Hilliger explains that, when seeking to develop technological tools at the local level, it is essential to have a specific infrastructure. However, in many cases, accessing this type of infrastructure is complicated. Given this difficulty, it is likely that institutions will choose to use existing solutions that do have such infrastructure. She warns that the problem is that this involves accepting contracts where data can be hosted on cloud servers, which poses a greater risk in terms of protecting information compared to local storage within an institution. Added to this are the information transfer processes, which raise important ethical considerations related to privacy and the use of data.

Also, I. Hilliger recognizes that this problem is not only technological, but human. In a context where technological tools are advancing rapidly, it is essential to maintain a constant dialogue and generate consensus on what the teacher is teaching, how, and for what purpose, in spaces where teachers can reflect on and reevaluate their subject and how it is articulated with the curriculum. Similarly, organizational intelligence is required to assess the appropriateness of daily educational actions on an ongoing basis. This is intended to encourage active participation of individuals in broad and diverse educational contexts.

For her part, R. Luckin states that smart infrastructure can be compared to electricity. Just as electricity powers a wide variety of devices, smart infrastructure is based on data about how students learn and interact with the world. This information should be moderate and ethically managed through innovative data governance models, such as data trusts. The key is that this infrastructure enables and empowers different types of learning experiences, from a two-person conversation to using online platforms, mobile devices, or technologies like augmented reality.

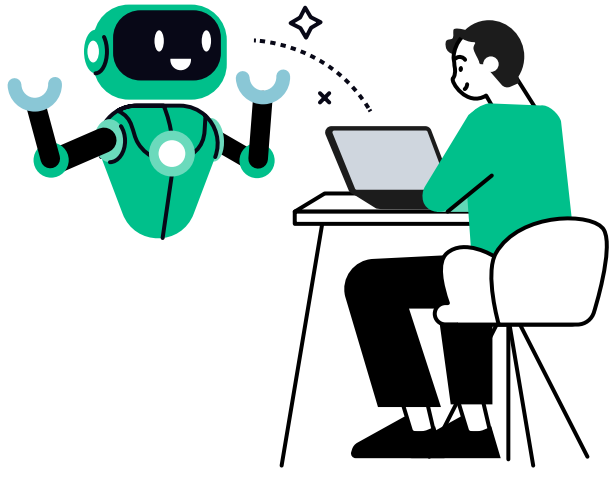
However, Professor Luckin emphasizes that this infrastructure will only have real utility if it combines AI with human participation, that is, if people can interpret and make sense of the results offered by the technology. In that case, infrastructure becomes a valuable resource that strengthens all forms of educational interaction, where data acts as a starting point, and AI can analyze it to provide a clear view of

each student's individual progress. This analysis ranges from their understanding of specific topics to more complex aspects, such as their epistemological development, that is, how they build their knowledge, their critical thinking, and their capacity for reflection.

She adds that if implemented correctly, this approach will lead to very positive results. It will train people who not only know how to leverage the tools of Generative AI to make their tasks easier, but who have an in-depth understanding of the true potential of these technologies.

From another point of view, A. Iñiguez points out that companies like OpenAI have begun to establish agreements with universities to use their products. However, the biggest challenge lies in the subscription model; for universities, generating strategies to give access to subscription-based technology can be a solution to enhance the use of AI, but it also represents a risk. Although it is a valuable tool, it should also encourage the production of free software with a wide range of options, since relying only on commercial platforms can limit technological autonomy.

She also suggests that universities have been interested lately in having all the technologies, but resources are limited and should be managed with caution. Even the development of proprietary tools presents a particular difficulty when competing with large corporations that invest millions of dollars in their creations. Most of these higher education institutions seek to stay at the forefront of innovation; however, technology must be accessible to the entire university community. To achieve this, it is critical to establish fair agreements with technology providers.



Professor Iñiguez also points out that she has identified a high cost of these solutions, because, although many platforms offer free basic features, they require payments for advanced features. In addition to this, the need to be constantly connected to the internet stands out; what works for many cities represents faults and limited access for others. Most of these instruments require powerful servers and expensive equipment, hindering their deployment without good infrastructure.

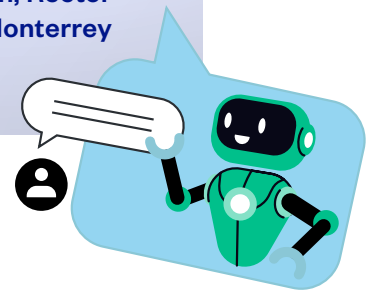
Regarding financing, M. Kriscautzky emphasizes the importance of distinguishing between public and private higher education institutions when talking about GenAI. She points out that it is often very expensive, which means a high investment in infrastructure, and it is still in a commercialization phase, in which companies continue to test its effectiveness while trying to position it in the market. This situation raises a concern: that vicious circle in which institutions use and validate this business model and become dependent on it.

For example, she mentions the case of the UNAM. Being a public and large institution, with an enrollment of around 360,000 students, they do not consider paying for software licenses per student. Instead, they opt for policies of using free software and look for specialized tools that serve for training in specific areas of knowledge. If there is a free solution that serves the same purposes, its use is prioritized.

In addition, she highlights that the UNAM has computer experts capable of developing their own tools, which not only strengthens the university's technological autonomy but also allows sharing those solutions with the university community and other institutions, which in turn promotes a collaborative model.

For AI to be a benefit to society, it is not enough to think about buying time or selling advertising. It is necessary to imagine and propose an AI that works differently, one that does not treat people as data for business, but rather respects and cares for them, avoiding the potential for causing serious harm. It must be at the service of everyone and work together to address the latent problems that affect entire populations. Over time, this instrument has to be managed as a global common good to prevent a few companies from dominating the market and to enable opportunities that generate real value for society (Beliz, 2025).

> *"The challenge is that advances in artificial intelligence do not remain isolated solutions, but become shared opportunities. Its potential must be aimed at multiplying access to learning and strengthening our communities so that technological progress translates into a social transformation with sustainable impact."*
>
> **- Juan Pablo Murra Lascurain, Rector of Tecnológico de Monterrey**



Similarly, M. Kriscautzky warns of the risk of acting with haste by adopting resources that resolve in the short term, but give rise to technological dependence in the future. Her recommendation is to collaborate between the same educational institutions to promote a more sustainable, ethical model without so much dependence on the market and to take into account the environmental impact of these decisions.

Therefore, it is imperative that both educational institutions and technology management decision-makers take an active and thoughtful role in the acquisition and use of GenAI tools. It is not just a matter of following trends or acquiring new technologies, but of carefully evaluating their pedagogical or institutional purpose, as well as considering the financial and infrastructure resources available.

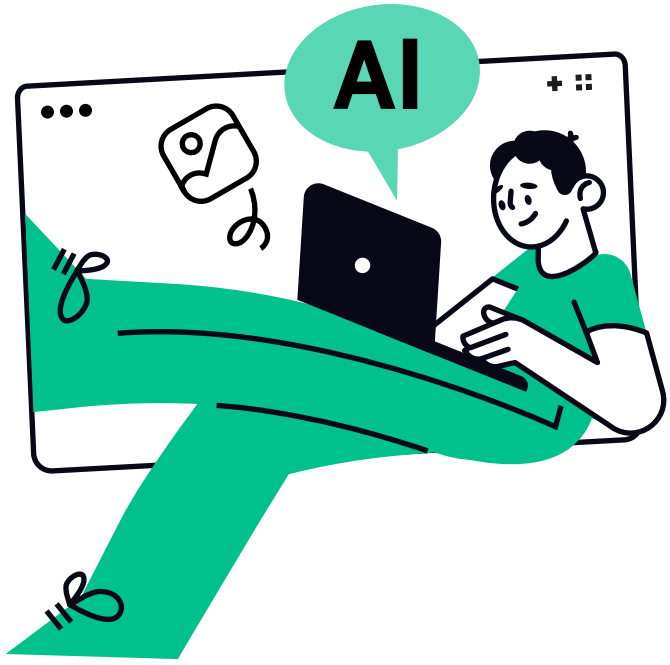
It is essential to promote a culture of critical analysis that allows us to identify when these tools really add value to learning or operational efficiency, and when their use responds only to a logic of technological consumption without a clear or sustainable benefit. This avoids falling into unnecessary expenses and strengthens decision-making aligned with each institution's educational goals and real capabilities.

8. Educational Technologies - Implementation Examples

Educational technologies have become a central hub of education. Their evolution can be traced from before the invention of the whiteboard to the incorporation of various digital applications designed to facilitate the teaching and learning process. However, their implementation continues to stimulate diverse views among specialists, highlighting the need for careful planning and careful monitoring. The use of these technologies should not only respond to the inertia of innovation but also to a deep reflection on their relevance, effectiveness, and pedagogical purpose.

According to M. Kriscautzky, most of the technologies used in education were not originally designed for educational purposes. Today, educators should identify their pedagogical possibilities and integrate them based on their own understanding of teaching and learning. Some tools have been used to convey information, for example, PowerPoint in the 1990s or technologies such as Generative AI today; however, their importance lies in the act of teaching and not the tools themselves. If teaching is believed to be only about transmitting data, any technology, however advanced, will be used only for that.

In this context, the integration of GenAI in educational institutions can offer multiple examples of application if done meaningfully. When its use is set in a clear strategy and accompanied by continuous evaluation, it is possible to exploit its potential to transform the learning experience of students in a positive way, which maximizes its benefits and minimizes risks or uses that may deteriorate some human competencies.



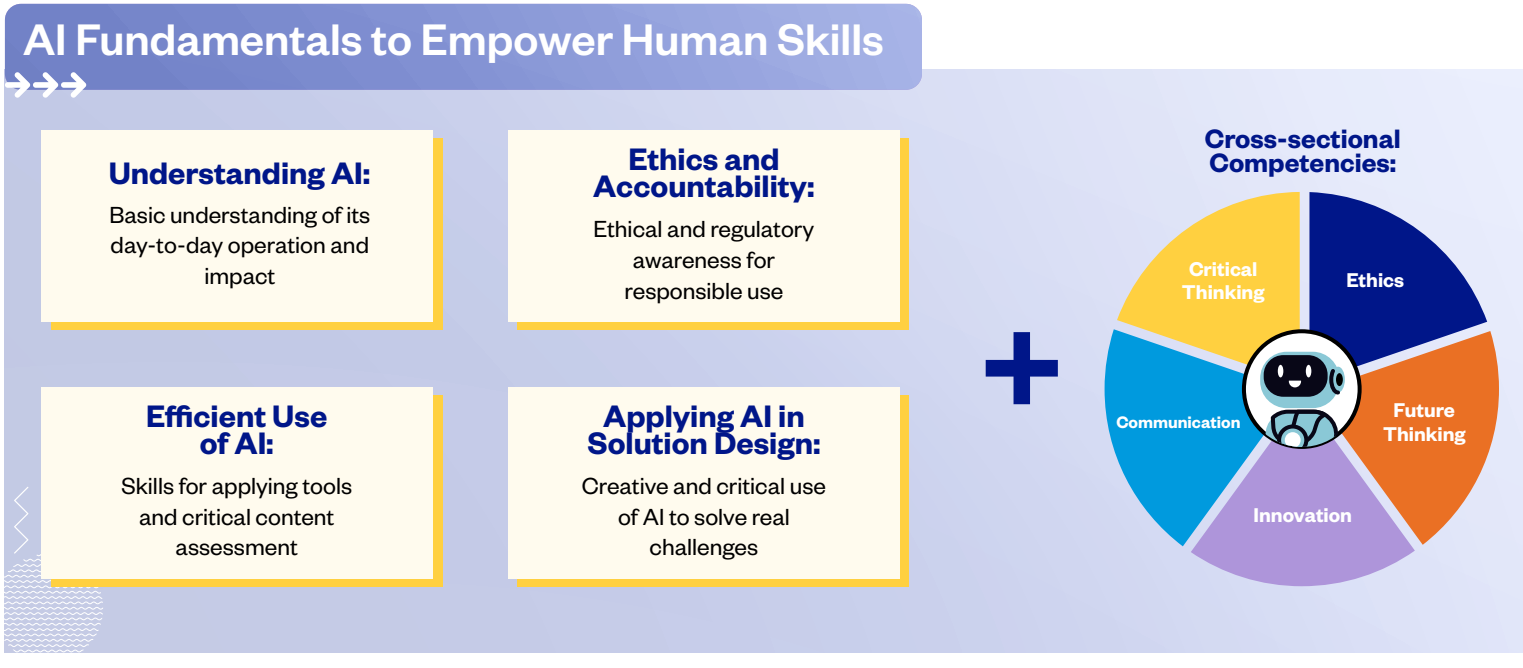
A. Tecnológico de Monterrey

For more than 80 years, Tecnológico de Monterrey has maintained a constant commitment to educational innovation by promoting teaching and learning experiences that foster creativity and critical thinking. Today, due to the need to develop competencies that prepare students to meet future challenges and adapt to an ever-changing environment, the institution seeks to strategically incorporate Generative AI, consolidating it as a key axis in the comprehensive training of its students.

As I. Hidrogo explains, for Tecnológico de Monterrey, the fundamentals of AI to empower human skills are a cross-sectional topic. This serves as a foundation for ensuring that both students and staff, including faculty, have the foundation to use AI or develop projects with it. Additionally, the fourth component of the five priorities outlined in the 2030 strategic plan, which encompasses all of the institution's commitments and initiatives, focuses on "consolidating its educational leadership in a world shaped by artificial intelligence and other emerging technologies."

He also explained that it was necessary to have a proprietary AI framework due to the university's educational model and the human skills that students require after graduation to fulfill their responsibility to Mexican society. This approach entails integrating the use and context of AI in each discipline of the university's academic programs.

Therefore, he stated that four elements were defined as part of the fundamentals for enhancing human skills: understanding of AI, ethics and accountability, efficient use of AI, and application in solution design. However, it was combined with cross-sectional competencies from the institution's professional education model, relevant in a changing world where soft skills are essential: critical thinking, ethics, future thinking, communication, and innovation.



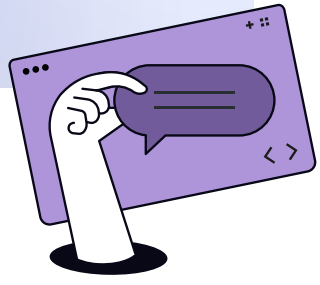
This approach leads to an effective implementation, as it prepares students for software that may not exist five years from now or that may come ten years later. Thus, students are able to improve by understanding any technology, as these teachings endure over time and have the potential to adapt to future transformations.

I. Hidrogo comments that Tecnológico de Monterrey has three great lines for the new demands of the labor market; its proficiency will bring value and impact the students' professional environment. Today, the institution is designing training units in the new curricula that will take effect in August 2026.

This institutional effort will be part of Tec21, the same educational model of competency development through real challenges of companies, hospitals, governments, and organizations, where the academy focuses on developing skills that involve the integration of AI. I. Hidrogo clarifies that while they are not based solely on AI, they do include it.

In this regard, R. Diegoli explains that the Tec21 was already preparing students for an advanced technology environment. This enables AI to be integrated naturally into training processes as the challenges of the labor market are brought directly into the classroom.

> *"We found in AI a way to contribute to raising the quality of teaching and enhancing our impact on society."*
>
> **- David Garza Salazar, Executive Chairman of Grupo Educativo Tecnológico de Monterrey (as cited in González, 2025)**



I. Hidrogo qualifies that this is not the only component, since the first generation of the 2026 plans will begin graduating after 2030, which would imply that current degree candidates are not fully ready for their professional future. Therefore, the second component has been to hold the AI Faculty Summit, an event that, in this recent edition, brought together 400 teachers from all schools across all campuses in person for three days to craft sessions and activities to implement in their groups.

The third component consists of a disciplined AI strategy developed with each of the schools at Tecnológico de Monterrey. This means that Tecnológico de Monterrey is not only defining the actions each school will take over the next five years to integrate AI into student training, but is also establishing discipline-specific centers focused on AI. These centers will emphasize global advancements and develop academic programs tailored to the needs of each industry. Likewise, certifications, hackathons, or events that add to student development are taken into account, as well as a pertinent training program for the faculty.

R. Diegoli states that the integration of AI into academic programs is a highly collaborative process, involving multiple hours of dialogue between academic committees at each school and program. In addition, active listening is conducted by teachers, employers, AI experts, and students with the goal of constructing common guidelines that can then be adapted to the particularities of each discipline and educational level. R. Diegoli describes this approach as a form of "decreasing democracy," where the process begins with broad consultation and ultimately leads to common policies that are subsequently adapted to specific contexts.

As for the teaching-learning process, Tecnológico de Monterrey determines four specific uses:

1. **It assists in the common needs of teaching practice.**
2. **It assists in teaching discipline-specific issues.**
3. **It supports studying techniques and habits.**
4. **It facilitates the development of discipline competencies.**

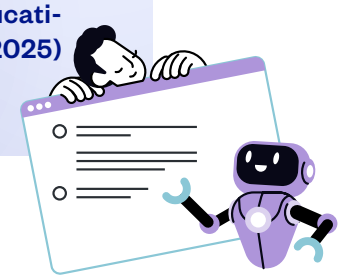
In addition, I. Hidrogo conveys that there are four projects aimed at supporting the use of AI as a tool to enrich the educational process.

1. **Evaluation of learning in a world with AI**. Its premise is to understand the changes that occur in the evaluation process in an AI context, and to assimilate that feedback from the same teacher is essential to make learning more personalized (because they know the learner), without losing quality or human touch.
2. **Academic TECbot**. It is a conversational agent available 24/7 to resolve questions students have about certain topics in the class, as well as to generate concept maps, recommend library resources, or remind them when deliverables are scheduled.
3. **Smart faculty assistance system**. Currently at a planning and development stage, it will be an assistant that supports teachers in their professional development.
4. **AI in the accompanying model**. As part of the Tec21 educational model, comprehensive follow-up is provided for students that is not merely academic, but of their student life through a series of enablers and individuals, such as the entry director, program director, and their mentor, to provide better care.

In addition, Tecnológico de Monterrey has an internal platform called TecGPT, which serves as a framework that covers Generative AI tools developed in the in-

stitution. First, through ChatGPT's LLM, installed in Tecnológico de Monterrey's own cloud with Microsoft Azure and OpenAI Services for data privacy and security, professors and collaborators can use information that, even if sensitive, is not used to train models or leaked to other entities. Not only is it a platform for tools such as ChatGPT, DALL·E, and other AI models, but it also includes a programming environment with additional resources, says José Escamilla de los Santos, Associate Director of the Institute for the Future of Education.

> *"At Tec de Monterrey, we aim to transform lives and communities through education. We found in AI a way to contribute to raising the quality of teaching and enhancing our impact on society."*
>
> **- David Garza Salazar, Executive Chairman of Grupo Educativo Tecnológico de Monterrey (as cited in González, 2025)**



Second, Skill Studio is an instrument for teachers to generate small AI applications built from interactive forms with specialized prompts that generate personalized educational content (such as exercises, activities, case studies, etc.). This way, teacher users only have to give instructions of the activity and the language required so that the system yields an instrument proposal. So far, faculty have shared that they save up to 70% of their time when they use the skill they require. C. Abarca describes that more than 2,500 teacher-designed skills have accumulated collaboratively, positioning the university as one of the institutions with the highest number of practical AI applications in teaching in Latin America and possibly in the world.

Finally, Agent Studio is a pilot project designed for teachers to produce agents on the institutional platform, with the personality, purpose, tasks, and documents that the teacher indicates.

Moreover, R. Diegoli states that the incorporation of AI is not limited to student training; it also affects teaching and evaluation. Some AI tools are already being used by teachers to support feedback, evaluation, adaptive learning, and material design processes.

H. Ceballos highlights that collaboration initiatives between universities are being pursued in Latin America to encourage the responsible use of AI in educational settings. In this context, Tecnológico de Monterrey made available the TecGPT Open Edition platform, designed as a safe and accessible environment for teachers, which is being piloted by twelve universities from different countries in the region.

This pilot seeks to observe how students receive these tools, identify how well they fit into Latin American educational culture, and make necessary adjustments. He reports that, as part of the process, training courses have been developed for participating teachers, which include content on creating prompts, technical use of the tools, and communication on their ethical and responsible use.

In addition, H. Ceballos reveals that the Institute for the Future of Education (IFE) is working on a regional diagnosis of the perception and use of AI in the university setting. To this end, in conjunction with the Digital Education Council, a survey was launched involving 22 universities, mostly from Mexico, but also from other countries. This measurement will allow to establish an overall status of the use of AI in Latin America, both from the perspective of faculty and students. The results will also integrate analysis of the use of so-called "skills" (specific tools or functions) already deployed on AI platforms.

Meanwhile, P. Blikstein discloses that the project Shaping Skills uses GenAI (specifically, machine learning and natural language processing) to analyze job openings and extract information in an automated manner about the skills most demanded

by different industries, such as the communications and automotive sectors. This information helps anticipate future trends in the labor market and design training strategies more aligned with actual demand, as well as support educational and political decision-making. For example, it seeks to assist companies so that instead of laying off employees when demand drops, they can reconvert their skills and reassign them to other functions within the same organization. The project has been recognized internationally, and several countries have shown interest in adopting it.

Finally, many of these tools are already being prepared to be available via an Application Programming Interface (API), allowing for use by both companies and developers, extending their impact beyond the academic environment.

Another project, called iClassroom, led by the Research Lab IFE developed at Living Lab IFE, is based on a methodology known as "Multimodal Learning Analytics (MLA)," which seeks to analyze learning beyond traditional methods (such as exams or quizzes). This approach includes the use of cameras, motion sensors, eye tracking, microphones, and other devices to collect behavior data in the classroom. This helps identify the most effective educational practices and how to optimize the classroom organization, says P. Blikstein.

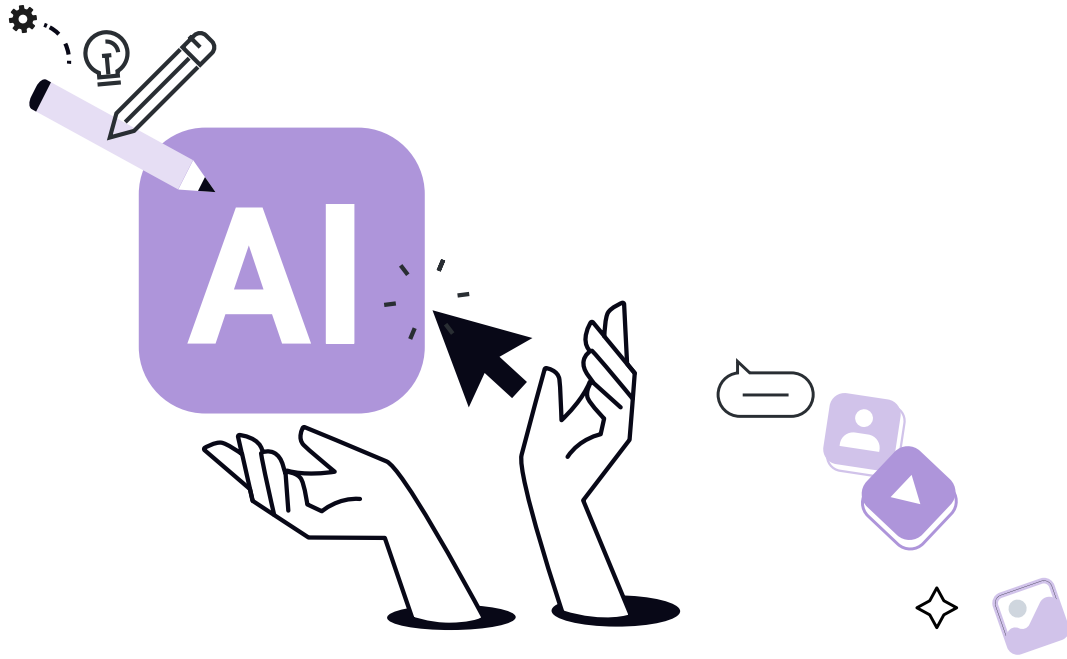
Additionally, C. Abarca demonstrates how Tecnológico de Monterrey has integrated AI to improve both operational and academic processes. One example of this is the process of receiving and editing student badge photos. Previously, it was a manual and inefficient procedure that required multiple interactions with the student. Now, an AI automates the review: face detection, background adjustments, and lighting and angle corrections. This has minimized iterations and improved efficiency without ethical or academic implications.

Also, he points out that there is a critical consideration to pay special attention to: the scientific veracity of content yielded by GenAI tools. As a university, Tecnológico de Monterrey has a duty to ensure that all information shared is factually correct and scientifically validated. Because Generative AI can produce inaccu-

rate or erroneous content, its use requires special surveillance within the academic environment.

The integration of AI in Tecnológico de Monterrey not only responds to a technological trend, but to a strategic educational vision. As R. Diegoli and C. Abarca explain, this commitment seeks to strengthen students' skills to be inserted in very dynamic and technological work environments, as well as to elevate the quality of the educational process from multiple fronts.

This comprehensive approach positions the university as a benchmark in the responsible, strategic, and ethical use of technology in higher education. Above all, it reaffirms its commitment to training professionals prepared for the present and, in particular, for a future that is yet to be defined.



B. Other Universities

Some universities around the world benefit from relationships with industry. These institutions strive to innovate in their own areas to provide their students and other interested audiences with a baseline model for the development of modern solutions. They want to prepare people to meet the challenges of the future with AI-based tools.

R. Luckin points out that the University of Sydney created Cogniti, a platform designed by teacher educators, currently in the pilot phase. Using AI, this tool allows faculty to create custom chatbots, which can be provided with specific instructions and resources. This way, teachers can support the learning of their students in a contextualized way and adapted to their particular needs.

Meanwhile, the University of Michigan has decided to offer its community, including administrative staff, students, and faculty, a proprietary suite of free, on-campus, Generative AI tools. According to A. Marocco, the project began with U-M GPT, a conversational resource similar to ChatGPT or Gemini, but adapted to the specific needs of the university community. This assistant includes features that make it versatile and useful in different fields. For example, it can be used in humanities to analyze large volumes of text or identify trends in surveys, and in engineering to prototype new designs, she explains.

One of the pillars of this initiative is security, privacy, and accessibility. The tools have been developed to handle sensitive data responsibly, allowing it to be used in academic contexts without compromising confidentiality.

Another featured resource is U-M Maizey, a platform for building knowledge bases from a variety of sources. Users can upload files from websites, Google Drive, or Dropbox, and then ask questions about that information. The tool has recently been integrated with the Canvas educational platform, allowing students to interact with their courses: make curriculum summaries, practice with questions, and generate personalized exams.

In addition, the university has launched Go Blue, a virtual assistant designed to answer community-specific questions. For example, new students can view information about campus buildings or post photographs on their class journeys. Agent Studio is another key tool: an open-source platform to create conversational agents (such as chatbots), designed for anyone in the community to develop customized solutions.

in different formats: self-managed, via Zoom, or even delivered weekly via email. These are tailored to the time and needs of each learner, promoting an inclusive experience that recognizes the different abilities and limitations of each individual. To ensure an equitable experience, they have started incorporating complementary tools such as NotebookLM, which facilitates the analysis of long documents.

Meanwhile, P. LeBlanc has proposed, along with other experts, the creation of a global data consortium in higher education, where universities can share information in a secure and anonymized manner. The idea is that increasing the amount of data available improves the quality of the AI models developed. This consortium would have its own governance and prioritize privacy and collaboration between institutions. As he points out, when organizations tell him that their data is a competitive advantage, that just makes him think they don't understand AI.

As in the cases mentioned, more and more educational institutions around the world have begun to integrate AI tools into their pedagogical models and even their curricula. The most relevant thing about these initiatives is not only the technology adoption itself, but also that it is done with the intention of enhancing the mission and vision of the organization, strengthening the teaching-learning processes, and preparing its communities for an increasingly digital, dynamic, and data-driven environment. The key is to implement these technologies ethically and strategically.

9. Organizational Culture and Audience Awareness

Educational institutions have an inherent culture that goes through all levels, from organizational vision to teaching methodologies. From this perspective, universities need to reconsider their goals regarding Generative AI: how they view the technology, the purposes for which they will use it, and the ways they want to prepare students for its application. Beyond embracing it as a tool, it's critical to assess whether this technology is aligned with the institutional vision. In addition, it is essential to educate the university community on its use, understand its ethical and social implications, and explore potential applications in various industries to ensure responsible and effective integration.

I. Hilliger says it is relevant for people to be able to distinguish between different types of AI and recognize when they are interacting with a machine. She argues that because of the ease of use some interfaces offer, machines are often humanized, falling into the wrong belief that there is a person behind. Therefore, it is necessary to understand the limitations of these technologies, especially if humans are considered to have the critical ability to analyze and evaluate them.

In addition, Professor Hilliger states that when discussing AI, there is often a lack of clarity about which type of AI is being referenced, although, intentionally or not, it generally refers to Generative AI. She highlights that there are other types of AI based on different types of data processing that are also important. Therefore, to promote more transparent and critical use, the goal is not to reject these technologies but to understand their differences, capabilities, and limitations.

Similarly, H. Ceballos clarifies that, since Generative AI is now easily accessible from almost any device, a deep lack of knowledge persists about its proper use, the actual scope of its capabilities, and the errors and biases it may contain. For this reason, he asserts that GenAI should be regarded as a support tool that adds value as a complement to various activities. However, he notes that we have yet to clearly define the specific activities in which GenAI is genuinely relevant.

According to S. Butt, the role of faculty should be focused on inspiring, as knowledge today can be gained from multiple sources or devices. Their work should focus on motivating students to reflect and develop critical thinking, a competency that AI cannot teach. Each subject should have this purpose, beyond being limited to a simple transmission of content between sender and receiver. Consequently, curriculum design should be oriented toward critical problem analysis, which would promote an education that shapes people capable of thinking for themselves.

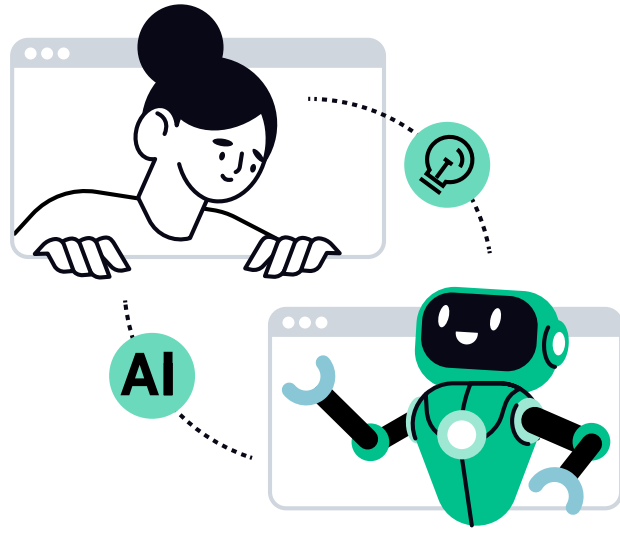
R. Luckin understands that AI in general, including generative, is a powerful tool to understand how to learn better through resources that support a better understanding of the students' skills, strengths, or areas of opportunity. While there are

also ethical challenges around privacy or bias, it represents an instrument that will pass through each individual's life. Ultimately, it must be acknowledged that students will continually acquire new knowledge throughout their lives.

R. Luckin, citing the book *21 Lessons for the 21st Century* by Yuval Noah Harari, highlights the importance of knowing oneself and explains that, "if you don't, artificial intelligence will understand you better than you do." This way, she emphasizes the need to use these tools in a positive way so that we continue to own ourselves and our personal understanding, especially when it comes to how we learn."

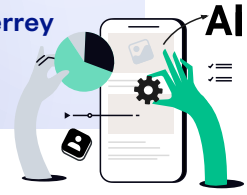
Additionally, A. Forés puts forward a scenario in which different AI platforms were asked if what is currently happening in Gaza can be considered a genocide. While one platform responds no, another affirms yes. This contrast shows that responses are not neutral, but rather involve moral positioning. A. Forés warns that if people rely only on these responses to form their opinion, they risk reproducing biases already present in algorithms, which would affect their ability to judge autonomously.

According to R. Diegoli, cultural resistance and fear of the unknown are inevitable phenomena, as there will always be new knowledge or technologies to learn and understand. However, when these novelties are not adequately assimilated, they can lead to uncertainty or discomfort. Therefore, she emphasizes the importance of establishing dialogue committees where clear conversations about the use that will be given to AI take place, as well as the expectations and limitations observed.



She also says that it is essential to make a gradual and conscious deployment of these technologies, as well as to have special consideration for those who are beginning to become familiar with them. In addition, she suggests that, given the gap in digital skills that affects both teachers and students, it is necessary to serve the different audiences involved by adapting the implementation processes to their realities and needs.

> *"In every case, we must question the relevance of using this tool, because we ultimately serve the teaching and learning process."*
>
> **- Rafaela Diegoli Bueckmann, Academic Vice-Rector of Tecnológico de Monterrey**



It is paramount to generate dialogue spaces where the feasibility of incorporating certain technological tools is discussed in order to reach consensus on their use. This process must be aimed at ensuring that these tools respond to the general purpose and educational objectives of the subject, the training plan, or the institution itself. It is necessary to maintain a common line of action in which all involved agents are informed, updated, and actively participating in making decisions on how to dispose of these resources in the most effective and consistent manner possible.

10. Aspects to Consider

The integration of Generative AI is already a reality that the world is rapidly adapting to, and it is here to stay. However, despite the benefits it brings, there are multiple implications to consider when implementing it, as it also yields negative aspects that can have a significant impact on educational gaps, the vulnerability of personal data, the environment, among others.

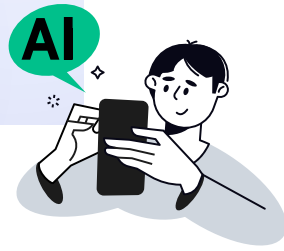
When it comes to funding, integrating GenAIs into the school system is very costly. D. Gašević shares his concern about the use of these tools, which can deepen the educational gap, especially in those institutions that do not have the economic resources to obtain and follow the path of such technologies. Their usage can increase inequalities because either the most advanced models are leveraged through various APIs or a robust computational infrastructure is in place to be able to use open source language models efficiently. Both options can be very expensive, resulting in the lag of many institutions that do not have the resources to integrate them into their education systems. If the digital gap is an ever-increasing reality, then GenAI is a critical element that further deepens it.

Even though AI is the technology that is on everyone's minds, many people have misconceptions about its use. Professor Butt points out that one of these ideas is to think that everything can be done through Generative AI, which is a perception that must change, because although it can provide quick solutions, they are often not the right ones. Yet, AI has infiltrated all areas, which is due to the inherent conception that these tools will automatically add value. It is important to note that, beyond being a technology for creating content, GenAI should be seen primarily as a tool that supports human creativity.

Also, R. Diegoli adds that it is important to consider the organization and ensure the high quality of information, as GenAI responds based on the data it is fed and trained on. For this reason, a significant operational barrier that multiple institutions may encounter is that the information is not organized or is incomplete or null, which affects the quality of the implementation of the tools in the institution and decreases the solutions that could be generated from AI.

The use and implementation of AI should always be cautious and purposeful. P. Blikstein says that just because something is modern and innovative, it doesn't make it good in itself; this is why the technical understanding of AI, and in particular Generative AI, is critical for students. Otherwise, ignoring these topics can lead people to have blind confidence in those tools and make mistakes because they don't know they are prone to hallucination, false information, and bias.

> *"When the AI hallucinates and invents things, it's really just AI working and not a malfunction: that's exactly what these tools were designed for."*
>
> **- Sarah Thelen, Professor of Teaching and Learning Improvement (Digital Education) at University College Cork**



S. Thelen alludes to the lack of multidisciplinary teams involved in developing these technologies as a significant obstacle to the critical use of such tools. On one hand, there are individuals dedicated to science and technology who see only the scientific side of AI, while on the other, there are humanities experts who approach these topics from a humanistic perspective. This situation can complicate communication between both areas by having deep-rooted perspectives on their specialties. Having the most comprehensive possible understanding of such a recent and important topic as GenAI should be explored from diverse, multidisciplinary perspectives to better understand it.

Unfortunately, AI has posed a risk that can lead to fatalities for emotionally vulnerable people, such as those who fall in love with or decide to trust and safeguard themselves in a chatbot. That's why, as discussed earlier, critical use of tools will not only help discern the good use of technologies throughout the educational process but also create learning paths that enhance student performance and improve their overall well-being.

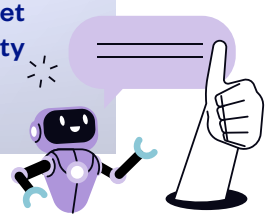
At the University of Michigan, an AI assistant called Go Blue enables the institutional community to easily access information within the university. This tool has several functions, from helping students find their classroom and checking the weather to asking questions about their subjects and even creating practice exams. Through this app, students can feel confident creating their own learning paths.

A. Dimensions of Inequality

As technology advances, so do gaps in inequality. P. Ricaurte points out that, due to the rapid growth of these technologies in recent years, a significant accumulation of resources and capital is concentrated in the hands of a few individuals and countries, which further widens social and international gaps. The technological concentration of AI, that is, the governance, ownership, and control of these systems, not only reconfigures the global social order but also results in the capture of the world's knowledge. Those in control of these systems are also concentrating the knowledge of all people, which causes epistemic inequality.

P. Ricaurte emphasizes that inequality gaps increase both in material and immaterial terms, and it is important that, as a society and citizens, we stay alert to how we contribute to this accumulation of wealth in a few people, as our participation in it incentivizes it.

> *"We are becoming poorer people: poorer in knowledge and poorer in material resources by being users of these systems, while owners of large companies are concentrating all material resources, infrastructure resources, etc."*
>
> **- Paola Ricaurte Quijano, Professor and Senior Researcher at the Department of Media and Digital Culture of the Mexico City campus of Tecnológico de Monterrey and Associate Professor at the Berkman Klein Center for Internet and Society at Harvard University**



B. Cognitive Functions

If a few years ago we were already said to be living in the era of misinformation, Generative AI has further exacerbated this problem. Information analysis capabilities, data interpretation, critical thinking, and efficient knowledge transmission are at risk if learners blindly trust any source of information. B. Palacios says that these skills can be drastically diminished, which would represent a significant loss, as humans are normally able to develop them to a higher level than any AI system could achieve.

P. Blikstein adds that students should identify, as learners, what they should learn in a given course. For example, relying entirely on GenAI in a creative writing class, where the tool does all the writing for the student, undermines the essence of the course. As a result, the knowledge gained from the course is lost, making it a waste of time, and any potential learning is entirely wasted.

Not only is it about increasing productivity and optimizing time, but also learning through difficulties and making mistakes, as ease does not represent a cognitive effort for the brain and therefore prevents learning. There is a big difference between using a tool to learn and letting technologies do all the work, because the latter prevents learning.

P. Blikstein is concerned about the dependency new generations may develop by growing up with these technologies, as they often misuse them to perform already easy tasks such as writing emails, looking up information, or correcting texts, which can be dangerous to cognitive processes. Despite this, unfortunately, it is already a reality that new generations are losing their self-confidence when it comes to academic work.

P. Ricaurte recalls an occasion where, when asking what her students use Generative AI for, one of the answers that shocked her most was that of a student who uses it to review all of his texts, since he didn't trust his own skills. This shows that trust is increasingly deposited in machines and no longer in ourselves.

As a result, we see an impairment of autonomy and agency, because the ability to decide for ourselves whether the work being performed is well done or not is lost, which subtracts evaluation skills. Humans are capable of creation, analysis, synthesis, and assessment, which are superior cognitive competencies. So, what happens if students feel not skilled enough to judge their own work?

C. Ethical Considerations

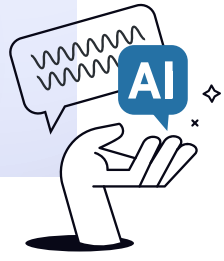
C. Abarca describes Generative AI as “no more than algorithmic, sophisticated, and vector calculation. Therefore, there is no awareness or recognition of evil or good.” So, it will only respond with the data that was used during system training; in other words, these services are responsible for combining existing data to provide the best answers.

For example, when an application such as ChatGPT or Perplexity is asked to write a poem, what it actually does is a knowledge-by-training combinatorial exercise that produces something that fits into the pattern and that the data identifies as a poem. There is no artistic criterion, and it does not have to be good or bad; simply probabilistically, it can result in valuable work. Because of these surprising responses, people can use GenAI without judgement.

The way AIs are trained becomes problematic, since, regardless of the efforts to get rid of biases, the mere act of classifying information already involves such biases and even social construction, making the system dependent on the categories with which it was fed. The first versions of the most popular chatbots were trained with public Internet content, which is usually mostly generated by white, heterosexual, mature, and normally English-speaking men, so such chatbots tend to reproduce the biases of their training data.

C. Abarca says that a significant challenge for universities will be to use data that is representative, neutral, and unbiased. This is not an easy task considering the volume of digital data generated, which already has biases and does not establish equal participation rates of the world's population or vulnerable groups, in terms of gender, etc.

> *"It's very important that we all have a critical spirit and that we don't assume that technology is a carrier of truth, because it's just an interpreter of the data we provide to it."*
>
> **– Carles Abarca de Haro, Vice President of Digital Transformation at Tecnológico de Monterrey**



Thus, Generative AI can have flaws. As we use it, we must be aware of the tool itself, its biases, the unauthorized use of data, and the veracity of information it yields, among other aspects. To do this, the correct use of these technologies encompasses a number of cross-sectional competencies such as ethics and critical thinking. In that regard, R. Diegoli states that academic institutions must generate policies and regulations for proper management; in addition, first, it is necessary to reflect on the use of AI use in the current context of each particular institution.

For any tasks entrusted to AI, C. Abarca advises academic institutions to ensure that the data that make up their AI systems is curated and that they meet ethical criteria, guidelines, and principles as an organization. This includes the organizational culture, vision, and mission that the university identifies with. Overall, the entire institutional community has a tremendous duty, because delegating a task to an AI does not mean that these automated technologies are responsible for the results it delivers; universities are the ones who should always have the reins of those machines and not let them manage everything.

S. Butt advises that there is space to receive human feedback in every application produced with these technologies. If a structured communication process isn't followed when developing a system, no matter how old or how polished an application is, there will always be biases at the end. It is imperative to accept that Generative AI has many biases and that people will face them, so there must always be a legal notice, and under no circumstances can all responsibility be left to Generative AI.

Similarly, these AI-induced biases can have a severe effect on decision-making skills. Human decision-making is more dynamic compared to AI decision-making, which depends entirely on the prompts provided to it and, therefore, is not able to consider all the possibilities of the environment it will face.

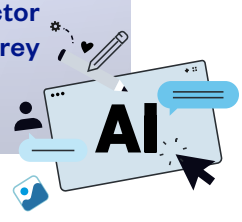
As mentioned before, AI is governed by the data users feed to it; for educational institutions, it means that information from the academic community may be exposed. It is essential that the people who handle this information are aware of the

type of data and where it will be placed, among other characteristics, in order to safeguard these personal records that may be very sensitive.

Generative AI can optimize tasks and accelerate processes, but this also has consequences. B. Palacios exemplifies the use of AI as a weapon. On the one hand, we have a person with ethics and respect for the integrity of others, with an understanding of the danger AI brings, so they should not pose a risk. However, on the other hand, we have a person without that understanding, but with ease of access, so they could use the weapon dangerously. Similarly, a person could misuse these tools, which would damage their own cognitive skills, as well as those of others by misusing information, for example, by creating alarmist and false information, or committing crimes, among other misuses.

"In education, the challenge of artificial intelligence is not limited to the technological realm; it covers ethical and social dimensions. The goal is to ensure that its use empowers human talent rather than deepening inequalities. The core question is not what AI can do, but what we need to do with it to build education systems that are fairer and oriented to the common good."

- Juan Pablo Murra Lascurain, Rector of Tecnológico de Monterrey



P. Blikstein shares four fundamental pillars that encompass the above to make ethical use of GenAI in the academic field:

- **AI has to be used with ethically collected information.** Unfortunately, many AI systems are powered by information collected unethically. For example, the use of an artist's drawing style without attribution or payment, the use of books without paying copyright, or the mere use of the data of thousands of people uploading photos to their personal accounts without knowing that their information will be used in an AI model. For this reason, educational institutions will need to seek authorization for the use of data from their academic community, as well as clarify the information to be taken, be transparent with the ways in which it will be collected, and how it will be implemented to improve the educational and administrative experience of the institution.
- **AI does not replace teachers.** Generative AI tools should complement faculty classes as well as serve as an incentive to improve their practice. Beyond the technical knowledge they bring, the experiences, techniques, and guidance an education specialist can give are irreplaceable. In addition, as mentioned above, GenAI cannot function on its own and must always be managed by an individual due to the risk of hallucinating or providing biased and non-truthful information.
- **AI needs to be designed and controlled by education experts.** Integrating GenAI technologies should always empower people, not massify or industrialize education. That's why these tools should be designed and managed by education experts, those in the classroom, not technology or business.
- **AI should enhance teaching.** The use of GenAI to teach old things in an economical way should be avoided. These tools have the potential for teachers to teach in previously unimaginable ways, opening the door to a world of possibilities for teachers to create new techniques that drive learning.

Knowing the boundaries and being able to distinguish and apply the ethical criteria themselves to make proper use of these technologies in the educational field will

also prepare students for its daily use, since now Generative AI is also embedded in people's daily lives. It is becoming easier to spread unrealistic ideas, make up events that did not occur, or rely on unproven data in order to spread false information to create a social alarm and increase a user's popularity. For this reason, educating students about the risks and misuse of these technologies will enhance their learning and allow them to navigate a world increasingly more plagued by untruthful, poor-quality content.

P. Ricaurte stresses that education acts as an engine of social change, so a values-based, social justice-oriented education is critical to guiding institutions in the selection of necessary technologies and answering the questions of what, how, and why. It is necessary to plan carefully and focus on the correct implementation of the learning processes to achieve the transformation of students, which, in turn, will transform their environment. This mindset must be embraced by the organizational culture of educational institutions.

P. LeBlanc says that higher education cannot be reactive and must be involved in everything that happens with Generative AI today. Educational institutions know about learning and know students better than any other industry, so it is imperative that they establish how these technologies are deployed and ensure they are healthy for students and society.

11. Future Remarks

The world of the future with AI may seem uncertain and be surrounded by speculation. What is considered known today could drastically change in as little as a year. However, some experts working with this technology daily offer valuable guidance on what the future might bring.

R. Luckin explains that, while there have been significant advances in the development and adoption of AI tools, there isn't enough evidence of a clear, positive impact. In fact, misuse of these technologies can lead to negative consequences. She believes we are at a crossroads in which current decisions will impact future generations. Students will not stop using these resources, but it is necessary to think about how to equip them and support them in using them properly.

To make positive progress, she proposes to focus on four key areas: inclusiveness, ethics, youth protection, and scientific evidence. Thus, she highlights the need for robust data on the real impact of AI on education and training and emphasizes that all industry players must understand the risks to protect vulnerable populations.

Meanwhile, T. Daniels agrees that conversations about ethics and equity should permeate, above all, the university arena. Universities are ideal spaces to foster diversity and explore new solutions to complex problems. Rather than just requiring these institutions to address AI, she advises that they be thoroughly informed to use not only their academic power, but also their purchasing ability.

For those without access to large resources, T. Daniels says it will be critical to be willing to dialogue and advocate for topics they see as important, such as environ-

mental sustainability or advocacy for vulnerable communities impacted by the advancement of AI. Higher education should play a role in realizing these values and leveraging its negotiation ability to align with like-minded causes.

M. Kriscautzky warns that it is possible to have the wrong belief that digital technologies are more environmentally friendly compared to conventional methods, since they do not use materials such as paper or wood. However, when employing Generative AI, it is critical to consider its environmental impact. This technology requires data centers that consume large amounts of energy, since every response generated involves more energy expenditure than a simple online search.

Also, T. Daniels believes that, in the coming years, AI will require educators to reimagine their role in teaching from mere information transmitters to true learning guides so that personalized learning consists of concrete opportunities and viable trajectories for each student. She also notes that the flipped classroom approach will become increasingly common, which will mean teachers are willing to learn and experience the use of AI. In the same sense, encouraging dialogue with students about what methods are effective will allow teachers to redesign the assessments to make them more dynamic and aligned with actual learning needs.

For her part, A. Forés says we are at a transition stage where the old is no longer useful, and the new hasn't consolidated yet. This technology-driven change is strong and may be even more radical in the future, although its impact will also depend on economic and global factors. In this scenario, she stresses the importance of staying attentive and flexible without losing sight of the main purpose: namely, to equip future generations with the tools needed to transform the world.

P. LeBlanc explains that the use of GenAI in education will not have to be limited to classifying students into large groups as "online" or "in-person." Instead, the goal is to offer an experience based on an in-depth knowledge of the individual, such as understanding whether a student is going through a bad emotional moment or

has strengths in certain areas, but difficulties in others. Ideally, there should be a consolidation of systems that understand each student in real time, beyond labels.

Even P. LeBlanc uses a metaphor to explain it: “from the whole to the one.” This means using all available data to provide an individualized experience. This approach could transform education and make it more human, but only if approached ethically and carefully.

Additionally, S. Thelen says many jobs are disappearing due to AI automation, but people are still there, so we need to think about how to sustain them. She brings up that the way AI eliminates tedious tasks is beneficial, but she says that it is also necessary to decide which tasks should remain human. The expansion of AI did not happen organically; it was driven by people who decided to use it and trust it.

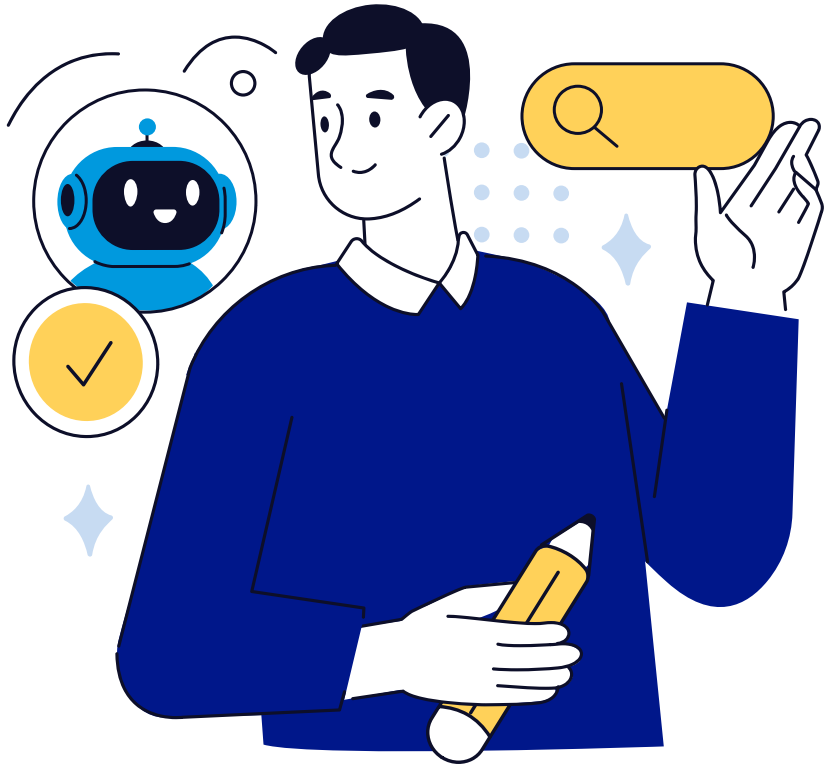
Now that the world is in a collective process of defining what must remain exclusively human, it is important to regulate AI, because companies prioritize their profits rather than social welfare. For this reason, she explains that the government must set clear limits and rethink standards, values, and workloads. She asserts that while there are no simple answers, it is vital to reflect deeply.

Finally, P. Blikstein points out that AI should not replace teachers, but rather complement them and enhance their work. The ideal AI is one created and controlled by people with educational experience, not by technologists or entrepreneurs, and its purpose must be to empower teachers, not to massify or industrialize teaching.

P. Blikstein says that some institutions allow technology companies to modify their teaching methods, as with surveillance systems, to avoid cheating, which end up having a negative impact on students with disabilities or in vulnerable contexts. By following commercial products, this scenario harms the educational mission. He also compares this situation to social media, which seemed harmless at first, but has been shown to have severe consequences. Similarly, AI companies today appear to have good intentions, but many times they don’t really understand education. For this reason, he insists that educators should be the key decision makers.

He also invites all college students, regardless of discipline, to learn about AI from the first year: how it works and how to use it in a healthy and ethical way. This has the potential to make any professional (writer, journalist, artist, engineer) more creative, productive, and independent if trained with discretion.

Generative AI, like many other technology tools, is here to stay. However, its true contribution to education will depend on the use it is given. To create value, it is critical that each involved agent takes their role responsibly, acts with adaptability and agility, and ensures that innovation always maintains a human approach.



12. Conclusion

Experts from around the world, both in the education and AI fields, agree on the benefits that adopting Generative AI can bring to learning processes. However, they also warn of the importance of carefully considering certain key aspects to ensure proper implementation.

C. Abarca highlights that higher education institutions face the challenge of integrating AI in a context of great organizational diversity. Although some are more advanced than others, in general, the system still goes through a process of adapting and understanding the phenomenon. He implies that, beyond technological readiness, the academic judgment with which these tools are used is crucial; it's not about integrating technology just because it is, but about doing it with knowledge, purpose, and responsibility.

Both C. Abarca and S. Thelen agree that there is a concern about the transformation of the labor market due to AI. There will be disruptions, especially in intellectual work, which could affect college education. Professor Thelen complements that increased productivity is expected with fewer human resources, posing challenges for both businesses and education systems, which must rethink how to prepare students for an environment with fewer initial opportunities.

What is relevant is that, as in previous technological revolutions, this one will also raise the bar on what is expected of human work, which in turn will allow people to focus on tasks that require creativity, judgment, and complex thinking.

S. Thelen adds that while AI takes on creative tasks, it could reach a point where it loses its utility due to the saturation of content generated by this technology, which would lead to more selective and critical use of the tool.

According to A. Iñiguez, Generative AI should be viewed as a cross-sectional tool of the learning process, useful for unlocking ideas, facilitating understanding of complex topics, and fostering key competencies such as critical thinking, ethical use, and creativity. Its use should be intentional and thoughtful: know when, how, and for what it is used. It needs to be integrated into a broader digital competency.

S. Butt says that prohibiting the use of GenAI in the classroom is unfeasible and naive. Students will find ways to use it, and in many cases, their answers cannot be distinguished from those of humans. Instead of trying to restrict it, the focus should be on improving education by learning from its mistakes and leveraging it.

R. Diegoli recommends avoiding absolute responses about the use of AI. The value lies in having a constant, critical, purpose-driven dialogue. Institutions must remain committed to developing leaders with social judgment, vision, and responsibility, capable of applying AI not only to their personal development but also to contribute to a better society.

Integrating AI into education requires constant reflection, shared responsibility, and a clear vision of educational purposes. The most relevant factor is to use AI as a tool, not a substitute, and always maintain human leadership in educational decision-making.

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