Digital Competences and Artificial Intelligence in Higher Education: Systematic Review Article

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Abstracts: It is observed that students and professors of the different existing universities in the world have the technological tools that would allow them to continuously carry out an education strengthened by the appropriate platforms with the necessary information to answer multiple questions and tasks, this research is a work of systematic review article. The method used was PRISMA, a very meticulous and rigorous written method performed in the structure for the construction of the research, the search for information was carried out in the following databases such as Scopus, Redalyc, SproQues, SciELO, obtaining 898,276 articles or academic papers in the entire search, excluding 898,218 and considering only 58 academic papers that were selected for the research; according to the academic works carried out in 10 years, the results shown an increasing way from year 2014 to 2023, showing a big change in 2021 corresponding to the use of the tools being more frequently in students of all educational levels, due to quarantines established by governments, being them the technological tools for a synchronous virtual education; digital skills are increasingly essential in today's labor market. Owning these skills increases employability and career opportunities. In education, digital competences enable students to access to online learning resources, collaborate on digital projects, and adapt to online education environments. Digital competences facilitate online communication and collaboration, which is crucial in a globalized and connected world.

Keywords: Digital Competences, Digital Skills, Icts in Education, Artificial Intelligence, A.I. in Education, Icts and A.I.

1. INTRODUCTION

In today's society, digital skills are essential for full participation in everyday life. From communication to education, work and entertainment, digital technology plays an important role in virtuality in all aspects of our lives. In the workplace, digital skills have become a prior prerequisite across a wide range of industries. Companies are looking for workers who are not only competent in their respective fields, but also having the ability to use digital tools effectively and adapting to rapid technological changes.

The study of digital information and communication has a very important role in the field of education and training of professionals before and after this pandemic caused by COVID-19 (Soto et al., 2022), who at the time was responsible for making education being develop through distance technologies (Castellanos Sánchez et al., 2017), this does not mean that at the time before the pandemic occurred, there was no virtual education and distance education, in fact it did exist but in less use in academic society.

UNESCO (October 21, 2023) mentions the importance of achieving the development of ICTs in schools and universities showing that despite the great efforts there is a very large gap to make all nations meet the commitment to make students improve their digital skills and be connected by the Internet, there is a project in progress called strengthening digital skills of professors, this is executing in many countries and a few thousands of these educators are benefitting from it.

At the international and Ibero-American level mentioned by (Padilla Escobedo et al., 2021), it is possible to say that the use of educational technologies is insufficient without an approach and order in the academic structure that seeks to provide a line of professional training (García Vélez et al., 2021), in other words, it refers to a formal education that deepens the knowledge mediated by technology, and a deep learning and teaching, likewise it is shown that there is a long way to link learning from the teaching level (Tippe Marmolejo et al., 2021), that means that it is necessary to strengthen professors training and become the multiplier effect on some interesting digital tools in the courses taught by university professors.

Likewise, it is understood that the training of a transversal tool in education makes many people seek to develop these new approaches Manzano García (2015) and knowledge using educational technology, being this a problem to be solved through state policies (George Reyes et al.,2022), who are responsible for bringing internet and wifi for communication through digital technology equipment to all their nations (Tippe Marmolejo et al., 2021), regarding to the internet connection, the problem to be solved is the connectivity itself in many countries with little economic opportunities, because the technology has a big budget, such as the obtaining of technological equipment for the use of these technological tools.

The study of digital competences according to researchers has had an international opening on the use and practice of these tools in higher education classrooms (Montesano de Talavera et al., 2023), being important in the transversal training of learning, especially now that there is an exponential development of artificial intelligence (A.I.), this is the way in which the construction of new paradigms is developed in the structure of a digital education at all levels, increasing its use in all countries where is necessary for the formation of a digital culture.

(Tippe Marmolejo et al., 2021), mention about the research carried out on the perception of the integration of technologies developed in a group of professors in which they train showing certain results of getting involved with these digital tools (Díaz et al., 2022), while others found it difficult due to the lack of link with technological equipment such as PCs and laptops, this shows that there are not opportunities for many students since not all of them have electronic devices for internet connection.

If we ask ourselves why it is important to research on this topic, the answer would be due to the necessity of knowing how much has been the production and development over time of these new paradigms in higher education (Turcios-Peraza et al., 2023), and showing the importance to know and understand what could happen in time due to the cases already known in the construction of an approach based on digital skills and the integration of A.I., which is booming at the time of writing this article.

The justification for this research is based on the necessity to understand the integration of digital skills and A.I. linked in university education (Rodríguez et al., 2022), or in technical studies, it is understood that A.I. is contributing in all vocational training disciplines, such as medicine, engineering, within professors training and even in other disciplines not mentioned in this research (Morales et al., 2021).

The aim of this investigation is to answer the following questions: What are the contributions of digital competences and artificial intelligence? How have digital competences developed over time? What opportunities do these ICT tools and AI show? How could ICTs and AI be implemented in professional training? Is there any danger in using these tools?

The technological tools applied in the field of architecture is reinforced by A.I. and cyber-physical-social (Martínez-Comesaña et al., 2023), which allows to have construction projects controlled by automated electronic

controllers that improves the educational quality of students in engineering and among other disciplines (Sanabria-Navarro et al., 2023), (Armijo et al., 2019).

The impact of A.I. in education and professional training is in a fast-development (Conde-Zhingre et al., 2022), seeking to control things, being IOT one of the internet specialties, something that is practiced by university students (Jeon, 2023), in the same way, the impact surprises users by what can be done using A.I. on things (Xu et al., 2023), the students seeks to improve every day in their competences or skills to achieve empowerment of the tools at the programming level (Wang X et al., 2023), or in the mastery of (Górriz et al., 2023), programming languages and further into the structure of new approaches to robotics among others (Ortiz et al., 2023), created and formulated in the problems of learning that are presented in classrooms.

Within these tools such as A.I., it is observed that in practice engineering students allow them to predict, monitor, optimize and plan the design of construction in the case of civil engineering, which is similar in the cases of other engineering (Msweli et al., 2023), this training is acquired by students during their professional training (Nombela eta al., 2023), being something interesting to verify the technological advances from its use in engineering students and it is more when they graduate and received as professionals (Benvenuti ;Li; Hariri-Ardebili, 2023).

Likewise, it is important and necessary that within the educational curriculum in higher education classrooms the development of technological tools is incorporated in each course as mentioned by González (2022), indicating that being established in the curriculum Manzano (2015), the entire teaching staff would be aligned in the use of tools, being as a priority the training of each professor in ICTs (Julca Guerrero et al., 2022), this shows that the institution has their own regulations for its improvement in educational quality or what is delivered to students (Chiecher & Melgar, 2018), this is the reason for the continuous training in the use of different technological tools since the class presentation, to collaborative work mediated by the platforms, specifically in the evaluations of each student (Caballero Montero et al., 2023), (Pérez García et al., 2020) and (Castellanos Sánchez et al., 2017).

There are many ways to develop ICTs such as Flipped Clasrroom, where students can improve their learning through technology (Díaz et al., 2022) and (Morales et al., 2021), these are tools capable of improving the quality of education where in these stages it is developing the A.I. in all learning fields; many researchers seek to study the behavior of students and professors against technological tools, likewise, in teaching there is the t-MOOC evaluation system (Cabero-Almenara et al., 2021), so this is where the strength of these tools appear, generating skills and academic improvements as shown in Image 1.

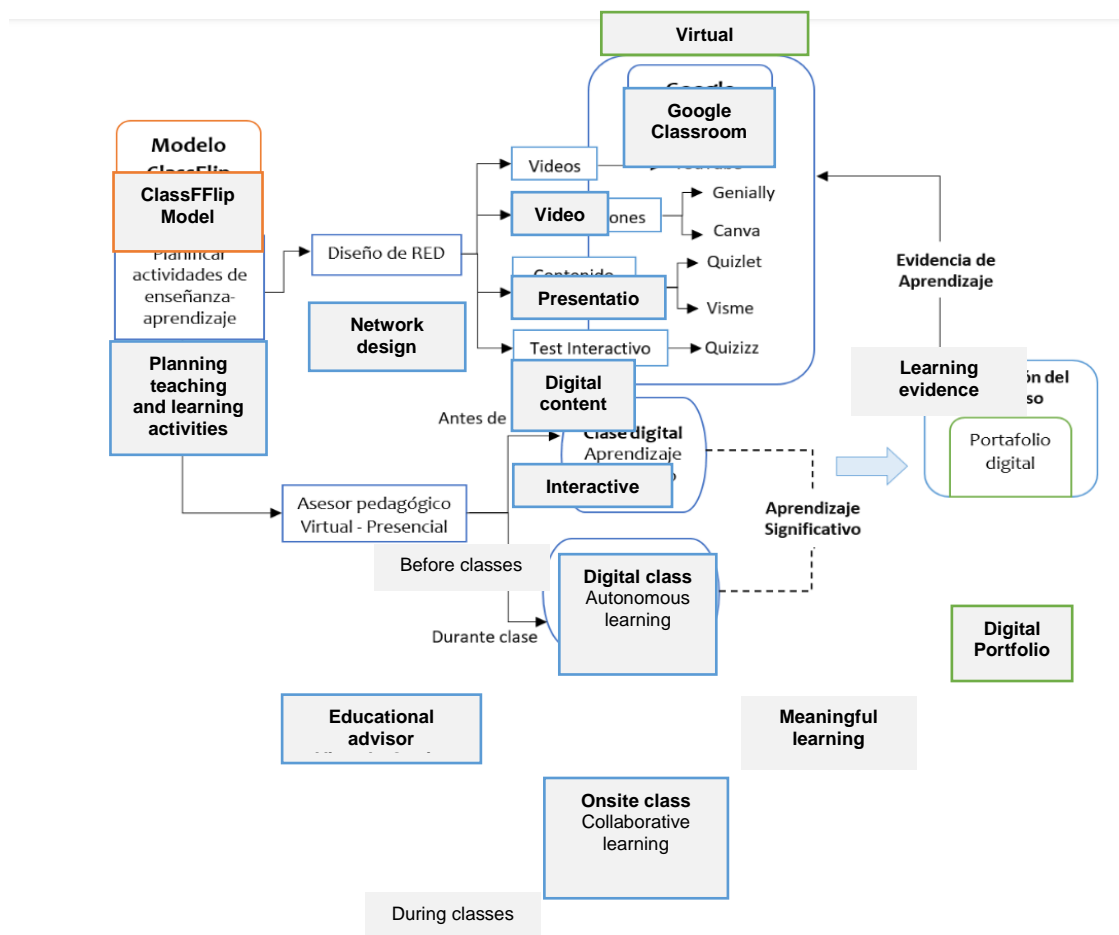**Image 1.** Flipped Classroom Model (ClassFlip)

Image taken from (Díaz et al., 2022).

Digital skills are defined as the ability to use information and communication technologies (ICT) effectively and to understand how they work (Peiró & Martínez-Tur, 2022). These skills include a wide range of knowledge and skills ranging from basic digital literacy to advanced skills in areas such as programming, data analysis and cybersecurity. Basic digital literacy involves knowing and understanding fundamental concepts (Padilla Escobedo et al., 2021), such as how computers work, how to navigate the internet and use common software and applications (Álvarez-Cadavid et al., 2022).

Moreover, the increasing digitization of the economy has created new job opportunities in technology-realted fields (Deroncele-Acosta et al., 2023). Programming, data analysis, web design and social media management are just a few examples of jobs that require strong digital skills (Montenegro-Rueda & Fernández-Cerero, 2023). Therefore, students who own these skills have a competitive advantage in the labor market (García Vélez et al., 2021).

Digital skills and artificial intelligence in higher education are two essential concepts that are radically transforming the way students acquire knowledge and prepare for the world of work in the digital age (Turcios-Peraza, 2023).

Digitall competences refer to the ability to use information and communication technologies (ICT) effectively, being this is a variable used by many researchers to answer questions or problems found in schools. In the context

of higher education, this means that students and professors should be able to navigate the internet, use software and hardware, and understand basic computer concepts. In addition, digital competences include the ability to communicate, and also to collaborate and create content in digital environments, critical skills for online learning and online collaboration (Soto; George Reyes & Glasserman Morales, 2022).

Digital skills are fundamental in today's society. From education to employment and participation in everyday life, these skills play a crucial role. As technology continues to develop (Acosta–Silva, 2017), it is important that students and professors engage in continous learning and develop their digital competences to be prepared for the challenges and opportunities presented by the digital world in all vocational specialisations (Msweli et al., 2023). Digital literacy has become a fundamental skill in the digital age, and those who own it have a significant advantage in today's society and labor market.

On the other hand, artificial intelligence (AI) in higher education involves the application of machine learning and data processing systems to enhance the educational experience. AI can personalise learning by providing students some materials and activities according to their needs and learning styles. Recommender systems can help students to choose courses and resources that match their academic goals. In addition, AI can automate the assessment of tasks and tests, providing fast and accurate feedback (Benvenuti et al., 2023).

In order to acquire digital skills, time and effort need to be invested in learning. Education plays a crucial role in this process (Tippe Marmolejo et al., 2021). Schools and universities are increasingly integrating the teaching of digital skills into their curricular programs (Chiecher & Melgar, 2018). However, it is not just about formal education. Lifelong learning and self-discipline play an important role in the development of digital competences (Julca Guerrero et al., 2022). There are lots of online resources, from video tutorials to online courses, allowing individuals to learn according to their specific needs and at their own pace.

Cybersecurity is a key component of digital skills. As the threat of cyber-attacks and data theft increases, it is essential that individuals understand how to protect their personal information online and take good security practices. This includes creating strong passwords, using anti-virus software and recognizing potential online scams (Ortiz et al., 2023).

Likewise, in the gamification of the use of technological tools integrated with A.I., it allows the evaluation of student learning using platforms (Martín-Párraga et al., 2022), as mentioned above, professors and students should also be able to take ownership of ICTs.

The integration of artificial intelligence (AI) in education is a topic of growing relevance in the modern world. AI, which is a field of computer science that focuses on creating systems capable of autonomous learning and decision-making (Silva-González et al., 2021), is having a change in the way of teaching and learning. We will explore how AI is being incorporated into education, its benefits, challenges, and the impact on the learning process (Gual, 2023) and (Restrepo-Echeverri et al., 2022).

The integration of artificial intelligence in education has the potential to significantly transform the teaching and learning process (Coto Jiménez, 2021). One of the most remarkable aspects of AI in education is its ability to personalize the learning experience (Hidalgo Suárez et al.,2021). AI systems can analyze each student's progress, adapting content and activities according to the student's individual needs and abilities (Bonami et al., 2020). This allows educators to provide an approach focused mainly in the student, increasing knowledge retention and engagement (Restrepo-Echeverri et al., 2022).

Intelligent tutoring systems are an example of how AI is being used to personalize education. These systems can provide immediate feedback, create individualized study plans and adapt the difficulty of assignments based on students' performance. In addition, AI can help to identify areas where a student may need additional help and suggest specific resources (Rodríguez, 2021).

Another important benefit of AI in education is its ability to monitor and analyse large data sets. This allows educators and institutions to get valuable information about student progress and performance. With this information, informed decisions can be taken to improve curriculum and teaching strategies. AI can also help to identify patterns in the data that can lead to early detection of learning or behavioural problems, likewise it can lead to a more effective intervention (Ocaña-Fernández, 2019).

AI is also used in the creation of educational content. Automatic content generation systems can create high-quality learning materials, such as assessments, exercises and lessons, saving educators time and ensuring a greater consistency in content (Ocaña-Fernández, 2019).

In addition, AI has proven to be useful in language learning. Chatbots and virtual assistants can offer opportunities, in order to have conversation practice and instant feedback in a variety of languages. They can also be used in grammar correction and pronunciation. This makes language learning more interactive and accessible for learners.

Despite the obvious benefits, the integration of AI and digital skills in education also proposes challenges and concerns. One of the challenges is the need for training educators and students. To benefit the most of AI, education professionals need to understand how these systems work and how they can effectively integrate them into the classroom. In addition, there is a concern about the excessive dependency on technology that can lead to the loss of important social and cognitive skills, such as problem solving and critical thinking (Basilotta-Gómez et al., 2022), (Adarme et al., 2018), (Engen & Engen, 2019).

The integration of artificial intelligence in education represents a significant advance in the way we teach and learn. AI systems can personalize the learning experience, provide instant feedback and help in the creation of educational content. However, it is important to approach challenges related to training, data privacy and equity of access to ensure that AI is effectively and ethically used in education. The future education will be inextricably linked to AI, and understanding its role in the educational process is critical to maximizing its potential.

2. METHODOLOGY

The PRISMA methodology (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) is a structured approach used in scientific research, mainly in the elaboration of systematic reviews and meta-analyses. Its main objective is to improve the quality and transparency of research reports that synthesize scientific evidence on a particular topic (Urrútia & Bonfill, 2010).

PRISMA establishes a set of detailed guidelines that researchers should follow at the time of conducting systematic reviews. These guidelines include specific steps for identifying relevant studies, selecting articles, extracting data, assessing the quality of included studies, and presenting the results. The PRISMA methodology focuses on ensuring that the review is reproducible and that biases in the selection of studies are minimized, which contributes to the validity of the results (Urrútia & Bonfill, 2010).

By adhering to the PRISMA methodology, researchers can present information in a clearer and more complete manner, providing the critical evalution of the review and its applicability in medical or scientific decision making. To sum up, PRISMA is an essential tool that promotes quality and integrity in the synthesis of scientific evidence (Urrútia & Bonfill, 2010).

The method used was PRISMA, it is a systematic review article (Urrútia & Bonfill, 2010) which consists to search for information in different databases or repositories of academic or scientific works carried out by other researchers, reviewing at the end of this process, the advances of a specific type of research, being very rigorous in the way the information is searched (Urrútia & Bonfill, 2010).

Likewise, the key questions used in this research are shown in Image 1. These will allow us to obtain academic works from the different sources or databases stored in them (Urrútia & Bonfill, 2010)

Image 2.

Keywords used in this research

In the first search for information starting on the date of August 02, 2023, was directed to Scopus, which is a repository of high impact in academic field having scientific publications reviewed by blind peers, likewise the keyword "Competencias AND digitales" was used, giving a first result of 155 academic papers, in the same way the following filtrations were made in the area of social sciences, these were types of academic work articles, digital skills and competences, within a range of 10 years in the development of digital competences from 2014 to 2023, delivering 44 academic works being selected one by one and thus focusing on the search for information on the topic of research, where 8 academic works were obtained being excluded in this first search 147 articles reviewed one by one.

Continuing the search for information in Scopus with the keyword "inteligencia AND artificial AND educación", 13 academic papers were obtained to be then reviewed one by one, where only 3 were selected taking part from this investigation and 10 were excluded due to they belonged to other disciplines, continuing looking for more information we used only the keyword "artificial AND intelligence", gving us a first result of 517,533 papers, following the same steps and research conditions, being them performed by specialty or discipline and in a period of 10 years, being from the year of 2014 to 2023; filtered all them by article, learning system, language used (English or Spanish), obtaining a result of 17,446 articles, and the filtration was performed again taking into account papers from 2014 to 2023, having a result of 14,124 articles, reviewing one by one and at the convenience of the researcher, who was in charge of searching articles that correspond to the information of this investigation, choosing at the end 9 articles and excluding 517,524.

Proceeding with the search for information, we continued using another keyword "technological AND skills" having a result of 17.493 articles, being them filtered by year of publication from 2014 to 2023, type of research article, education specialty, language used (English and Spanish), delivering 630 articles, for being then reviewed one by one as appropriate to the research for study, at the end 4 academic papers corresponding to the investigation were found and 17,489 articles were excluded.

In the following academic works search, we looked in Redalyc repository using the keyword "competencias digitales" having a result of 236,260 articles, where the filtered was applied having into account works from 2014 to 2023, and by specialty in education and language used (English or Spanish), including some countries such as Colombia, Brazil, Mexico and Spain, delivering 9,595 articles, having a total of 236,252 excluded, and being only 8 selected for the research, after that a search for information with following keyword "inteligencia artificial" was done, obtaining 109,144 articles, proceeding to filter them in order to select and exclude the works helping to the construction of the research, filtered them again by language used (English or Spanish), in the specialty of education, giving us 54 articles of which were reviewed on by one, where there were not academic works related to the keyword, then the research continued with the keyword "inteligencia artificial", obtaining 3,652 articles that were

selected through multidiscipline to search if there was information for the research, having as a result of 133 articles, which were studies one by one, likewise no work related to the research was even found.

The search for information in Scielo with the keyword "competencias digitales" was made, giving a result of 84 scientific articles, being filtered by year of publication from 2014 to 2023 and in the specialty of education delivering in this first filtration 41 academic papers, to then be considered 6 articles for the study and 78 academic papers were excluded.

Continuing the search for information in Scielo repository, the keyword "inteligencia artificial en educación" was used for the filtration of articles from 2014 to 2023, obtaining a result of 53 academic papers, where only 7 were selected and 46 excluded.

Proceeding with the information search, now through ProQuest repository and using the keyword "Competencias digitales" a result of 17,541 blind peer-reviewed scientific articles were obtained, then the first filtering of academic papers was performed, excluding newspapers, press service, books, blogs, poscasts and websites, reports, doctoral these and dissertations, professional and general journals, giving a result of 6,805 academic papers, after this the filtering in peer-reviewed articles was done, reducing the number to 6,297, continuing with the filtering by subject in education, it is reduced to 641 academic papers, it continues reducing in articles having then a result of 475 works, the next filter was performed by the use of the English language obtaining a result of 183 articles, after filtering by the year of publication from 2014 to 2023, it delivered 177 articles, whose were evaluated one by one and excluding the works that were not part of the research, and as a result we obtained 9 articles that were used in this investigation, being excluded 17,532 of them.

3. RESULTS AND DISCUSSION

After a deep search, the following image shows under a rigorous review some detailed information, showing the search process, selection and exclusion of the academic works that allowed the development of this work.

Image 3.
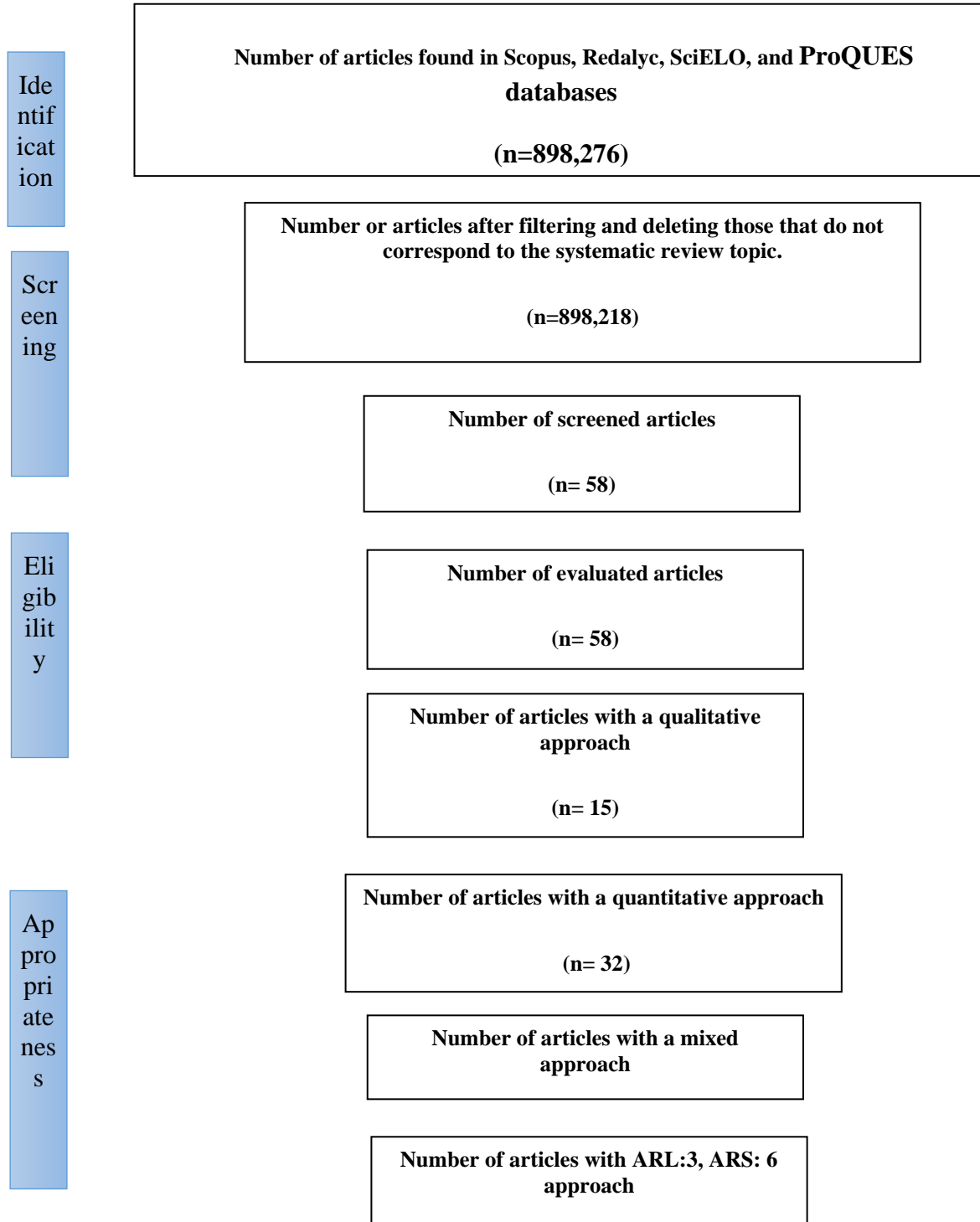
Flowchart of the research on digital skills and artificial intelligence in higher education.

Table 1. Bibliometric table of the academic papers included in the research.

Year of publication	Country	Study approach	Database	Language
2023	Spain	QUANTITATIVE	SCOPUS	SPANISH
2022	Spain	QUALITATIVE	SCOPUS	SPANISH
2023	Spain	QUANTITATIVE	SCOPUS	SPANISH
2022	Spain	QUANTITATIVE	SCOPUS	SPANISH
2022	Spain	QUANTITATIVE	SCOPUS	SPANISH
2022	Spain	QUANTITATIVE	SCOPUS	SPANISH
2022	Spain	QUANTITATIVE	SCOPUS	SPANISH
2021	Brazil	QUANTITATIVE	SCOPUS	SPANISH
2023	Spain	ARL	SCOPUS	ENGLISH
2023	Spain	ARL	SCOPUS	ENGLISH
2022	Ecuador	QUANTITATIVE	SCOPUS	ENGLISH
2023	USA	ARS	SCOPUS	ENGLISH
2023	China	QUANTITATIVE	SCOPUS	ENGLISH
2023	Spain	QUANTITATIVE	SCOPUS	ENGLISH
2023	Italy	QUANTITATIVE	SCOPUS	ENGLISH
2023	Iran	QUANTITATIVE	SCOPUS	ENGLISH
2023	USA	ARS	SCOPUS	ENGLISH
2023	China	QUANTITATIVE	SCOPUS	ENGLISH
2023	USA	ARS	SCOPUS	ENGLISH
2023	China	QUANTITATIVE	SCOPUS	ENGLISH
2023	Italy	QUANTITATIVE	SCOPUS	ENGLISH
2023	Brazil	QUANTITATIVE	SCOPUS	ENGLISH
2023	Spain	ARL	SCOPUS	ENGLISH
2023	South Africa	QUANTITATIVE	SCOPUS	ENGLISH
2022	Mexico	QUALITATIVE	REDALYC	SPANISH
2015	Venezuela	QUANTITATIVE	REDALYC	SPANISH
2017	Colombia	ARS	REDALYC	SPANISH
2018	Mexico	QUANTITATIVE	REDALYC	SPANISH
2022	Mexico	QUANTITATIVE	REDALYC	SPANISH
2017	Mexico	QUANTITATIVE	REDALYC	SPANISH
2022	Cuba	QUANTITATIVE	REDALYC	SPANISH
2022	Mexico	MIXED	REDALYC	SPANISH
2022	Spain	QUANTITATIVE	SCIELO	SPANISH
2022	Mexico	QUANTITATIVE	SCIELO	SPANISH
2022	Argentina	QUANTITATIVE	SCIELO	SPANISH
2021	Mexico	ARS	SCIELO	SPANISH
2021	Mexico	QUALITATIVE	SCIELO	SPANISH
2021	Cuba	QUALITATIVE	SCIELO	SPANISH
2021	Peru	QUALITATIVE	SCIELO	SPANISH
2021	Mexico	QUALITATIVE	SCIELO	SPANISH
2023	Spain	QUALITATIVE	SCIELO	SPANISH
2022	Colombia	QUANTITATIVE	SCIELO	ENGLISH

2022	Peru	QUALITATIVE	SCIELO	SPANISH
2021	Chile	QUANTITATIVE	SCIELO	SPANISH
2021	Colombia	ARS	SCIELO	SPANISH
2021	Costa Rica	QUALITATIVE	SCIELO	SPANISH
2021	Mexico	QUANTITATIVE	SCIELO	SPANISH
2021	Mexico	QUANTITATIVE	SCIELO	SPANISH
2019	Peru	QUALITATIVE	SCIELO	SPANISH
2022	Spain	QUALITATIVE	ProQues	ENGLISH
2022	Spain	QUALITATIVE	ProQues	ENGLISH
2018	Colombia	QUALITATIVE	ProQues	ENGLISH
2019	USA	QUALITATIVE	ProQues	ENGLISH
2022	Spain	QUALITATIVE	ProQues	ENGLISH
2023	Spain	MIXED	ProQues	ENGLISH
2023	Spain	QUANTITATIVE	ProQues	ENGLISH
2019	Mexico	QUANTITATIVE	ProQues	ENGLISH
2020	Mexico	QUANTITATIVE	ProQues	ENGLISH

Note. Bibliometric summary of academic papers by database, year, countries, approaches and languages.
The following information was obtained from the bibliometric table and is shown below.

Table 2

Number of articles published on this research per year	Frequency
2015	1
2017	2
2018	2
2019	3
2020	1
2021	11
2022	18
2023	20
Total	58

Note: This table shows the frequency of publications on digital competences and integration of artificial intelligences in education.

Table 2 shows the amount of academic works carried out in those years, which is increasing since 2021 due to the quarantines established by the governments, where students and professors use technological tools for synchronous virtual education more frequently.

Image 4.

Graphic bars of the production of articles accumulated in the 4 repositories investigated
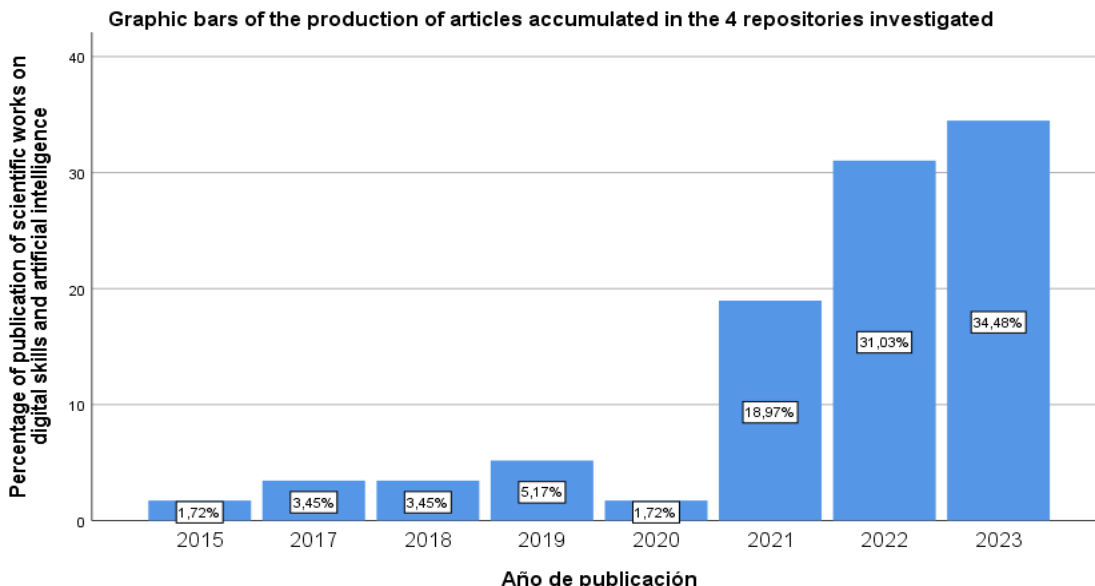
This image shows the percentage by year of articles related to research.

An exponential process is observed in the research showing the development of new approaches based on technological innovations dedicated to education and vocational training, it is also observed that in 2020 there is a decline in research on digital skills, retaking this new way of learning during the pandemic and post pandemic of COVID-19, this information allows us to show the evolution of the use of these tools in education among professors and students.

We can also see that 2020 emerges as a turning point in this process. During this year, COVID-19 pandemic suddenly boosted professors to adapt their teaching to online education and highlighted the need for effective technology solutions in education.

This period showed both challenges and opportunities in the adoption of educational technology, forcing educators and students to adapt quickly to new digital environments.

Education and vocational training have become highly dependent on technology, which has triggered a significant increase in research and innovation in this field. Research shows a clear emphasis on the development of online teaching methods, assessment tools, learning platforms and the integration of artificial intelligence to enhance the personalization of education.

Image 5.

Percentage of academic papers by country published in Scopus, Redalyc, Scielo and ProQues repositories.
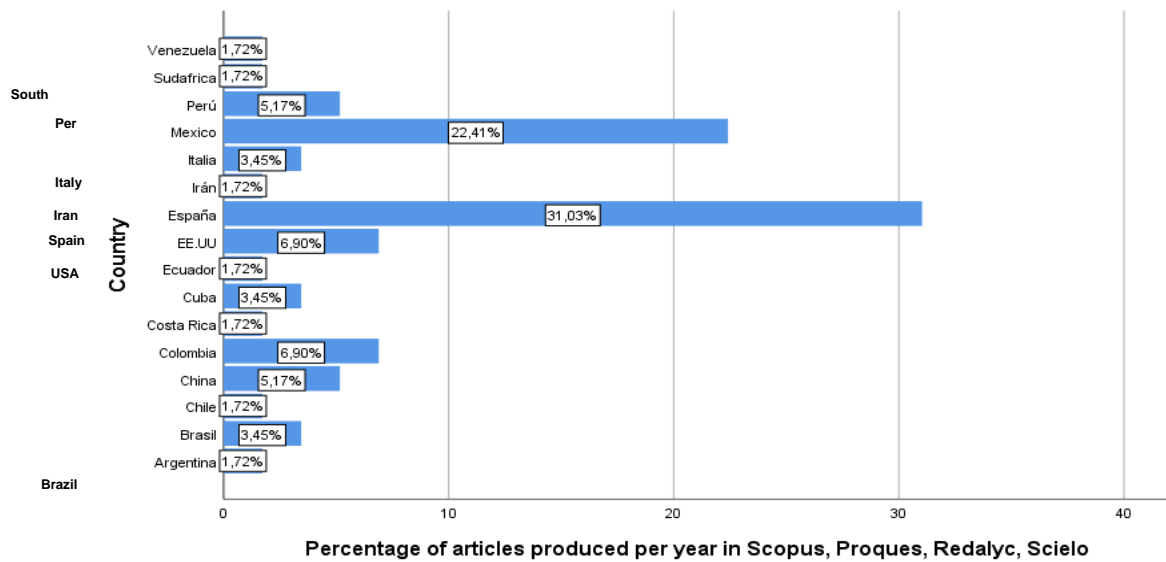
This graph shows the publications by country and the percentage of these research publications, showing the countries with the highest number of publications on the development of digital skills and A.I.

Image 6. Bar chart showing the types of approaches found in this research.
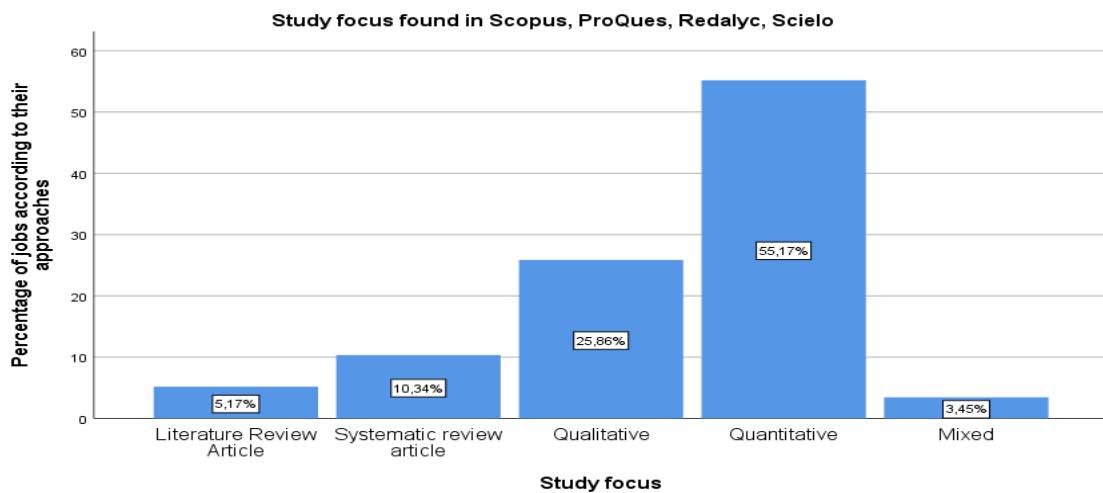
Thi image shows the production of academic papers according to their study focus.

Table 3

Number of articles in the following databases	Frequency
ProQues	9
Redalyc	8
SciELO	17
Scopus	24
Total	58

Note. Number of articles found for research in the following repositories

Image 7. Bar of percentages of articles according to databases studied
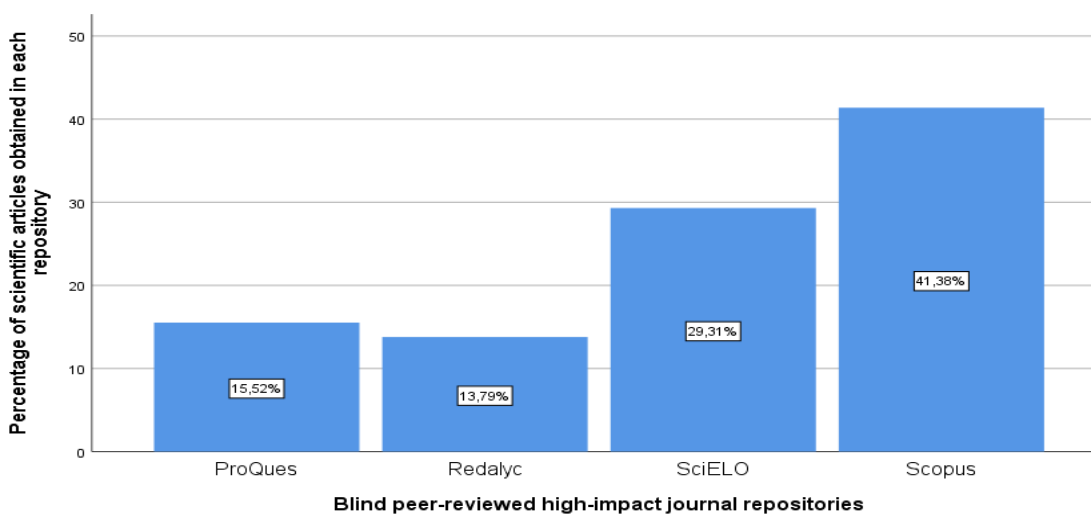
Percentage of articles studied in the following databases

Table 4

Production of articles by language of research interest	Frequency
Spanish	32
English	26
Total	58

Note. After a deep and rigorous search for informations, we found academic works in English and Spanish proposed in the

search according to the authors.

The combination of digital skills and artificial intelligence (AI) in higher education is a crucial topic of discussion today, due to it represents a significant transformation in the way knowledge is delivered and acquired, as shown in each of the images above thanks to the research carried out.

AI enables the personalization of learning by adapting content, speed and teaching style to the individual needs of students. This promotes an approached focused mainly in university students, improving retention and engagement of individual students by making technology-based pedagogical innovations part of professional training.

AI can also automate administrative tasks, such as correcting exams or scheduling, allowing enough time for professors to focus on higher-value activities, like interacting with students. AI-supported online education can increase access to higher education, overcoming geographic and socioeconomic barriers. We can say that it is constantly progressing. Also, the exposure to AI and technology in higher education prepares them for the demands of the job market.

However, there are challenges, such as the digital gap and the need to ensure ethics and transparency in the use of AI. In addition, it is essential that higher education balances technology with the development of critical skills, such as critical thinking and problem solving.

The following table shows some of the research contributions of some of the authors selected for this investigation.

Table 5. Contributions obtained after a rigorous investigation of each researcher.

N°	Authors	Research contributions
1	(Montesano et al., 2023).	They state that digital competences strengthen academic training, determines that ICTs play an important role in digital environments being easily accessible to students and professors, and also considers that educators acquire these skills through training. Similarly, they mention that 57,1% students present technological skills in the learning process at an intermediate level and 71% do not understand the use of these tools.
2	(Díaz & Reyes, 2022)	They mention that there is a significant change in education mediated by ICTs where among many tools, the Flippd Classroom is used for doing a better evaluation and preparing materials, allowing them to place online materials or academic resources giving a feedback to academic training, strengthening in students the area of information or training to search for study materials online, communication between their partners and the professor, thus being a way to create materials or content, and especially the knowledge of a security system called cyber security.
3	(Soto et al.,2022)	They mention that digital competence consists in three levels, the lack of technologies that can be applied in the classroom due to the deficiency of technological tools forcing the professors to carry out their classes in a traditional way adding some academic innovations helping to improve educational quality, likewise the next level is the sufficient one, because the professor considers that digital competences are technologically competent to improve education, boosting directors of academic institutions to promote and manage these tools in the classroom, and the last level of development is the innovation, which is achieved by having the appropriate equipment to develop a digital education.
4	(Cabero-Almenara et al.,2021)	They consider that t-MOOC is a technological technique that allows them to perform tasks that are currently included in virtual education universities and that could lead to a hybrid education, this allows them to have free access to the platforms, a long life education, helping oneself to specialize, and adapt to the new paradigms of virtual education.
5	(Morales et al.,2021)	They mention in their research the terms of ICTs that help to strengthen students as: digital literacy, which is the practice of handling literature found on the internet, as well as digital agency, which is the ability that enable the student to make the appropriate decision, and digital involvement, necessary for technological reinforcement, and also the boaster that consists of a set of skills and mastery, being this the empowerment of digital kwnoledge.

Answering the objectives according to the academic papers obtained for the research:

What are the contributions of digital skills and artificial intelligence?

Digital skills are increasingly essential in today's labor market. Owning these skills increases employability and career opportunities. In education, digital competences enable student to access online learning resources, collaborate on digital projects, and adapt to online education environments. Digital competences facilitate online communication and collaboration, which is vital in a globalized and connected world. Students with digital competences can use technology to empower themselves, access to information, solve problems, and make informed decisions.

AI can also adapt teaching and learning materials to the individual needs of learners, improving the effectiveness of the educational process. Tedious and repetitive tasks can be performed more efficiently, freeing up time for more creative and strategic activities. Similarly, large data sets can be analyzed quickly and accurately, which is very important in fields such as research, healthcare and business decision making. A.I. makes it possible to help in the early identification of diseases and provide more accurate prognosis in the area of medicine, improving medical care in the professional training of students. AI promotes process automation, which increases efficiency and reduces production costs. Overall, AI contributes to efficiency improvements in a variety of applications, from resource management to transportation and logistics.

How have digital skills developed over time?

The development of digital competences over time has been a process influenced by the rapid evolution of technology and the changing demands of society, in that sense we can observe images 5,6,7 and 8, and how it has been getting involved over time, also researchers have managed to conduct these investigations due to new approaches and paradigms in innovation education based on technologies.

What opportunities do these ICT tools and AI show?

The opportunities are many since these tools allow the improvement and effectiveness in the learning of students, and it is also personalized from the moment the student is in front of a computer or any electronic device.

How could ICT and AI be implemented within vocational training?

The implementation according to the works reviewed in this study is that you can create online learning platforms, digital educational resources, tutorials to strengthen learning and teaching, but to create all these is necessary to build collaborative platforms where students interact and perform a synchronous digital socialization type.

Is there any danger in using these tools?

Some authors indicate that, it is dangerous in the following situations: personal data information privacy, which is something important, inequality due to the economic proverty of some sectors of the countries, and students with few opportunities to have a computer or any other technological equipment with internet connection, as well as technology dependency or manipulation of information and ethical risks; all these would be part of the danger that students must face using these tools.

CONCLUSION

In conclusion, digital competences and AI in higher education shows a very remarkable evolution according to the statistics made in the product of the research results, likewise we are concern these tools are fundamental in higher education, forcing human being to be dependent on technology so far since today it is necessary to have technological equipment connected to the internet, whereof these skills include capabilities to use software and educational tools that allow them to operate in digital environments, this shows that so far there is a huge variety of information that delivers many opportunities to develop a quality education and promote research.

Likewise, this conclusion shows that there is a revolution in the creation of fully interactive materials capable of simulating physicial and mechanical phenomena for a better understanding of the subject studied, allowing correcting homework, reinforcing the basic knowledge of academic training, personalizing the education acquired by each student individually, and in some way also addresses the ethics of respecting authorship.

However, while digital skills and AI present many opportunities, they also present challenges and ethical considerations that must be taken into account. First, equitable access to technology and digital skills training is crucial to avoid creating or increasing gaps among students. Lack of access to technology or digital skills training could leave some students behind, which is the opposite of the goal of accessible education for all.

In the case of AI, transparency and responsibility are critical issues. AI algorithms can be subject to biases if they are not trained properly or if the data used to train them is biased. This could lead to unfair decisions in areas such as college admissions or hiring. The ethics of AI is an ongoing concern, and clear regulations and standards are needed to ensure that it is used fairly and ethically in higher education.

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