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Artificial intelligence (AI) and the 21st Century University: Discussion on a New University Scenary

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Abstract: *Introduction: The vertiginous growth of Artificial Intelligence (AI) is present in all fields including the University, implying a rethinking of pedagogical processes that has to be seen from the technoetic to give way to new ways of learning and personalizing learning. Method: this research is of qualitative perspective from the Grounded Theory of systematic design. For the analysis, AI was established as the central category, then open coding was established to give way to axial coding. Phases: 1) theoretical sampling, 2) constant comparison based on axial coding, 3) synthesis and paradigmatic reinterpretation. Results: After the review of the scientific literature reaching theoretical saturation, 3 elements were identified that should accompany the current critical and analytical debate: 1) AI and pedagogy, 2) AI in university educational practice, 3) AI and technoethics. Discussion: there is a need to create knowledge about application, possible impact and effects of AI in the university. Any review on AI should be done from the technoethical to give way to a technodidactics that allows progress towards digital transformation and the promotion of technological humanization. The University must respond to the new scenario presented by AI.*

Keywords: *artificial intelligence; educational technology; university; qualitative research.*

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Introduction

Artificial Intelligence (hereinafter AI) has experienced a significant upturn globally and in the university context is presented as a new opportunity to rethink and reorient the new ways in which to work in the pedagogical process, i.e., it is necessary to assume that, with the technological boom, it is necessary to move from digital competence to a digital transformation. However, AI understood as the design of a system that aims to simulate human intelligence (Ocaña-Fernández et al., 2019) and that is also capable of solving problems (Ayuso-Del Puerto et al. 2022) is also an element to be reviewed since the integration of AI in university pedagogical processes unquestionably requires a technoetic treatment so that the integration of AI as a resource for the optimization and improvement of learning is the result of a critical and analytical process and not as an additive element that may lead to unethical practices.

This rapid dynamic, which corresponds to profound and heterogeneous changes at all levels, is seen with more challenges than certainties, and in the University one of these challenges corresponds to the revision of the design of AI based on the type of responses that it can generate, avoiding prejudices or biases (Flores-Vivar & García-Peñalvo, 2023), with which, personalization and adaptation to a context becomes increasingly urgent as an almost uncontrolled growth of AI is observed. Therefore, and given the emerging and progressive nature of such intelligence, it is considered necessary to establish a set of elements that serve as a starting point for the analytical, critical and technoetic treatment of what the integration of AI in the University entails.

This research is based on a qualitative analysis identifying AI as a central category, which has been explored from three interconnected spheres: 1) AI and pedagogy, 2) AI in university educational practice and 3) AI and technoethics. Thus, it is expected that these contributions will allow visualizing a whole range of possible implications before what is already a reality and for which, it is necessary to adopt effective measures that respond to a new scenario from the recognition of new resignifications regarding how learning takes place and how the ethical consideration must be before a resource that can have effects as undesirable as laudable from the non-neutral intentionality that accompanies the design of algorithms. Therefore, the University, once again, is called to respond to the challenges that AI generates, while knowledge is produced at great speed between rationality and uncertainty of technological humanism (Terrones, 2020).

Method

The objective of this research is to analyze AI and its possible implications in the university context. To this end, a qualitative research was designed since it is not expected to explain or control facts (Martínez-Corona et al. 2023) with which the Grounded Theory of systematic design is assumed by pretending to generate a global theory that helps to understand a given process (Hernández Sampieri et al. 2014) which in this case revolves around AI and how it can produce a series of interactions in the university environment. Following Hernández Sampieri et al. (2014) to perform the analysis of the selected scientific literature, a set of categories was established that served as a guide when identifying the elements that are related to the central category (open coding and axial coding) as specified in Table 1.

Table 1 *Categories of analysis*

Central Category: AI	
Open coding	Axial coding
a.-Pedagogy: discussions related to teaching and learning methods, teacher training and teaching resources. b.-Technology: research related to technology, including its development, impact on society and its application in different fields such as education or work. c.-IA: research related to AI, its technical development, impact and use in education, society and other fields. d.-Ethics: discussions related to ethics, the use of technology, AI and its educational impact, and the responsibility of individuals when using them.	a.- AI and pedagogy: the use of AI in pedagogy can help personalize learning, adapt it to the individual needs of each student, provide real-time feedback, and analyze large amounts of educational data to optimize pedagogical processes. b.- AI in university educational practice: challenges and opportunities arise: the need to develop digital skills and competencies in teachers and students, the need to guarantee the ethics and privacy of educational data. c.-AI and technoethics: some of the ethical concerns when using AI: data privacy, discrimination, transparency, accountability, security, social and economic impact. It also implies the need to establish rules and regulations to guide the development and use of ethically responsible AI.
Selective coding ⟺ Theory generation	

Note: table prepared by the authors (2023).

Procedure

Once the categories of analysis were defined, we proceeded to perform the theoretical sampling, which in this case corresponded to the scientific literature published between 2018-2023, reviewing the databases: WoS, Google academic and Redalyc. The researches were added as the categories of analysis were developed until reaching theoretical saturation at the moment of observing that no significantly differentiating findings were found within the theoretical contributions in correspondence with the subject matter of this research. The obsolescence of knowledge is a great opportunity to observe the contemporary advancement of knowledge (Coronados et al. 2019). In addition, the constant technological changes are generated rapidly and in relation to AI, an important growth has recently appeared in the scientific context, which coincides with the years selected to carry out this research. That is why, in order to try to explain the scientific advance (López Borrul, 2017) it was necessary to analyze the scientific literature between the years 2018-2023 coinciding with the rise of AI and all its implications. Therefore, one of the methodological decisions selected was to review the scientific production generated between 2018 and 2023 corresponding with the large scientific production regarding the expansion and growth of AI.

Phases of the investigation:

1.-Theoretical sampling: analysis and exploration from a conceptual perspective of the phenomenon under study for the subsequent theoretical construction as a result of the research process, after reaching theoretical saturation. The inductive process of qualitative perspective was also included.

2.-Constant comparison from axial coding: identification of theoretical elements from axial coding, in addition to visualizing the internal connection of the research findings while developing the theoretical interpretation.

3.-Paradigmatic synthesis and reinterpretation: construction of a new theory or a new interpretation as a result of the research. Theoretical triangulation was also included, understood as "the categorization procedure extracted from the scientific literature from the state of the art of the research that obeys the use of documents, antecedents, theories and concepts proper to science" (Piñero & Perozo, 2021, p. 8).

Results

AI and pedagogy

The contemporary pedagogical approach is still in a process of redefinition based on the recognition that the new logics of understanding allow identifying connectivism as the paradigm associated with the current pedagogical process (López & Escobedo, 2021, Toledo-Lara, 2022). This means that connectivism promotes a network of connections from a technological and social point of view, which should not be understood as a learning exercise in isolation, but rather as a kind of learning that, mediated by technologies, comprises a set of elements under the premise of hyperconnectivity (Martínez Ruiz, 2019).

Now, from a pedagogical perspective, AI must involve a reorientation of pedagogical processes, in this case from the university context, in the face of a society that is increasingly mediatized by technologies, globalized and interconnected (Caballero Ardila, 2020). Although it is true that it will depend on the discipline or field of study from which the possibility of including AI in learning can be observed, it is relevant to first consider what is understood by AI. A review of the scientific literature reveals several meanings of AI, for example, that it should be understood as the scientific discipline from which machines are configured to solve problems through their capacity to adapt and their ability to learn patterns (Ayuso-del Puerto & Gutiérrez-Esteban, 2022).

On the other hand, AI can be understood as a grouping of algorithms that allow software to have the ability to be intelligent like humans while learning from data with little human interference (Prieto-López et al. 2021; Campione, 2021), which means a computer system that can mimic or simulate the way a human brain acts when processing external data and transforming that data into information (Incio et al. 2022). For its part, the European Commission states that "AI is a body of technologies that combine data, algorithms and computing power" (2020, p.3). Although the interest of this research does not revolve around the technical specifications of AI, it is worth bearing in mind that such intelligence generates its activity, according to García Villarroel (2022) from three basic elements: 1.-machine learning algorithms (known as machine learning), 2.-neural network models (known as neural network) and 3.-layers of representation of methods and calculations (known as deep learning).

Logically, by visualizing AI as the possibility of a machine imitating the human brain (Ocaña-Fernández et al. 2019) and being able to analyze a large amount of data to transform it into information, one can run the risk

that it will be a machine that will learn and not the person, in this case, for example, a university student. This conception, although it entails a real risk in the mismanagement of AI, does imply a modification both in the way in which learning is promoted by the teacher and the new logics by which people learn, and even more so in a university context in which, theoretically, there should be a favorable predisposition towards digital culture and literacy (Carbajal-Amaya, 2020; Guevara & López, 2022; Roa et al. 2021) that can permeate all university work and with it, the readaptation of pedagogical processes that will facilitate the appropriate use of this AI, although the university institution in many cases continues to be subject to a nineteenth-century past (Area et al. 2022).

A scenario full of challenges is then presented in the face of the systematization of AI experiences in terms of the development of the pedagogical model that is in line with the growing digitization of contemporary pedagogical processes (Martínez Ruiz, 2019; Montes-Serrano, 2022), understanding that the interest should not be exclusively in the digitization of administrative processes but in the design of new pedagogical dynamics that can ultimately enrich the learning experience in this case, within the university context (Rivera Vargas & Cobo Romaní, 2019).

A more critical stance is expressed by Grané (2021) when he states that currently we observe the establishment of a new system that revolves around techno-education, which translates into a separation between those who have the possibility of accessing technology and those who cannot afford it, which leads to the discriminatory effect generated by the management of data, the digital footprint and the control of learning data. There is also talk of the loss of privacy and intimacy since, through the tracking of our digital activity, the prediction of what the person has to observe as their contact with the digital develops is personalized. In the same vein, the European Commission (2020) has warned not only of the benefits of AI (improving people's well-being, combating climate change, improving the response to demographic challenges, promoting the competitiveness of industry in Europe, among others) but also of the possible harmful effects, such as criminal use of data, infringement of rights and personal safety, discrimination in access to employment or damage to property, among others.

Thus, AI, although it has not just appeared in the world, technological growth and digital presence has allowed it to be overexposed today, therefore, this boom in AI is still, if you will, in a phase of discovery while the undesirable effects are visualized that, although it is in a process of constant growth, it has come to recognize its unintended effects (Coriciano,

2020). Among other strategies, the European Commission (2020) understands the need to establish requirements to be applied at the time of programming the algorithm while preserving the data in order to verify possible actions in the face of potentially risky decisions in the execution of AI.

AI in university educational practice

It may be thought that AI is only circumscribed, for example, to large transnationals that market technological equipment or e-commerce. In reality, AI is present in those scenarios, but in the educational context, its potential is still being discovered (Peñaherrera et al. 2022), which means that it is something that is being generated dynamically, as is the case with emerging pedagogies and, in its case, the so-called Technopedagogy (Toledo-Lara, 2021). Indeed, when reviewing recent scientific literature, it is possible to identify a set of forms of work in which AI is present, but it is still necessary not only to scientifically record the experiences, but also to establish a theoretical substrate that, if necessary, can serve as a basis for the generation of knowledge in this particular. Although it is an emerging issue, some guiding criteria can be presented since the personalization of learning, as one of the possible advantages of AI in university education in this case, is still generally observed in those fields of study that are disciplinarily more inclined towards technology, therefore, the application of AI at the university level still has a long way to go (Parra-Sánchez, 2022), i.e., there is a great field for research.

Cukierman and Vendrell (2020) explain the recognition of personalized learning based on the digital footprint. In other words, when students manipulate computer systems, they generate a digital trace, which can serve as a starting point for the generation of personalized learning that must be translated, among other things, into the design of activities or the construction of a training path adapted to each of them. The same authors recognize that this task, in addition to being ambitious, may involve a significant economic investment, so that the intention of improving the learning experience is not enough, but also having the infrastructure and financing are also determining aspects.

García Villarroel (2022) introduces the analysis of evaluation in a virtual learning environment, indicating that this process implies the revision of the pedagogical model that nurtures the training process, with which the teacher has to review and, if necessary, adjust the evaluation processes so that they correspond to the virtual nature of the studies. Therefore, it is not appropriate to transfer to a virtual environment an evaluation that

corresponds to a traditional evaluation. We are talking here about reducing the correction time of the contributions, the reliability of the students' activities and their originality, the integration of one or more activities in other subjects or fields of study, as well as the possibility of reaching more students regardless of the distance or the time at which the student is available for his or her homework.

Peñaherrera, et al. (2022) indicate that AI should favor the process of administration and personalization of learning through the development of several actions such as, for example, the establishment and promotion of a digital culture in the university institution translated into the design of a virtual tutoring system, online learning, learning analytics, design of algorithms that can support evaluation moments, detection of digital behavior patterns in students according to the learning process, among others. In the same vein, the contributions of García-Peña et al. (2020) show the application of AI in processes related to educational supervision and quality, university education admission systems, the detection of possible behavioral problems based on the analysis of genetics, environment and attitude, as well as the improvement of the learning process in students with disabilities.

Another of the findings and possible implications of AI in the university context is presented by Crovetto (2020), who indicates that the radical change that AI will bring about in the structure of the educational system will modify and redefine the role of the teacher in view of the speed of change and the large amount of data management that can account for, for example, the information handled by students. In other words, it is possible to analyze the interaction of students with the platform they are manipulating while they are within the educational content being worked on, and this can serve for the analysis of those factors that may affect the pedagogical process. The same author refers, for example, to platforms that promote MOOCs (Massive Online Open Courses).

In this regard and regarding the ChatGPT, Lopezosa and Codina (2023) recall that this chat is a model that generates real-time responses from language processing, i.e., it is a model of AI and natural language processing (Carrasco et al. 2023; Celi-Parraga et al. 2021), however, the use of this ChatGPT necessarily involves constant training based on critical use so as not to lose sight of the fact that it is designed by humans, which means that the responses generated are not error-free. ChatGPT, for example, can be applied to generate summaries, translation, grammatical corrections or answer questions (Boa et al. 2021; Floridi & Chiriatti, 2020), however, the overall quality of the answers generated and written by ChatGPT is very

diverse and reviewable (Elkins & Chun, 2020), with which, it should not be observed absolutely, but should be carefully analyzed and not assumed as totally perfect everything generated therein as these systems are prone to produce unreliable and meaningless answers, which prevents their use in real conversational applications (Budzianowski & Vulić, 2019).

There are also a number of points of review regarding the results that have been observed from the use of ChatGPT. Dale (2021) presents several elements to be taken into account when exploring and manipulating this chat, for example, the results generated may lack semantic coherence and the algorithms may be biased by certain ideological tendencies. On the other hand, the results generated by the ChatGPT may correspond to statements that do not conform to the truth so that it is necessary to run the same question several times to subsequently select the best answer or the best result generated by the ChatGPT, therefore, we are facing a language model that at this time does not offer 100% reliability and the unrestricted use of this ChatGPT is an aspect to be reviewed, taking into account the overexposure of this resource that has been observed recently (Markel et al. 2023).

Therefore, a common finding observed in the scientific contributions reviewed is that AI should favor and even consolidate the personalization of learning mediated by contact with technology based on the premise that the incorporation of AI is expected to improve the pedagogical process, which undoubtedly includes teaching and learning (Castillejos López, 2022; Jiménez-Sánchez, 2020). This has to be seen from the favorable point that AI can have in relation to the pedagogical process, without neglecting the promotion of critical thinking translated into the student having the interest to transcend beyond what he manages to discover throughout his transit through university studies, which must be accompanied by questioning, search for answers and the transfer and inference of information.

We are then facing a reaffirmation of the need for constant training aimed at university teachers (García-Fuentes et al. 2023) that goes beyond the rhetoric of occasional and, if desired, superficial training, to give way to an effective reconciliation that allows us to visualize a new way of approaching technology within the pedagogical process with a view to improving the teaching profession (Asensio Muñoz et al. 2022). This has to be assumed from the conviction that we are facing a phenomenon that, visualized from the use of AI, is reconfiguring a set of elements that affect all human spheres and as discussed above, in the university spectrum it involves a series of challenges starting with an unstoppable dependence on

digital platforms with which, the mediatization of algorithms and their effects on competitiveness can become a flashpoint for critical discussion (Li, 2022).

AI and technoethics

The contemporary technological approach involves a series of considerations that, regarding the visibility of AI in all fields of human endeavor (Morton, 2022), pose challenges that must be seen unquestionably from critical thinking and therefore in what Vivas (2018) calls "culture of technological responsibility", this includes the promotion of ethical practices framed in technology and the use made of it (Terrones, 2018). We are then facing a challenge of singular importance in that AI is not exempt from biases that in its case reproduce practices that may come to entrench differences between people and in the case of the university context, such practices will be present as long as the permanent need for digital competence in university teaching is not transcended (Prendes Espinosa et al. 2018) if it continues to be observed from technological utilitarianism and not from the participation of future professionals in the contemporary dynamics that logically, is determined to a large extent by technology.

It must be understood then that AI besides being presented as an opportunity to address global challenges in the fields of health, welfare of the planet, climate change, education among others (Lledó & Monje, 2020) also involves a set of challenges that lead to a deep questioning from the technoetic such as; the use of AI to create intentionally biased ideological arguments (Ferrante, 2021), creation of non-original content, processing of information that crosses the boundaries of human privacy and intimacy, commodification of information for spurious purposes, among others. Therefore, we are facing a scenario that, although it is true, has gained notoriety, the effects cannot be classified as a whole at the moment, although there is sufficient evidence to visualize unethical practices when using AI.

More specifically in the context of university education, the regulation in the use of AI must unquestionably go through a curricular rethinking that allows to lay the foundations to confirm that technoethics must serve to understand that AI cannot be taken as the primordial and inspirational root of learning (Flores-Vivar & García-Peñalvo, 2023) basically because it does not generate the necessary linkage between the active actors of the pedagogical process, i.e., AI cannot generate, for example, inspiration, motivation or critical analysis as a human teacher would. On the other hand, AI lacks the awareness to differentiate right from wrong, so the position

must be that students are being trained in a technological context and must learn to use technology from a beneficial point of view, but in no case must AI replace the original performance of the activities (Dehouche, 2021) but rather, it must serve as part of the competencies that they must have as professionals of the 21st century.

At this point, another focus of discussion opens up, which revolves around the debate on the coexistence between human beings and AI, i.e., whether these two entities are destined to convergence or divergence. It is important to keep in mind that while it is true that we talk about intelligence, we also talk about the fact that this intelligence is artificial, i.e., it is not natural, therefore this debate, if we want to be techno-philosophical and techno-anthropological, will be determined by the use that is made of technology and the object with which it is designed, i.e., it is the intentionality of the human being, it is the intentionality of the human being that will determine to what extent AI will or can continue to be controlled by the human species, or rather, whether we are facing a new scenario in which human dynamics will be determined to a large extent by AI, which is the result of a given historical context (Morales Gamboa, 2020).

On this point, Arbeláez et al. (2021) make two assumptions that must be present in the dialectic argument about AI: 1) AI as an opportunity to improve the quality of present and future human life and 2) the consequences and threats that can be generated by the use of AI, which in their case would imply the moral attrition of humanity. Apparently, one may be missing the fact that technology is no longer neutral, i.e., it depends on the use that is made of it, but there is more. In the algorithmic culture in which we find ourselves, there is also a whole intentionality and although it may seem a universe far removed from many people, the algorithmic pattern is constantly present, which leads to a new form of transmission of a predetermined scale of values in which what needs to be known is preferentially displayed, i.e., it is a way of presenting the hidden curriculum of technology.

Dehouche's research (2021) raises a point that can serve to further advance the debate on technoethics and AI by exposing the need for those autonomous systems in which AI is present to be designed and equipped with moral values from the beginning, i.e., that both the algorithms and the accompanying computer systems are already technoethically designed with the aim that ethical and moral use should not be a struggle to be faced but that, by decision, AI should be compatible with human values. This has to be worked from the regulation and systematization of public policies aimed at what Terrones (2020) calls technological humanism from two

components referenced by Lledó and Monje (2020): 1) AI must guarantee an ethical purpose from the recognition of rights, principles and essential values, 2) AI must have a technical domain from which its technological infallibility and correct handling can be ensured.

In summary, technoethics understood as that field in which the ethical and moral elements of technology are analyzed in depth (Vivas, 2018), must be a constant when working the pedagogical process from the university context and specifically from the ethical and critical-analytical sphere and this aspect is the one that is presented as the most complex because there is still a long way to go in terms of the work from the critical and analytical in the university classrooms. Hence the importance of interdisciplinary work from the recognition of the need to strengthen the idea of technological humanism (Terrones, 2020).

Discussion and conclusions

The recent rise of AI has opened a new scenario of debate about the real possibility of technology covering more human spaces than was unimaginable a few years ago. As with all technological discoveries and advances in this case, in the university sphere it has also revealed another point of review and understanding of new logics that, imperatively, are bursting rapidly while still, the University in general continues its perennial struggle to adapt to new global dynamics.

In this panorama, and as a sort of crossroads of knowledge, pedagogy from a technopedagogical vision is called to recreate and re-found a dialectical and theoretical corpus that tries to lay the foundations of a future reality that undoubtedly needs a redefinition of the pedagogical model or models, accepting once and for all that people no longer learn as before and that the speed of change and the rapid obsolescence of knowledge, The University must once again initiate a deep critical and reflective process so that the pedagogical process framed in the university context can be improved and, if necessary, readapted to a population of both students and professors who can no longer afford to continue seeing technology as something accessory or marginal. Thus, AI is increasing its field of action whose application in all fields of human endeavor is increasingly present, and it is undeniable that it is already in university classrooms. Therefore, technodidactics, seen as something tangible and executable, should outline the didactic identity of the contemporary university.

Throughout the process of analysis and review of the scientific literature, it has been possible to identify a common point, which is that it is no longer useful to speak of digital teaching competence, but rather of a

permanent and updated training that enhances this teaching competence. However, how can university teachers be induced to immerse themselves in a new way of exercising their university teaching, if the weight of tradition still largely conditions didactic updating? The University in general, cannot continue to devote efforts to build a good position in world rankings while waiting for an improvement in the personalization of university teaching, which, in this case, there is an inclination to observe an important opportunity with AI with a view to an improvement in the relationship that is generated in the classroom under the subterfuge of learning together.

Another aspect that can be concluded is what has to do with technoethics and AI. Indeed, the development of AI includes a non-neutral and deliberate programming of algorithms, i.e., these algorithms are developed by people who obviously have their ideological convictions and even biases that at certain times may be compatible with human anti-values that are far from technological humanization. In addition to this, the improper use of AI in the university sphere can bring with it the appearance of unethical practices, for example, when elaborating a contribution, a text or some intervention that erroneously the user in this case, takes as valid without having the criterAI to determine whether what that AI generates is correct or actually corresponds to a valid answer. So, should the delivery of a contribution by students or researchers be evaluated? Or is the way in which the contribution is presented or argued to be evaluated?

Thus, technoethics has to become the key factor when developing everything that has to do with the implementation of AI and its possible impact and effect in all fields including logically the university context. It is necessary to promote technoethics as soon as possible always visualizing that the technological scenario is constantly changing. That is why a new curricular approach must be far from a procedural slowdown that may hinder its reorientation to the new challenges posed by the growing development of AI. Given these perspectives, many fronts open up as a possibility for research that can revolve around the following terms: a) AI in educational public policies, b) learning experiences with AI, c) technoethics in the generation of algorithms, d) the ecology of learning in the virtual university context, e) the assessment of learning and AI, f) the technopedagogical design of university degrees, g) the monitoring of digital competence training of university faculty and its impact on the improvement of the university pedagogical process.

Finally, the emerging and growing nature of AI demands a critical, analytical and constructive stance from the University, so that it can generate knowledge that will serve as support for all areas or fields of study, so that

they can move towards a new training paradigm that allows reconciling technological advances with the respective ethics, without losing sight that motivation, inspiration and involvement in the learning experience is only possible among humans and there AI, in its case, will only be to record the link between the active actors of the pedagogical process.

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