Artificial Intelligence And Its Contribution To Formative Research: An Analysis From Classroom Projects In Higher Education

Diana Martínez Torres[1]; Ph.D.(c). Freddy Mestre Gómez[2]; Ph.D. Oscar Torres Yarzagaray[3]; Ph.D. Marelys Mulford Hoyos[4]; Mg. Álvaro Morales Otero[5]; Mg. Brenda Martínez Burgos[6]

[1] Fundación Universitaria Colombo Internacional. Master's Degree in Innovation Management, Technological University of Bolívar. Leader of the research group on productivity and business management – GIPGEM.
[2] Corporación Universitaria Minuto de Dios, ORCID: https://orcid.org/0000-0002-0037-0189
[3] Economist, Universidad de Cartagena (Cartagena de Indias, Colombia). Master's Degree in Logistics and Master's Degree in Organizations, Almirante Padilla Naval Cadet School (Cartagena de Indias, Colombia). PhD in Economic Sciences, University of Zulia (Maracaibo, Venezuela). Research Professor, Universidad del Sinú Elías Bechara Zainum, Cartagena de Indias Section. ORCID: https://orcid.org/0000-0001-6108-0401.
[4] Fundación Universitaria Colombo Internacional. Leader of the GIPEAIN research group. Email: mmulford@unicolombo.edu.co. ORCID: https://orcid.org/0000-0002-6985-5424
[5] Academic Vice-Rector, Fundación Universitaria Colombo Internacional. ORCID: https://orcid.org/0009-0003-0319-8614.
[6] Dean General, Fundación Universitaria Colombo Internacional

Abstract

The integration of artificial intelligence (AI) in higher education has transformed teaching-learning and research processes. This article analyzes the role of AI in formative research, taking classroom projects as a pedagogical strategy for the development of research competencies. A mixed study was carried out that combines a quantitative descriptive approach with 102 students at university programs, whose data were obtained through a structured survey, as well as a qualitative component through a panel of experts with tutors of classroom projects. The results show that 99% have participated in classroom projects and that 63% feel satisfied or very satisfied with this strategy. It is evident that AI is perceived as a support tool in stages such as bibliographic research, data analysis and academic writing. The pedagogical, ethical and methodological

implications of the use of AI in formative research contexts are discussed. It is concluded that the integration of AI in classroom projects strengthens critical thinking, improves the quality of academic products and promotes authentic research practices.
Keywords: artificial intelligence, formative research, classroom projects, higher education, educational innovation.

Resumen
La integración de la inteligencia artificial (IA) en la educación superior ha transformado los procesos de enseñanza-aprendizaje e investigación. Este artículo analiza el papel de la IA en la investigación formativa, tomando como eje los proyectos de aula como estrategia pedagógica para el desarrollo de competencias investigativas. Se realizó un estudio mixto que combina un enfoque cuantitativo descriptivo con 102 estudiantes de programas universitarios, cuyos datos se obtuvieron mediante una encuesta estructurada, así como un componente cualitativo a través de un panel de expertos con docentes tutores de proyectos de aula. Los resultados muestran que el 99% ha participado en proyectos de aula y que el 63% se siente satisfecho o muy satisfecho con esta estrategia. Se evidencia que la IA es percibida como una herramienta de apoyo en etapas como búsqueda bibliográfica, análisis de datos y redacción académica. Se discuten las implicaciones pedagógicas, éticas y metodológicas del uso de IA en contextos de investigación formativa. Se concluye que la integración de IA en proyectos de aula fortalece el pensamiento crítico, mejora la calidad de los productos académicos y promueve prácticas investigativas auténticas.
Palabras clave: inteligencia artificial, investigación formativa, proyectos de aula, educación superior, innovación educativa.

1. INTRODUCTION

The advent of artificial intelligence (AI) has precipitated a paradigm shift in contemporary educational processes, emerging as a seminal disruptive technology. Its integration into higher education has precipitated a transformation in the modes of teaching, learning, and research (Zawacki-Richter et al., 2019). As Flores and García (2023) posit, artificial intelligence (AI) has the potential to serve as a valuable ally for students and educators. This assertion is supported by the ability of AI to provide customized pedagogical content, as well as individualized assistance and tutorials.

Therefore, its capacity to automate tasks, offer rapid feedback, perform analysis of large volumes of data, and generate natural language suggests direct applications in formative research, understood as the incorporation of research practice into the curriculum, gradually and sequentially, to form scientific competencies. A review of recent literature reveals that, despite the rapid growth in research on AI in education, there are still significant gaps regarding the translation of these technological capabilities into tangible benefits for learning and the enhancement of research skills in university settings.

As academic institutions endeavor to enhance the research aptitudes of their students, the question of how artificial intelligence can contribute to the development of formative research, particularly through strategies such as classroom projects, arises.

Classroom projects, known in the literature as Project-Based Learning (PBL) when structured under this approach, constitute a widely recognized didactic strategy for the development of research and professional competencies. This is because they involve the resolution of authentic problems and the development of products or deliverables that evidence learning that is the product of research work. Consequently, classroom projects have established themselves as an active methodology that fosters meaningful learning, problem-solving, and the collective construction of knowledge (Thomas, 2020). The integration of artificial intelligence (AI) into such projects has been shown to enhance the efficiency of research processes while fostering students' autonomy, creativity, and critical thinking skills.

The pertinence of the subject matter is underscored when contemplating the prevailing challenges confronting higher education. A recent study by the ICDE (2024) indicates that only 19% of students in Latin America use artificial intelligence (AI) tools critically in their academic projects, even though 89% of employers consider them essential (ILO, 2023). The observed discrepancy between the competencies cultivated within academic settings and the requirements of the employment sector necessitates a comprehensive evaluation of prevailing pedagogical approaches. When applied strategically, PBL has proven effective in addressing this discrepancy, demonstrating a positive impact on academic performance (Chen et al., 2023).

The objective of this article is to examine the role of artificial intelligence in formative research. This examination is based on a study that was administered to university students, using data from a survey that was administered to 102 participants, as well as a panel of experts that was administered to project tutors. The objective of this study is to comprehend perceptions, satisfaction levels, and the formative impact of classroom projects and the utilization of AI tools.

2. BACKGROUND AND THEORETICAL FRAMEWORK

Recent scientific literature demonstrates an emerging interest in the integration of artificial intelligence (AI) within educational settings and academic research methodologies. Research conducted by Holmes et al. (2021) and Luckin (2022) demonstrates the potential of artificial intelligence (AI) to personalize learning and enhance the efficacy of cognitive processes involved in research activities.

2.1 Overview of Ai in Higher Education

Education is among the fields most susceptible to the implementation of artificial intelligence (AI), prompting significant inquiries into its transformation (Romeu Fontanillas et al., 2025).

AI in education is defined as the use of algorithms, predictive models, and intelligent systems to support teaching and learning processes (Zawacki-Richter et al., 2019). A review of the extant literature reveals a wide diversity of applications, including intelligent tutoring systems, information search, text generation, predictive performance analytics, writing assistants, learning mining, automation of academic tasks, recommendation systems, and tools to automate feedback. The review finds that, despite the growth of the field, uncertainty persists about how to scale solutions pedagogically.

Baker and Smith (2019) conducted an analysis of artificial intelligence tools applied to education from three approaches: a) student-centered, b) teacher-oriented, and c) system-oriented. A variety of tools have been developed to assist students in their academic endeavors. Among these tools are programs designed to facilitate the acquisition of knowledge in specific disciplines. Examples of such programs include adaptive or personalized learning management systems and intelligent tutoring systems (ITS). Conversely, teacher-oriented tools aim to facilitate their work and alleviate their administrative obligations by automating processes such as task management, evaluation, feedback, and plagiarism detection. Furthermore, these solutions furnish data on student progress, enabling educators to provide timely interventions with specific guidance. Regarding system-oriented tools, they furnish administrators and institutional managers with pertinent information, such as the identification and monitoring of dropout patterns in faculties or educational centers. In the domain of higher education, the notion of the student life cycle (Reid, 1995) is adopted as a framework to delineate the various AI-based services that function at the institutional and administrative levels, in addition to those that facilitate the academic process itself.

In the domain of higher education (HE), the advent of artificial intelligence has precipitated a substantial impact, as institutions, researchers, professors, and university students are confronted with a paradigm shift (García-Peñalvo et al., 2024; Huang et al., 2021). The rapidity of these transformations engenders limited opportunities for assimilation (Grassini, 2023; Hwang & Chen, 2023).

A growing body of research has begun to examine the integration of artificial intelligence within academic institutions. This includes studies by Al Shloul et al. (2024), who examined the adoption of tools such as ChatGPT in university settings, and Wang and Lei (2024), who analyzed the impact of AI on online university environments.

Tandayamo (2023) posits that the integration of artificial intelligence in educational processes can enhance learning through the implementation of training programs, thereby reducing the repetitive tasks performed by teachers. This paradigm shift supports the potential for a more customized educational experience, concurrently fostering enhanced collaborative learning through its prioritization.

Despite the numerous advantages offered by artificial intelligence in the domains of learning and research skills, this technological advancement introduces significant challenges. The ability of this tool to generate highly complex academic texts has the potential to hinder students' development of critical thinking skills, as well as their ability

to discern between factual and fictitious information (Rahman & Watanobe, 2023). In this regard, Holmes, Bialik, and Fadel (2021) present an analysis of the promises and risks of AI in teaching and learning, highlighting the need for ethical frameworks, transparency, and digital literacy for teachers and students.

As Romeu Fontanillas (2025) has asserted, the integration of artificial intelligence (AI) within educational institutions prompts various stakeholders to explore novel methodologies and establish fresh legal and ethical frameworks.

2.2 Formative research

Formative research is defined as a pedagogical practice that fosters the development of scientific skills through participation in structured activities (Restrepo, 2013). The fundamental components of this process encompass the formulation of problems, a comprehensive literature review, the design of methodologies, the analysis of data, the processing of information, the preparation of research reports, and the communication of results.

Luckin (2022) has proposed frameworks for understanding the complementarity between human and artificial intelligence. The author highlights that AI should be designed to expand human capabilities (metacognition, criticism, creativity), not to replace them. This is a critical aspect of formative research. AI has the capacity to facilitate instrumental tasks; however, research training necessitates deliberation, critical judgment, and methodological design on the part of the student.

2.3 Classroom projects as a research strategy

In the context of formative research, Latin American studies (Restrepo, 2013; Véliz & Rivera, 2020) underscore the significance of classroom projects in fostering research skills from the initial university semesters.

Classroom projects have been described as an effective strategy for this purpose (García et al., 2019), as they allow the practical application of scientific methodologies in real contexts. The Classroom Project, as conceptualized by Landin Miranda (2015), is predicated on a series of projects and tasks, to be developed in various scenarios, with the objective of ensuring that students participate in rich learning experiences that facilitate the integration of diverse knowledge. In a similar vein, the classroom project signifies a research paradigm that engages students and teachers as integral components of their daily pedagogical practices. It demonstrates a dedication to the challenges of practical application and curricular development, offering an enriching methodological perspective that adapts to the environments of the teaching and learning processes (Stenhouse, 2003).

The implementation of classroom projects as a pedagogical strategy within higher education is predicated on three fundamental theoretical pillars: social constructivism, project-based learning (PBL), and research culture. Each of these approaches offers a significant contribution to the understanding of their influence on university education. These conceptual frameworks, which are supported by recent empirical evidence from

2019 to 2024, allow for an examination of how classroom projects promote the development of professional and technological competencies in students.

Project-based learning (PBL) has been shown to promote complex problem-solving, collaborative work, and the production of applied knowledge. In his seminal review, Thomas (2000) synthesizes the benefits and challenges of PBL, including factors such as motivation, transfer, complexity in assessment, and the necessity of teacher support. The integration of artificial intelligence into problem-based learning (PBL) must be executed in a manner that preserves pedagogical principles, including authenticity, collective construction, and formative assessment.

3. METHODOLOGY

3.1. Type of study

The present study was developed under a mixed methodological design, combining a quantitative descriptive approach and a qualitative interpretative approach. As posited by Tamayo (2006), the scope of descriptive research encompasses the description, documentation, analysis, and interpretation of the prevailing characteristics and the composition or processes of phenomena, while operating within the domain of factual realities (p. 66). This perspective is pertinent to characterize students' perceptions and practices regarding the use of artificial intelligence (AI) in formative research processes. The qualitative approach serves to complement the quantitative data by facilitating a profound comprehension of the experiences, assessments, and concerns articulated by the tutors. These tutors, acting as experts, offer insights into the integration of AI in classroom projects.

In the quantitative phase of the study, a structured survey comprising 36 items was administered to students enrolled in various programs at a higher education institution in the city of Cartagena. The instrument incorporated both closed, multiple-choice questions and Likert scales. The closed questions were designed to ascertain participation in classroom projects, while the Likert scales gauged satisfaction with the methodology, the development of research competencies, and the utilization of artificial intelligence tools in academic processes.

The qualitative component was developed through a panel of experts, comprised of tutors of classroom projects, who provided detailed information on the pedagogical integration of AI, the training gaps identified in students, the ethical and academic risks associated with the use of AI, as well as the institutional challenges for its responsible implementation. This technique provided a complementary analysis of the quantitative results, offering a more profound interpretation of the practices, limitations, and opportunities of artificial intelligence (AI) in the context of formative research.

3.2. Population and sample

The type of sample employed is non-probabilistic in nature, determined by the principle of saturation (Sandelowski, 1995; Saunders et al., 2018) through convenience or snowball sampling. A total of 102 university students responded to an electronic questionnaire.

3.3. Sources of information collection

The sources of information employed are primarily primary, as evidenced by the application of surveys to university students from a Higher Education Institution in the city of Cartagena and a panel of experts through semi-structured dialogue with tutors of classroom projects. Secondary sources were also utilized, encompassing scientific articles from indexed journals, books on research results, and national, departmental, or local reference documents. These sources were selected based on their direct relevance to the subject of artificial intelligence in the educational context and formative research.

3.4. Collection instrument and analysis procedure

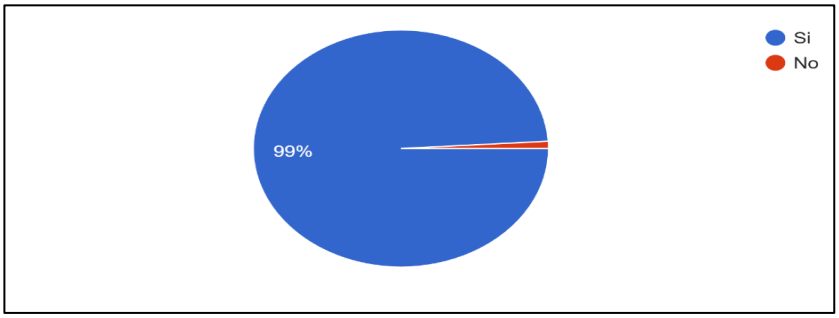
To obtain relevant information, a survey containing 36 items was administered to a sample of university students. The survey included multiple-choice questions, a Likert scale, and closed questions. The data were processed using SPSS, a software program that facilitates statistical analysis and the categorization of results. The qualitative data were then subjected to thematic analysis, a process that led to the identification of emerging categories related to opportunities, risks, institutional needs, and teachers' perceptions of AI in classroom projects.

A similar methodology was employed, namely the use of documentary review. This approach enabled the acquisition of pertinent information from bibliographic sources. The data contained in scientific articles, institutional web pages, and other documents accessible online pertaining to the subject of study were employed.

4. RESULTS

The quantitative results indicate that classroom projects play a substantial role in university education. This is evidenced by the fact that 99% of students have participated in such projects, and 63% of them report to be satisfied or very satisfied with the experience.

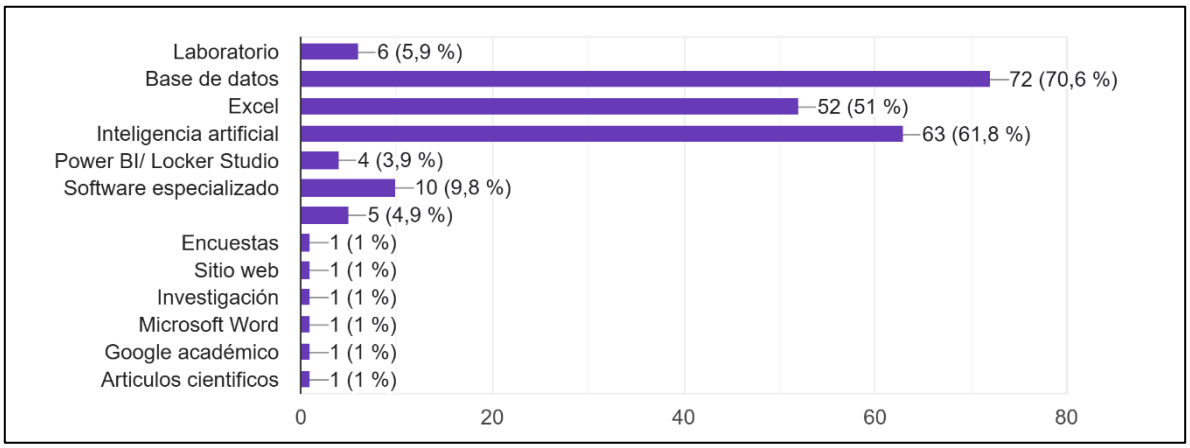
Table 1. Student participation in Classroom Projects.



Source: Applied survey.

It has been identified that these projects serve to strengthen key research competencies, including information search, theoretical framework development, academic writing, problem formulation, and basic data analysis. Specifically, 86% of respondents believe that classroom projects directly contribute to the development of skills necessary for formative research. A survey of resources and tools employed in the development of classroom projects reveals that students primarily utilize databases, artificial intelligence, and Microsoft Excel.

Table 2. Tools used for the development of Classroom Projects.



Source: Applied survey.

The integration of artificial intelligence into pedagogical practices is a rapidly evolving trend. Furthermore, 61.8% of respondents reported utilizing AI tools in their professional practice. However, when the subjects were asked about the specific applications of the tool, the responses indicated that it is primarily used for writing texts and correcting writing (63%), conducting bibliographic and information searches (43%), initiating the idea generation process (41%), as well as for the creation of instruments (23%) and basic data analysis (17%).

However, critical gaps in associated technological competencies were identified. The data indicates that a mere 15% of students reported using advanced digital tools in their projects, and only 19% employ artificial intelligence (AI) in a critical, thoughtful, and methodologically rigorous way. This finding indicates that, while AI has been integrated into academic processes, its application remains primarily instrumental.

The qualitative results of the panel of experts, which included teachers, corroborated these findings. Teachers concur that classroom projects constitute a valuable pedagogical space for promoting meaningful learning, as they allow students to articulate theory and practice and assume an active role in the construction of knowledge. The emphasis on this methodology is placed on its capacity to enhance critical thinking skills, as well as communicative and methodological competencies. However, the study also identifies significant limitations, including the absence of institutional guidelines regarding the use of AI, the lack of teacher training in digital tools, and the necessity for an integrative project that articulates formative research between semesters and subjects.

With respect to the use of artificial intelligence, educators have noted that most students employ it as an immediate resource to address tasks, without engaging in the verification of information, the comparison of sources, or the ethical evaluation of the content generated. Additionally, it is noted that students are not fully leveraging the advanced features of AI, such as assisted qualitative coding, results synthesis, text mining, statistical analysis, or preliminary reporting. From an academic perspective, these discrepancies present an opportunity for educators to rethink research training by integrating critical digital literacy and reflection processes to promote responsible use of emerging technologies.

The results of the surveys administered to university students indicate that 99% of the student population has participated in classroom projects. This finding suggests that this pedagogical strategy is extensively utilized in the institution and has been effectively assimilated by the student community. The students recognize classroom projects as a pivotal approach for acquiring research skills from the earliest semesters.

5. DISCUSSION

The triangulation of quantitative, qualitative, and theoretical findings facilitates an integrated understanding of the role of classroom projects and artificial intelligence in formative research. The high level of student engagement in classroom projects, as evidenced by their favorable assessments, corroborates the assertions made by scholars such as Thomas (2020). According to Thomas, Project-Based Learning has been demonstrated to foster motivation, autonomy, and critical thinking in students. Concurrently, the students' perception that these projects fortify research competencies aligns with the methodologies of Restrepo and García et al. (2013), who underscore that classroom projects serve as optimal environments for acquiring research skills through practical application and addressing authentic problems.

However, when incorporating the contributions of the panel of experts and the tutor teachers, it becomes evident that the impact of classroom projects can be constrained by institutional factors. Such factors include the lack of sequencing between courses, the absence of a unified methodological approach, and the discrepancies in guidance provided by teachers. These findings are in dialogue with the extant literature, which highlights the importance of articulating long-term formative research to generate cumulative learning.

The application of AI, however, introduces a more intricate dimension to the discourse. The utilization of these tools by students aligns with the trends documented by Zawacki-Richter et al. (2019) concerning the expanding integration of AI in higher education. However, the predominantly instrumental use identified in this study is consistent with the warnings articulated by Holmes, Bialik, and Fadel (2021). These researchers emphasize that the absence of critical training can result in superficial practices, which in turn can hinder the development of deep investigative skills. In a similar vein, Luckin

(2022) posits that AI should serve as a complement to and an enhancer of human intelligence, rather than a replacement for the processes of analysis, reflection, and judgment. This perspective aligns with the concerns expressed by teachers regarding the potential for over-dependence on AI.

The methodological triangulation thus demonstrates a central point: students recognize the pedagogical value of classroom projects and adopt emerging technologies such as AI. However, there is a discrepancy between the theoretical opportunities that these tools offer and the actual use given to them in practice. While the extant literature highlights the potential of AI to support complex processes (e.g., data analysis, conceptual model generation, or the interpretation of results), its current use is mostly limited to low-cognitive activities, such as writing or quickly searching for information.

The discussion has thus concluded with the affirmation that the integration of classroom projects and AI represents a significant opportunity to strengthen formative research, provided that the identified gaps are addressed. Teachers emphasize the necessity of establishing ethical and pedagogical guidelines, ensuring ongoing teacher training, cultivating critical digital literacy skills among students, and devising an institutional framework that coherently articulates formative research. This perspective aligns with the assertions put forth by Romeu Fontanillas et al. (2025), who contend that the integration of AI in educational settings, when executed with a responsible and pedagogically oriented approach, has the potential to foster autonomy, critical thinking, and scientific inquiry.

The findings corroborate the literature on the subject, which indicates that classroom projects are conducive to the development of research skills and the enhancement of active learning. The elevated degree of satisfaction indicates the pertinence of this pedagogical strategy.

6. CONCLUSIONS

The findings of the study demonstrate that artificial intelligence (AI) is redefining formative research processes in higher education. This redefinition is evidenced by its facilitation of essential tasks such as searching for information, organizing data, academic writing, and generating initial ideas. Students have identified this potential, with 61.8% of respondents indicating that they use AI, particularly for writing and proofreading texts (63%), conducting literature searches (43%), and assisting in preliminary information analysis (17%). This spontaneous appropriation indicates that AI has been naturally integrated into academic practices, albeit without structured institutional support.

Conversely, classroom projects have been shown to serve as an effective strategy for developing research skills. A significant proportion of the student body, specifically 99%, has engaged in these projects, and a notable 63% of them have expressed satisfaction or a high degree of satisfaction. These findings serve to substantiate the pedagogical significance of Project-Based Learning (PBL) in fostering meaningful learning

experiences, autonomy, and critical thinking skills. Moreover, 86% of respondents believe that these experiences contribute to the development of fundamental skills, including information search, methodological design, academic writing, and data analysis. The qualitative evidence provided by the panel of teachers serves to complement these results. Experts concur that artificial intelligence (AI) signifies a potential avenue for enhancing the quality of research outcomes and streamlining processes that formerly necessitated a substantial degree of teaching assistance. However, they also identify significant gaps, including the absence of institutional guidelines, the dearth of critical digital literacy skills, and the pressing need for teacher training to ensure the ethical and pedagogical use of these tools. Furthermore, it is noteworthy that merely 19% of students employ AI in a critical manner, a statistic that carries with it implications for potential risks. These risks include, but are not limited to, excessive dependence on AI, an overly simplistic interpretation of results, and the erosion of profound research capabilities.

There is a consensus among students and teachers that the integration of AI in formative research must be executed from an ethical, reflective, and learning-oriented perspective. To conclude, the design of institutional policies is imperative to regulate the use of generative tools, establish transparency criteria, and promote the construction of a responsible research culture. Conversely, classroom projects are regarded as the optimal environment for experimenting with AI in a structured manner, integrating the development of technological skills with the pillars of PBL (authenticity, collaborative work, problem solving, and metacognitive reflection).

In summary, the integration of artificial intelligence with classroom projects signifies a strategic opportunity to modernize formative research. The integration of artificial intelligence (AI) has been demonstrated to enhance the efficiency and breadth of processes. Classroom projects have been shown to guarantee the pedagogical depth, critical sense, and formative nature of the research experience. However, to realize this potential, institutions must develop guidelines, teacher training programs, and pedagogical environments that promote ethical, creative, and responsible use of artificial intelligence. It is imperative to recognize that this is the sole method through which AI can be transformed into a genuine ally in the training of novice researchers and the enhancement of university scientific culture.

References

1. Al Shloul, T., Mazhar, T., Abbas, Q., Iqbal, M., Ghadi, Y. Y., Shahzad, T., Mallek, F. y Hamam, H. (2024). Role of activitybased learning and ChatGPT on students' performance in education. Computers and Education: Artificial Intelligence, 6, 100219. https://doi.org/10.1016/j. caeai.2024.100219

2. Baker, T., y Smith, L. (2019). ¿Educ-IA-ción reinventada? Explorando el futuro de la inteligencia artificial en escuelas y universidades. Recuperado del sitio web de la Fundación Nesta:
https://media.nesta.org.uk/documents/Future_of_AI_and_education_v5_WEB.pdf

3. Flores, J. M., & García, F. J. (2023). Reflexiones sobre la ética, potencialidades y retos de la Inteligencia Artificial en el marco de la Educación de Calidad (ODS4). Comunicar, 1-11.
4. García, M., López, A., & Rincón, D. (2019). Proyectos de aula como estrategia para el desarrollo de competencias investigativas. Revista Educación y Humanismo, 21(36), 112–129.
5. García-Peñalvo, F. J., Llorens-Largo, F. y Vidal, J. (2024). La nueva realidad de la educación ante los avances de la inteligencia artificial generativa. RIED Revista Iberoamericana de Educación a Distancia, 27(1), 9-39.
https://doi.org/10.5944/ried.27.1.37716
6. Grassini, S. (2023). Shaping the Future of Education: Exploring the Potential and Consequences of AI and ChatGPT in Educational Settings. Education Sciences, 13(7),
7. 692. https://doi.org/10.3390/ educsci13070692
8. Holmes, W., Bialik, M., & Fadel, C. (2021). Artificial Intelligence in Education: Promises and Implications. Center for Curriculum Redesign.
9. Huang, J., Shen, G. y Xiping, R. (2021). Connotation Analysis and Paradigm Shift of Teaching Design under Artificial Intelligence Technology. International Journal of Emerging Technologies in Learning, 16(5), 73-86.
10. https://doi. org/10.3991/ijet.v16i05.20287
11. Hwang, G. J. y Chen, N. S. (2023). Editorial Position Paper: Exploring the Potential of Generative Artificial Intelligence in Education: Applications, Challenges, and Future Research Directions. Educational Technology and Society, 26(2).
12. https://doi.org/10.30191/ ETS.202304_26(2).0014
13. Landín Miranda, M. (2015). El Proyecto Aula. Una propuesta de innovación para la docencia y la formación profesional. Universidad Veracruzana - México.In Educación. Vol. XXIV, N° 46. (pp. 117–131)
[Journal-article]. https://dialnet.unirioja.es/descarga/articulo/5061326.pdf
14. Luckin, R. (2022). Machine learning and human intelligence: The future of education in the 21st century. Computers & Education, 182, 104463.
15. Rahman, M. M. y Watanobe, Y. (2023). ChatGPT for Education and Research: Opportunities, Threats, and Strategies. Applied Sciences, 13(9), 5783.
16. https://doi.org/10.3390/app13095783
17. Reid, J. (1995). Gestión del apoyo al estudiante. En F. Lockwood (Ed.), Aprendizaje abierto y a distancia hoy (pp. 265–275). Londres: Routledge.
18. Restrepo, B. (2013). La investigación formativa y el aprendizaje basado en problemas. Revista Educación y Pedagogía, 25(66), 95–108.
19. Romeu Fontanillas, T., Romero Carbonell, M., Guitert Catasús, M., & Baztán Quemada, P. (2025). Challenges of generative artificial intelligence in higher education: promoting its critical use among students [Desafíos de la inteligencia artificial generativa en educación superior: fomentando su uso crítico en el estudiantado]. RIED-Revista Iberoamericana de Educación a Distancia, 28(2), pp. 209-231.

https://doi.org/10.5944/ried.28.2.43535
Sandelowski, M. (1995). Focus on Qualitative Methods Sample Size in Qualitative Research. Research in Nursing & Health, 18, 83.
20. Stenhouse, L. (2003). Investigación y desarrollo del currículum. Madrid: Morata.
21. Tandayamo, R. C. G., Haro, R. E. M., Lozada, R. F. L., Cobos, D. I. J., & Gaibor, W. a. C. (2023). La Inteligencia Artificial Utilizada como un Recurso para el Aprendizaje. Ciencia Latina Revista Científica Multidisciplinar, 7(4), 8263–8277.
https://doi.org/10.37811/cl_rcm.v7i4.7561
22. Thomas, J. W. (2020). A review of research on project-based learning. The Autodesk Foundation.
23. Véliz, A., & Rivera, L. (2020). Formación investigativa y pensamiento crítico en educación superior. Revista Iberoamericana de Educación Superior, 11(32), 112–130.
24. Wang, X. y Lei, L. (2024). A Path Study of Generative Artificial Intelligence Enabling Online Education Platforms in Colleges and Universities. Proceedings of the 2024 International Symposium on Artificial Intelligence for Education, 332-338. https://doi.org/10.1145/3700297.3700354
25. Zawacki-Richter, O., Marín, V., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence in higher education. International Journal of Educational Technology in Higher Education, 16(39).