CHALLENGES OF TECHNOLOGIZING TEACHING AND LEARNING AT UNIVERSITY

RETOS DE LA TECNOLOGIZACIÓN DE LA ENSEÑANZA Y APRENDIZAJE EN LA UNIVERSIDAD

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Abstract: This narrative review addresses the challenge posed by the widespread extensive use of digital tools, i.e., technologization, in university education, highlighting three aspects. First, an overuse of digital tools by teachers is discussed, particularly slideware as the most frequently used technology. Concerns are raised as to how effective an extensive use of such a technology is in promoting learning. Additionally, the impact of electronic devices used by students, especially smartphones, is reviewed, and the decrease in comprehension and academic performance associated with reading digital texts and writing on digital media compared to printed format is highlighted. Finally, the impact of artificial intelligence (AI), specifically the ChatGPT language model, in education is discussed, addressing both its potential benefits and ethical and educational challenges. The integration and promotion of AI tools in education pose additional challenges, such as environmental impact, digital distractions, and educational exclusion. A need for a balanced approach which follows the precautionary principle is emphasized, so educational institutions take preventive action to protect individuals and the environment, as well as to avoid potential harm when scientific evidence about an activity or technology is uncertain or incomplete. The text underscores the importance of raising awareness about responsible use of technology in education and advocates for a critical and reflective approach in its application so Sustainable Development Goals may be achieved.

Keywords: ICT; Artificial Intelligence; Sustainable Development Goals; Technologization; Higher Education.

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Resumen: Esta revisión narrativa aborda el desafío que plantea el uso generalizado y extensivo de herramientas digitales en educación superior (tecnologización), destacando tres aspectos. Primero, se analiza el uso excesivo de herramientas digitales por parte de los docentes, particularmente presentaciones de diapositivas como la herramienta digital más utilizada. Se plantean dudas sobre la eficacia del uso extensivo de dicha tecnología para promover el aprendizaje. Además, se explora el impacto del uso de dispositivos electrónicos por parte de los estudiantes, especialmente teléfonos inteligentes, y se destaca la disminución de la comprensión y el rendimiento académico asociados a leer textos digitales y escribir en medios digitales en comparación con el formato impreso. Por último, se analiza el impacto de la inteligencia artificial (IA), específicamente el modelo de lenguaje ChatGPT, en educación, abordando tanto sus beneficios como los desafíos éticos y educativos. La integración y promoción de herramientas de IA en la educación plantean desafíos adicionales, como el impacto ambiental, las distracciones digitales y la exclusión educativa. Es necesario plantear un enfoque equilibrado que siga el principio de precaución con el fin de que las instituciones educativas tomen medidas preventivas para proteger a individuos y medio ambiente, así como para evitar posibles daños cuando la evidencia científica sobre una actividad o tecnología no sea concluyente. El texto subraya la importancia de sensibilizar sobre el uso responsable de la tecnología en la educación y aboga por un enfoque crítico y reflexivo en su aplicación para poder alcanzar los Objetivos de Desarrollo Sostenible.

Palabras clave: TIC; Inteligencia Artificial; Objetivos de Desarrollo Sostenible; Tecnologización; Educación Superior.

1. Introduction

The widespread and regular use of digital technology among university faculty and students poses a significant and pressing challenge that should not be overlooked. Easy, convenient and low-cost access to modern technologies, encompassing everything from smartphones to high-speed internet connectivity, exposes learners to a double-edged sword. What was once an aid with enormous power for information dissemination for both teachers and students now risks becoming a source of potential distraction, psychological distress and dependence if not used rationally. In fact, the pervasiveness of technology use and misuse within contemporary classrooms presents a growing concern for educational institutions, authorities and society in general. This narrative review aims to gather in a non-systematic way recent evidence, many of which comes from meta-analyses and systematic reviews, of the effects of technologizing education, particularly higher education, which in turn impacts a

number of Sustainable Development Goals (SDG) (United Nations, 2015). The focus will be on the extensive use of digital technology in tertiary education from the perspective of both teachers and students, ranging from the (over/mis)use of slideware and smartphones in class specifically to the introduction of artificial intelligence (AI) for academic purposes, as well as the possible consequences of such a use. It is imperative for society, with universities playing a pivotal role, to promptly confront and tackle these challenges, as they may threaten to overwhelm and impede the cognitive development of this and future generations.

2. Literature review

2.1. *Technology in education*

Over the last two decades technology has gradually been introduced in education settings. Notably, public authorities across nations have actively advocated for the incorporation of information and communication technology (ICT) in primary, secondary and tertiary education as a means to improve academic outcomes. Across Europe, the European Union has implemented the Digital Education Action Plan (2021-2027) as a policy initiative to support the sustainable and effective adaptation of the education and training systems of EU Member States to the digital age with two priority areas: 1) fostering the development of a high-performing digital education ecosystem; and 2) enhancing digital skills and competences for the digital transformation. A close look at one European country, Spain, as an example reveals that this country took steps towards digitalizing education with an organic law on Education in 2006 which set as one of the aims of the national educational system "training students to guarantee their full integration into a digital society and learning of a safe use of digital media" (Ley Orgánica 2/2006, p. 16). Digital technologies were presented as fundamental tools to introduce methodological change in teaching-learning and to transform education. A subsequent education law put forward that educational authorities should be in charge of "promoting the use of ICTs […] among all teachers, regardless of the subject they teach, by establishing specific training programs" (Ley Orgánica 2/2020, p. 50) and

"promoting the use of ICTs in class as it is an adequate and valuable teaching-learning tool" (p. 52).

Following the specific example of Spain, the promotion of the use of ICTs among teachers has been reflected in recent education reforms which have introduced the so-called "Teacher Digital Competence" among teachers. Similar to the Common European Framework of Reference for Languages which describes an individual's language ability on a six-level scale, from 2024 Spanish teachers should have their digital knowledge certified and recognized from A1 to C2. The digitalization and technologization directives from past and current Spanish governments for the last two decades have very important and serious consequences in education and for society in general. Such directives convey the unequivocal message that, without ubiquitous digital technology in class, any teaching methodology that follows "traditional standards" (that is, technology-free methods) is outdated and non-innovative. With the Digital Competence prerequisite for Spanish school teachers, the pressure for using technology widely will definitely increase.

Society must be informed about the actual positive and negative effect of technologizing education (including non-conclusive evidence), especially at early years and primary education levels because of the tremendous impact it will have on individuals at later stages in life. UNESCO's Global Education Monitoring Report (GEM, 2023) on technology in education around the world highlights some of the positive effects of using technology in education, such as customizing learning experiences, providing feedback more effectively, and adapting materials to different learning needs. Equipping students with digital literacy is crucial. However, digital literacy does not mean that teachers should use digital technology in class as its effectiveness must yet be evidenced. Often technology is not the solution or even "the right approach to address contextual and systemic challenges that prevent learners from acquiring basic skills" (UNESCO, 2023, p. 69). The GEM report concludes that technology can facilitate teaching and learning processes but requires contextualization and integrated support. In fact, a systematic review on the effectiveness of online and blended learning from schools conducted by Topping et al. (2022, p. 32) concluded that "many papers (analyzed in their review) were authored by digital enthusiasts who were less enthusiastic about pedagogy" because there was little information about the pedagogical details of the interventions

analyzed in the studies subject to analysis. Thus, technology may offer potential benefits for teaching and learning but the evidence has major limitations, highlights UNESCO (2023).

There are number of key messages to be highlighted in the GEM (2023) report. First, the evidence on the impact of technology on learning is not conclusive, as several meta-analyses shed contradictory results. On the one hand, Kates et al.'s (2018) study on the relationship between student mobile phone use and educational outcomes covering students from pre-primary to higher education in 14 countries between 2008 and 2017 found a consistent negative, albeit small, effect on educational achievement. The authors suggest that avoidance of mobile phones in educational settings could be beneficial for academic performance. In contrast, Kärchner et al.'s (2022) meta-analysis found moderate to high effect sizes for the seven identified learning-related outcomes such as self-efficacy, intrinsic motivation and self-determination. Assessing the impact of technology use on learning alone is difficult because it is often impossible to isolate it from other factors (such as teacher support, resources, class size, etc.) which may actually be the ones affecting learning positively.

A second argument, the UNESCO (2023) GEM reports, is that technology companies can have enormous influence over public opinion, as some (such as Pearson, as mentioned in the report itself) have funded their own studies that disseminate significant, positive effects on learning, and then contested the results of other independent studies which have shown no impact of technology on outcomes. Another example may be BlinkLearning, an international educational technology company present in 60 countries, which publishes a yearly report on the use of technology in class. The 7th Global Study on the use of technology in education conducted specifically in nine Latin American countries and Spain reports strikingly positive results from around 5,000 teachers surveyed in 2022, such as that only 3% of teachers reported not using technological contents at all, and 3% reported not identifying any pedagogical benefit from using technology in class. Connectivity is reported as the greatest challenge when using technology in class, and a worrying 38% report using digital and paper contents to the same extent while 24% admit using only digital materials (BlinkLearnking, 2022). Conclusions such as these may send the public opinion an implicit message that digitalizing education comes risk-free. In addition, they reveal a generalized unawareness among teachers about the

potential risks of an extensive use of digital use on learning. Thus, the arguments put forward by the UNESCO GEM report on the need to be cautious with technology in class should be disseminated widely so governments and teachers may make sound decisions.

2.2. *Technologization of university teaching*

One sector where technology has been used extensively is universities. Faculty have increasingly used technology in their lessons driven by the aspiration to enhance their instructional efficacy and make lectures more appealing. Teaching software involves an array of tools such as digital presentations, online platforms for disseminating course materials, interactive simulations, educational video resources, virtual debates, and synchronous collaboration tools.

Among all available digital tools for educational purposes, slideware (i.e., computer programs for designing digital presentations) stands as the most widely used at school and university. In particular, Microsoft PowerPoint (PPT) emerges as the favored software choice, as reported by Martin & Carr (2015), who found that over 93% of primary and secondary school teachers reported to used PPT as a tool to integrate technology and multimedia in class. At college level, figures are overwhelmingly high (e.g., Hill et al., 2012) as lecturers use slides to project lecture notes, explanations and definitions, graphs and to guide them when introducing contents. Teachers find them useful to organize information, provide clarity for students and presumably improve their own teaching performance, while students like slide presentations because they outline lecture notes and important information and keep the audience interested in what is happening in class. Today hardly any university student would raise doubt that their teacher used slide presentations in class.

PPT is a software originally created to design visual aids for group presentations within organizations. The program has ready-made templates, but users may customize appearance in many different ways to adapt the layout to their needs. It is the default format of PPT that has been the focus of attention of some studies, such as the one by D'Angelo (2018), which found that PPT default slide structure of topic-subtopic-bullet points negatively impacts how much information undergraduate students retain compared to the assertion

evidence structure (that is, a sentence headline that orients the audience to the purpose of the slide supported by visual evidence underneath). Teachers may customize their presentations, but most use bulletizing as it is, apparently, the clearest way to present information.

As well as the default format, PPT includes a variety of elements to help users create engaging and visually appealing presentations such as text boxes, images, shapes and icons, animations and transitions and embedding of audio and video files into slides to add multimedia content. Such elements may have a positive impact on learning, as combining text and visual features contributes to enhanced learning and higher achievement, as suggested by a study by Mayer & Moreno (2003). However, there is no conclusive evidence on the positive impact of PPT on outcomes, as reported by a meta-analysis by Baker et al. (2018), which found mixed results with regard to the relationship between teachers' use of PPT and students' cognitive learning partly due to a lack of information as to how PPT was used by teachers. Hence, conclusive evidence as to how effective PPT may be in promoting learning is yet to be found.

Indeed, if PPT presentations are overused, overloaded with information and not wisely designed, they may lead to distraction, boredom and loss of interest by the audience. This is not only the case of PPT, but also other digital tools such as Kahoot! or Genial-ly that many university teachers have quickly embraced, tempted by the beautiful layouts and numerous format options. An overuse or misuse of such software is not harmless, as an excess of visual elements, as well as a tendency to oversimplification, may redirect attention from content, knowledge and the promotion of reflection to format of learning materials, thus leading to disengaged entertainment and turning students into passive spectators. As a matter of fact, enriching instruction with so-called seductive details (interesting yet irrelevant information in learning materials such as pictures, animation, etc.) hinders learning, as evidenced by Sundararajan and Adesope's (2020) meta-analysis. Most recently, an online quasi-experiment by Kienitz et al. (2023) showed that seductive details have detrimental effect on learning with multimedia instruction, especially when the added seductive information rather than pertinent content is deeply processed. The study showed seductive details divert learning as students focus on and integrate them with prior knowledge at the expense of relevant content. The authors suggest that teachers should omit seductive details from learning materials or alternatively

inform students about the irrelevance of such details, as it is the best way to prevent from the negative effects of deeply processing unnecessary information, which eventually impacts learning outcomes negatively.

When used poorly PPT may even constrain speaker's discourse so a number of points (bullet points) are covered and thus hinder connection and dialogue with students. Research such as the one by Hill et al. (2012) evidences that slideware may not be effective in encouraging discussion and interaction in class because it may act more like a movie theater where passive entertainment is projected. And even if they capture student attention, slide presentations may not foster reflection or engaging group discussion if the lecturer is keen on following the preset guide of bullet points and must speed up speech to cover all points on a slide against a ticking clock. In short, entertainment is a desirable element in the learning process, but entertainment without learning is a waste of time and resources.

The fact that teachers intensively use digital tools such as PPT in their lessons may convey the message that slideware constitutes an indispensable instructional resource. Often, slides may become the center of attention and even the main source of study for students, who become distressed if teachers do not give them access to their slide presentations via their online platform. Experimental evidence from a study by León & García-Martínez (2021) points at the negative impact of providing PPT slides to students on academic performance and attendance, which all lecturers should know when deciding which learning materials their students should have access to.

2.3. *Technologization of university student learning*

College instructors are not the only ones attending lessons armed with technological tools. The great proliferation and availability of technology and internet connectivity over the last decade have allowed a large proportion of the population to own devices at affordable prices. Nowadays, college students attend classes fully equipped with electronic devices. Recent reports conducted by the Pew Research Center (2024) on mobile phone trends in the USA show that 97% of people aged 18-29 owns a smartphone, while 80% of students report connecting 2 or more devices (typically a smartphone and a laptop)

to campus Wi-Fi on a daily basis, as evidenced by other piece of research by Gierdowski et al. (2020). Figures in Spain are similar, as 87% of college students use laptops to take notes in class and 75% use smartphones to check for information (Martínez-Rodrigo et al., 2019). The almost universal access to internet (in developed countries), coupled with fulltime accessibility and portability of electronic devices, has turned technology such as smartphones into an omnipresent item in today's higher education environments.

The prevalent use of screens in all sorts of formats such as mobile phones, laptops, or tablets by university students in class today may have significant consequences, as reported by scientific evidence. Devices, in particular smartphones, act as distractors for students and may hamper reaching academic goals as they are incessantly bombarded by push notifications and engage in an excessive use of social media platforms. Studies such as the one by Al-Furaih and Al-Awidi (2021) show that when asked not to use smartphones in class students' level of fear of missing out (FoMO) is high and strongly correlates with both attention distraction and learning disengagement. Smartphones are thus sources of entertainment as they take student attention away from the focus of learning and hinders comprehension, as evidenced by research by Huey and Giguere (2023), which may eventually affect academic achievement negatively. In fact, recent studies, in particular the literature review by Amez & Baert (2020), have pointed at a relationship between smartphone use among university students and low academic achievement.

Distraction may not only come from one's own electronic device but from peer students in class. Hall et al.'s (2020) study evidenced that students' laptop use distracts neighboring students and shows that the types of activities that laptop users engage in during lecture (whether on-task note-taking or off-task internet browsing) matters for all neighboring students' comprehension of material. Thus, students' laptop use may be detrimental to their comprehension of lecture material.

Classroom management may also be negatively affected by the use of digital technology in class. For instance, Nikolopoulou (2020) reported that teachers' perceived concerns were associated with students' abusive behavior, difficulty in controlling students (classroom management problems), noise and disruption in class, as well as students' distraction when they access unintended resources or irrelevant information.

To make matters worse, smartphone use may lead to anxiety and stress (Stankovic et al., 2021), worse psychological wellbeing (Huey & Giguere, 2023), as well as poor sleep quality (Stankovic et al., 2021). Research by the Pew Research Center (2024) showed that 20% of north American adults aged 18-29 were smartphone dependent in 2023, yet the proportion of smartphone dependency among college students ranged between 6% and 13%. Nevertheless, despite the percentage being lower among university students, a meta-analysis by Sunday et al. (2021) concludes that smartphone addiction negatively impacts students' learning and overall academic performance.

UNESCO's (2023) GEM report informs that at a global level almost one in four countries has introduced banning mobile phones from schools in laws or policies, and these are more common in Central and Southern Asia. A few countries have even introduced policies that ban the use of mobile phone among both students and teachers, yet the question is whether banning is legitimate and if the solution may require actions beyond prohibition. Given the proliferation of digital diversions, smartphone banning at university is an unrealistic goal.

Many proponents, including UNESCO, suggest that students must become discerning users of technology by understanding its potential benefits and risks, developing critical thinking skills, and learning to function effectively in both technology-rich and technology-free environments. That being said, such proposals may neglect the fact that children's self-control, which allows them to self-regulate their desire to achieve instant gratification, develops during childhood and stabilizes by age 10 (Vazsonyi & Jiskrova, 2018), and is still very low among adolescents between 15 and 19 (Oliva et al., 2019). Thus, it would be very difficult for a child, adolescent and young adult to inhibit their natural drive to explore the world (including the online world) if widely and extensively exposed to digital technology. Hence, hoping students will critically use ICTs, refrain from exploring and turn screens off, even at education premises, may be a utopian ideal. When digital technology is available and unsupervised, the temptation to explore is even greater and the ability to self-regulate one's own desire to achieve instant gratification diminishes.

Given the ubiquity of digital learning tools and the intensive utilization of electronic devices by students, teachers may wonder whether the type of medium (whether paper or screen) plays a role in how much students actually understand from what they read. The answer may come from a meta-analysis by

Delgado et al. (2018) which analyzed 54 studies involving 171,055 participants. The main finding clearly points at lower reading comprehension and shallower processing when reading digital texts compared to printed texts, which had been suggested by prior studies. The causes of screen inferiority have to further be analyzed (e.g., anticipation that digital texts may be easier, reading strategy and speed, distractors on screen, online interferences, etc.), yet teachers may consider this evidence when promoting learning in digital environments. Some may claim that significant reliance on digital media saves paper and contributes to SDG #12 on ensuring sustainable consumption and production patterns. The key, however, may lie in finding a balance between printed and digital texts.

Last but not least, neuroscience is shedding light on the paper-onscreen debate when it comes to writing. Two recent investigations have pointed in the same direction: writing on paper (handwriting) is superior to writing on a digital device. First, research by Ose Askvik et al. (2020) analyzed the adult brain related to cursive writing, typewriting, and drawing, and concluded that handwriting helps remember information better, thus "because of the benefits of sensory-motor integration due to the larger involvement of the senses as well as fine and precisely controlled hand movements when writing by hand and when drawing, it is vital to maintain both activities in a learning environment to facilitate and optimize learning" (p. 1). In addition, neuroscientists Umejima et al. (2021) revealed that when comparing paper notebook, electronic tablet, and smartphone as tools for recording a task, the duration of recording was shorter and accuracy was much higher with a notebook than with electronic devices. In particular, higher-order brain functions such as memory, visual imagery, and language during the retrieval of specific information, as well as the deeper encoding of that information, were stronger when using paper.

2.4. *Artificial intelligence at university*

In the intricate landscape of contemporary higher education, the emergence of artificial intelligence (AI) poses additional challenges and complexities that the entire education community should be aware of. The proliferation of AI tools has elicited varied responses among academic professionals, ranging from apprehension and calls for prohibition to enthusiastic embracement due

to perceived benefits and transformative potential. Some educators see that AI models have the potential to enhance learning, among other things, because it allows students to learn at their own pace. In fact, a systematic review by Forero-Corba and Negre Bennasar (2024), which analyzed 55 studies on the use and impact of machine learning and AI technologies in education conducted in 38 countries revealed that a number of intelligent techniques are increasingly used in education, such as detection of students' academic performance early, improvement of educational skills of teachers, facilitation of learning of students with autism spectrum disorders, prediction of school dropout and decision making, improvement of academic and career guidance for students, and prevention of spread of fake news on social networks, among others. At the opposite end, scholars and educators are concerned with ethical considerations, data privacy and a potential misuse and manipulation of AI, exemplified by students using AI language model ChatGPT or Gemini for producing assignments devoid of substantive or genuine learning, which may result in academic dishonesty and lack of integrity.

As a matter of fact, when prompted with what the drawbacks of using ChatGPT are in higher education, the language generation model itself mentioned:

> accuracy: ChatGPT's responses may not always be accurate, potentially leading to misinformation or misunderstanding among students; data integrity: There may be concerns regarding the quality and reliability of the data used to train ChatGPT, leading to biases or inaccuracies in its responses; ethical considerations: The use of AI raises ethical questions related to privacy, consent, and the responsible use of technology in education; safety concerns: There may be risks associated with interacting with AI models like ChatGPT, particularly in terms of cybersecurity threats or inappropriate content generation; and Knowledge plagiarism: There is a risk that students may rely too heavily on ChatGPT for answers, potentially leading to plagiarism or a lack of original thinking in their work (OpenAI, 2024).

The aforementioned issues will surely soon be tackled and analyzed in the near future and evidence shared. When further prompted about how using ChatGPT may hinder learning at university, the model gave examples such as:

> overreliance on instant answers, […], leading to a lack of critical thinking and independent problem-solving skills; misinformation, as ChatGPT's responses

> may not always be accurate or reliable, potentially leading to the dissemination of misinformation among students; reduced engagement, as constant interaction with ChatGPT may lead to decreased engagement with course materials and reduced participation in class discussions and activities; lack of depth in understanding, as it may provide surface-level explanations or responses without delving into deeper conceptual understanding, hindering students' ability to grasp complex topics thoroughly; decreased interaction with peers and instructors, reducing opportunities for meaningful interactions with peers and instructors, which are essential for collaborative learning and academic growth; and dependency on technology […] for learning, potentially hindering students' ability to develop essential cognitive and communication skills offline (OpenAI, 2024).

Research will soon start shedding light on these concerns, such as the study on university students by Ahmad et al. (2023), which revealed that using AI in education increases the loss of human decision-making capabilities, makes users lazy by performing and automating the work, and increases security and privacy issues.

The use of AI may pose additional challenges, as students who do not have access to reliable internet connectivity or devices capable of interacting with ChatGPT may face barriers in participating fully in classroom activities, thus worsening existing disparities in educational access and outcomes. As a result, inclusive and equitable quality education for all promoted by SDG #4 (quality education) may not be guaranteed. Equally important is the environmental impact that the widespread use of screens in education may result in, as it contributes to electronic waste and energy consumption, raising sustainability concerns, all of which do not support SDG #7, which aims to ensure access to affordable, reliable, sustainable and modern energy for all.

The fact that AI applications operate within a digital interface, that is, screens of some sort, whether smartphone, laptop or tablet, means students interacting with it may also be exposed to other distractions on their devices (such as social media and videogames), further hindering focus and attention. Thus, the use of ChatGPT in education could potentially exacerbate the problems associated with learning using screens rather than paper, for instance reduced retention or worse comprehension, as mentioned earlier. Moreover, prolonged exposure to screens can lead to eye strain, headaches, and fatigue, which may

in turn impact concentration and learning outcomes. On top of this, students may experience digital overload, as introducing ChatGPT into the learning environment adds another layer of digital interaction, thus contributing to feelings of overwhelm and cognitive load, especially if students are already experiencing digital fatigue from other screen-based activities.

Consequently, educational institutions should deliberate on whether the integration and promotion of AI tools in higher education may inadvertently aggravate the pervasive use of digital media (namely, screens for lecturing, learning, reading and writing), thus perpetuating the challenges stated earlier. Research should provide solid evidence of the actual impact of AI and digital technology on teaching and learning. Until then it may be wise to apply the Precautionary Principle, by which institutions should take preventive action to protect individuals and the environment, as well as to avoid potential harm when scientific evidence about an activity or technology is uncertain or incomplete (De Smedt & Vos, 2022). The aforementioned arguments should be borne in mind when using AI, well as a massive use of technology, for the sake of innovation in education.

AI has emerged not free from controversy and poses great challenges to education today. These tools are increasingly being used, thus complete banning is unlikely. Faculty must understand both the capabilities and limitations of this type of technology to promote ethical and responsible use, while equipping students for the fast-evolving technological environment in education. Maintaining transparency regarding AI language models in the classroom is crucial for educators. By effectively communicating both the purpose and limitations of these tools to students, educators can ensure responsible integration of AI into the learning process. Faculty members should grasp both the potential advantages and constraints inherent in ChatGPT, and hence craft assignments that promote self-reflection, critical thinking, problem-solving, and independent learning. At the same time, students must receive instruction on how to critically assess information and make well-informed decisions.

3. Conclusions

If employed judiciously, technology has the potential to make lessons more dynamic, accessible, and engaging for students, while it provides supplementary

resources and facilitates communication between learners and educators. Yet, the question is whether the teaching-learning process would improve if teachers and students alike left aside the technological tools (or at least some) that keep their attention away from teaching and learning or do not promote deep, meaningful learning. If slideware and other digital tools were used less intensively and extensively in class, minimal smartphone use was made, and more pen and paper for reading and writing were employed at university, the teaching-learning experience may be likely to improve for all parties.

In addition, teachers ought to reassess how they use PPT in class. As suggested by some studies (e.g., León & García-Martínez, 2021), the usefulness of slideware may be determined by the way in which they are used and not simply by whether slides are used or not in class. Lecturers would be able to hold two-way discussions with students, focus on the contents they really want to develop, foster analysis and reflection, and not be overshadowed by a screen or a set of bullet points, while students would stay focused on what is happening in class, become active participants and make the most of the learning experience by comprehending more of what they read and write. Both teachers and students would gain control, and the latter would eventually become protagonists of their own learning, as they would have the time, space and energy needed for the paced process of learning, reflection and discussion.

In light of the evidence that poor academic performance may be related to providing slides to students, using smartphones in class by students, and reading and writing on screens, it may be timely for educational institutions to start warning about the overuse (and hence misuse) of technology. In order to reach this ideal scenario, training should be given to both university teachers and students so they make a critical, reflective and justified use of tools (whether digital or not). Only then will they be able to discern and adopt those that enable effective teaching and learning under optimal conditions, regardless of the medium employed.

In sum, educators, on the one hand, should employ technology thoughtfully and rationally to ensure that learning objectives are accomplished in the most effective way. Even basic technology can have a big impact and be effective, as posited by the UNESCO (2023) GEM report. Students, on the other, should be taught to critically integrate technology in their everyday life and learning habits, so distractions are minimized and the learning process is optimized.

Should training on how to use technology (including AI) not be provided, many lecturers and students may continue using it uninformed of its flaws. University bears the responsibility of fostering awareness among young individuals regarding the responsible use of technologies for academic purposes. This ensures that students leverage available learning opportunities, so quality education may be provided and Goal #4.4 of the SDGs may be attained.

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