e-ISSN: 2631 - 2786
https://doi.org/10.35290/rcui.V12N1.2025

UISRAEL
REVISTA CIENTÍFICA

VOL. 12
No. 2 2025
MAY - AUGUST

Universidad Israel

SciELO Ecuador

DOAJ DIRECTORY OF OPEN ACCESS JOURNALS

latindex catálogo 2.0

CONTENTS

LEGAL PAGE

PUBLICATION FREQUENCY – EVERY FOUR MONTHS

PUBLISHING ENTITY
Universidad Tecnológica Israel
Dirección: Marieta de Veintimilla E4-142 and Pizarro, Quito
Código postal EC-170522
editorial@uisrael.edu.ec - Phone: (02) 255-5741 ext. 113

EDITORIAL

PhD. Yolvy Javier Quintero Cordero
Editor of Revista Científica UISRAEL
https://orcid.org/0000-0002-5773-2574

Dear readers of our scientific journal UISRAEL, it is an honor for us, its Board of Directors, to reach out to you with this second issue of 2025, in conjunction with the efforts of our collaborating researchers, to disseminate their most recent works, the fruit of their scientific diligence and with the aim of opening up new perspectives for solving problems affecting different areas of knowledge.

And that has always been the interest of research. In the words of Farfán (2023), through research "we manage to expand our limits of understanding and unlock new knowledge on various topics, from the functioning of the universe to human biology and ecosystem interactions (p.1)

Indeed, the mission of universities is inherent to the ever-increasing demands of society and the establishment of strategies that lead to relevant solutions. In this regard, De Wit et al. (2015) warn that the above becomes even more relevant when highlighting the importance of the internationalization of research as a function that comprehensively promotes the quality of education, thereby bringing about significant changes for the benefit of society.

The Andrés Bello Catholic University (n.d.) has already warned of this when it pointed out that the internationalization of research is linked to initiatives that arise between researchers from different parts of the world with the aim of achieving a solid, intercultural, interdisciplinary, cooperative and comparative integration on specific topics.

In pursuit of this goal, universities, through their researchers, must coordinate networked actions supported by appropriate information and communication technologies, which constitute formidable platforms for the internationalization of research.

Similarly, Mauduit and Gual (2020) argue that international cooperation allows international relations not only to be configured but also consolidated in order to address the challenges of global society. In this sense, international cooperation

becomes a fundamental instrument in the implementation of projects and programs consistent with the fulfillment of the SDGs.

In the specific case of Ecuador, Castillo and Powell (2019) warn that scientific production, during the period 2006-2015, has increased 5.6 times, even exceeding the average of Latin American countries. However, and despite its relevance, Rivera et al. (2017) argue that there is no full internalization of the actions carried out by the agents involved in the development of research, so it is necessary to raise awareness and sensitize teachers so that they assume research as a key element in their professional training. In this sense, it is necessary to strengthen the undergraduate program and create the necessary platform to internationalize the postgraduate program and research.

This is a task that all universities must take on significantly in order to integrate their human resource training and technological innovation to address, in terms of quality, the enormous problems facing the global community.

Below are 11 scientific articles that reflect our collaborating researchers' interest in scrutinizing different aspects of human knowledge, and our journal's interest in its noble mission to disseminate them. First, we present the article entitled "Feedback in Formative Assessment: Challenges and Challenges." The objective of this article is to determine whether feedback in formative assessment truly addresses students' need for knowledge acquisition, contributing to improvements in their learning.

The type of research is basic, using the Prisma method and searching for research in databases such as Scopus, Dialnet, and Scielo, among others. The studies analyzed converge in that feedback is indeed essential as part of formative assessment, highlighting its importance in the teaching-learning process.

Second, there is the article "Learning Areas with Double Integrals Using GeoGebra: A Study of Master's Students in Mathematics Education." The objective of this article was to evaluate the impact of teaching area calculus through the use of Double Integrals using GeoGebra on students enrolled in the Geometric and Trigonometric Analysis course within the Master's in Education with a focus on Mathematics Teaching at the Universidad Técnica Particular de Loja.

A positivist, quantitative, and descriptive-correlational approach was adopted. Seventy students were selected and divided into two groups: one experimental and the other a control group. A study sequence was implemented to apply a dynamic geometric representation of the concept of integral. It is concluded that a significant improvement was observed in the geometric understanding of the double integral.

Third, there is the article “Guided Reading for the Development of Reading Comprehension in Elementary School Students.” Specifically, the aim is to determine how guided reading affects children’s reading comprehension. This is a correlational study; SPSS statistical software was used for data analysis, with the application of the chi-square statistical model to test hypotheses based on the relationship between variables. The study yielded a value of 0.007, supporting the alternative hypotheses.

In fourth place is the article “University Social Responsibility and Perceived Value among Students at Higher Education Institutions.” Its objective is to analyze students’ assessment of social responsibility in their educational experience. A documentary review and content analysis approach were adopted.

The documents were obtained from the Scopus, Redalyc, Scielo, and Google Scholar databases. The results allowed us to identify three categories: theoretical perspectives and approaches to social responsibility; its influence on the perception of the educational experience; and current dynamics and challenges in social responsibility research. It is concluded that social responsibility plays a fundamental role in university students’ perception of the educational experience.

In fifth place is the article “Sowing the Future: Transformation and Progress in the Rural Communities of Cariamanga.” Its objective is to identify how participation in training programs and the installation of a mini-food processing plant in the community has improved the nutritional status and income of its members. The methodology included observation of members’ participation in training sessions, workshops, production cycles, and focus groups with association members. From a quantitative perspective, structured surveys were conducted with descriptive statistical analysis. The results showed an increase in self-management capacity and sustainability, highlighting international academic and financial support as key factors in rural development.

In sixth place is the article “Lesson Study: Learning to Unlearn in Teacher Training.” The study’s objective is to analyze how Lesson Study enables teachers to adapt to constant changes in the pedagogical order and transform their practices to provide relevant, quality education to their students. A methodology was implemented that includes a documentary review to critically reflect on practices and a willingness to question any entrenched educational position in the teaching-learning process. The results revealed an increase in teacher motivation and significant improvements in the implementation of teaching practices. Furthermore, students showed greater interest in learning and their academic performance.

In seventh place is the article “The Impact of Artificial Intelligence on Learning Personalization and Its Effects on Academic Performance and Educational Inclusion.”

Its objective is to analyze how this technological tool facilitates the personalization of content and pedagogical strategies according to students' needs. A quantitative approach with a quasi-experimental design was used to understand the contribution of artificial intelligence to educational inclusion. The findings highlight that the application of this tool can enhance students' academic performance by providing learning experiences tailored to each student. However, challenges such as data privacy and algorithmic bias are evident that must be addressed. A series of useful recommendations are made for its implementation in the classroom.

Eighth, an article is presented whose essential objective is to analyze the level of influence that reading comprehension exerts on the solving of mathematical problems among sixth-grade students of basic general education at the 10 de Agosto Educational Unit during the 2022-2023 school year. To this end, the positivist paradigm and a quantitative approach were used; the type of research was documentary, and the level was descriptive. Thirty-six students were surveyed, concluding that reading comprehension certainly influences the solving of mathematical problems.

In ninth place is an article whose objective is to analyze how digital tools contribute to the development of basic competencies in mathematics learning. Its design was non-experimental, basic, and quantitative. The study population consisted of 82 secondary school students. The article concludes that there is a significant relationship between the variables studied. Not only do digital tools contribute to the development of competencies in mathematics learning, but they also allow for a deeper understanding of numbers, their properties, and their application in the socio-educational context.

In tenth place, there is an article whose essential objective was to evaluate the professional and scientific performance of graduates of the Doctoral Program in Educational Sciences developed at the University of Matanzas during the 2016-2023 period. To this end, a survey was used on the most relevant aspects of doctoral training. Information was obtained on intellectual growth, professional growth, and satisfaction levels, which facilitate and reveal their levels of development as graduates. The article concludes that there is a need to improve the follow-up procedures for graduates of doctoral training processes.

Finally, we have the article "The role of communication skills in comprehensive university education." In this sense, this work proposes a review of the role of communication skills in comprehensive university education. Documentary research is chosen to gather information and develop the proposed study.

We are hopeful that these scientific products will not only contribute knowledge to the scientific community and readers at large, but will also serve as a reflective basis for future research.

References

Castillo, J y Powel, M. (2019). Análisis de la producción científica del Ecuador e impacto de la colaboración internacional en el periodo 2006-2015. *Revista española de documentación científica, vol 42 n° 1*. DOI: https://doi.org/10.3989/redc.2019.1.1567.

De Wit, H., Hunter, F., Howard, L., & Egron-Polak, E. (2015). *Internationalization of Higher Education, Policy Department B-Structural and Cohesion Poli*cies [Internacionalización de la Educación Superior, Departamento Temático B-Políticas Estructurales y de Cohesión]. Parlamento Europeo. https://bit.ly/3gs3DNN.

Farfán, G (nov, 02, 2023). *La relevancia de la investigación científica en la actualidad*. https://www.ucv.edu.pe/noticias/la-relevancia-de-la-investigacion-cientifica-en-la-actualidad.

Mauduit, J., & Gual Soler, M. (2020). Building a Science Diplomacy Curriculum. *Frontiers in Education*, 5(138), 1-7. https://doi.org/10.3389/feduc.2020.00138.

Rivera, Ch; Espinoza, J y Valdés, Y. (2017). La investigación científica en las universidades ecuatorianas. Prioridad del sistema educativo vigente. Revista cubana de educación superior, vol 36, n° 2. cielo.sld.cu/scielo.php?script=sci_arttext&pid=S0257-43142017000200011

Universidad Católica Andrés Bello (s/f). La internacionalización de la investigación. internacionalizacion.ucab.edu.ve/internacionalizacion-casa/internacionalizacion-de-la-investigacion/.

Uisrael
REVISTA CIENTÍFICA

May – August 2025 period
Vol. 12, No. 2
rcientifica@uisrael.edu.ec
https://doi.org/10.35290/rcui.v12n2.2025.1287 • e-ISSN: 2631 - 2786

Feedback in formative evaluation: Challenges and Challenges

Retroalimentación en la evaluación formativa: Retos y Desafíos

Date of receipt: 2024-05-05 Date of acceptance: 2025-01-28 Date of publication: 2025-05-10

Marleny Maribel Welson Vda. de Calderón [1]
Universidad César Vallejo, Perú
mwelsonwe17@ucvvirtual.edu.pe
https://orcid.org/0000-0001-7646-4715

Iran Aparicio Castañeda Castañeda [2]
Universidad César Vallejo, Perú
iacastanedac@ucvvirtual.edu.pe
https://orcid.org/0009-0002-9380-3322

Hilda Chuquinaira Sama [3]
Universidad César Vallejo, Perú
hildachu@ucvvirtual.edu.pe
https://orcid.org/0009-0000-6185-581X

Abstract

Evaluation as a process of continuous training, has the purpose of identifying and responding to the acquisition of knowledge of students, in order to make improvements for the development of learning, having feedback in formative evaluation as its main tool. The type of research is basic, carried out the "PRISMA" systematic review method, and the technique of searching primary research within the databases of Scopus, Dialnet, Scielo among others, with a time of no more than equal to five years of publication, using the connectors and logical algorithms "AND-OR-NOT" and keywords, subsequently data from primary sources was selected and compiled on topics related to the comments during

the evaluation phrases to improve learning, as a student training process. The selected studies converge that feedback is essential within formative evaluation, highlighting its positive impact on the development of teaching-learning, highlighting the need and importance of adapting feedback to challenging tasks or goals, focused on correcting errors and highlighting achievements. at the same time adapting feedback to emerging technologies and virtual learning environments.

Keywords: Learning, assessment, strategies, feedback

Resumen

La evaluación como proceso de formación continua, tiene como propósito identificar y responder a la adquisición de conocimientos de los estudiantes, con el fin de realizar mejoras para el desarrollo de los aprendizajes, teniendo como herramienta principal, el feedback en la evaluación formativa. El tipo de la investigación es básica, llevada a cabo el método de revisión sistemática “PRISMA”, y la técnica de la búsqueda en investigaciones primarias dentro de las bases de datos de Scopus, Dialnet, Scielo entre otros, con un tiempo no mayor o igual a cinco años de publicación, empleándose los conectores y algoritmos lógicos “AND-OR-NOT” y palabras claves, posteriormente se seleccionó y recopilo datos de fuentes primarias en temas relacionados a los comentarios durante las fases de la evaluación para mejorar el aprendizaje, como proceso de formación del alumno. Los estudios seleccionados convergen que la retroalimentación es esencial dentro de la evaluación formativa, destacando su impacto positivo en el desarrollo de la enseñanza-aprendizaje, resaltando la necesidad e importancia de adaptar el feedback en tareas o metas desafiantes, centrados en corregir errores y destacar logros, al mismo tiempo adecuar la retroalimentación a las tecnologías emergentes y entornos de aprendizaje virtual.

Palabras clave: Aprendizaje, evaluación, estrategias, retroalimentación

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Introduction

Within the global educational context, formative assessment is focused on monitoring meaningful learning, helping students to learn actively and consciously, with the support of teachers, structuring their learning in a systematic way (Bizarro et al. 2021a). This perspective underscores the need to review and refine the methods of continuous assessment in students, promoting a solid effective and high quality education (Beriche & Medina, 2021a).

Indeed, teachers should provide some continuous feedback to students in order to discover their outstanding skills and opportunities for growth in learning, aiming to generate development, convictions, stances and understanding (Holz & Poblete, 2018a). Likewise, in Denmark, for the learning of students between 6 to 15 years old, an assessment methodology based on “individual student plans” is used, which allows continuous and focused assessment to achieve specific educational objectives in all subjects (Holz & Poblete, 2018b); in Finland, assessment and feedback within its curriculum, focus on constructively guiding students, helping them to reflect on their learning and motivating them to develop holistically (Rodes, 2020).

The assessment of student performance by teachers at the end of a lesson is subjective and depends on the performance and evidence obtained in class (Moreno, 2019). On the other hand, evaluation is not only used to rate student performance, but also to provide timely and constructive feedback that promotes growth and continuous improvement (Rodriguez et al. 2022). In this sense, Mella and Calatayud (2023) point out that it is essential to make use of feedback, insofar as it favors true evaluation in the processes that are carried out to assess student learning.

Peruvian education is undergoing a transition towards the implementation and application of new perspectives in evaluation with a formative approach (Cruzado, 2022a). These approaches are still not adequately considered by teachers, who tend to evaluate more to grade the teaching received by students, despite the fact that the Ministry of Education establishes rules to provide online subjects and orientations.

In this sense, teachers still face limitations in their implementation in the classroom, which is detrimental to learners in their knowledge acquisition path (Ministry of Education, 2022a).

Feedback tends to become powerful opportunities within the assessment process, improving student learning and refining teachers’ planning of their curricular activities (Cifuentes, 2021a). Similarly, Cruzado (2022b) points out that there is a drawback in how teachers conduct evaluations, following a traditional and cognitive approach that does not take into account the different multiple intelligences of students. The educational process, especially in basic education, depends largely on how teachers provide feedback to improve student performance and how parents use progress reports to reinforce their learning (Garcia et al. 2021).

It is suggested that formative assessment should be applied in all phases of learning, both in primary and secondary education (EBR) and in university education, moving away from evaluative models that provoke resistance by not recognizing its contribution to the improvement of learning

(Beriche & Medina, 2021b). Formative feedback is process of exchanging insights and suggestions to encourage attention to student performance (Burga et al. 2023).

The study is justified by its ability to provide information with tools and resources for teachers, facilitating the implementation of more effective feedback techniques in the classroom (UNESCO, 2021). Therefore, it will contribute to the knowledge on formative assessment, especially as an appropriate resource for students' learning and skills improvement, allowing to explore theories such as constructivism and formative assessment in practical contexts, offering a deeper understanding of how feedback impacts the formative process (Anijovich & Cappelletti, 2020a).

From all this, the question arises Why is it important to analyze the challenges and challenges of feedback in formative assessment, highlighting the relevance of feedback as part of formative assessment as a vital component in the evaluation phase. On the other hand, Chávez et al, (2021a) concluded that formative assessment is transformed from a highlighted aspect, as a crucial instrument for the promotion of competencies, despite the fact that the educational process encompasses more than mere evaluation, the latter is established as essential to ensure success in learning. According to Valdivia and Fernandez (2020) formative assessment plays a key role in education, as its purpose is to promote the holistic development of students, with particular emphasis on feedback as a key element.

Sánchez and Carrión (2021a) identified the importance of proposing a didactic approach that guides teachers in improving high quality feedback. Valdez et al. (2023a) highlighted that feedback has a fundamental role in the formative evaluation process. In addition, they emphasize the imperative of using strategies and instruments that are consistent with the educational objectives in a competency-oriented pedagogical framework, emphasizing the importance of obtaining reflective feedback directly from the students.

Hortigüela et al. (2018a) state that feedback is fundamental in decision making to improve student learning, being important that educators create environments conducive to the intellectual growth of students, actively involving themselves by motivating them to solve problems. On the other hand, Tippe et al. (2024a) mention that formative assessment is a key pedagogical element that drives changes in student performance and thinking, perfecting the educational process that contributes to the enrichment of students' knowledge, skills and tactics.

Feedback is to reduce the distance between the student's current situation and the ideal situation he/she intends to reach, evidencing his/her difficulties in order to make adequate use of the tools to solve it (Bizarro, 2019).

Meanwhile, Rojas et al. (2021a) state that feedback within the learning process requires students to take responsibility for directing their own learning through reflection, recognizing their progress, needs and difficulties. Cifuentes (2021b) the "Feedback Ladder" method proposes a structured and constructive approach to improve educational feedback, focused on clarifying, evaluating and expressing concerns in a constructive manner, in addition to making useful suggestions for student learning.

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Table 1:

Feedback Processes

Respecto a la fuente	Respecto a su interés	Respecto al momento	Respecto a la forma	Respecto al receptor
Docente	Tareas	Formal	Verbal	Individual
Compañeros	Proceso	Informal	No verbal	Grupal
Experto externo	Autorregulación		Escrito	
Alumno	Persona		Actuado	

Fuente: Procesos de la retroalimentación organizados según sus tipos (Mendivelso, Ortiz & Sánchez, 2019, p.25)

In Table 1: It can be seen that the identification of the feedback agent is fundamental. This can be the student, his/her peers, the teacher or an external person, the purpose of the feedback must be defined, which can be focused on the work, on the learning process, on the self-regulation of this process or directly on the student; the feedback can be formal, either in a structured or informal evaluation, or in verbal communication during the teaching process, it must be determined if the feedback is directed to a specific individual or to a group of students.

According to, Ministry of Education, (2022b) the importance of a formative evaluation, should be oriented to the well-being and integral development of the student, emphasizing in addition to the academic progress, a holistic approach that includes cognitive, emotional and social aspects, being feedback essential for the development of learning, since it helps students to identify their successes and mistakes, reflecting on their performance (Vera, 2022).

Learning is based on evidence that seeks to achieve specific competencies, ensuring that such evidence does not fade away during the process and that it corresponds to the established objectives and results or competencies. For this reason, it is crucial to have evaluation tools, which constitute the means that facilitate the analysis of the evidence and allow determining performance according to the defined criteria and performances (Alca, 2022, p. 37).

Table 2.

Evaluation Tools

INSTRUMENTO	CARACTERISTICA	UTILIDAD
Registro de observacion	Utilizado por el docente para registrar los aprendizajes y comportamientos del alumno.	Se usa de manera continua para tener una visión amplia sobre lo que acontece en el aula.
Lista de cotejo	Permite cotejar o enlistar los comportamientos o desarrollo de competencias de manera simplificada.	Se utiliza para verificar el logro o cumplimiento de una actividad y comportamientos de los estudiantes.
Rubricas	Permite realizar el seguimiento del aprendizaje de manera sistemática.	Se utiliza de manera continua para dar seguimiento y retroalimentación continua a los estudiantes o entre los estudiantes.

In this regard, Monje (2022) mentions that classroom interaction reflects the continuity of external evaluation criteria of pedagogical work, in such a way that evaluation practices reflect educational objectives and depend on the opportunities provided to students to explore their qualities. Moreno (2023) feedback in the training process is considered as a powerful influence to improve interest in teaching-learning.

Methodology

The research is basic, carried out using the systematic theoretical review method. This process involved the careful selection of a variety of articles, related to the use and practice of feedback in formative assessment by teachers (Bizarro et al. 2021b). For data collection, the technique of searching for primary articles within a range of recognized databases such as Scopus, Proquest, Dialnet, Scielo and others, with no more than five years of publication, using logical algorithms such as AND-OR-NOT, keywords and a wide range of sources, such as scientific articles, academic journals and normative documents, was used, To ensure that the systematic review is a transparent, accurate and complete publication, the author should describe how the previous studies were identified and selected through the literature reviews (Page et al. 2021). In the filtering of sources, the Prisma model was used, which incorporates reviews and systematic searches that have emerged in recent years to date (Barquero, 2022). The process began with a preliminary set of 70 texts chosen for their relevance to the topic, and later included 15 additional records obtained from other sources. The inclusion criteria focused on publications made between the years of 2019 and 2023, which were directly related to the study and which emphasize classroom practices, resulting among them in the selection of 34 records, of which 24 were chosen for the more detailed analysis on various definitions of feedback. Ten records were subsequently excluded because they were not directly related to the focus of the study and to avoid redundancies in the information, to which 4 were also excluded because there was no relationship and association between variables, their results being unclear.

Finally, 20 full-text articles were analyzed in depth in order to examine the theoretical bases of feedback in formative assessment and explore ways to improve student learning and teacher work related to feedback. This systematic analysis was carried out through guiding questions and the search of specialized literature, which allowed advancing in the analysis, the construction of the discussion and the presentation of results, as shown in Figure 1.

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Figure 1:

Schematization of the systematic review flowchart..

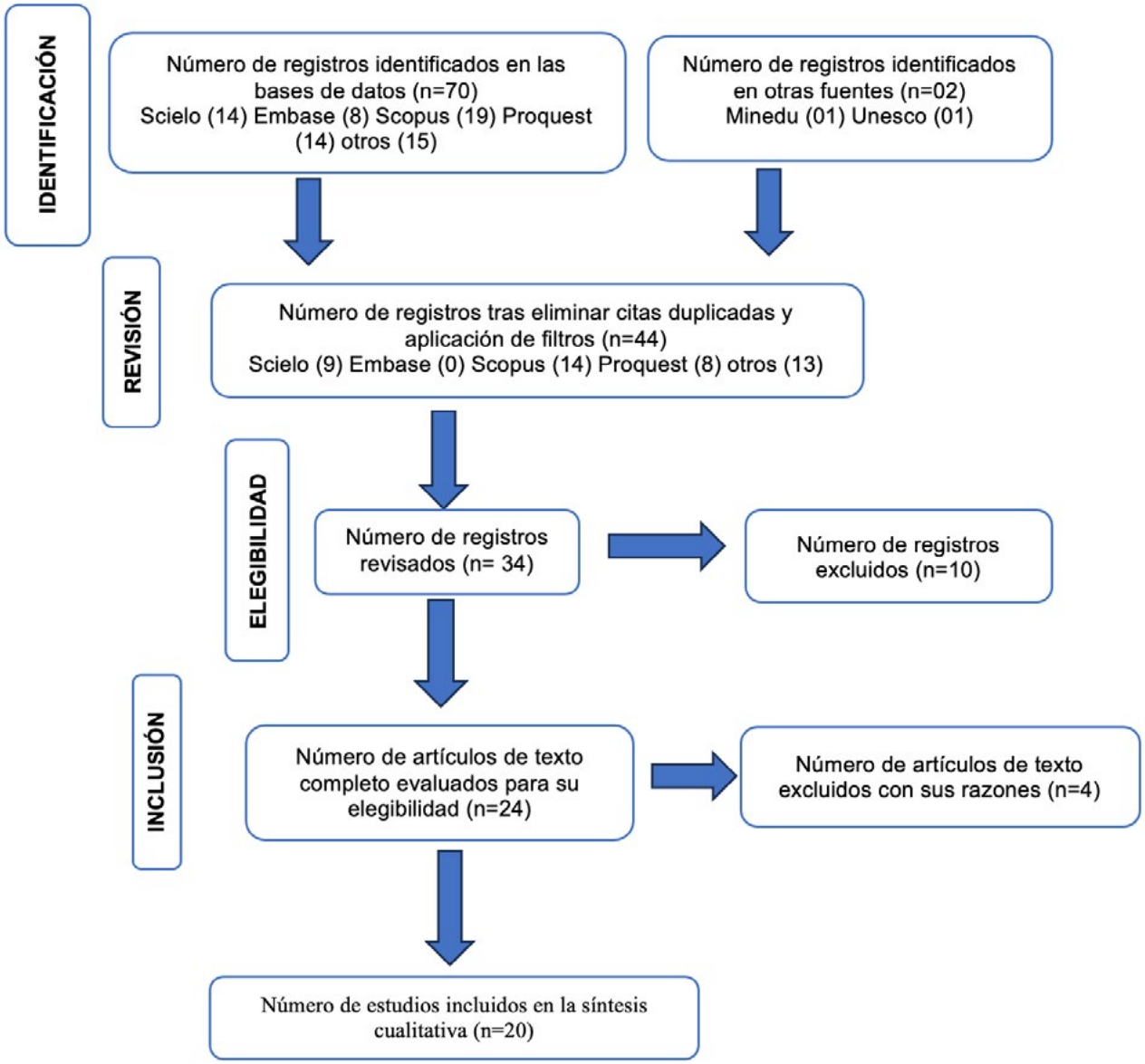
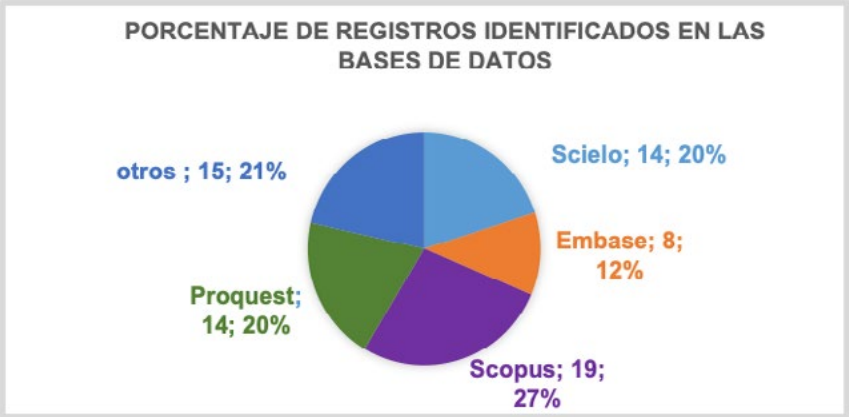


Figure 2:

Percentage of records identified in the databases.

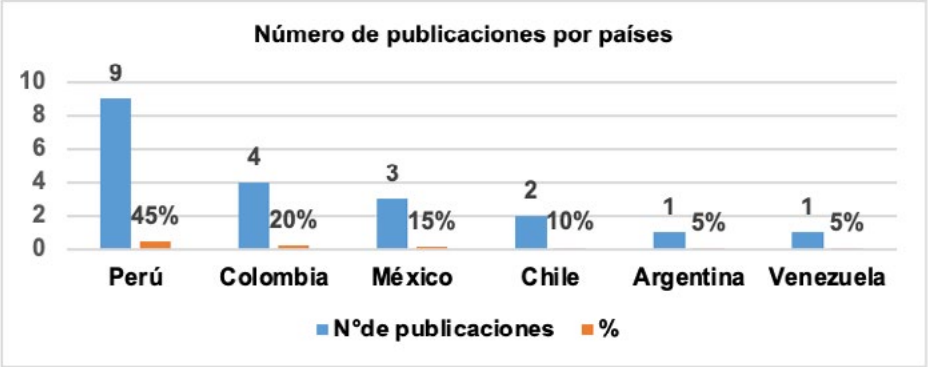


Results

Within the analysis carried out, it is possible to deepen the specific challenges faced by educators, students and educational systems in general regarding the successful implementation of feedback in formative assessment. In this line, the Ministry of Education develops rules, standards and institutional management procedures regarding the phases and processes of competency assessment, which contribute to the integral development of students and the continuous improvement of learning in public and private educational training centers and basic education. Strategies and best practices can also be explored to overcome these challenges and improve the quality of feedback in the educational process. Within the analysis explored in the systematic review we found (see Table 3).

Table 3:

Latin American countries where studies have been conducted on the categories of feedback and formative evaluation.



In Table 3: Peru presents more publications than the other countries with 45%, followed by Colombia 20%, Mexico 15%, Chile 10% and Argentina and Venezuela in 5%, this implies that, despite

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

the efforts to research on the study variables, we still have a long way to go to improve formative evaluations in our educational system.

Table 4:

Autores que identifican los desafíos y retos.

AUTOR	TITULO	DESAFÍO Y RETO
Díaz López Mónica María (2018)	Impacto de la retroalimentación y la evaluación formativa en la enseñanza-aprendizaje de Bio-ciencias	Alinear las evaluaciones con el pensamiento pedagógico contemporáneo, los objetivos de los cursos y los resultados esperados del aprendiza-je.
García y Lasagabaster (2019)	El efecto de la evaluación y la retroalimentación en la autonomía, la motivación y el aprendizaje del español como L3	Adaptar las estrategias de retroalimentación y evaluación para que sean efectivas en diversos contextos educativos.
Anijovich y Cappelletti (2020)	La retroalimentación formativa: Una oportunidad para mejorar los aprendizajes y la enseñanza	Proporcionar retroalimentación cualitativa enfo-cada en logros, desafíos y posibles mejoras en el trabajo del estudiantado.
Vertya y Rodrí-guez (2021)	La retroalimentación efectiva en estudiantes desde la perspectiva de los docentes.	Enriquecer el manejo instrumental de herramien-tas que les permita retroalimentar de manera permanente.
Sánchez y Car-rión (2021)	Modelo didáctico basado en la retroalimentación reflexiva para promover la evaluación formativa	Proponer un modelo didáctico que orientara a los docentes a desarrollar una retroalimentación de calidad.
Monje (2022)	Criterios de evaluación y retroalimentación for-mativa: perspectivas docentes	Desarrollar y aplicar criterios de evaluación claros, justos y alineados con los objetivos de aprendizaje del curso.
Abad et al. (2023)	Retroalimentación y trabajo en equipo en estudi-antes de una universidad de Lima Metropolitana	Desaprender para construir nuevos saberes, fomentando el trabajo en equipo bajo una visión sistémica.
Muñoz et al. (2023)	Retroalimentación como evaluación formativa desde la perspectiva docente en odontología: estudio de caso	Integración de retroalimentación en currículos existentes.
Valdez et al. (2023)	Evaluación formativa: retroalimentación, estrate-gias e instrumentos	Realizar programas de retroalimentación in-novadores adaptados a las necesidades de los estudiantes en diferentes niveles educativos.
Burga et al. (2023)	Retroalimentación formativa en el desempeño docente	Utilizar retroalimentación de calidad para proporcionar comentarios, contra preguntas y apreciaciones que guíen a los estudiantes en su proceso de aprendizaje.
Moreno (2023)	La Retroalimentación en la evaluación formativa en la educación superior	Transitar hacia una retroalimentación dialógica centrada en el estudiante.
Parra et al (2023)	Retroalimentación docente universitaria: una práctica de autorregulación del aprendizaje	Investigación de enfoques híbridos en el feed-back y la evaluación docente.
Muñoz (2023)	La evaluación formativa en el contexto educati-vo colombiano	Sistematización correspondida con la realidad.

In Table 4: Only 13 studies of the 70 scientific studies initially identified are shown, for which authors, title, challenges and challenges that have been identified were taken as detailed in the table.

According to (Hortigüela et al. 2018b), formative evaluation not only drives changes, but also promotes decision making, in this line, García & Lasagabaster (2019a) mention that feedback and evaluation strategies should be adapted to be effective in different educational contexts, as well as systematization (Muñoz et al. 2023a). In formative evaluation, contemporary pedagogical thinking should be taken into account (Díaz, 2018), in addition, Anijovich and Cappelletti (2020b) point out that qualitative feedback should be provided, because not everything should be measured statistically. Likewise, García and Lasagabaster, (2019b); Sánchez and Carrión (2021b); Veytia and Rodríguez (2021) propose a very didactic model for feedback in the classroom, as well as in existing curricula (Muñoz, 2023a).

Meanwhile, Chávez et al. (2021b) mention that evaluative training is a crucial instrument for the promotion of competencies and this is in line with the competency-based approach proposed by the Peruvian educational system. According to Rojas et al. (2021b), it must be understood that feedback as a formative aspect, tends to return information to the student, regarding their competence and learning objectives, being oriented to their improvement. On the other hand, innovation-oriented researchers seek more hybrid approaches as mentioned by (Parra et al. 2023). Similarly, Muñoz et al. (2023b) state that classroom interaction reflects the continuity of external evaluation criteria of pedagogical work. The main challenges according to Abad et al. (2023) is to unlearn in order to build new challenges. However, Tippe et al. (2024b) indicate that formative assessment is a key pedagogical element that drives changes in student performance and thinking.

Table 5:

Studies addressing the two categories together from the research

TITULO	AUTOR	AÑO DE PUBLICACION
Impacto de la retroalimentación y la evaluación formativa en la enseñanza-aprendizaje de Biociencias.	Díaz López M.	2018
El efecto de la evaluación y la retroalimentación en la autonomía, la motivación y el aprendizaje del español como L3.	García Pujals A. Lasagabaster David	2019
Modelo didáctico basado en la retroalimentación reflexiva para promover la evaluación formativa.	Sánchez Valdez, S. Carrión Barco, G.	2021
Criterios de evaluación y retroalimentación formativa: perspectivas docentes.	Monje Verónica Y.	2022
Retroalimentación como evaluación formativa desde la perspectiva docente en odontología: estudio de caso.	Muñoz et al.	2023
Evaluación formativa: retroalimentación, estrategias e instrumentos.	Valdez Valdez et al.	2023
La Retroalimentación en la evaluación formativa en la educación superior.	Moreno Olivos T.	2023

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Table 5: shows 07 studies that address feedback and formative evaluation, both categories of study, which present a coherent view on the validity of feedback within formative evaluation, although they highlight different aspects and challenges in their respective studies.

Muñoz (2023b); Valdez et al. (2023b) both authors agree on the relevance of feedback as a key tool in formative evaluation, highlighting its role in the continuous improvement of the teaching-learning process. Each study focuses on different educational contexts, from basic education to university teaching in various Spanish-speaking countries, who point out the challenge of effectively integrating feedback into existing educational processes, as well as the need to prepare and train teachers in order to provide effective feedback to students, a recurring theme being the importance of adapting feedback practices to emerging technologies and virtual learning environments.

They propose specific models or strategies to implement formative feedback more effectively, adapting to the needs and characteristics of different student groups. The effective implementation of formative feedback appears to be highly dependent on the specific educational context. This poses a challenge in terms of adaptability of feedback strategies in different settings and student needs. It is inferred that the studies emphasize that feedback in formative assessment has a positive impact on student learning, promoting self-regulation and autonomy.

Conclusions

The selected studies converge that feedback is essential in formative assessment, highlighting its positive impact on learning and teaching, emphasizing the need for effective integration and teacher training in feedback techniques. This emphasizes the importance of adapting feedback to emerging technologies and virtual learning environments through feedback that promotes their autonomy, as it would reduce academic underachievement, improving social and emotional aspects to achieve full coexistence (Yucra, 2023).

The authors highlight the capacity of feedback to foster autonomy and self-regulation in students, proposing specific strategies for its effective implementation in different educational contexts.

Feedback has been identified as a key element in formative assessment, since it not only allows the student to know his or her progress, but also helps to adjust the teaching process, which, when properly integrated, significantly improves learning as well as teaching. To maximize its effectiveness, it is necessary that teachers are trained in feedback techniques, ensuring its relevance.

Meanwhile, studies suggest that teachers need continuous training in the use of feedback strategies, both in the face-to-face and virtual contexts, as it includes developing competencies to handle feedback in real time and in asynchronous environments.

With the growing adoption of technologies and online learning, it is essential that feedback evolves to adapt to new educational contexts, allowing students to take greater control of their learning process and academic performance,

In this sense, studies recommend strategies such as formative and differentiated feedback, which allow students to reflect on their own progress and adjust their learning strategies autonomously, awakening self-regulation and autonomy.

Conflict of interest

The authors declare that there is no conflict of interest for the publication of this scientific article.

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

References

Abada, I., Pantigoso, N., Jara., G. & Colina, F. (2023). Retroalimentación y trabajo en equipo en estudiantes universitarios de una universidad nacional de Lima Metropolitana. Desde el Sur, 15(3), e0041. https://doi.org/10.21142/DES-1503-2023-0041

Alca, C. (2022) Estrategia de evaluación formativa para desarrollar el aprendizaje autónomo en los estudiantes del programa de sistemas de información de un instituto tecnológico de Lima. Lima - Perú. Disponible en: https://repositorio.usil.edu.pe/server/api/core/bitstreams/23f264bf-b10f-4ccc-9851-a29f31c59545/content

Anijovich, R. & Cappelletti, G. (2020). La retroalimentación formativa: Una oportunidad para mejorar los aprendizajes y la enseñanza. Buenos Aires: Paidós. https://www.researchgate.net/publication/354792393_La_retroalimentacion_formativa_Una_oportunidad_para_mejorar_los_aprendizajes_y_la_ensenanza

Barquero, W. (2022). Analisis de Prisma como Metodología para Revisión Sistemática: una Aproximación General. aúdemedes, *8*(sup1), 339–360. https://doi.org/10.18310/2446-4813.2022v8nsup1p339-360

Beriche, M. & Medina, P. (2021). La evaluación formativa: su implementación y principales desafíos en el contexto de la escuela y la educación superior. Educación, 27(2), 201-208. 10.33539/educación. 2021.v27n2.2433 https://revistas.unife.edu.pe/index.php/educacion/article/view/2433

Bizarro, W., Sucari, W., & Quispe, A. (2019). Evaluación formativa en el marco del enfoque por competencias. *Revista Innova Educación*, *1*(3), Article 3. https://revistainnovaeducacion.com/index.php/rie/article/view/45/88

Bizarro, W., Paucar, P., & Mescco, E. (2021). Evaluación formativa: Una revisión sistemática de estudios en aula. Horizontes. Revista de Investigación en Ciencias de la Educación, 5, 872-891. https://doi.org/10.33996/revistahorizontes.v5i19.244

Burga, V., Ortega, M. & Hernández, B. (2023). Retroalimentación formativa en el desempeño docente. *Horizontes*. Revista De Investigación En Ciencias De La Educación, 7(27), 99–112. https://doi.org/10.33996/revistahorizontes.v7i27.500

Chávez, L., Peña, C., Gomez, S., & Huayta, Y. (2021). Evaluación formativa: un reto en la educación actual. 38(3), 41 al 63. https://doi.org/10.17993/3ctic.2021.103.41-63

Cifuentes, J. (2021). Aprendizaje del protocolo de la valoración a través del marco de la enseñanza para la comprensión. Revista de Investigación, Desarrollo e Innovación, 11(2), 335–348. https://doi.org/10.19053/20278306.v11.n2.2021.12760

Cruzado, J. (2022). La evaluación formativa en la educación. Comuni@cción, 13(2), 149-160. https://doi.org/10.33595/2226-1478.13.2.672

Díaz, M. (2018). Impacto de la retroalimentación y la evaluación formativa en la enseñanza-aprendizaje de Biociencias. *Educación Médica Superior*, *32*(3), 147-156. http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S0864-21412018000300012

García, A. & Lasagabaster, D. (2019). El efecto de la evaluación y la retroalimentación en la autonomía, la motivación y el aprendizaje del español como L3. Revista Española de Lingüística Aplicada/Spanish Journal of Applied Linguistics [1] DOI: https://doi.org/10.1075/resla.17050.gar

García, J., Farfán, J., Fuertes, L. & Montellanos, A. (2021). Evaluación formativa: un reto para el docente en la educación a distancia. *Delectus*, *4*(2), 45-54. https://doi.org/10.36996/delectus.v4i2.130

Holz, M. & Poblete, M. (2018). Evaluación de estudiantes en tres países OCDE: Estonia, Finlandia y Dinamarca. In Biblioteca Del Congreso Nacional de Chile. https://www.bcn.cl/obtienearchivo?id=repositorio/10221/25543/2/BCN_Evaluacion_OCDE.pdf

Hortigüela, D., Pérez, Á. & Moreno, A. (2018). La evaluación formativa y compartida en la formación inicial del profesorado. Estudios pedagógicos (Valdivia), http://dx.doi.org/10.4067/S0718-07052018000200007

Mella, F. & Calatayud, S. (2023). Prácticas y creencias del profesorado de educación secundaria sobre la retroalimentación en los procesos de evaluación del alumnado. *Revista Electrónica Educare*, *27*(3), 156-171. https://www.scielo.sa.cr/scielo.php?script=sci_arttext&pid=S1409-42582023000300156&lang=es

Ministerio de Educación (2022) R.V.M. Nº123-2022-MINEDU. Disposiciones para la evaluación formativa de los aprendizajes de estudiantes de Formación Inicial Docente de las Escuelas de Educación Superior Pedagógica. Disponible en: https://www.minedu.gob.pe/superiorpedagogica/evaluacion-formativa/

Monje, Y. (2022). Criterios de evaluación y retroalimentación formativa: perspectivas docentes. Revisión humana. Revista Internacional de Humanidades / Revista Internacional de Humanidades 11 (5):1-16. DOI: https://doi.org/10.37467/revhuman.v11.3875

Moreno, M. (2019). Temas clave de la evaluación de la educación básica. Revista mexicana de investigación educativa, 24(81), 633-644. Recuperado en 04 de mayo de 2024, de http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S1405-66662019000200633&lng=es&tlng=es

Moreno, T. (2023). La retroalimentación de la evaluación formativa en educación superior. Universidad Y Sociedad, 15(2), 685–694. Recuperado a partir de https://rus.ucf.edu.cu/index.php/rus/article/view/3673

Muñoz, P., Henríquez, E. & Kunakov, N. (2023). Retroalimentación como evaluación formativa desde la perspectiva docente en odontología: Estudio de caso. *Educación médica*, *24*(2), 2. https://dialnet.unirioja.es/servlet/articulo?codigo=8757568

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Muñoz, L. (2023). La evaluación formativa en el contexto educativo colombiano. CIENCIAMATRIA, 9(17), 86-98. https://doi.org/10.35381/cm.v9i17.1126

Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura [UNESCO]. (2021). Evaluación formativa: Una oportunidad para transformar la educación en tiempos de pandemia. Santiago: UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000378045

Page, J., McKenzie, J., Bossuyt, P., Boutron, I., Hoffmann, C., Mulrow, D., & Alonso, S. (2021). Declaración PRISMA 2020: una guía actualizada para la publicación de revisiones sistemáticas. Revista Española de Cardiología, 74(9), 790-799. https://www.sciencedirect.com/science/article/pii/S0300893221002748

Parra, B., Orejarena, H. & Acosta, U. (2023). Retroalimentación docente universitaria: una práctica de autorregulación del aprendizaje. Inclusión Y Desarrollo, 9(1), 24–36. https://doi.org/10.26620/uniminuto.inclusion.9.1.2022.24-36

Rodes, J., Benavides, P. & Torrejón, J. (2020). La docencia en la Enseñanza Superior. Nuevas aportaciones desde la investigación e innovación educativas. https://www.researchgate.net/publication/350175244_La_docencia_en_la_Ensenanza_Superior_Nuevas_aportaciones_desde_la_investigacion_e_innovacion_educativas

Rodríguez, M., Moreno, E., Rueda, L., Torres, L. & Hurtado, A. (2022). Percepción de estrategias de evaluación formativa en la enseñanza de Biología en la Universidad Nacional de Educación Enrique Guzmán y Valle, 2020. Dilemas Contemporáneos: Educación, Política y Valores. https://doi.org/10.46377/dilemas.v9i2.3107

Rojas, L, Salgado, R., Salazar, M., & Méndez, J. (2021). La retroalimentación en el desarrollo de competencias matemáticas en la educación a distancia: Revisión sistemática. *CIEGCIEG, Revista Arbitrada del Centro de Investigación y Estudios Gerenciales, (50), 211. https://revista.grupocieg.org/wp-content/uploads/2021/06/Ed.50211-223-Rojas-Gomez-et-al.pdf

Sánchez, S. & Carrión, G. (2021). Modelo didáctico basado en la retroalimentación reflexiva para promover la evaluación formativa. tzhoecoen, 13(1), 88-100. https://doi.org/10.26495/tzh.v13i1.1875

Tippe, S., Ramos, M., Bardales, L., Munive, E. & Dionicio, G. (2024). Perspectivas Acerca de la Retroalimentación en Entornos Virtuales Universitarios: Una Revisión Sistemática de la Literatura en Hispanoamérica Durante el Periodo 2017 Al 2022. En N. Callaos, J. Horne, E. F. Ruiz-Ledesma, B. Sánchez, A. Tremante (Eds.), Memorias de la Décima Cuarta Conferencia Iberoamericana de Complejidad, Informática y Cibernética: CICIC 2024, pp. 36-42. International Institute of Informatics and Cybernetics. https://doi.org/10.54808/CICIC2024.01.36

Valdez, L., Sánchez, J. & Lescano, G., (2023). Evaluación formativa: retroalimentación, estrategias e instrumentos. Revista Educación, 47(2). https://doi.org/10.15517/revedu.v47i2.53987

Valdivia, S. & Fernández, M. (2020). La evaluación formativa en un contexto de renovación pedagógica: Prácticas al servicio del éxito. Revista Actualidades Investigativas en Educación, 20(1), 1-26. https://www.scielo.sa.cr/scielo.php?pid=S1409-47032020000100387&script=sci_abstract&tlng=es

Veytia, G. & Rodríguez, K. (2021). La retroalimentación efectiva en estudiantes desde la perspectiva de los docentes. Transdigital, 2(4). DOI: https://doi.org/10.56162/transdigital63

Vera, M. (2022). Retroalimentación como herramienta efectiva para el aprendizaje. *TZHOECOEN*, *14*(2), 21-33. https://doi.org/10.26495/tzh.v14i2.2281

Yucra, H., Núñez, A., & Villafuerte, C. (2023). La evaluación formativa a través de la revisión sistemática en la práctica docente en las aulas. https://rclimatol.eu/2023/09/25/la-evaluacion-formativa-a-traves-de-la-revision-sistematica-en-la-practica-docente-en-las-aulas/.

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Uisrael
REVISTA CIENTÍFICA

May – August 2025 period
Vol. 12, No. 2
rcientifica@uisrael.edu.ec
https://doi.org/10.35290/rcui.v12n2.2025.1297 • e-ISSN: 2631 - 2786

Learning of areas with double integrals using GeoGebra: A study of master's students in mathematics education

Aprendizaje de áreas con integrales dobles usando GeoGebra: Un estudio en alumnos de maestría en educación matemática.

Date of receipt: 2024-05-27 Date of acceptance: 2024-11-20 Date of publication: 2025-05-10

Marco Antonio Ayala Chauvin [1]
Universidad Técnica Particular de Loja, UTPL, Ecuador
maayala5@utpl.edu.ec
https://orcid.org/0000-0002-0084-6773

Richard Leonardo Luna Romero [2]
Ministerio de Educación del Ecuador, MINEDUC, Ecuador
richard.luna@educacion.gob.ec
https://orcid.org/0009-0008-8832-7898

Abstract

The main purpose of this research was to evaluate the impact of the teaching of area calculation using Double Integrals using GeoGebra in students enrolled during Geometric and Trigonometric Analysis within the master's degree in education, mention in Mathematics Teaching, at the Universidad Técnica Particular de Loja. From this perspective, the research approach was framed in the positivist paradigm and adopted a quantitative approach of descriptive correlational character. The sample was selected from a population of 70 students, who were distributed in two groups, 35 students for the experimental group and 35 for the control group. A study sequence was implemented with the purpose of applying a dynamic geometric representation of the concept of Double Integral through the parameterization of curves and surfaces in GeoGebra, which allowed geometric visualization and calculation of generated areas. As a result, a significant improvement was observed in the geometric understanding of the Double Integral by the students with respect to the calculation of areas in flat regions..

Keywords: areas, double integrals, GeoGebra, academic performance

Resumen

El propósito fundamental de esta investigación fue evaluar el impacto de la enseñanza del cálculo de áreas a través del uso de Integrales Dobles mediante GeoGebra en los estudiantes inscritos en el curso de Análisis Geométrico y Trigonométrico dentro de la Maestría en Educación mención Enseñanza de la Matemática de la Universidad Técnica Particular de Loja. Desde esta perspectiva, el enfoque de la investigación se enmarcó en el paradigma positivista y adoptó un enfoque cuantitativo de carácter descriptivo correlacional. La muestra se seleccionó de 70 estudiantes, distribuidos en dos grupos, 35 estudiantes para el grupo experimental y 35 para el de control. Se implementó una secuencia de estudio para aplicar una representación geométrica dinámica del concepto de Integral Doble mediante la parametrización de curvas y superficies en GeoGebra, lo que permitió visualizar geométrica y calcular áreas generadas. Como resultado, se observó una mejora significativa en la comprensión geométrica de la Integral Doble por parte de los estudiantes con respecto al cálculo de áreas en regiones planas.

Palabras clave: áreas, integrales dobles, GeoGebra, rendimiento académico

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Introduction

The integral calculus of functions of one or more variables is usually considered by students at both undergraduate and graduate level as one of the most complex topics within mathematics courses (Pino et al., 2018), due to the fact that it is not enough to follow algebraic procedures to correctly calculate the result of an integral, but it is essential to understand the geometric meaning of the mathematical object.

Frequently, university students in the first semesters taking subjects related to mathematics respond to abstract contents in a memoristic way by solving the exercises mechanically, forgetting how important it is to delve into the concepts that enclose the topics in question.

Given the abstract nature of calculus, the use of computational tools, such as GeoGebra, is essential in the teaching of double integrals. In traditional approaches, mathematical graphs are represented statically, usually plotted on the blackboard or on paper, which limits dynamic interaction with geometric representations of the regions of integration. This restriction prevents a more accurate and manipulable visualization of mathematical objects, negatively affecting the deep understanding of concepts such as calculating areas and volumes using multiple integrals (Dahl et al., 2019).

The disconnection between geometry and algebra in the study of mathematical objects generates that students with less ability in abstract thinking get lost in an environment dominated by formulas and equations, which are applied mechanically without considering their geometric interpretation (Baena, 2020). As a result, students tend to memorize common exercises, facing difficulties when presented with problems that require more logical and spatial understanding. This situation is due to the fact that they do not go deep enough into the geometric representation of the mathematical object, which limits their ability to continue with a rigorous and complete analysis (Quintilla and Fernández, 2021).

According to Duval (2006), it is always necessary to move from one semiotic register to another to the mathematical object studied, because if the student only remains in one register, for example, the algebraic one, he will not be able to interpret it geometrically. In the same way, Svensson and Campos (2022) state that it is essential for the student to be able to move from one register to another, which will allow him to recognize with greater agility each register that represents the mathematical object.

The use of technological tools, such as GeoGebra, is essential for the conversion between different registers of semiotic representation. This software allows the study of various mathematical objects and facilitates the user's transition between the algebraic and graphical registers, and vice versa. GeoGebra, developed in 2002 by Markus Hohenwarter as part of his master's thesis at the University of Salzburg, Austria (Arteaga et al., 2019), has been consolidated since its inception as an open source software, standing out for its accessibility and ease of use.

According to Ortiz (2019), the use of GeoGebra in university students has a significant impact on their ability to understand exercises related to the representation of regions and the calculation

of volumes. Similarly, León (2021) points out that the incorporation of augmented reality with GeoGebra in the learning process of spatial geometry generates a positive effect on elementary school students. Finally, Narh and Sabtiwu (2022) highlight that the use of GeoGebra in the teaching and learning of geometry produces a noticeable improvement in the grades and interest of both mathematics education students and teachers, based on an applied research approach.

Therefore, the use of technological tools requires teachers to ensure that their classes are participatory, dynamic and engaging. This is relevant when teaching a digital native generation, with a natural mastery of technology, having been born and raised on digital devices and technological resources. The effective integration of these tools in the classroom not only fosters active learning, but also responds to the expectations and needs of students accustomed to interacting with technology from an early age (Jiménez and Jiménez, 2017).

In the master's degree in Mathematics Education and in other careers at the Universidad Técnica Particular de Loja, new teaching and learning strategies are sought that are conducive to obtaining better results and allow increasing the critical thinking indispensable in learners, which is a permanent challenge for the teacher seeking methodologies that contemplate the use of ICT in their classes.

In the subject of Geometric and Trigonometric Analysis, the topics are very relevant and complex due to their extensive mathematical contents. This is evident in the double integral when it comes to represent algebraically and geometrically certain concepts, especially when the study of flat regions is approached. For this reason, this work proposes the use of GeoGebra software in the didactics and understanding of the double integral, in the geometric analysis of the calculation of areas of flat regions of Type I and Type II.

1.1. Fundamental Mathematical Concepts of Double Integrals

Antes de introducir la herramienta tecnológica de GeoGebra en la enseñanza de las integrales dobles, es esencial establecer una base sólida en los conceptos matemáticos fundamentales que subyacen a este tema. A continuación, se presentan los conceptos clave que los estudiantes deben comprender para abordar las integrales dobles de manera efectiva.

1.1.1. Definition of Double Integral

A double integral is used to calculate the volume under a surface in three-dimensional space. It is defined as the extension of the simple integral to functions of two variables. Mathematically, the double integral of a function $f(x,y)$ over a region R in the plane is expressed as:

$$\iint_R f(x,y)dA$$

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

where dA represents an area element in the region R. This integral can be interpreted as the sum of infinite contributions of $f(x,y)$ at each point in the region *R*.

However, this study will focus only on the calculation of areas of flat regions, i.e., double integrals without function $f(x,y)$, which are calculated as follows:

$$\iint_R dA$$

1.1.2. Integration Regions

Double integrals can be computed over different types of regions in the plane, which are generally classified into two types:

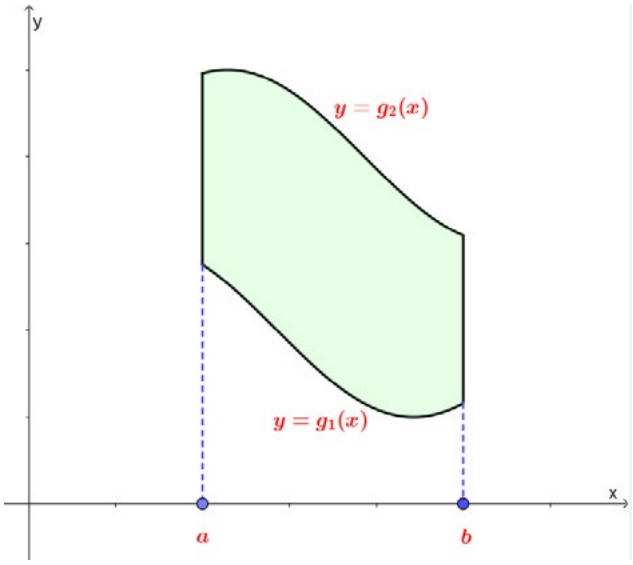
- **Type I regions:** these are regions that can be described as the area between two curves in the *xy*. plane. They are integrated first with respect to y and then with respect to *x*.

$$\int_a^b \int_{y=g_1(x)}^{y=g_2(x)} dydx$$

This type of region is illustrated in figure 1

Figure 1

Type I Region



Note: Own elaboration

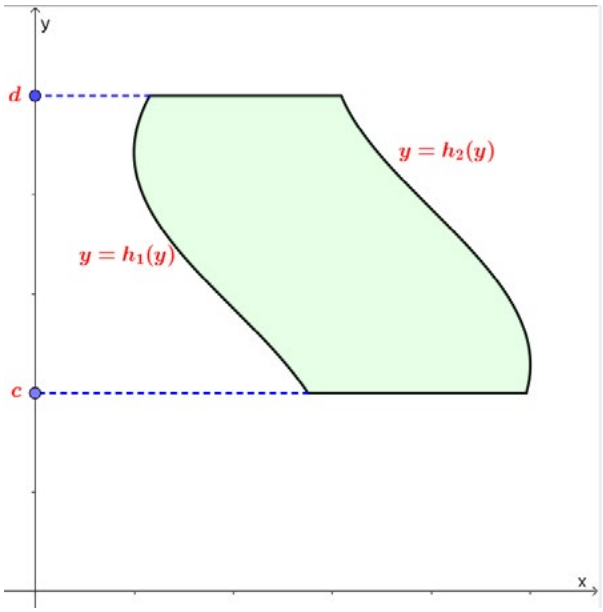
- **Type II Regions:** These are areas that can be described as the area between two horizontal lines. They are integrated first with respect to *x* and then with respect to *y*.

$$\int_c^d \int_{x=h_1(y)}^{y=h_2(y)} dxdy$$

These type II regions are illustrated in Figure 2.

Figure 2

Type II Region



Note: Own elaboration

The correct identification of the region of integration is crucial to establish the limits of integration in the calculation of areas through double integrals.

1.2.3. Geometric Interpretation

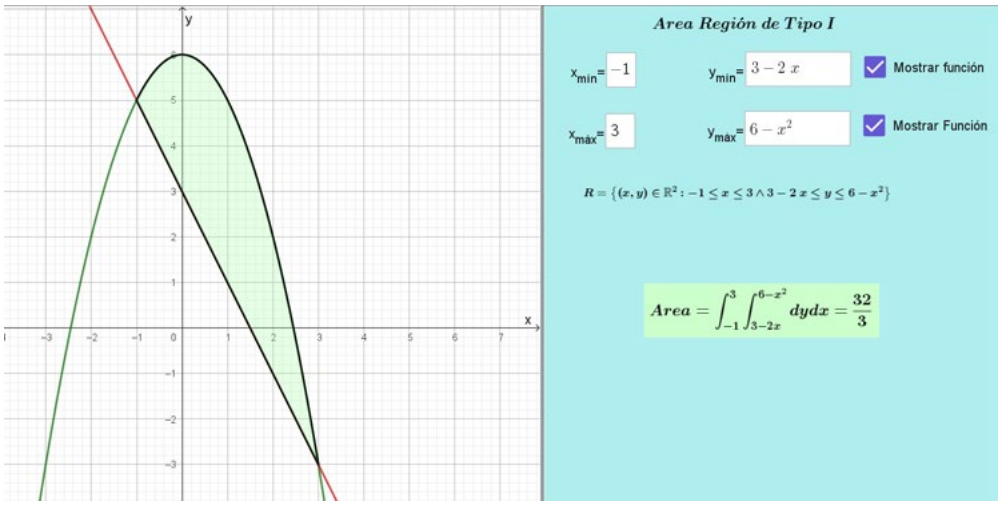
It is essential that students understand the geometric interpretation of double integrals. This includes visualizing how a no-argument integral f(x,y) represents the area of the region R. Understanding this relationship between algebra and geometry is key to effective learning of double integrals. Therefore, specific applets have been developed to calculate areas in type I and type II regions, so that students can dynamically visualize the regions and obtain the value of them. These applets are shown in Figures 3 and 4, and can be accessed through the following link:

https://utpl-my.sharepoint.com/:f:/g/personal/rlluna_utpl_edu_ec/Ej2jHFTanw5Aqi1J2Jz0LnoBd5rb1PZmjwDlmZukhp3-2Q?e=KS1iLL

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Figure 3

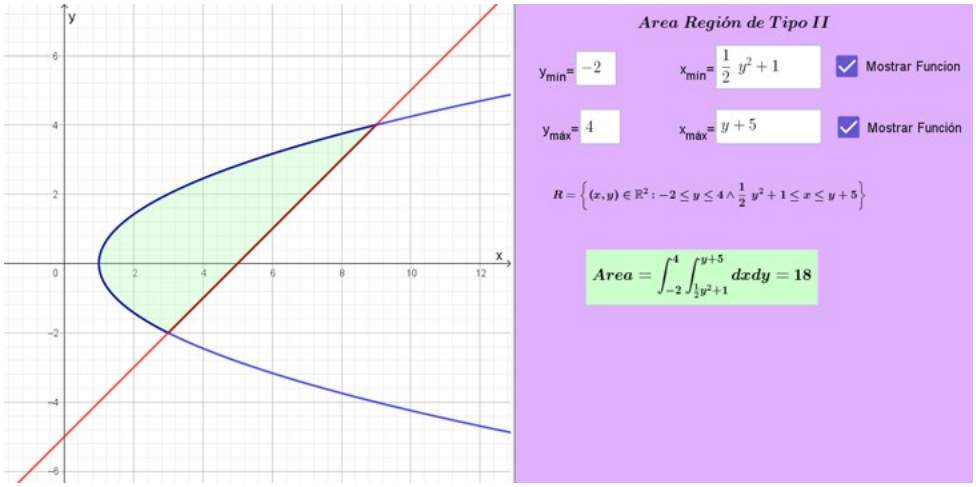
Area by double integral of a type I region



Note: Own elaboration

Figure 4

Area by double integral of a type II region



Note: Own elaboration

Methodology

In this research work, the positivist paradigm was chosen, since it provides a clear separation between the researcher, understood as a neutral subject, and the study work, independent of the researcher's subjectivity (Miranda and Ortiz, 2020).

The research was quantitative, since variables were used to measure the results numerically.

The scope of the research was descriptive-correlational. It was descriptive because it focused on specifying the characteristics of the population under study (Guevara et al., 2020), while it was correlational because it sought to measure or collect information regarding the study variables (GeoGebra and student learning) to then determine the incidence or relationship that exists of one variable with respect to the other within the sample (Hernández et al., 2014).

A quasi-experimental research design was chosen because of its focus on analyzing the causality between the independent variable (GeoGebra use) and the dependent variable (student learning) (Valmi et al., 2007).

Another reason for selecting a quasi-experimental design was that the assignment of students to the study groups was not randomized, since the two courses used as experimental and control group had been previously determined by the Universidad Técnica Particular de Loja (Zurita et al., 2018).

2.1. Objective

To determine the impact generated by the teaching of areas with Double Integrals using GeoGebra software in students taking the Geometric and Trigonometric Analysis course of the master's degree in education, mention in mathematics teaching, at the Universidad Técnica Particular de Loja (UTPL).

2.2. Population and Sample

In the Master's Degree in Education in Mathematics Teaching of the UTPL, the total population in Geometric and Trigonometric Analysis is 70 students distributed in two parallels of 35 students each. Thus, one parallel was chosen as the experimental group, to which the classes with GeoGebra were applied, and the other was considered the control group, which allowed comparing if there is an impact on the teaching of the mathematical object through the GeoGebra software.

2.3. Instrument

The technique and instrument used in this research, after having taught the mathematical object in several class sessions, consisted of the application of a survey by means of a questionnaire, addressed to both the experimental group and the control group. This made it possible to obtain the scores of each student for subsequent statistical analysis.

2.4. Procedure for data collection and analysis

Due to the nature of this research and its design, statistical tools had to be used to process and analyze the data and interpret the results in order to respond to the stated objective.

After data collection using the instrument of this research, the values were organized in Excel tables and then transferred to SPSS (Statistical Package for the Social Sciences) software.

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

According to Purwanto et al. (2021), SPSS is one of the most widely used programs in quantitative research, as it facilitates researchers to accurately organize and analyze large volumes of data.

Results

Several sessions of area classes with double integrals were implemented by means of a traditional class to the control group and by means of a dynamic geometric representation through applets, elaborated with GeoGebra, to the experimental group.

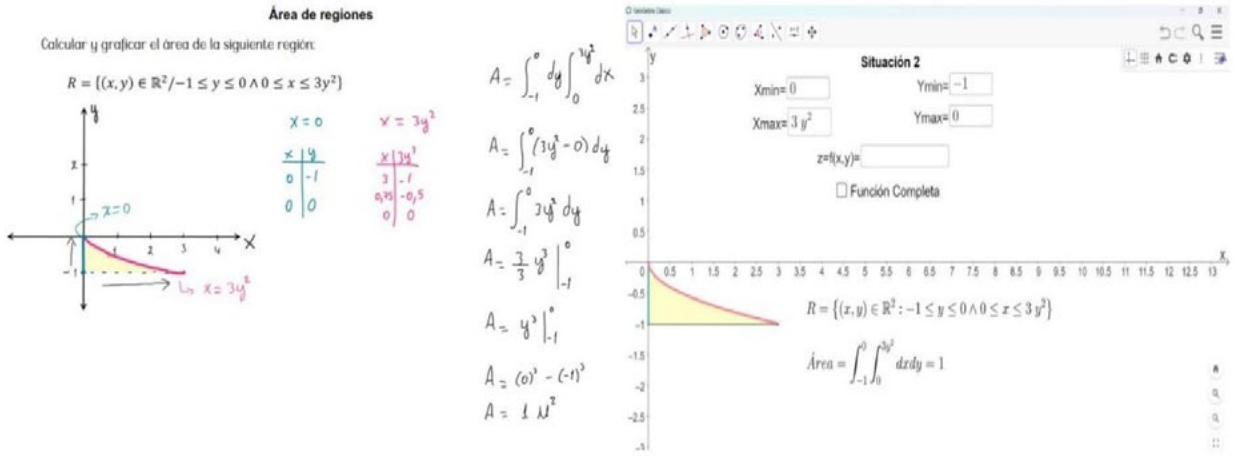
In the applets shown in Figures 3 and 4, students enter the values of the functions and the interval that make up the region, and as a response, the graph of the region and the value of its area are shown. These applets converted the algebraic register to the graph, thus putting Duval's theory of semiotic representations registers into practice.

This allowed the students in the experimental group to check whether their hand-drawn graphs were correct, as well as to verify the result of the double integral.

Figure 3 shows the workshop of a student in the last class where he performs the calculation of an area with a double integral by hand and its verification with GeoGebra.

Figure 5

Workshop elaborated by a student of the experimental group



Note: Own elaboration

The elaboration of the workshops of the last class by the students of the experimental group of the master's degree in mathematics education is shown in the following link:

https://utpl-my.sharepoint.com/:f:/r/personal/rlluna_utpl_edu_ec/Documents/Taller%20Area%20de%20Regiones?csf=1&web=1&e=jD0L0E

Once the classes were implemented, the students were evaluated with a 10-point questionnaire, according to the criteria in Table 1. These results are presented in Figure 6:

Table 1

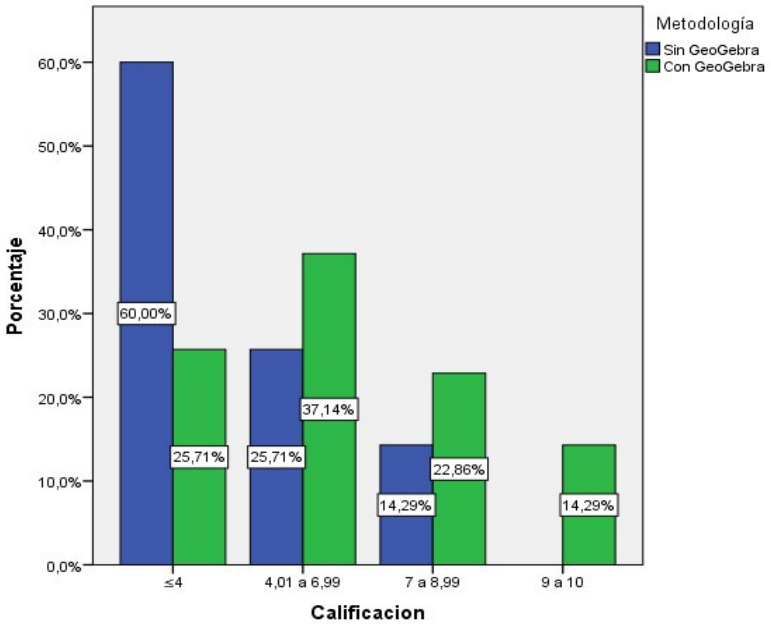
Student evaluation criteria

Llevaron a cabo de manera adecuada la coordinación de registros, prepararon correctamente los límites de integración de la región en el plano y resolvieron la integral.	Sin cometer errores en los cálculos algebraicos. Con imprecisiones en los cálculos algebraicos.
Coordinaron correctamente los registros, pero únicamente en los límites de integración de la región en el plano.	Sin cometer errores en los cálculos algebraicos Con imprecisiones en los cálculos algebraicos.

Note: Own elaboration

Figure 6

Results of the evaluation of the experimental-control group



Note: Own elaboration

This comparative graph shows that the results obtained in the evaluation in the experimental group are better than in the control group, since there is a lower percentage of students with grades lower than or equal to 4 in the experimental group than in the control group, and there is a higher percentage of grades higher than or equal to 7 in the experimental group with respect to the control group, that is, 22.86% in the experimental group compared to 14.29% of students in the control group who obtained grades between 7 and 8.99, and 14.29% of the experimental group compared

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

to 0% of the control group with grades between 9 and 10, giving a total difference of 22.86% of students with grades greater than or equal to 7 in the experimental group than in the control group.

Although the results of the experimental group are better than those of the control group, it is necessary to know if there is an incidence of the use of GeoGebra in the academic performance of the students of the Master's Degree in Education in Mathematics Teaching, so a statistical test was performed to determine if there is a significant difference between the means of the experimental group and the control group.

First, the normality test was applied to both the experimental group and the control group. These results are shown in the following table..

Table 2

Normality test in the results obtained from the sample

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Estadístico	gl	Sig.	Estadístico	gl	Sig.
Resultados Sin GeoGebra	,150	35	,044	,945	35	,081
Resultados con GeoGebra	,123	35	,199	,946	35	,084

Note: Own elaboration

The Shapiro-Wilk test was considered because the number of students in each group is less than 50 and a significance of 0.05, i.e., 95% confidence, was taken as a basis. The p-values shown in Table 1 corresponding to the results without GeoGebra (control group) and with GeoGebra (experimental group) are 0.081 and 0.084 respectively, which indicates that both exceed the 0.05 value of significance; that is, the grades of both groups possess a normal distribution (Hernández and Mendoza, 2018).

Once the grades passed the normality test we proceeded to perform the parametric statistical Student's t-test for independent samples, which is shown in the following table.

Table 3

T-test for the equality of means in the students' evaluation score

		Prueba de Levene para la igualdad de varianzas		Prueba T para la igualdad de medias		
		F	Sig.	t	gl	Sig. (bilateral)
Calificación	Se han asumido varianzas iguales	,285	,595	-3,814	68	,000
	No se han asumido varianzas iguales			-3,814	67,476	,000

Note: Own elaboration

Table 2 shows that Levene's test for equality of variances shows that p = 0.595 >= 0.05, which indicates that the variances of the groups are equal. Therefore, the control and experimental groups are homogeneous.

As in the normality test and Levene's test, a confidence interval of 95% was considered, which is equivalent to a significance of 0.05. Thus, the result of the Student's t-test between these two study groups yielded a bilateral significance of 0.000, being this a value lower than 0.05, which mathematically evidences that the use of GeoGebra for teaching the calculation of areas with double integrals significantly improves the academic performance of the students of the master's degree in education, mention in mathematics teaching.

Discussion and conclusions

The superior results of the experimental group compared to the control group, according to Arteaga et al. (2019), are due to the fact that GeoGebra is a valuable tool in the teaching-learning process of mathematics and related disciplines. GeoGebra facilitates rapid mathematical problem solving during learning, stimulates students' creativity, allowing them to explore and build the essential foundations for a deep understanding of any mathematical concept.

However, there is a low percentage of students who still do not master the mathematical object under study and its respective graphical representation, this according to Borja et al.(2021) is due to additional factors that affect the academic performance of students at university level, the main ones being: economic possibilities, problems with the use of new technologies, poor training at high school and undergraduate level and the number of hours devoted to their study.

In this research work it is shown that the application of GeoGebra to teach the calculation of areas with double integrals gave positive results at a general level; it is determined that the use of this program significantly influences the academic performance of the students participating in this study. This is evidenced, above all, by the fact that in the control group the students' grades were less than or equal to 4 in 60%, while in the experimental group only in 25.71%.

Although the application time of GeoGebra was limited due to the cross-sectional nature of the study, its usefulness was clearly demonstrated. This suggests that by increasing the time and frequency of use of the software, even more significant results are likely to be obtained.

Finally, after the analysis carried out, it is concluded that the teaching of the calculation of areas with Double Integrals using GeoGebra software improves the academic performance and therefore the comprehension of the students, so it is confirmed that this technological tool is a valid alternative to improve the academic performance of the university students of the master's degree in education mention in mathematics teaching.

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

References

Arteaga, E. y Felipe, M. y Mendieta, J. y Martínez, J. (2019). El GeoGebra: una herramienta tecnológica para aprender matemática en la Secundaria Básica haciendo matemática. *Revista Conrado*, *15*(70), 102–108. http://scielo.sld.cu/pdf/rc/v15n70/1990-8644-rc-15-70-102.pdf

Baena, D. (2020). *Recursos de GeoGebra para Geometría en el Espacio* [Universidad Politécnica de Madrid]. https://oa.upm.es/65698/1/TFM_DIEGO_BAENA_ALVAREZ.pdf

Borja, G. M. y Martínez, J. E. y Barreno, S. N. y Haro, O. F. (2021). Factores asociados al rendimiento académico: Un estudio de caso. *Revista EDUCARE-UPEL-IPB-Segunda Nueva Etapa 2.0*, *25*(3), 54–77. https://doi.org/10.46498/reduipb.v25i3.1509

Dahal, N. y Pant, B. P. y Shrestha, D. (2019). Integration of GeoGebra in Teaching and Learning Geometric Transformation. *Journal of Mathematics and Statistical Science*, *5*, 323–332. https://www.researchgate.net/publication/354776485

Duval, R. (2006). A Cognitive Analysis of Problems of Comprehension in a Learning of Mathematics. *Educational Studies in Mathematics*, *61*(1), 103–131. https://doi.org/10.1007/s10649-006-0400-z

Guevara, G. P. y Verdesoto, A. E. y Castro, N. E. (2020). Metodologías de investigación educativa (descriptivas, experimentales, participativas, y de investigación-acción). *Revista Científica Mundo de La Investigación y El Conocimiento*, *4*(3), 163–173.

Hernández, R. y Fernández, C. y Baptista, P. (2014). *Metodología de la Investigación* (6th ed.). MacGraw Hill.

Hernández, R. y Mendoza, C. P. (2018). *Metodología de la investigación: las rutas cuantitativa, cualitativa y mixta*. McGRAW-HILL INTERAMERICANA EDITORES, S.A. de C. V.

Jiménez, J. G. y Jiménez, S. (2017). GeoGebra, una propuesta para innovar el proceso enseñanza-aprendizaje en matemáticas. *Revista Electrónica Sobre Tecnología, Educación y Sociedad*, *4*(7). https://www.ctes.org.mx/index.php/ctes/article/view/654/736

León, N. (2021). *Realidad Aumentada como Recurso Didáctico para el Aprendizaje Significativo de la Geometría Espacial* [Universidad de Cartagena]. https://repositorio.unicartagena.edu.co/bitstream/handle/11227/14924/TGF_NIdia%20Leon.pdf?sequence=1&isAllowed=y

Miranda, S. y Ortiz, J. A. (2020). Los paradigmas de la investigación: un acercamiento teórico para reflexionar desde el campo de la investigación educativa. *Revista Iberoamericana Para La Investigación y El Desarrollo Educativo*, *11*(21). https://doi.org/10.23913/ride.v11i21.717

Narh, M. y Sabtiwu, R. (2022). Use of GeoGebra to improve Performance in Geometry. *African Journal of Educational Studies in Mathematics and Sciences*, *18*(1). https://doi.org/10.4314/ajesms.v18i1.3

Ortiz, A. (2019). *Software GeoGebra 3D en el aprendizaje de la descripción de superficies en el curso de Matemática Analítica 3 en estudiantes del tercer ciclo de la carrera de Ingeniería Electrónica en la Universidad Peruana de Ciencias Aplicadas* [Universidad Nacional de Educación Enrique Guzmán y Valle]. https://repositorio.une.edu.pe/handle/20.500.14039/3830

Pino, L. R. y Font, V. y Larios, V. y Gordillo, W. y Breda, A. (2018). Analysis of the meanings of the antiderivative used by students of the first engineering courses. *International Journal of Science and Mathematics Education*, *16*(6), 1091–1113. https://doi.org/10.1007/s10763-017

Purwanto, A. y Asbari, M. e Iman Santoso, T. y Sunarsi, D. y Ilham, D. (2021). Education Research Quantitative Analysis for Little Respondents: Comparing of Lisrel, Tetrad, GSCA, Amos, SmartPLS, WarpPLS, and SPSS. *Jurnal Studi Guru Dan Pembelajaran*, *4*, 335–351. https://doi.org/10.30605/jsgp.4.2.2021.1326

Quintilla, M. y Fernández, A. (2021). *GeoGebra para la enseñanza de la geometría descriptiva: aplicación para la docencia online*. 285–295. https://doi.org/10.5821/jida.2021.10545

Svensson, K. y Campos, E. (2022). Comparison of two semiotic perspectives: How do students use representations in physics? *Physical Review Physics Education Research*, *18*(2), 20120. https://doi.org/10.1103/PhysRevPhysEducRes.18.020120

Valmi, S. y Driessnack, M. y Costa, I. A. (2007). Revisión de diseños de investigación resaltantes para enfermería. Parte 1: diseños de investigación cuantitativa. *Rev. Latino*, *15*(3). www.eerp.usp.br/rlae

Zurita, J. N. y Márquez, H. y Miranda, G. y Villasís, M. Á. (2018). Experimental studies: Research designs for the evaluation of interventions in clinical settings. *Revista Alergia México*, *65*(2), 178–186. https://doi.org/10.29262/ram.v65i2.376

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Uisrael
REVISTA CIENTÍFICA

May – August 2025 period
Vol. 12, No. 2
rcientifica@uisrael.edu.ec
https://doi.org/10.35290/rcui.v12n2.2025.1304 • e-ISSN: 2631 - 2786

Guided reading for the development of reading comprehension in elementary school students

Date of receipt: 2024-05-19 Date of acceptance: 2024-11-20 Date of publication: 2025-05-10

Date of receipt: 2024-05-19 Date of acceptance: 2024-11-20 Date of publication: 2025-05-10

Diana Pilar Sibri Salto [1]
Universidad Central del Ecuador, Ecuador
dpsibri@uce.edu.ec
https://orcid.org/0000-0003-0136-1783

Ruth Emilia Pinduisaca Torres [2]
Universidad Central del Ecuador, Ecuador
repinduisaca@uce.edu.ec
https://orcid.org/0000-0002-4655-5066

Abstract

Developing reading comprehension in students has become an odyssey for teachers because even though reading comprehension is one of the most essential pillars to develop during the educational process, students have difficulties in understanding what they read, with little vocabulary, little interest in reading, and with difficulty in applying the levels of reading comprehension. Taking into account the demands of today's society, it was necessary to establish improvements for reading comprehension and to innovate the teaching methodology, thus pointing out guided reading. The objective of this work was to determine how guided reading improves reading comprehension in elementary school students. The research is correlational type with the use of the hypothetical deductive method

starting from general premises to reach a particular conclusion, for the analysis of the data the statistical software SPSS was used, with the application of the chi-square statistical model to test hypotheses according to the relationship between variables, resulting in a value of 0.007 approving the alternative hypotheses. As a last point, it was determined that guided reading allows improving reading comprehension in students.

Keywords: reading, reading comprehension, guided reading, reading interest, reading levels

Resumen

Desarrollar la comprensión lectora en los estudiantes se ha convertido en una odisea para los docentes porque a pesar que la compresión lectora es uno de los pilares más esenciales a desarrollar durante el proceso educativo, los estudiantes presentan dificultades en comprender lo que leen, escaso vocabulario, poco interés lector, y con dificultad pueden aplicar los niveles de comprensión lectora. Teniendo en cuenta las demandas de la sociedad actual, fue necesario establecer mejoras para la compresión lectora e innovar la metodología docente señalando así la lectura guiada.
El objetivo de este trabajo fue, determinar de qué manera la lectura guiada permite mejorar la comprensión lectora en los estudiantes de primaria. La investigación es tipo correlacional con el uso del método hipotético deductivo partiendo de premisas generales para llegar a una conclusión particular, para el análisis de los datos se usó el software estadístico SPSS, con la aplicación del modelo estadístico chi cuadrado para probar hipótesis de acuerdo a la relación entre variables, dando como resultado un valor de 0,007 aprobando las hipótesis alternativas. Como último punto se determinó que la lectura guiada permite mejorar la comprensión lectora en estudiantes.

Palabras clave: lectura, comprensión lectora, lectura guiada, interés lector, niveles de lectura

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Introduction

"Reading comprehension involves the interaction between the reader and the text to be read" (Murillo & Naranjo, 2021, p.14). That is, it is one of the most essential skills to develop during the teaching-learning process. However, difficulties and low levels of reading comprehension among students are a concern for educational institutions. A large number of students do not understand what they read—not because reading is not encouraged in the classroom, but rather because they do not comprehend, often due to the fact that the strategies applied by teachers are not always effective for reading comprehension. At the international level, as indicated by Duvillier and McCaffrey (2022), following the COVID-19 pandemic, "four out of five children in Latin America and the Caribbean will not be able to understand a simple text." In this sense, reading comprehension has been significantly affected. In our country, this issue represents a great challenge. As UNESCO (2021) states: "In Reading for 7th grade EGB, 26.1% of students in Ecuador reached at least Level III performance in ERCE 2019" (p.18). This means that they achieved a minimum level of competence, but still, 73.9% of students remain below the minimum level of competence.

Given this problem, it is necessary to implement improvements in reading comprehension, which is why this research topic was undertaken. Strengthening this skill is essential, and it can be achieved through the application of innovative teaching methods such as guided reading.

1.1. Reading Comprehension

According to Roldán (2019, p.3), reading comprehension "is the interaction between the reader's knowledge of the world and the explicit ideas in a text. In summary, the text becomes a set of linguistic elements that must be understood, represented, interpreted, or applied." Based on this, the reader acquires the ability to relate the information they read to their own reality, leading to a deeper understanding and enabling them to express their own opinions. In the academic field, developing this skill is crucial, as it is essential for learning in all areas of knowledge, from reading children's stories to comprehending complex academic texts.

1.2. Levels of Reading Comprehension

The literal level refers to a student's ability to recognize key ideas and important words within a text. In this regard, Cervantes et al. (2017) state that at this level, students "capture what the text says without any intervention in the intellectual structure of the reader." Therefore, the reader focuses on extracting explicit ideas and information. Key skills at this level include identifying the main idea of a paragraph or text and recognizing the chronological order of actions presented in a passage.

At the inferential level, students must develop the ability to establish connections between ideas and infer content that is not explicitly stated in the text. As Cieza (2023, p.5) explains, "At this level, the reader does not merely absorb textual information but also actively interacts with it, employing reasoning and prior knowledge to infer details, themes, and underlying meanings."

Critical reading has an evaluative nature, involving the reader's formation, value judgment, and knowledge of the text. This level is essential, as it allows students to formulate their own opinions about the content, compare it with other sources, and assess the accuracy and acceptability of the information.

1.3. Reading Skills

Reading skills enable individuals to understand and process written information. They can be divided into two categories: decoding and vocabulary. According to Zamudio and Rendón (2023, p.23), decoding "is the skill a reader acquires to interpret a written code in order to understand the message embedded in a text. In other words, it is the ability to decipher meaning through codes." Thus, this skill is fundamental for reading comprehension, as it allows the reader to grasp the meaning of a text.

Conversely, Figueroa and Gallego (2021) describe vocabulary as the ability to understand the meaning of words and connect them with ideas within a text. This skill is essential for proper reading comprehension. If a student has a limited vocabulary, they will struggle to understand what they read. Therefore, it is crucial for teachers to implement different methods—such as guided reading—to strengthen reading skills. This method exposes students to new words and allows them to read aloud with the teacher, who provides support and correction when necessary, thus enhancing comprehension.

1.4. Reading Strategies

The guided reading model relies on and can be developed through various reading strategies. As Lucas and Chancay (2022, p.10) indicate, strategies before reading may include "introducing the text, motivating students, activating prior knowledge, and stating reading objectives." These processes help the reader recognize and evaluate what they already know or do not know about the text.

During reading, Lucas and Chancay (2022) suggest strategies such as "summarizing the reading content, making hypotheses and predictions about the story's ending, looking up word definitions in a dictionary, and formulating questions to ensure comprehension" (p.10). These strategies are designed to enhance reading comprehension. Additional techniques include underlining key information, pausing to reflect, taking notes, paraphrasing, and identifying the text structure.

Finally, after reading, strategies such as summarization, synthesis, mind maps, reflections, and discussions can be applied. These approaches help deepen text comprehension, enabling students to analyze, verify information, and express opinions. Additional strategies include sampling, prediction, inference, and cause-effect analysis.

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

1.5. Guided Reading

Guided reading is a method in which, as Verano and Espinoza (2019) state, “a small group gathers, where each student reads a text aloud while the teacher assumes the role of mediator, provides instructions, suggests activities, and intervenes to improve reading” (p.23). In guided reading, the teacher supports, monitors, and guides students as they engage in reading activities, using strategies such as prediction, anticipation, confirmation, and self-correction to develop reading skills.

1.5.1. Stages of Guided Reading

Verano and Espinoza (2019) describe guided reading as taking place in several stages:

Before the guided reading, the teacher forms groups and selects books according to the students’ reading ability. The teacher introduces the book, provides instructions, asks questions, and familiarizes students with the text. During the guided reading, the teacher first reads aloud while students follow along. Then, students read aloud independently, and the teacher observes, providing support as needed to help with unknown words. After the guided reading, the teacher facilitates a discussion, reviews whether initial hypotheses were correct, assigns activities such as summaries, and helps students draw conclusions (pp.23-24).

1.6. Selection of Texts

According to Romero (2019), in guided reading, “the teacher selects books based on the level that students are capable of reading and understanding, providing more tailored texts rather than simply using the standard textbooks for the course, as not all students in a class read at the same level” (p.99). If the text is appropriate, engaging, and suited to the student’s reading level, reading becomes more dynamic and enjoyable.

1.7. Importance of Guided Reading in Reading Comprehension

As Verano and Espinoza (2019) state, “its importance lies in the development of students’ reading skills, as it enhances their ability to predict texts, decode, read fluently, comprehend, expand vocabulary, and analyze text content” (p.23). In other words, implementing guided reading in the classroom fosters various skills, including critical thinking, fluency, comprehension strategies, and a love for reading.

1.8. Guided Reading and Reading Comprehension Levels

Guided reading helps students identify main ideas, answer comprehension questions, think inferentially, and critically analyze texts. This enables them to assess information, detect biases, and form their own opinions.

1.9. Guided Reading and Reading Skills

Teachers must implement methods to strengthen students' reading skills, particularly decoding and vocabulary (Ovalle, 2006). As Verano and Espinoza (2019) emphasize, guided reading improves decoding, fluency, comprehension, and vocabulary (p.23), exposing students to new words and enriching their understanding.

Methodology

2.1. Research Approach

This study adopts a mixed-method approach. According to Bagur et al. (2021), "The mixed approach allows for merging perspectives and collecting both qualitative and quantitative data throughout the research process" (p.2). Therefore, the research follows a quantitative approach, as data was collected through surveys as a primary source, and a qualitative approach, as documentary research was conducted to develop the theoretical framework.

2.2. Correlational Research Type

This study is correlational, as it seeks to determine whether there is a relationship between the guided reading method and reading comprehension in elementary school students. As stated by Vizcaíno et al. (2023), "Correlational research aims to determine whether a statistical relationship exists between two or more variables" (p.9740). To achieve this, the data obtained from the survey was analyzed using the SPSS software.

Additionally, the hypothetico-deductive method was applied. As Sánchez (2019) explains, this method "starts from general premises to arrive at a specific conclusion, which forms the hypothesis to be tested for validity" (p.108). Through this method, the study demonstrated how guided reading contributes to improving reading comprehension.

2.3. Research Technique

The study employed surveys as a research technique, targeting 40 teachers. The questionnaire served as the instrument, which, according to Ávila et al. (2020), is an "empirical method for data collection that uses a form designed to obtain responses" (p.72). The survey gathered information on the relationship and influence between the variables.

To analyze the data, Chi-square testing and factor analysis were applied, as these methods assess the relationship between the two variables: guided reading and reading comprehension, and verify the hypotheses.

As indicated by Lastre et al. (2019), "The Chi-square test is used to analyze the dependency relationship between two qualitative variables." Through this test, hypotheses are verified by analyzing the relationship between variables: If the significance level is less than 0.05, there is a

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

correlation between the variables, and the alternative hypothesis is accepted. If the significance level is greater than 0.05, no relationship exists, and the null hypothesis is accepted. On the other hand, factor analysis is a descriptive data reduction technique. Its purpose is to eliminate redundant or excessive data, which may arise when collecting information from multiple variables. This technique operates by reducing data complexity to identify underlying, unobservable factors (López & Gutiérrez, 2019). In essence, it simplifies large datasets to enhance data interpretation. If the significance level is greater than 0.7, there is a correlation between the variables. If the significance level is less than 0.7, no correlation exists.

Resultados

This section presents the Chi-square test results for the following related variables:

3.1. Reading Skills and the Literal Level of Reading Comprehension

This study aimed to establish the relationship between decoding and vocabulary skills, which are developed through guided reading, and the literal level of reading comprehension. Therefore, the following hypotheses were formulated.

- **Ha (Alternative Hypothesis):** Guided reading, by developing decoding and vocabulary skills, enhances students' ability to comprehend texts at the literal level.
- **Ho (Null Hypothesis):** Guided reading, despite developing decoding and vocabulary skills, does not enhance students' ability to comprehend texts at the literal level.

Table 1

Chi-square test between reading skills promoted by guided reading and the Literal Level of reading comprehension

	Value	df	Asymptotic Significance (bilateral)
Pearson Chi-square	9,930[a]	2	0,007

Source: Own elaboration (2024)

In Table 1, the Chi-square result is 0.007. Since this value is less than 0.05, the alternative hypothesis is validated. This confirms that guided reading, by developing decoding and vocabulary skills, improves students' ability to comprehend texts at the literal level, enabling them to identify main ideas and understand the content more effectively.

3.2. Reading Strategies and the Inferential Level of Reading Comprehension

At the inferential level of reading comprehension, students infer implicit information from the text. The relationship between Question 1, which examines whether guided reading employs various comprehension strategies, and Question 5, which focuses on whether guided reading helps

students better understand texts at an inferential level, led to the formulation of the following hypotheses:

- **Ha (Alternative Hypothesis):** Guided reading, by employing comprehension strategies, allows students to better understand texts and develop inferential reading comprehension.
- **Ho (Null Hypothesis):** Guided reading, despite employing comprehension strategies, does not help students better understand texts or develop inferential reading comprehension.

Table 2

Chi cuadrado de Estrategias y nivel Inferencial de comprensión lectora.

	Value	df	Asymptotic Significance (bilateral)
Pearson Chi-square	8, 711 [a]	1	0,003

Source: Own elaboration (2024).

In Table 2, the Chi-square result is 0.003, which indicates a statistically significant relationship between the variables. This validates the alternative hypothesis, confirming that guided reading, by incorporating comprehension strategies such as summarization, paraphrasing, and discussions, helps students develop inferential reading comprehension.

Students who develop critical reading comprehension can formulate reasoned judgments about what they read. Based on the responses to Question 6, which examines whether guided reading fosters critical reading comprehension, and Question 3, which focuses on the development of meaningful learning, the following hypotheses were formulated:

- **Ha (Alternative Hypothesis):** Guided reading, by fostering critical reading comprehension, promotes meaningful learning.
- **Ho (Null Hypothesis):** Guided reading, despite fostering critical reading comprehension, does not promote meaningful learning.

Table 3

Chi cuadrado de entre el nivel crítico y aprendizajes significativos

	Value	df	Asymptotic Significance (bilateral)
Pearson Chi-square	14,422 [a]	1	0,000

Source: Own elaboration (2024).

In Table 3, the Chi-square result is 0.000, validating the alternative hypothesis. This indicates a strong correlation between critical reading comprehension and meaningful learning, as students develop the ability to verify information and express well-founded opinions.

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Additionally, factor analysis was conducted, yielding the following results:

3.4. Time and Interest in Reading and the Inferential Level

Question 3 examines whether guided reading encourages students to dedicate more time to reading and develop greater interest.

Question 5 focuses on whether guided reading helps students develop inferential reading comprehension, enabling them to understand the meaning of a text beyond what is explicitly written.

Table 4

Correlation matrix between Time and Interest in Reading and the Inferential Level

Correlation Matrix		
Correlation	Value	Question 5: Do you believe that Guided Reading, as a method where the teacher directs the reading process through reading strategies, helps students better understand the meaning of the text beyond what is explicitly written?
	Question 3: Do you believe that the Guided Reading method, as a cooperative reading method, allows students to dedicate more time to reading and develop a greater interest in it?	,733

Source: Own elaboration (2024).

Based on the correlation matrix, it was observed that the value is 0.733 between questions 3 and 5. Therefore, there is a relationship between the time dedicated to reading and interest in it, and the development of the inferential level of comprehension in students.

3.5. Literal Level and Inferential Level

Question 4 focuses on the fact that the guided reading method, where the teacher guides and provides instructions, allows the student to better understand the reading, identify the main ideas, and understand the subject of the reading, thereby developing the literal level of comprehension. Question 5, on the other hand, focuses on the fact that guided reading allows the development of the inferential level, as the student understands the meaning of the text beyond what is written.

Table 5

Correlation Matrix between Literal Level and Inferential Level

Correlation Matrix		
Correlation	Value	Question 5: Do you consider that Guided Reading, being a method in which the teacher guides the reading process through reading strategies, would allow the student to better understand the meaning of the text beyond what is written?
	Question 4: Do you consider that through Guided Reading, where the teacher guides and provides direct instructions about the reading, students can better understand the reading, identify the main ideas, and understand what the story is about?	,787

Source: Own creation. (2024)

Based on the correlation matrix, a value of 0.787 was obtained, which indicates a correlation between the literal level of comprehension and the inferential level. This suggests that students must first have the ability to identify the main ideas and make predictions about what a text is about just by reading the title or observing the cover, before analyzing the information that is implicitly included..

3.6. Inferential Level and Critical Level

Question 5 focuses on the fact that guided reading allows the development of the inferential level, as it enables the student to understand the meaning of the text beyond what is written. Meanwhile, question 6 indicates that guided reading allows students to identify and evaluate the ideas in the text and express opinions about what they have read.

Table 6

Correlation Matrix between Inferential Level and Critical Level

Correlation Matrix		
Correlation	Value	Question 6: Do you consider that Guided Reading, being a method focused on reflection and understanding of the text, would allow students to identify, evaluate the ideas in the text, and express opinions about what they have read?
	Question 5: Do you consider that Guided Reading, being a method where the teacher guides the reading process through reading strategies, would allow the student to better understand the meaning of the text beyond what is written?	,808

Source: Own creation. (2024)

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Based on the correlation matrix, the value obtained between questions 5 and 6 was 0.808, indicating that there is a relationship between the inferential level of comprehension and the critical level. This suggests that, with the help of the teacher, students must develop the ability to understand the information that is implicitly present in the text, and then critically express an opinion about the content of the text they have read.

Conclusions

It was demonstrated with a chi-square value of 0.007 that guided reading, by developing decoding and vocabulary skills, improves literal comprehension of texts. With a chi-square value of 0.003, it was determined that guided reading, by employing various comprehension strategies such as summaries, paraphrasing, and discussions, allows students to understand texts on an inferential level. And with a chi-square value of 0.000, it was proven that guided reading, by fostering critical reading skills, promotes meaningful learning. Thus, guided reading, through the use of strategies and the development of reading skills, enhances the levels of literal, inferential, and critical reading comprehension.

Based on the results obtained, it was determined that guided reading improves reading comprehension, as the results from the factor analysis (Tables 7, 8, 9) show a correlation between questions 3 and 5 with a value of 0.733. This method utilizes certain aspects of reading comprehension, such as the time dedicated to reading and interest in it (Table 7), in order to better develop literal comprehension. Guided reading helps students identify the main ideas of a text and understand its content.

Regarding the students' comprehension levels, the factor analysis results (Tables 8 and 9) indicate a relationship between guided reading and both inferential and critical reading comprehension levels. This helps students develop the ability to identify ideas in the text and use them to deduce information that is not explicitly stated, which in turn fosters critical thinking about the content of the text.

In conclusion, it was determined that guided reading promotes reading interest and comprehension. Through the reading strategies it employs, guided reading encourages the development of reading skills such as decoding and vocabulary, while also strengthening reading comprehension levels.

References

Ávila, H. Gonzales, M y Licea, S. (2020). La entrevista y la encuesta ¿Métodos o técnicas de investigación empírica? *Revista Didasc@lia: Didáctica y Educación. 11*(3). https://revistas.ult.edu.cu/index.php/didascalia/article/view/992/997

Bagur Pons, S., Rosselló Ramon, M., Paz Lourido, B., y Verger, S. (2021). El Enfoque integrador de la metodología mixta en la investigación educativa. RELIEVE - Revista Electrónica De Investigación Y Evaluación Educativa, 27(1). doi:https://doi.org/10.30827/relieve.v27i1.21053

Cervantes, R., Pérez, A., y Alanís, M. (2017). Niveles de comprensión lectora. sistema CONALEP: caso específico del plantel n° 172, de ciudad Victoria, Tamaulipas. *Revista Internacional de Ciencias Sociales Y Humanidades, SOCIOTAM*, *XXVII (*2), 73–114. https://www.redalyc.org/journal/654/65456039005/html/

Cieza Altamirano, W. P. (2023). Análisis de la comprensión lectora en la educación. Horizontes. Revista de Investigación en Ciencias de la Educación, 7(31), 5. doi:https://doi.org/10.33996/revistahorizontes.v7i31.695

Duvillier, L y McCaffrey. C. (2022). Cuatro de cada cinco niños y niñas en América Latina y el Caribe no podrán comprender un texto simple. *Unicef*. *https://www.unicef.org/lac/comunicados-prensa/cuatro-de-cada-cinco-ninos-y-ninas-en-america-latina-y-el-caribe-no-podran-comprender-un-texto-simple*

Figueroa Sepúlveda, S., y Gallego Ortega, J. (2021). Relación entre vocabulario y comprensión lectora: Un estudio transversal en educación básica. REVISTA SIGNOS. ESTUDIOS DE LINGÜÍSTICA Revista Signos. Estudios de Lingüística, 54(106). doi:http://dx.doi.org/10.4067/S0718-09342021000200354

Lastre, D., Páez Santana, M., y López Tumbaco, O. (2019). Análisis estadístico de tablas de contingencia y chi cuadrado para medir el flujo migratorio en Ecuador en 2018. *Revista Científica Ecuatoriana, 3*(1). doi:https://doi.org/10.46480/esj.3.1.24

López Aguado, M., y Gutiérrez Provecho, L. (2019). Cómo realizar e interpretar un análisis factorial exploratorio. *REIRE Revista d'Innovació i Recerca en Educación, 12*(2), 14. doi: https://doi.org/10.1344/reire2019.12.227057

Lucas Bazurto, M., y Chancay Cedeño, C. (2022). Estrategia metodológica para fomentar la comprensión lectora en los estudiantes de Educación General Básica en la Institución Teresa Intriago Delgado. Revista EDUCARE - UPEL-IPB - Segunda Nueva Etapa 2.0, 26(Extraordinario), 1-22. doi:https://doi.org/10.46498/reduipb.v26iExtraordinario.1666

Lucas Bazurto, M., y Chancay Cedeño, C, op. cit, p. 10.

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Murillo, L., y Naranjo, A. (2021). Fortalecimiento de la Comprensión Lectora Mediante la Plataforma de Educaplay en Estudiantes de Grado Sexto del Colegio Integrado del Municipio de Cabrera. [Tesis de Titulación, Universidad Libre de Colombia] Repositorio Unilibre.https://repository.unilibre.edu.co/bitstream/handle/10901/19593/Trabajo%20de%20grado.pdf?sequence=1&isAllowed=y

Ovalle, A. (2006). Producto educativo: Guía docente para la aplicación del Método de lectura Guiada en Segundo y Tercero de la Escuela Básica en el Liceo Martin Heidegger. [Tesis para la obtención del título académico]. Repositorio Ups https://dspace.ups.edu.ec/bitstream/123456789/3208/1/UPS-QT01643.pdf

Roldán, A. (2019). Leer, comprender y aprender en la escuela secundaria: enfoques y perspectivas. *Revista Scielo Brazil, 30*. doi:https://doi.org/10.1590/0103-6564e20180126

Romero, J. (2019). Aplicación del enfoque de Lectura Guiada para la mejora de la comprensión lectora en español en alumnos que participan en un programa bilingüe inglés-español. Revista de Estudios Filológicos, 4(96-123). doi:10.57087/Verbeia.2019.4060

Sánchez Flores, F. (2019). Fundamentos epistémicos de la investigación cualitativa y cuantitativa: consensos y disensos. Revista Digital de Investigación en Docencia Universitaria, 21. doi:https://doi.org/10.19083/ridu.2019.644

Unesco. (2021). Estudio Regional Comparativo y Explicativo (ERCE 2019): reporte nacional de resultados; Ecuador. 0000380246. Obtenido de https://unesdoc.unesco.org/ark:/48223/pf0000380246

Verano Dorival, N., y Espinoza Quispe, H. (2019). La enseñanza de la lectura desde el modelo de lectoescritura balanceada. Obtenido de [Tesis de grado, Pontificia Universidad Católica del Perú] PUCP Repositorio: https://tesis.pucp.edu.pe/repositorio//handle/20.500.12404/18037

Verano Dorival, N., y Espinoza Quispe, H, op. cit, p. 23-24.

Vizcaíno Zúñiga, P., Cedeño Cedeño, R., & Maldonado Palacios, I. (2023). Metodología de la investigación científica: guía práctica. Ciencia Latina Revista Científica Multidisciplinar, 7(4), 9723-9762. doi:https://doi.org/10.37811/cl_rcm.v7i4.7658

Zamudio Chávez, L., y Rendón Casas , R. (2023). *De la decodificación a la lectura comprensiva: una experiencia en contextos educativos rurales de los departamentos de Antioquia y Bolívar.* Obtenido de [Tesis de grado, Universidad de La Salle]: https://ciencia.lasalle.edu.co/lic_literatura_lengua_castellana/2

Uisrael
REVISTA CIENTÍFICA

May – August 2025 period
Vol. 12, No. 2
rcientifica@uisrael.edu.ec
https://doi.org/10.35290/rcui.v12n2.2025.1321 • e-ISSN: 2631 - 2786

University Social Responsibility and perceived value in students of Higher Education Institutions

Responsabilidad Social Universitaria y valor percibido en estudiantes de Instituciones de Educación Superior

Date of receipt: 2024-05-22 Date of acceptance: 2025-11-20 Date of publication: 2025-05-10

Rita Angélica Córdova Romaní [1]
Universidad César Vallejo, Perú
rcordovarom@ucvvirtual.edu.pe
https://orcid.org/0000-0002-1072-6118

David Edgardo Peñaloza Guerrero [2]
Universidad César Vallejo, Perú
dpenalozag@ucvvirtual.edu.pe
https://orcid.org/0000-0002-3926-3786

Abstract

University Social Responsibility places universities as centers of knowledge and promotion of ethical values, challenging them to take an active role in solving social problems. The research aimed to analyze the effect of MSW on the assessment made by university students of their educational experience, so a documentary review approach was adopted and content analysis was used. The documents examined were obtained from the Scopus, Redalyc, Scielo and Google Scholar databases. A selection criterion was applied that resulted in the identification of nineteen studies. The results allowed to identify three categories of analysis: a) Perspectives and Theoretical Approaches in the Definition and Conceptualization of University Social Responsibility, b) Influence of University Social

Responsibility on the Perception of Educational Experience and c) Current dynamics and challenges in the research of University Social Responsibility in Higher Education. It is concluded that University Social Responsibility plays a fundamental role in the perception of the educational experience by university students, influencing the quality of teaching, the active participation of students and their sense of belonging to the academic community.

Keywords: Social responsibility, university students, higher education, academic community

Resumen

La Responsabilidad Social Universitaria sitúa a las universidades como centros de conocimiento y promoción de valores éticos, desafiándolas a asumir un papel activo en la solución de problemas sociales. La investigación tuvo como objetivo analizar el efecto de la RSU en la valoración que hacen los estudiantes universitarios de su experiencia educativa, por lo que se adoptó un enfoque de revisión documental y se empleó el análisis de contenido Los documentos examinados se obtuvieron de las bases de datos Scopus, Redalyc, Scielo y Google Scholar. Se aplicó un criterio de selección que resultó en la identificación de diecinueve estudios. Los resultados permitieron identificar tres categorías de análisis: a) Perspectivas y Enfoques Teóricos en la Definición y Conceptualización de la Responsabilidad Social Universitaria, b) Influencia de la Responsabilidad Social Universitaria en la Percepción de la Experiencia Educativa y c) Dinámicas actuales y retos en la investigación de la Responsabilidad Social Universitaria en Educación Superior. Se concluye que, la Responsabilidad Social Universitaria desempeña un papel fundamental en la percepción de la experiencia educativa por parte de los estudiantes universitarios, ejerciendo influencia en la calidad de la enseñanza, la participación activa de los estudiantes y su sentido de pertenencia a la comunidad académica.

Palabras clave: Responsabilidad social, estudiantes universitarios, educación superior, comunidad académica

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Introduction

In the realm of higher education, a scenario of notable complexity and dynamism unfolds. Higher education institutions, recognized as strongholds of knowledge transmission and academic training, find themselves immersed in a reality characterized by increasing global interconnectedness, a constant demand for innovation, and society's growing expectations for their active involvement in addressing contemporary challenges (Gomez et al., 2018). These trends not only reflect a shift in social expectations but also signal an evolution in the role that universities must assume to remain relevant and effective in shaping future leaders.

In this context of continuous evolution, higher education stands at a crossroads, where its fundamental role in the holistic development of individuals and the construction of a more promising future is being questioned. It is within this scenario of inquiry and transformation that University Social Responsibility (USR) emerges, positioning itself as a guiding light in the search for an educational purpose that transcends the boundaries of the classroom. This self-reflection and evolution within universities have a profound impact on society, which is in a constant state of change (Marco et al., 2018). The transformative role of USR highlights the need for universities to not only be centers of knowledge but also active agents of social change.

Consequently, this dynamic and complex environment compels higher education institutions to rethink their educational approach and their relationship with society. USR emerges as a paradigm that not only acknowledges the central role of universities in knowledge acquisition but also emphasizes their responsibility in promoting ethical values and actively participating in addressing social challenges. This ever-evolving concept has become a fundamental axis in the strategies of many academic institutions (Forero-Jiménez, 2019). Integrating USR into the core of university strategies means adopting a holistic vision that values both academic success and social impact.

USR, at its core, entails a redefinition of higher education. It is not limited to the academic and professional training of students but also focuses on shaping engaged and responsible citizens. This translates into a series of tangible actions, such as volunteer programs, collaboration with local communities, and the integration of ethical principles into teaching and research (Valdés Pérez & Villegas Rodríguez, 2017). By embracing this redefinition, universities can create educational environments that not only prepare students for their future careers but also empower them to become active agents of change in their communities.

The influence of USR on students' perceptions is a crucial area of research, as it could provide valuable insights into how social responsibility-oriented activities and programs affect the educational experience. USR seeks not only to transform institutions but also to impact those who are part of them, including students. The way students perceive and value USR could significantly influence their identity as responsible citizens and their motivation to actively participate in society (Condori & Reyna, 2019). Understanding these perceptions is essential for designing USR programs that truly resonate with students and maximize their transformative potential.

As these interconnections are explored, the need for multidimensional research becomes evident. This research article aims to contribute to the understanding of the relationship between USR and

the perceived value among students in higher education institutions. By analyzing this complex dynamic, it is possible to shed light on how USR is shaping the educational experience and students' perceptions, which, in turn, may have significant implications for the future of higher education and its commitment to society.

The justification for this study on USR and the perceived value among students in higher education institutions lies in the growing relevance that USR has gained in the higher education landscape. USR provides students with a unique opportunity to engage in activities and projects that go beyond mere knowledge acquisition, allowing them to actively contribute to the construction of more just and sustainable communities (Macías Vilela & Bastidas Vaca, 2019).

However, despite advancements in the implementation of USR in educational institutions, uncertainties and gaps persist regarding its real impact on students' perceptions and engagement. The need for a deeper understanding of how USR influences the assessment of the educational experience and students' willingness to engage in solving social challenges is evident. Therefore, this study seeks to provide a solid foundation for decision-making in higher education and to promote a more effective approach to the implementation of USR, benefiting both institutions and students.

Given the aforementioned, it is crucial to understand how USR influences students' perceptions of their educational experience in higher education institutions. Various studies have indicated that proper implementation of USR can enhance the quality of teaching, increase student participation, and strengthen the sense of belonging to the academic community. Therefore, this study aims to analyze the effect of USR on university students' evaluation of their educational experience.

Methodology

In this study, a documentary review was chosen as the research method. In this process, content analysis was used as a fundamental strategy for generating knowledge (Martín López, 1963). The selection of this technique is based on its suitability for exploratory research of this nature, as it allows for the identification of patterns and trends in the existing literature on University Social Responsibility (USR) and its relationship with students' assessment of their educational experience. However, it is acknowledged that this approach has inherent limitations, as it does not collect first-hand data. Therefore, the results should be interpreted as an initial approximation that provides a general and indicative overview.

2.1. Documentary Review Procedure

To conduct the research, information was gathered from recognized academic databases such as Scopus, Redalyc, Scielo, and Google Scholar. These databases are widely used in the academic community due to their access to a broad range of peer-reviewed documents, which generally ensures a certain level of quality and academic rigor in the published studies.

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

2.2. Document Search and Retrieval

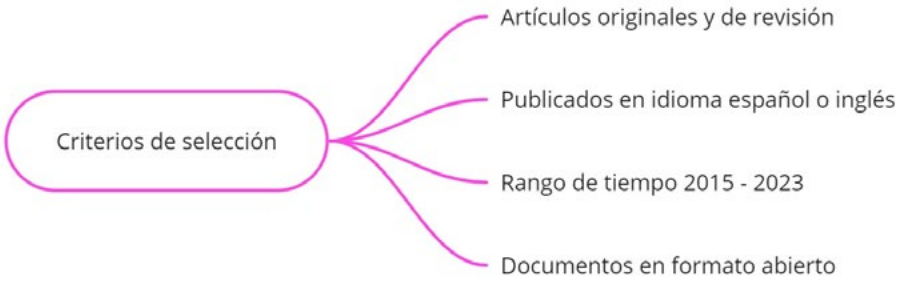
The initial search was conducted in October 2023, using a combination of keywords relevant to USR and student perception. The keywords included terms such as “University Social Responsibility,” “assessment of the educational experience,” “impact of USR,” among others. This search yielded a total of one hundred and thirty scientific articles.

2.3. Inclusion and Exclusion Criteria

To refine the results and select the most relevant documents, specific inclusion and exclusion criteria were applied. These criteria were designed to ensure the relevance and quality of the selected studies. Certain characteristics, presented in Figure 1, were considered to determine the inclusion of studies.

Figure 1.

Criteria for the inclusion of documents



2.4. Systematization and Selection of Documents

Subsequently, a systematization of the identified documents was carried out. This stage involved reviewing the abstracts and, when necessary, the full content of the articles to assess their relevance and quality based on the established criteria. This process resulted in the selection of nineteen (n=19) documents that met all criteria and were deemed suitable for the review.

2.4. Content Analysis

After identifying, organizing, and structuring the selected documents, an analysis was conducted using qualitative research methods. This analysis focused on identifying units of meaning by searching for keywords and recurring themes. To carry out this analysis, specialized online tools were used to facilitate the coding and categorization of qualitative data. The content analysis allowed for the extraction of relevant patterns and trends, providing a deeper understanding of how USR impacts students’ perceptions in higher education institutions. This approach not only helped identify the most discussed aspects in the literature but also highlighted areas that require further attention and development in future research.

Results

The results led to the selection of 19 publications, detailed in Table 1, organized by:

a. Year of publication,
b. Author/year,
c. Database, and
d. Methodology used.

This table presents the documents analyzed in this review. Additionally, Figure 2 illustrates the identification of a set of keywords that were essential in discerning the units of meaning that supported the review. This, in turn, facilitated the creation of three categories of analysis, which are detailed below.

Table 1.

Corpus of reviewed documents

N°	Author/Year	Database	Methodology
1	Salehi & Monavvarifard (2022)	Google Scholar	Mixed
2	Andia Valencia et al. (2021)	SciELO	Documentary review with qualitative analysis
3	Espitia Cubillos et al. (2020)	Google Scholar	Mixed
4	Rubio-Rodríguez et al. (2020)	Redalyc	Mixed
5	Bolio Domínguez & Pinzón Lizarraga (2019)	Scopus	Mixed
6	Condori & Reyna (2019)	SciELO / Google Scholar	Descriptive quantitative
7	Duque & Cervantes-Cervantes (2019)	SciELO	Bibliometric analysis
8	Macías Vilela & Bastidas Vaca (2019)	Redalyc	Quantitative
9	Pumacayo Palomino et al. (2019)	Google Scholar	Quantitative
10	Ostos Ortiz & Cortés Gallego (2019)	Redalyc	Prospective analytical
11	Forero-Jiménez (2019)	SciELO	Descriptive analytical qualitative
12	Naranjo Africano & Mejía Reatiga (2018)	Scopus	Documentary review
13	Vallaeys (2018)	SciELO	Qualitative, critical analytical
14	Marco et al. (2018)	Google Scholar	Mixed
15	Gómez et al. (2018)	Redalyc	Quantitative
16	Valdés Pérez & Villegas Rodríguez (2017)	SciELO	Documentary review
17	Gaete Quezada (2015a)	SciELO	Hermeneutic qualitative
18	Gaete Quezada (2015b)	SciELO	Hermeneutic qualitative
19	Ramallo (2015)	Redalyc	Qualitative

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Figure 2.

Keywords for the creation of categories

3.1. Perspectives and Theoretical Approaches in the Definition and Conceptualization of University Social Responsibility

Before analyzing the theoretical perspectives on the definition and conceptualization of University Social Responsibility (USR), it is essential to acknowledge that this topic has become a central subject of discussion and reflection in academia over recent decades. The growing relevance of USR is attributed to the increasing awareness that universities play a crucial role in shaping citizens and promoting social well-being. However, what defines and constitutes USR varies significantly depending on the theoretical perspective from which it is approached. Three key perspectives emerge in this context:

a. The ethical and philosophical perspective
b. The pragmatic and market-oriented perspective
c. The pedagogy- and competency-development-oriented perspective

Each of these perspectives provides a unique understanding of USR and its role in higher education.

From an ethical and philosophical standpoint, USR is conceived as a moral imperative for higher education institutions. This perspective argues that universities have an intrinsic obligation to contribute to societal well-being by fostering the education of ethical and responsible citizens. In this approach, USR is seen as a fundamental commitment to social justice and equity. Essentially, it implies that universities cannot merely focus on imparting academic knowledge and skills; they must also take an active role in promoting ethical values and fostering a more equitable social environment (Espitia Cubillos et al., 2020).

On the other hand, from a pragmatic and market-oriented perspective, USR is interpreted as a strategy to enhance the reputation and competitiveness of educational institutions. According to this view, universities adopt socially responsible practices as a means to attract students, funding, and industry collaborations. Here, USR is associated with value creation and competitive advantages (Gaete Quezada, 2015a).

In this sense, USR becomes a strategic tool for academic institutions in a highly competitive environment. Universities recognize that social responsibility is not only a moral imperative but also a competitive advantage in attracting students and financial resources. The adoption of socially responsible policies and practices can enhance the institution's image, leading to increased enrollment and attracting academic and financial talent. Additionally, collaboration with industry and other social actors in USR projects can open new funding opportunities and strengthen ties with the business sector (Gaete Quezada, 2015a). However, this perspective also raises important questions about the authenticity of USR actions—whether they are merely part of a public relations strategy or genuinely reflect a commitment to society.

A third perspective, more focused on pedagogy and competency development, highlights USR as an opportunity for the development of skills and values in young people. From this viewpoint, USR is considered a means to engage students in projects and activities that foster leadership skills, teamwork, empathy, and problem-solving, thus enriching their educational experience. This pedagogical perspective views USR as a powerful vehicle for holistic student formation. It is not just about imparting academic knowledge but also about providing students with the opportunity to apply that knowledge in real-world contexts. Through USR projects, students can develop leadership skills as they take active roles in planning and executing social initiatives (Tobón Marulanda et al., 2019). Teamwork is strengthened as they collaborate with peers and community members to solve concrete problems. Empathy and understanding of others' needs are cultivated through direct interaction with project beneficiaries. Additionally, the ability to address complex social challenges fosters the development of critical and reflective students.

These perspectives, though diverse, are not mutually exclusive and often intertwine in the understanding of USR. As evidenced in this category, USR is recognized as a multifaceted concept encompassing ethical, strategic, and pedagogical dimensions. The various theoretical perspectives that frame it highlight its complexity and adaptability to the needs and objectives of academic institutions. This conceptual richness provides fertile ground for reflection and research, such as the one presented in this study. By understanding these perspectives and theoretical approaches, we can shed light on how USR influences students' perceptions and how it contributes to their formation as engaged and competent citizens.

3.2. Influence of University Social Responsibility on the Perception of the Educational Experience

This new category of analysis focuses on investigating how USR affects students' perception of their educational experience. As a concept that seeks the active commitment of higher education institutions to addressing social challenges, USR can have a profound impact on how students

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

evaluate their academic training. This category aims to understand how students perceive and assess the influence of USR on their educational experience, considering aspects that go beyond acquiring knowledge and skills.

The assessment of the educational experience encompasses various aspects, such as teaching quality, sense of belonging to the academic community, development of practical skills, preparation for professional life, and, increasingly, awareness of social responsibility. In this regard, the study will analyze how the presence and participation of institutions in USR activities affect students' perceptions in these key areas.

First, teaching quality plays a crucial role in students' perception of their educational experience. Students seek not only to receive accurate and up-to-date information but also effective teaching methods that promote deep understanding and the ability to apply knowledge in real-world situations. USR positively influences teaching quality by promoting innovative pedagogical approaches that integrate the social dimension into the learning process. This results in greater student interest and improved retention of the concepts taught (Pumacayo Palomino et al., 2019).

Additionally, USR acts as a catalyst for students' active participation in their educational process. When students engage in USR projects that address relevant social issues, they become protagonists of their own learning. This active participation not only allows them to apply classroom knowledge but also provides them with a sense of purpose and relevance in their education. The experience of tackling real-world challenges through USR motivates students to commit more deeply to their academic training and to view it as a tool for positive change in society (Gaete Quezada, 2015b).

Together, the influence of USR on teaching quality and students' active participation significantly enriches their educational experience. This pedagogical approach, centered on the practical application of knowledge and community contribution, leads to graduates who are better prepared and socially responsible, ultimately benefiting society as a whole.

The sense of belonging to the academic community is another relevant aspect. Students value feeling part of an educational community that not only focuses on knowledge transmission but also on their well-being and personal development. USR strengthens this sense of belonging by offering opportunities to engage in projects and activities that have a tangible impact on society. Students participating in USR initiatives often feel more connected to their institution and to a broader purpose in their education (Andia Valencia et al., 2021).

The development of practical skills is essential for professional life preparation. Students seek to acquire skills that are directly applicable to their future careers. USR facilitates this process by providing opportunities to work in real-world settings and address concrete challenges. For example, participating in USR projects that tackle social issues helps students develop problem-solving, leadership, teamwork, and communication skills—highly valued by employers (Marco et al., 2018).

Furthermore, USR connects students with professionals and organizations outside the academic sphere, giving them the opportunity to learn from real-world experiences and establish networks that can be beneficial for their future careers. This interaction with the external world also helps students understand how their academic knowledge and skills apply in practical situations and how they can contribute to overall societal well-being (Forero-Jiménez, 2019). In this sense, USR not only enriches students' education but also enhances their employability and ability to tackle professional challenges effectively.

Preparation for professional life is a fundamental goal of higher education. Students aim not only to obtain a degree but also to be prepared for the challenges and responsibilities of their future careers. USR plays a crucial role by offering experiences that link theory with practice and help students understand how they can meaningfully contribute to society through their future professional roles (Gómez et al., 2018).

In conclusion, these aspects are intertwined in students' evaluation of their educational experience in higher education institutions. By influencing these key elements, USR can have a profound impact on how students perceive and value their academic training and their preparation to contribute to society.

3.3. Current Dynamics and Challenges in Research on University Social Responsibility in Higher Education

In the analysis of current dynamics and emerging challenges in research on University Social Responsibility (USR), several trends stand out that affect both the perception and the experience of students in higher education. As USR has gained prominence in the academic and social spheres, significant changes have occurred in how it is approached and understood in educational research.

One of the most notable developments is the growth in the production of studies on USR, reflecting the increasing relevance of the topic. Researchers from various disciplines have engaged in interdisciplinary studies to delve deeper into how USR influences students and how universities can promote it more effectively. This boom in research has been accompanied by greater methodological diversity, encompassing qualitative, quantitative, and mixed approaches, as well as international comparative studies. These efforts contribute to a more comprehensive and detailed understanding of USR (Duque & Cervantes-Cervantes, 2019).

Collaboration between educational institutions and external organizations has also increased, enriching both the approaches to and the implementation of USR. By working with NGOs, businesses, and local governments, a more holistic approach to social and environmental challenges is encouraged. However, this intersectoral interaction also faces challenges in terms of coherence and coordination among the various actors involved in USR initiatives (Gaete Quezada, 2015b).

Despite these advances, significant challenges remain in the definition and measurement of USR. The wide range of activities and practices encompassed by USR makes it difficult to establish clear indicators and evaluation tools that measure its impact on students and the community.

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Additionally, the lack of consensus on the objectives and expected outcomes complicates the comparison of studies conducted in different contexts. The lack of clarity regarding expectations and desired outcomes can lead to a fragmented and uneven implementation of USR within the same institution (Ramallo, 2015).

Another key challenge in USR research is the sustainability and continuity of the initiatives. While many universities have begun to integrate USR into their activities, maintaining long-term institutional commitment remains a major concern. To ensure that USR initiatives are not isolated or short-lived, sustainability strategies are being developed, such as the creation of institutional policies that support USR on an ongoing basis. The integration of USR into the academic curriculum and collaboration with external organizations are key approaches to ensuring that USR activities have a lasting impact (Andia Valencia et al., 2021).

In addition to sustainability, another organizational challenge is the need for the deep integration of University Social Responsibility (USR) into institutional culture and structure. For USR to have a significant and lasting impact, universities must transform their structures and decision-making processes. This includes the creation of dedicated committees, interdisciplinary collaboration, and the incorporation of USR into the universities' long-term strategic plans (Vallaeys, 2018). The active involvement of universities in USR projects that engage multiple departments facilitates a collaborative and enriching approach to addressing social issues from various perspectives (Ostos Ortiz & Cortés Gallego, 2019).

Moreover, the increasing diversity of students presents an additional challenge in the implementation of USR. Students come from diverse cultural, socioeconomic, and academic backgrounds, making it necessary to develop strategies to ensure that USR initiatives are inclusive and accessible. Some of these strategies include personalizing USR activities by adapting them to the specific needs of students and promoting their active participation in project design. It is also important to provide additional resources and support to students who face barriers to participating in these initiatives, such as financial limitations or disabilities (Bolio Domínguez & Pinzón Lizarraga, 2019).

Finally, research on USR in higher education is marked by the need for a collaborative approach involving both academic and external stakeholders. USR should not be seen merely as an educational supplement, but as a fundamental component capable of transforming university education and significantly contributing to the resolution of social and environmental problems in the surrounding environment.

Conclusions

The research carried out has enabled a deeper understanding of the relationship between University Social Responsibility (USR) and students' valuation of their educational experience in higher education. Through a documentary review, a variety of perspectives and theoretical approaches regarding the definition and conceptualization of USR in this context have been analyzed, revealing the richness and complexity of this concept. The plurality of approaches reflects the diversity of perspectives adopted by educational institutions, ranging from those that view USR as an extension

of the educational function to broader approaches that consider the university's overall contribution to society.

One of the most significant findings is the positive impact of USR on students' perception of their educational experience. The documentary review shows that USR can enhance various aspects of students' academic life, including the quality of teaching, student engagement, and the strengthening of their sense of belonging to the university community. Although these observations should be interpreted with caution due to the limitations of the methodological approach, the patterns identified in the literature suggest that the effective integration of USR into higher education institutions can significantly enrich students' educational experience and foster active citizenship.

However, despite the progress observed, the research also identifies persistent challenges in the implementation of USR. The need for a clear definition and an effective measurement system remains an obstacle to consistently consolidating USR. In addition, the long-term sustainability of USR initiatives poses another major challenge. Nevertheless, a promising path is emerging toward the integration of USR as an essential component of higher education, driven by universities' commitment to creating clear institutional policies, fostering interdisciplinary collaboration, and ensuring the active participation of all stakeholders involved.

The personalized approach to USR, which considers the diversity of students and their varying needs, has also been identified as a crucial element to ensure equity and accessibility in these initiatives. By adapting USR programs and considering students' particular circumstances, it is possible to ensure that all students have the opportunity to engage in activities that promote social commitment and contribute to the development of responsible citizenship.

In summary, the research reaffirms the importance of USR as a key element in higher education—not only to improve academic quality, but also to foster a more just and engaged society. The effective and sustainable implementation of USR, supported by a robust institutional framework, can be a powerful tool to strengthen both students' educational experience and their role in the community.

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

References

Andia Valencia, W., Yampufe Cornetero, M., & Antezana Alzamora, S. (2021). Responsabilidad social universitaria: del enfoque social al enfoque sostenible. *Revista C1 ubana de Educación Superior*, *40*(3).

Bolio Domínguez, V., & Pinzón Lizarraga, L. M. (2019). Construcción y Validación de un Instrumento para Evaluar las Características de la Responsabilidad Social Universitaria en Estudiantes Universitarios. *Revista Internacional de Educación Para La Justicia Social*, *8*(1), 79. https://doi.org/10.15366/riejs2019.8.1.005

Condori, M., & Reyna, G. (2019). Percepción de la responsabilidad social universitaria en estudiantes de la Facultad de Sociología de una universidad pública de la ciudad de Huancayo, Perú. *Espacios*, *40*(39), 8.

Duque, P., & Cervantes-Cervantes, L.-S. (2019). Responsabilidad Social Universitaria: una revisión sistemática y análisis bibliométrico. *Estudios Gerenciales*, *35*(153), 451–464. https://doi.org/10.18046/j.estger.2019.153.3389

Espitia Cubillos, A. A., Meneses Portela, L. I., & Huertas Forero, I. (2020). Análisis de las expectativas de los egresados frente a un modelo de responsabilidad social universitaria. *Equidad y Desarrollo*, *1*(35), 61–84. https://doi.org/10.19052/eq.vol1.iss35.3

Forero-Jiménez, M. Y. (2019). Modelo de responsabilidad social universitaria: una propuesta para las instituciones colombianas. *Revista de Investigación, Desarrollo e Innovación*, *9*(2), 249–260. https://doi.org/10.19053/20278306.v9.n2.2019.9160

Gaete Quezada, R. (2015a). El concepto de responsabilidad social universitaria desde la perspectiva de la alta dirección. *Cuadernos de Administración (Universidad Del Valle)*, *31*(53), 97–107.

Gaete Quezada, R. (2015b). La Responsabilidad Social Universitaria desde la Perspectiva de las Partes Interesadas: Un Estudio de Caso. *Actualidades Investigativas En Educación*, *15*(1), 273–302.

Gomez, L. M., Alvarado Naveira, Y., & Pujols Bernabel, A. (2018). Implementing University Social Responsibility in the Caribbean: Perspectives of Internal Stakeholders. *Revista Digital de Investigación En Docencia Universitaria*, *12*(1), 101–120. https://doi.org/10.19083/ridu.12.714

Macías Vilela, D., & Bastidas Vaca, C. (2019). Responsabilidad Social Universitaria: estudio de caso desde la perspectiva de los estudiantes. *Ingeniería Industrial. Actualidad y Nuevas Tendencias*, *6*(23), 23–44.

Marco, R. A., Sarmento, D. F., & Pinto de Almeida, M. de L. (2018). Responsabilidad social universitaria : la perspectiva de los colaboradores en una universidad comunitaria brasileña. *Tendencias Pedagógicas*, *31*, 289–308.

Martín López, C. (1963). El análisis de contenido. *Revista de Estudios Políticos*, *132*, 45–64.

Naranjo Africano, G., & Mejía Reatiga, C. (2018). La transferencia tecnológica como práctica de responsabilidad social universitaria. *Arbor*, *194*(789), 472. https://doi.org/10.3989/arbor.2018.789n3014

Ostos Ortiz, O. L., & Cortés Gallego, M. A. (2019). Los campos de acción en la Universidad Santo Tomás. Resultados del estudio 2012 - 2018. *Revista Interamericana de Investigación, Educación y Pedagogía, RIIEP*, *12*(1), 15–40. https://doi.org/10.15332/s1657-107X.2019.0001.01

Pumacayo Palomino, I. I., Calla Vásquez, K. M., Yangali Vicente, J. S., Vásquez Tomás, M. R., Arrátia Méndez, G. K., & Rodríguez López, J. L. (2019). Responsabilidad social universitaria y la calidad de servicio administrativo. *Apuntes Universitarios. Revista de Investigación*, *9*(2), 46–56.

Ramallo, M. (2015). La evaluación de la Responsabilidad Social Universitaria. *Debate Universitario*, *4*(7), 25–38.

Rubio-Rodríguez, G. A., Estrada Sánchez, J. M., & Pedraza Vega, G. (2020). Responsabilidad social universitaria: Incidencia en diferentes grupos de interés en una universidad colombiana. *Revista de Ciencias Sociales*, *26*(4), 180–189.

Salehi, L., & Monavvarifard, F. (2022). Construction and validation of criteria for university social responsibility assessment. *Quarterly Journal of Research and Planning in Higher Education*, *28*(3), 113–141. https://doi.org/10.52547/irphe.28.3.113

Valdés Pérez, M. G., & Villegas Rodríguez, T. (2017). Responsabilidad social universitaria: fundamento para la gestión sociocultural. *Revista Cubana de Educación Superior*, *36*(3), 55–62.

Vallaeys, F. (2018). Las diez falacias de la Responsabilidad Social Universitaria. *Revista Digital de Investigación En Docencia Universitaria*, *12*(1), 34–58. https://doi.org/10.19083/ridu.12.716

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Uisrael
REVISTA CIENTÍFICA

May – August 2025 period
Vol. 12, No. 2
rcientifica@uisrael.edu.ec
https://doi.org/10.35290/rcui.v12n2.2025.1337 • e-ISSN: 2631 - 2786

Sowing the future: Transformation and progress in rural communities of Cariamanga

Sembrando futuro: Transformación y progreso en las comunidades rurales de Cariamanga

Date of receipt: 2024-06-18 Date of acceptance: 2025-01-16 Date of publication: 2025-05-10

Blanca Priscila Maldonado Pacheco [1]
Pontificia Universidad Católica del Ecuador, Ecuador
bpmaldonado@puce.edu.ec
https://orcid.org/0000-0002-5497-595X

Majo Carrasco-Tenezaca [2]
Pontificia Universidad Católica del Ecuador, Ecuador
mjcarrasco@puce.edu.ec
https://orcid.org/0000-0003-2548-3320

Abstract

The Valle de Gigantes Association, with the support of the Healthy Living Initiative from the Pontifical Catholic University of Ecuador, has participated in training programs and has arranged a food processing mini plant aiming at improving the nutritional status and income of its members. This project contributes to various Sustainable Development Goals (SDGs): poverty eradication, health and wellbeing promotion, gender equality, decent work and economic development, and responsible production and consumption. Participant observation during trainings and production activities, along with focus groups with association members were used as qualitative methodology. Structured surveys analyzed with descriptive statistics were used as quantitative methods. The results showed an increase in the ability of self-management and economic sustainability in the involved

communities and highlighted the importance of academic support and international financial support as key elements in rural development. In conclusion, this project has strengthened the community agency and their economic empowerment. This suggests that projects that aim to create or improve entrepreneurial abilities and interdisciplinary collaboration can be effective in fighting poverty and promoting sustainable economic development in rural areas.

Keywords: Rural Development, Community Empowerment, Education and Knowledge Transfer, Sustainable Development Goals

Resumen

La Asociación Valle de Gigantes con el apoyo de la Iniciativa Vivir Saludable de Pontificia Universidad Católica del Ecuador ha participado en programas de capacitación y ha dispuesto una miniplanta procesadora de alimentos con el objetivo de mejorar el estado nutricional y los ingresos económicos de sus miembros. Este proyecto contribuye varios Objetivos de Desarrollo Sostenible (ODS): erradicación de la pobreza; promoción de la salud y bienestar; igualdad de género; trabajo decente y crecimiento económico; y producción y consumo responsables. La metodología cualitativa utilizada incluyó observación de los participantes durante capacitaciones, talleres y ciclos de producción; y grupos focales con los miembros de la asociación. La metodología cuantitativa consistió en encuestas estructuradas con análisis estadístico descriptivo. Los resultados mostraron un incremento en la capacidad de autogestión y sostenibilidad económica de las comunidades involucradas y resaltaron la colaboración académica y el apoyo financiero internacional como factores clave para el desarrollo rural. En conclusión, el proyecto ha fortalecido la capacidad comunitaria y el empoderamiento económico de las comunidades, sugiriendo que las intervenciones basadas en la formación empresarial y la colaboración interdisciplinaria pueden ser eficaces para combatir la pobreza y fomentar el desarrollo económico sostenible en áreas rurales.

Palabras clave: Desarrollo Rural, Empoderamiento Comunitario, Educación y Transferencia de Conocimiento, Objetivos de Desarrollo Sostenible

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Introduction

The Valle de Gigantes Association (AVG) is a project that is part of the Healthy Living Initiative (IVS). The IVS has more than fifteen years of experience as a research group at the Pontifical Catholic University of Ecuador (PUCE) and is one of the university's flagship projects in the fields of action research, outreach, and applied research. This initiative began with the goal of creating a sustainable solution for preventing the transmission of Chagas disease. It later expanded to include proposals aimed at improving quality of life in the health sector and, finally, a concrete proposal focused on the equitable inclusion of gender through sustainable food production to enhance economic income.

The direct beneficiaries of the project are approximately 60 people who are members of the AVG, located in Bellamaría, Chaquizhca, and Guara, in the Chile parish of Calvas canton, along with their families. Additionally, there are indirect beneficiaries, such as families with productive gardens that contribute to the association's production with their surplus yield.

In 2023, the Pontifical Catholic University of Ecuador participated in the call for micro-projects under the "Strengthening Entrepreneurial Initiatives in Ecuadorian Universities" (FSPI) program, issued by the French Embassy. Three PUCE projects were selected, including the "Valle de Gigantes Association: Economic Development for Three Rural Communities in Southern Ecuador" project.

The Valle de Gigantes Association makes a significant contribution to several Sustainable Development Goals (SDGs) (CEPAL, 2018). Regarding SDG 1: No Poverty, AVG directly works to improve and diversify the economic income of participating families through the creation of micro-enterprises and training programs. This initiative not only seeks to increase the financial resources of these communities but also aims to reduce multidimensional poverty by strengthening skills and knowledge that are passed down across generations. These efforts ensure that families can generate income sustainably, contributing to a lasting improvement in their quality of life and the region's economic stability.

Regarding SDG 3: Good Health and Well-being, AVG promotes the nutritional value of traditional regional foods, improving family diets and enhancing overall well-being. This initiative not only increases access to healthier foods but also preserves local food heritage, ensuring that future generations continue beneficial dietary practices.

Concerning SDG 5: Gender Equality, the project plays a key role in empowering women, as 78.6% of the association's members are women. These women actively participate in all association activities, strengthening their economic and social autonomy, providing greater opportunities for leadership and personal development, and fostering gender equity within their communities.

Regarding SDG 8: Decent Work and Economic Growth, AVG promotes an equitable and community-driven work environment, deeply respecting local customs. By involving all community members, it fosters inclusive and sustainable local economic growth, based on social justice and respect for traditions, reinforcing long-term economic development.

Finally, SDG 12: Responsible Consumption and Production is reflected in AVG's sustainable agricultural practices. These practices respect the natural cycles of the land and are based on ancestral knowledge passed down through generations. The association's promotion of organic production ensures that its activities do not harm the environment, fostering a harmonious relationship with nature and contributing to long-term sustainability.

The objective of this article is to assess, among members of the Valle de Gigantes Association, the impact of both theoretical and practical training workshops, as well as the provision of equipment, on their development as a group and their empowerment at the business level.

Methodology

A mixed methodology was employed, combining qualitative and quantitative approaches to gain a comprehensive understanding of the project's impact on the Valle de Gigantes Association (AVG). The qualitative methodology captured participants' perceptions, experiences, and behavioral changes, allowing for an understanding of the subjective impact of implemented actions, such as equipment provision, member empowerment, and teamwork dynamics. The qualitative techniques used included participant observation during training sessions and production activities; semi-structured interviews exploring perceptions of equipment provision and the sense of empowerment; and focus groups that delved into shared experiences, emphasizing teamwork and relationships with local entrepreneurs.

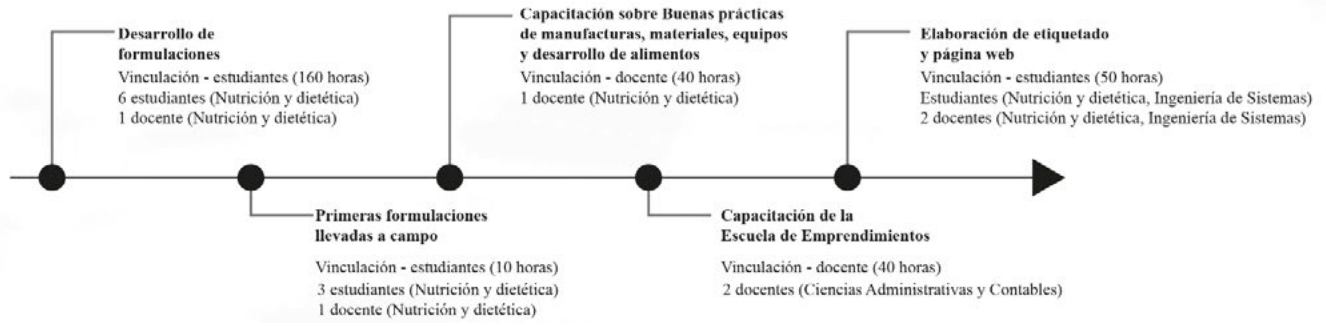
Simultaneously, a quantitative methodology was applied to measure the project's scope and concrete achievements. Structured surveys were conducted to assess attendance and objective fulfillment, recording an 80% participation rate in training sessions on product development and best practices for food handling. Additionally, the development of 20 formulations and three products ready for sanitary notification was documented. Finally, a descriptive statistical analysis was carried out to calculate percentages and averages related to attendance and satisfaction, providing a clear quantification of the project's impact.

The activities were based on a knowledge transfer methodology, in which faculty and students trained association members in topics such as good manufacturing practices, food development, machinery and equipment use, as well as business models and personal finance. The hybrid modality allowed for the participation of 90% of AVG members. The research project followed a multidisciplinary approach, involving faculty and students from the fields of Nutrition and Dietetics, Architecture, Business Administration, and Engineering, as well as allied institutions such as the French Embassy, PUCE – Quito, and Ohio University. PUCE contributed through training, formula development, and access to external networks, while the French Embassy financed equipment and seed capital. Meanwhile, Ohio University facilitated staff mobility and organized events to increase AVG's visibility. Additionally, in 2013, it supported the construction of a community center that now serves as an operations hub and houses the small-scale food processing plant. The stages of the knowledge transfer process are described in Figure 1.

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Figure 1

Stages of Knowledge Transfer.



Results

3.1 Qualitative Results

The main qualitative results were as follows:

Provision of Equipment and Supplies: Participants in this project did not have the financial resources to acquire the necessary equipment and supplies for the processing plant. They were provided with equipment for which they are responsible, increasing their sense of empowerment and self-confidence.

Relationships with Other Local Businesses: Training from the Entrepreneurship School allowed AVG members to establish relationships with experienced entrepreneurs in this field, helping them project a clear path forward.

Teamwork: The training sessions, especially those involving production practices, fostered teamwork and a positive attitude among association members.

3.2 Quantitative Results

The main quantitative results include:

80% of participants attended training sessions on product development and best practices for food handling.

Entrepreneurship School training exceeded expectations by 50% since the invitation was directly managed by Valle de Gigantes.

15 AVG members were trained in good food handling practices. This knowledge is applicable at the family level, benefiting a larger number of people.

20 formulations using locally sourced raw materials were developed.

Three products were created with documented processes and requirements for obtaining sanitary notification, allowing for market expansion.

The linkage between universities and rural communities through micro-enterprises can significantly improve the population's living conditions. Knowledge transfer through specific management models—integrating academic activities, research, and volunteer work—helps strengthen local capacities (Palacios, 2022). By fostering collaborative participation in problem recognition and solution development, the project fulfills the three core functions of higher education while emphasizing its focus on knowledge transfer to communities. Teaching is seen as the process of imparting knowledge produced through scientific research, which is fundamental for training professionals who can contribute to society (Hernández, 2019).

Teaching should not be limited to knowledge transmission; it must be deeply connected to research and social outreach, allowing students to apply what they learn to real-world problem-solving. The integration of these fundamental functions enhances professional training competencies (Soledispa-Rodríguez et al., 2021). In the case of the AVG project, efforts were directed toward the specific needs of the community, generating knowledge about the nutritional value of local raw materials and product diversification to improve economic access (Forero-Jiménez, 2019).

International cooperation in rural development projects highlights the importance of community empowerment and capacity building (Monge-Hernández et al., 2020). The AVG project showcases how association members have been empowered in their pursuit of an improved quality of life. The research began with a small group interested in developing a product based on local resources, which then sparked greater interest within the population, leading to job creation and better use of local resources. Training programs help enhance the capabilities of individuals and organizations at the community level, fostering economic and human development (Velázquez-Hernández et al., 2023). The experience gained by AVG members will likely inspire residents from the three communities to join this development initiative and further refine their skills and learning.

Action research plays a vital role in integrating university education with community needs, providing a platform for students to actively participate in productive and social activities. Community projects have a multiplier effect (Cieza et al., 2012) since outreach activities lead to the creation of new development projects, entrepreneurial ventures, and research initiatives through thesis work, reports, and new project proposals. Institutional and technical support is essential for strengthening micro-enterprises. Universities play a crucial role in transferring knowledge to the community (Parwez, 2017), facilitating greater local inclusion and participation in economic development.

Didactic strategies are fundamental for achieving effective learning in rural communities. These strategies should incorporate innovative tools and methods that facilitate better understanding and active participation among community members. In rural settings, where resources and access to technology are limited, it is crucial to implement flexible and locally relevant teaching methods (Herrera Gutiérrez & Villafuerte Álvarez, 2023). By designing teaching-learning strategies tailored to the target population, essential skills and knowledge for improving productivity and income

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

diversification are strengthened. This not only enhances the self-sufficiency of rural communities but also drives local economic development (Covarrubias Hernández, 2021).

Training in rural environments promotes social cohesion and community empowerment by equipping members with practical skills and relevant knowledge. This facilitates active participation in community decision-making, fostering a sense of belonging and shared responsibility. Training for Valle de Gigantes members was conducted in a hybrid format, with the main training module delivered virtually. Despite the distance between communities, attendance exceeded 80%. As a strategy to encourage participation, WhatsApp groups were created to share motivational messages about training sessions. Distance education using mobile phones and internet access not only facilitates knowledge acquisition but also empowers participants by providing them with the tools needed to engage in an increasingly digital and competitive world (Rodríguez Arce & Juárez Pegueros, 2017).

Figure 2

Photographs of hands-on experiences.

Entrepreneurship plays a crucial role in the economic and social development of countries. It not only generates employment but also fosters innovation and improves the quality of life of the population. The study of entrepreneurship helps to understand the factors that motivate individuals to create their own businesses, highlighting the importance of education and work experience in shaping entrepreneurial intentions.

In this context, entrepreneurship education becomes a key tool for enhancing individuals' skills and attitudes toward entrepreneurial activities. Furthermore, entrepreneurship drives the creation of new products and services, contributing to economic dynamism and national competitiveness. In the case of AVG, several products were developed as part of community-based enterprises, and participants received training in various areas (Bravo Bravo et al., 2021).

Entrepreneurs not only create new business and job opportunities but also drive innovation, responding to market needs and changes. This dynamism significantly contributes to economic growth, enhancing national competitiveness and promoting sustainable development. Moreover, entrepreneurship encourages the creation and application of knowledge, enabling businesses to adapt and transform in a globalized and constantly evolving environment.

Therefore, it is essential to promote an entrepreneurial culture that integrates innovation and knowledge to tackle the challenges of the 21st century and ensure economic and social well-being.

Figure 3

Products developed during the final phase of the intervention.

The role of women in entrepreneurship development is a crucial topic encompassing economic, social, and cultural aspects. Women's empowerment in entrepreneurship enables them to develop leadership skills, increase self-confidence, and achieve economic independence. Additionally, these enterprises often focus on sustainability and environmental responsibility, contributing to SDG 12 (Responsible Consumption and Production).

The female role in entrepreneurship is a powerful tool for gender equality and for improving living conditions both locally and globally (Ordoñez-Abril et al., 2021). Women entrepreneurs not only bring ideas and solutions but also promote gender equity and empowerment within communities. Their leadership has a multiplier effect on the well-being of their families and the broader community. Women's participation directly contributes to SDG 5 (Gender Equality), which aims to empower women and girls, fostering social and economic inclusion (García Arteaga et al., 2021). In

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

the AVG project, 78.6% of the participants are women who actively work in their productive gardens and are the primary suppliers of raw materials for food production.

Conclusions

The project “Asociación Valle de Gigantes: Economic Development for Three Rural Communities in Southern Ecuador” has demonstrated that sustainable economic development in rural contexts not only depends on the implementation of infrastructure and training but also on deep community participation. Initially, the request for support for the association from the community to the IVS meant that the project originated from the bottom up, which made its importance for the target population implicit. The active participation of the members of Bellamaría, Chaquizhca, and Guara in all phases of the project was key to ensuring the relevance of the interventions and their long-term sustainability. This participatory approach has not only generated a strong sense of ownership and commitment in the communities but has also allowed for adaptation to local changes in climate, economy, and has strengthened social cohesion.

Moreover, one of the most valuable lessons has been the bidirectional transfer of knowledge. The academy, through PUCE, has provided virtual and in-person workshops and training on advanced techniques and theories that have strengthened the productive capabilities of the communities. Students from various fields at PUCE have had the opportunity to participate in the association’s activities, from laboratory work in product formulation to active participation in production processes in the field. At the same time, the local knowledge and practical experience of the community members have enriched the academic understanding and motivated the students to create solutions tailored to the specific challenges of these rural areas. Additionally, the experience of the students outside the classroom has been highly enriching for their academic and personal development. This synergy has been essential for overcoming difficulties and maximizing the project’s impact, contributing to the achievement of several Sustainable Development Goals (SDGs), especially in the areas of poverty eradication, health, gender equality, decent work, and responsible consumption.

In the future, it will be essential to maintain this collaborative and flexible approach to ensure that the achievements are consolidated and continue benefiting the communities in the long term, promoting their self-sufficiency and resilience in the face of new challenges.

References

Bravo Bravo, I. F., Bravo Bravo, M. X., Preciado Ramírez, J. D., y Mendoza Ferrín, M. M. (2021). Educación para el emprendimiento y la intención de emprender. *Revista Economía y Política*, 139–155. https://doi.org/10.25097/rep.n33.2021.08

Cieza, R. I., Muro, M. G., Eirin, M. A., y Arias, R. (2012). Revista Extensión Universidad Nacional de Córdova. *La Formación de Estudiantes a partir de un Proyecto de Extensión en un Tambo Periurbano de Baja Escala.*, *4*(2). https://revistas.unc.edu.ar/index.php/ext/article/view/1378/pdf

Covarrubias Hernández, L. Y. (2021). Educación a distancia: Transformación de los aprendizajes. *Telos Revista de Estudios Interdisciplinarios en Ciencias Sociales*, *23*(1), 150–160. https://doi.org/10.36390/telos231.12

Forero-Jiménez, M. Y. (2019). Modelo de responsabilidad social universitaria: Una propuesta para las instituciones colombianas. *Revista de Investigación, Desarrollo e Innovación*, *9*(2), 249–260. https://doi.org/10.19053/20278306.v9.n2.2019.9160

García Arteaga, V. F., Cruz Coria, E., y Mejía Reyes, C. (2021). Factores que impulsan e inhiben el empoderamiento femenino: Una revisión de literatura. *Revista Reflexiones*, *101*(1). https://doi.org/10.15517/rr.v101i1.43649

Hernández, C. R. (2019). Sobre la función social del conocimiento humano mediante la vinculación y transferencia del conocimiento en América Latina. *Revista de la Educación Superior*, *48*(189), 121–132. https://doi.org/10.36857/resu.2020.48.189.7

Herrera Gutiérrez, C., y Villafuerte Álvarez, C. A. (2023). Estrategias didácticas en la educacion. *Horizontes. Revista de Investigación en Ciencias de la Educación*, *7*(28), 758–772. https://doi.org/10.33996/revistahorizontes.v7i28.552

La Agenda 2030 y los Objetivos de Desarrollo Sostenible: Una oportunidad para América Latina y el Caribe. (2018). Comisión Económica para América Latina y el Caribe (CEPAL). https://repositorio.cepal.org/bitstream/handle/11362/40155/24/S1801141_es.pdf

Monge-Hernández, C., Mena-García, P., Gutiérrez-Miranda, M., Gamboa-Conejo, R., y Céspedes-Araya, M. (2020). Sinergias en los procesos de desarrollo rural de un proyecto de cooperación entre Japón y Costa Rica. *InterSedes*, *21*(43), 152–174. https://doi.org/10.15517/isucr.v21i43.41990

Ordoñez-Abril, D. Y., Castillo-López, A. M., y Rodríguez-Bravo, I. M. (2021). Empowerment of women in entrepreneurship and innovation. *Población y Desarrollo*, *27*(52), 69–91. https://doi.org/10.18004/pdfce/2076-054x/2021.027.52.069

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Palacios, P. R. (2022). Modelo de transferencia de conocimiento a comunidades rurales desde el quehacer y formación universitaria en economía: Knowledge transfer model to rural communities from work and university education in economics. *South Florida Journal of Development*, *3*(2), 2366–2375. https://doi.org/10.46932/sfjdv3n2-062

Parwez, S. (2017). Community-based entrepreneurship: Evidences from a retail case study. *Journal of Innovation and Entrepreneurship*, *6*(1), 14. https://doi.org/10.1186/s13731-017-0074-z

Rodríguez Arce, J., y Juárez Pegueros, J. P. C. (2017). Impacto del m-learning en el proceso de aprendizaje: Habilidades y conocimiento / The Impact Of m-learning On The Learning Process: Skills and Knowledge. *RIDE Revista Iberoamericana para la Investigación y el Desarrollo Educativo*, *8*(15), 363–386. https://doi.org/10.23913/ride.v8i15.303

Soledispa-Rodríguez, X. E., Sumba-Bustamante, R. Y., y Yoza-Rodríguez, N. R. (2021). *Articulation of the substantive functions of Higher Education and its impact on professional training competencies*. *7*. https://dominiodelasciencias.com/ojs/index.php/es/article/view/1753/3494

Velázquez-Hernández, J. A., Romero-Zepeda, M., y Martínez-Anaya, A. (2023). Educación comunitaria para el emprendimiento del orégano y la damiana en la comunidad de Camargo. *Puriq*, *5*. https://doi.org/10.37073/puriq.5.501

Uisrael
REVISTA CIENTÍFICA

May – August 2025 period
Vol. 12, No. 2
rcientifica@uisrael.edu.ec
https://doi.org/10.35290/rcui.v12n2.2025.1339 • e-ISSN: 2631 - 2786

The Lesson Study: learning to unlearn in teacher training

La Lesson Study: aprender a desaprender en la formación docente

Date of receipt: 2024-06-11 Date of acceptance: 2024-11-20 Date of publication: 2025-05-10

Briggitte Estefania Pinto Ayala [1]
Universidad Cesar Vallejo, Perú
briggitteestefania2@gmail.com
https://orcid.org/0000-0003-2895-8053

Martha Cecilia Peñas Moreno [2]
Universidad Nacional de Educación, Ecuador
cecilia00597@gmail.com
http://orcid.org/0000-0001-9364-4857

Viviana Priscila Neira Quintero [3]
Universidad Nacional de Educación, Ecuador
viviana.neira@unae.edu.ec
https://orcid.org/0000-0003-2895-8053

Jefferson Geovany Castañeda Fuentes [4]
Universidad César Vallejo, Perú
Jeff64@hotmail.es
https://orcid.org/0000-0003-2597-6686

Abstract

In the current educational context, the need for teachers to learn to unlearn is presented as a crucial problem. The objective of this study is to analyze how Lesson Study allows education professionals to adapt to constant changes in the pedagogical field and renew their practices to offer quality and relevant teaching to 21st century students. To address this problem, a methodology based on a documentary review was implemented to seek critical reflection on teaching practices, openness to new ideas and approaches, and the willingness to question and modify deep-rooted beliefs about teaching. The main results obtained revealed an increase in the motivation and commitment of teachers, as well as significant improvements in the quality of pedagogical practices. The students, in turn, showed greater interest in learning and better academic performance. In conclusion, the process of unlearning and learning new ways of teaching was fundamental for the updating and continuous improvement of teaching work, highlighting the importance of flexibility, adaptability and willingness to change in the educational field.

Keywords: Lesson Study, teacher professional development, collaboration, educational improvement, critical reflection

Resumen

En el contexto educativo actual, la necesidad de que los docentes aprendan a desaprender se presenta como una problemática crucial. El objetivo de este estudio es analizar cómo la Lesson Study permite a los profesionales de la educación adaptarse a los cambios constantes en el ámbito pedagógico y renovar sus prácticas para ofrecer una enseñanza de calidad y pertinente a los estudiantes del siglo XXI. Para abordar esta problemática, se implementó una metodología basada revisión documental para buscar la reflexión crítica de las prácticas docentes, la apertura a nuevas ideas y enfoques, y la disposición a cuestionar y modificar creencias arraigadas sobre la enseñanza. Los principales resultados obtenidos revelaron un aumento en la motivación y el compromiso de los docentes, así como mejoras significativas en la calidad de las prácticas pedagógicas. Los estudiantes, a su vez, mostraron un mayor interés en el aprendizaje y un mejor desempeño académico. En conclusión, el proceso de desaprender y aprender nuevas formas de enseñanza resultó fundamental para la actualización y mejora continua de la labor docente, destacando la importancia de la flexibilidad, la adaptabilidad y la disposición al cambio en el ámbito educativo.

Palabras clave: Lesson Study, desarrollo profesional docente, colaboración, mejora educativa, reflexión crítica

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Introduction

Nowadays, learning is not only about acquiring new knowledge but also about questioning and reorganizing existing knowledge—a process that may involve unlearning to make way for new ideas. For teachers, the ability to unlearn and relearn is essential, especially when faced with the need to modify long-established educational practices in changing contexts. Two key concepts in this process of teacher updating and transformation are Lesson Study and learning to unlearn.

Lesson Study, originating from Japan, is a collaborative methodology in which teachers plan, observe, and reflect on lessons together, offering a space for critical analysis of their pedagogical practices (Peña & Pérez Gómez, 2019). This approach fosters peer learning and provides a structure that invites educators to revisit—and often abandon—outdated methodologies. In this sense, Lesson Study serves as a facilitator of unlearning, since by working collaboratively, teachers are prompted to reassess what they know and how they apply it in the classroom.

On the other hand, learning to unlearn becomes a crucial skill for teachers aiming to improve their educational practices. Unlearning involves letting go of habits or approaches that are no longer effective in order to adopt new methods that better meet current educational needs (Garzón, 2021). Lesson Study plays a fundamental role in this process, as it provides a framework for reflection and continuous feedback, allowing teachers to identify which of their practices need to be updated or even completely abandoned.

Several authors related to education and teacher training highlight the importance of this educational strategy and the concept of unlearning to enhance teaching. Gómez and Gómez (2021) state that the process of learning to unlearn requires deep questioning of entrenched beliefs and practices in education. This approach demands that teachers reflect critically on their own pedagogical experiences and be open to detaching from traditional approaches that no longer meet current demands. They also emphasize the importance of adaptability in the face of constant changes in the educational environment, allowing educators to evolve and adopt more relevant and innovative methodologies that foster meaningful and dynamic learning.

Likewise, Sumba et al. (2022) emphasize in their study that the expression learning to unlearn emerges as a crucial skill for educators who aspire to become true agents of change within the educational system. This process involves continuously rethinking their educational approach in order to improve classroom procedures and respond to the challenges of contemporary education, driving transformations that meet new demands in teaching and learning. Thus, this continuous process of reflection and renewal allows teachers to stay current and provide quality education to their students. Therefore, teachers must be prepared to unlearn what is no longer relevant and learn new teaching methods that address today's student needs.

In this context, it is important to understand that the changes that lead teachers to continuous learning are the result of external societal factors such as technological advances, the construction of new realities, and interculturality brought about by migration and globalization. As a result, today's students and their needs are shaped by new factors, which in turn has caused traditional teaching methods to lose the impact they once had 10 or 15 years ago. Therefore, it is essential to

seek alternatives such as methodologies, strategies, or techniques that contextualize knowledge, enabling students to achieve meaningful learning.

In response, Mujica (2020) points out that the rapid evolution of society and technology imposes constant challenges on teachers, who must adapt and renew their pedagogical practices to respond to students' changing needs. In this context, it is essential for educators to remain up to date and engaged in ongoing professional development to ensure quality education that prepares students to face the challenges of the 21st century. Collaboration among teachers and the use of technological tools are key factors in promoting meaningful and relevant learning in the classroom.

Similarly, Jimpikit Unkuch et al. (2024) emphasize that the integration of innovative methodologies, along with the development of skills such as critical thinking and problem-solving, is fundamental to preparing students for an increasingly demanding and competitive future. Therefore, it is crucial that teachers maintain an open attitude toward experimentation and creativity in their teaching practice, thereby fostering the holistic development of their students.

However, many education professionals face challenges in unlearning deeply rooted traditional methodologies and adopting more innovative and effective approaches, due to resistance to change and a lack of ongoing training in new pedagogical strategies. Córica (2020) and Casa et al. (2022) indicate in their studies that resistance to change hinders teaching quality and the achievement of optimal learning outcomes. For this reason, López-Larios et al. (2023) argue that it is essential for teachers to receive continuous training and support to update their skills and knowledge, and to foster an open mindset toward educational innovation.

Padilla and Alcocer (2023) suggest that educators must receive support and training to adapt to the demands of an ever-evolving educational environment, as ongoing updates in new methodologies will enable them to improve the quality of teaching and student learning. This aligns with Velásquez and Atehortúa (2024), who state that the lack of pedagogical updates can create a gap between students' learning expectations and the strategies used by teachers, negatively affecting motivation and academic performance. This underscores the importance of keeping teachers up to date with teaching methodologies and tools. Likewise, continuous professional development enables teachers to adapt to the changing needs of students and foster a more effective learning environment. In this way, innovation is encouraged and quality education is ensured.

Da Silva et al. (2022) point out that resistance to change can contribute to a disconnect between theory and practice in the classroom, thus limiting professional development and teaching effectiveness. Therefore, it is essential for teachers to stay up to date with new methodologies and educational approaches in order to adapt to the ever-evolving needs of students. This promotes a dynamic and enriching learning environment that fosters student academic success. Moreover, a willingness to change and grow as an educator can significantly improve teaching quality and have a positive impact on the learning process, thus fostering a more effective and enriching learning environment for everyone involved in education.

Collaboration among colleagues and the creation of learning communities can be key to encouraging the adoption of innovative teaching practices. Sumba and Mejía (2021) state that

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

educational institutions should promote a culture of collaboration and teamwork among teachers to encourage the exchange of experiences and best practices. By creating an environment where educators can share their knowledge and learnings, the professional development of each team member is enhanced. Teamwork enables teachers to address educational challenges from multiple perspectives, facilitating the creation of innovative and effective solutions. In addition, the regular exchange of experiences and successful strategies helps standardize high-quality teaching practices across the institution. Ultimately, this collaborative culture strengthens the sense of community and mutual support among teachers, creating a more cohesive and dynamic educational environment that benefits both educators and students.

Pérez (2022) argues that the barriers preventing the effective implementation of new pedagogical and technological methodologies in the classroom can be overcome by promoting collaboration and teamwork among teachers, which will significantly contribute to improving overall educational quality. He also emphasizes the importance of educational institutions fostering a culture of change and continuous improvement, providing the resources and opportunities necessary for educators to adapt to pedagogical and technological innovations.

According to Llinás and Guerra (2022), the only way to overcome the barriers that prevent the implementation of more effective pedagogical practices that align with current educational demands is for educational institutions to promote a culture of change and continuous improvement. This would drive innovation in the educational field and ensure that teachers are prepared to adapt to new demands and challenges in today's world.

For this reason, Elliott (2015) states that ongoing teacher training, continuous professional development, and openness to innovation are key to overcoming resistance to change and improving educational quality. Teachers must be willing to update their pedagogical practices to ensure meaningful and relevant learning for students, which requires a constant attitude of reflection and a readiness to adapt to society's changing needs. Moreover, it is essential for teachers to stay up to date with new technologies and educational methodologies to provide quality education in a rapidly evolving world.

Given the growing need to adapt to an ever-changing educational environment, it becomes imperative to explore training strategies that facilitate unlearning and promote the continuous professional development of teachers. These strategies should focus on the development of soft skills, the integration of innovative educational technologies, and active participation in collaborative learning communities—elements that are crucial for ensuring effective teacher training.

This study aims to establish a connection between Lesson Study and the concept of learning to unlearn as it clearly manifests in teacher education. By participating in collaborative Lesson Study sessions, educators recognize the need to replace outdated pedagogical methods with more effective approaches. In this sense, unlearning involves actively transforming previous knowledge to improve teaching.

Thus, Lesson Study becomes a valuable tool for professional development and educational innovation, providing a framework for improving teaching through evidence-based practices and peer dialogue. This methodology allows teachers to identify areas for improvement and collaborate on implementing positive changes in the classroom, fostering a culture of continuous learning within institutions. In this way, the educational community is strengthened, and professional growth is enhanced, based on the concept of learning to unlearn—a key paradigm for the evolution of teacher training that promotes the abandonment of obsolete pedagogical concepts and practices. Unlearning, therefore, involves not only recognizing the limitations of traditional methods but also opening up to new perspectives and innovations.

In this regard, Souza et al. (2021) indicate that unlearning has gained relevance as a strategy that promotes critical reflection and the transformation of prior knowledge, thereby facilitating meaningful learning.

Thus, a collaborative methodology is proposed to improve teaching and learning, positioning unlearning as a fundamental process for teachers' professional development through Lesson Study. The present study's main objective is to examine the role of Lesson Study as a training strategy to improve teaching practice, analyzing the benefits, challenges, and necessary conditions for its effective implementation in various educational contexts, including that of the educational unit in the city of Quevedo.

Hence, there is a need to explore training strategies that facilitate the process of unlearning and promote the ongoing professional development of teachers. These strategies must focus on the development of soft skills, the use of innovative educational technologies, and participation in collaborative learning communities to ensure continuous and effective teacher education.

The relationship between Lesson Study and learning to unlearn becomes evident when teachers, through these collaborative sessions, recognize that certain pedagogical methods need to be replaced by more effective ones. In this sense, unlearning is not simply about forgetting, but about actively transforming what one knows to improve teaching. Gómez and Gómez (2021) argue that this process is essential for teachers to adjust to contemporary demands, while Calvo Salvador et al. (2021) emphasize how the collaborative learning involved in Lesson Study facilitates this change.

Lesson Study is thus positioned as an effective tool for teacher professional development and educational innovation, as it provides a framework for improving teaching based on evidence and peer dialogue. It can significantly contribute to educational quality. Its focus on reflection and collaboration allows teachers to identify areas for improvement and work together to implement positive changes in the classroom. Furthermore, it promotes the creation of a culture of continuous learning in educational institutions, encouraging the exchange of ideas and experiences among education professionals. In doing so, the educational community is strengthened and teachers' professional growth is enhanced.

On the other hand, learning to unlearn should be considered a fundamental concept in the teacher training process, as it is an integral part of continuous teacher education and should not be

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

confined to initial training based solely on theoretical learning from universities or teacher training colleges. Calvo Salvador et al. (2021) argue that the concept of learning to unlearn is key to the evolution of teacher education, as it encourages the abandonment of pedagogical concepts and practices that have become obsolete. This process involves not only recognizing the limitations of traditional methods but also opening up to new perspectives and innovative approaches.

Finally, Souza et al. (2021) note that the concept of unlearning has gained significance in the educational field as a strategy that promotes critical reflection and the transformation of previous knowledge to enable meaningful learning. In this way, a collaborative methodology is proposed to improve teaching and learning, with unlearning positioned as a fundamental process in teachers' professional development. In this context, the present study aims to examine the role of Lesson Study as a training strategy for improving teaching practice, identifying the benefits, challenges, and necessary conditions for its effective implementation in various educational contexts.

Methodology

The main objective of this research was to conduct a documentary review to explore the practices associated with Lesson Study. This process enabled a deep understanding of this educational methodology through the search for relevant information and a detailed analysis of the findings. Additionally, the study aimed to identify the advantages and disadvantages of implementing this methodology in educational settings, as well as possible recommendations for its effective application. The results provided a broad perspective on the effectiveness of this methodology in improving the teaching-learning process.

2.1. Type of Research

The research adopted a descriptive, qualitative approach, involving a systematic review of existing literature on Lesson Study. Rather than generating new data or experimental results, it synthesized and analyzed the accumulated knowledge in this field, identifying trends, approaches, and prevailing practices. This approach enabled the identification of best practices and areas for improvement in implementation, while also contributing to the theoretical development of this educational methodology. Furthermore, the study aimed to establish connections among different studies to offer a more comprehensive and coherent view of the topic.

This research was conducted following the PRISMA guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses). The choice of these guidelines was justified by their ability to ensure the rigor and precision of the study. PRISMA provides a standardized framework that allows researchers to clearly and transparently structure the systematic review process, ensuring that every stage—from the formulation of the research question to the presentation of results—is thoroughly documented.

Inclusion criteria were established to select peer-reviewed scientific articles published within the last five years (from 2019 to 2023), with the goal of ensuring the relevance and currency of the data

analyzed. Original articles in both Spanish and English were included, sourced from databases such as Scielo, Scopus, Redalyc, and the Google Scholar search engine.

The search strategy employed logical Boolean operators (AND, OR, NOT) to optimize results and cover as much relevant information as possible. The keywords used were Lesson Study, teacher training, professional development, and educational improvement, ensuring adequate coverage of the key aspects of the topic under study.

The study focused on primary sources, meaning original and direct data related to the research topic. Priority was given to open-access articles to include recent and relevant research. These primary sources included empirical studies that collected original data through surveys, interviews, and case studies that explored the implementation of the Lesson Study methodology and its impact on teacher training and professional development. Additionally, qualitative studies were analyzed to gain a deeper understanding of teachers' experiences in Lesson Study processes through interviews and focus groups, aiming to assess the effectiveness of this training strategy.

Finally, case studies provided insight into specific contexts where Lesson Study was implemented, analyzing challenges and successes, which proved valuable in drawing lessons applicable to other educational institutions.

Regarding the exclusion criteria, secondary sources such as blogs, videos, theses, gray literature, and reports were excluded to maintain the academic and scientific quality of the study. Articles published before 2019 were also excluded to ensure the information was up to date.

After applying the PRISMA method to search for studies, the following results were obtained:

- Google Scholar: 240 results
- Scielo: 30 results
- Redalyc: 78 results
- Scopus: 10 results

An advanced search was then conducted in each database, consolidating:

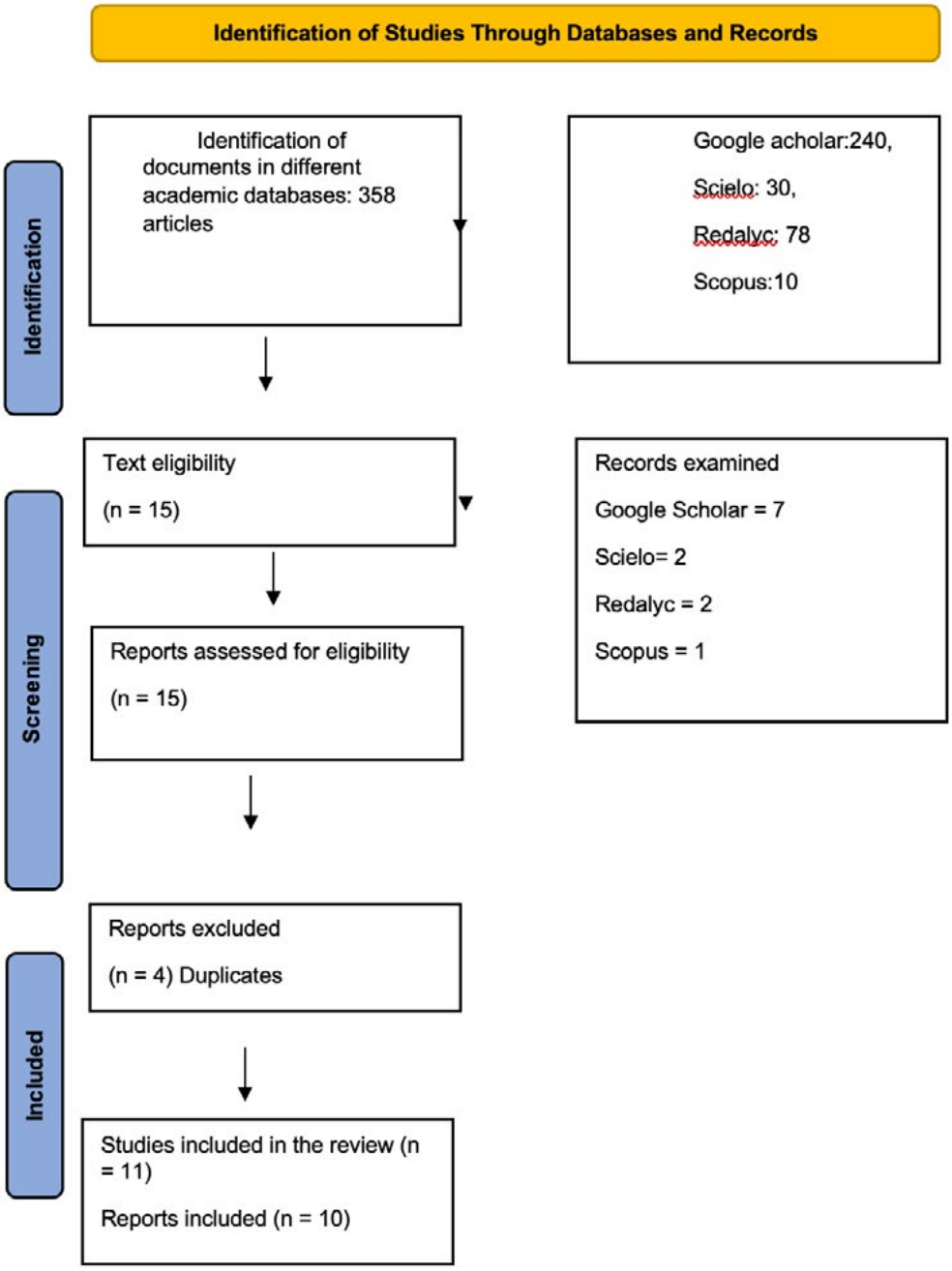
- 4 articles from Google Scholar
- 1 from Scielo
- 3 from Redalyc
- 2 from Scopus

In total, 10 reports were rigorously evaluated to determine their validity, as detailed below.

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Figure 1

PRISMA Analysis of the Investigated Databases



2.2 Study Phases

The study will be divided into several phases in order to ensure a systematic and comprehensive process:

2.2.1 Planning and Definition of Inclusion Criteria

A meticulous planning phase will be conducted, which will include defining the inclusion criteria to filter relevant information. These criteria will be designed to ensure the selection of pertinent documents that specifically address Lesson Study.

2.2.2 Inclusion and Exclusion Criteria

As shown in Table 1, the inclusion and exclusion criteria are as follows, and these helped filter the amount of information according to the necessary specifications.

Table 1

Selection Criteria

Criterios de Inclusión	Criterios de Exclusión
Relevancia temática: Los documentos deben abordar específicamente la *Lesson Study* y sus prácticas.	**Literatura gris:** Se excluyeron documentos que no estuvieran publicados en revistas indexadas o fuentes académicas reconocidas.
Actualidad: Los documentos deben haber sido publicados en los últimos años (2019 -2024) garantizar la relevancia y vigencia de la información.	**Documentos no pertinentes**: Se excluyeron aquellos documentos que no estuvieran directamente con la Lesson Study o que trataran sobre temas ajenos.
Enfoque educativo: Los documentos deben centrarse en el ámbito educativo y su aplicación práctica.	**Artículos menores al 2019**: A menos que fueran considerados textos canon en el tema de la *Lesson Study.*
Idioma: Se consideraron documentos en español e inglés, con el objetivo de ampliar el alcance de la revisión y abarcar una mayor diversidad de fuentes.	**Idioma:** No se consideraron documentos que estén en otros idiomas fuera del español e inglés,
Participantes: Se incluyeron documentos que abordaran experiencias y perspectivas de docentes y estudiantes como actores clave en el contexto de la *Lesson Study*.	

Note: Own elaboration.

To evaluate the quality of the selected articles, several rigorous methods were applied. First, a methodological quality assessment was conducted, reviewing the internal and external validity of the studies, the coherence of the objectives, and the clarity of the methods used. Additionally, a critical appraisal was performed using checklists such as the CASP (Critical Appraisal Skills Programme) for both qualitative and quantitative studies, which helped identify potential biases, weaknesses in study design, and the robustness of the results. Finally, the indexing of sources in recognized academic databases such as Scopus and Web of Science was verified to ensure that the selected studies had a relevant impact in the academic field.

Results

Table 2 presents the results obtained from the information search in different databases, applying the previously established inclusion and exclusion criteria.

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Table 2

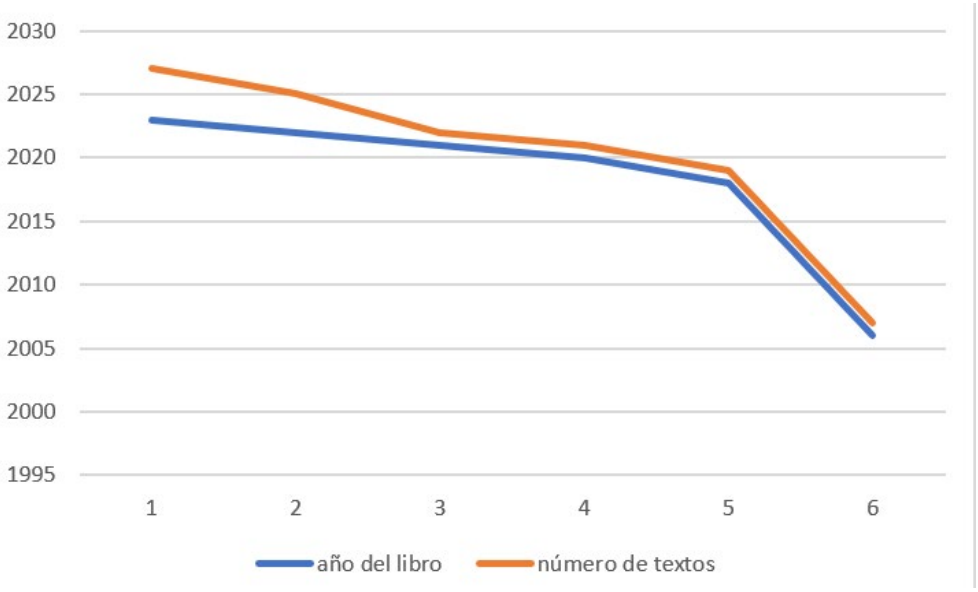
Results

Categoría	Resultados	Análisis
Mejorar la práctica docente	De acuerdo a Yusella et al. (2023) permite a los docentes observar, analizar y refinar sus estrategias de enseñanza en un entorno colaborativo, utilizando datos concretos del aprendizaje de los estudiantes. - Fomenta el intercambio de conocimientos y experiencias entre docentes, creando una comunidad de aprendizaje profesional (Simón et al., 2018).	- La implementación exitosa de Lesson Study requiere un compromiso sostenido por parte de los docentes, la administración escolar y las autoridades educativas. - Es fundamental contar con recursos y tiempo adecuados para la planificación, observación y análisis de las lecciones. - Se requiere una cultura escolar que valore la colaboración, la reflexión y la mejora continua.
Dificultades a lo largo de la vida para la práctica docente	- Los docentes enfrentan diversos desafíos en su vida profesional, como la falta de recursos, el aumento de la carga de trabajo, las demandas cambiantes de los estudiantes y la sociedad, y la necesidad de actualización constante (Gómez, 2022). - Estas dificultades pueden afectar negativamente la motivación, el bienestar y la eficacia docente (Fernández, 2021); (Lewis et al., 2006) .	- Es necesario brindar a los docentes el apoyo y los recursos necesarios para afrontar estos desafíos. - Se deben implementar políticas y programas que promuevan el bienestar docente y la formación continua. - Es fundamental fomentar una cultura escolar positiva y colaborativa que valore el trabajo docente.
Educación continua y formación	- La educación continua y la formación son esenciales para que los docentes se mantengan actualizados y adapten sus prácticas a las necesidades cambiantes de los estudiantes y la sociedad (Rubio, 2023). - Existen diversas modalidades de educación continua y formación, como cursos, talleres, seminarios, programas en línea y comunidades de aprendizaje profesional (Corica et al., 2023). - La participación en actividades de educación continua y formación puede tener un impacto positivo en la práctica docente y el aprendizaje de los estudiantes.	- Es necesario que las instituciones educativas y las autoridades educativas brinden oportunidades de educación continua y formación de alta calidad a los docentes. - Los docentes deben ser incentivados a participar en actividades de educación continua y formación. - Se deben reconocer y valorar los logros de los docentes en materia de educación continua y formación.
El Aprendizaje docente	- El aprendizaje es un proceso complejo y multifacético que involucra cambios duraderos en el conocimiento, las habilidades, las actitudes y los comportamientos de los individuos (Usieva, 2022). - El aprendizaje ocurre en diversos contextos, tanto formales como informales, y a lo largo de toda la vida (Marhayani et al.,2022). - Existen diferentes teorías del aprendizaje que explican cómo aprenden los individuos (Estrella & Olfos, 2023) (Robles & Gómez, 2020).	- La comprensión del aprendizaje es fundamental para diseñar y implementar prácticas docentes efectivas. - Los docentes deben conocer las diferentes teorías del aprendizaje y cómo aplicarlas en su práctica. - Es importante crear entornos de aprendizaje que fomenten el aprendizaje activo, colaborativo y significativo.

Note: Own elaboration.

Figure 1

Tendencia de los textos seleccionados



Note: Own elaboration, 2024.

The Lesson Study methodology has gained attention in recent years as an innovative strategy for teacher improvement. It is a collaborative cycle that allows teachers to plan, implement, observe, and reflect on their teaching practices. This research-based and collaborative approach has proven to be beneficial in enhancing teaching and learning. Therefore, the discussion in this study has been structured into categories.

3.1 Improving Teaching Practice

Lesson Study is a professional development methodology that has been shown to be effective in improving pedagogical practice and student learning outcomes in various educational contexts (Simón et al., 2018). This aligns with findings from Yusella et al. (2023), who support this claim by reporting significant progress in elementary students' writing skills following its implementation. Specifically, there was a 3.11% increase in written expression abilities and a notable 21.43% increase in the proper use of capitalization and punctuation. These results demonstrate that Lesson Study not only fosters tangible improvements in student skills but also creates a collaborative environment where teachers can refine their pedagogical practices.

Hervas (2023) has confirmed these findings, emphasizing that Lesson Study fosters the development of critical thinking, problem-solving, and teamwork skills in both students and teachers. Additionally, this methodology has contributed to the creation of professional learning communities, which in turn strengthen instructional leadership and a culture of continuous improvement in educational institutions.

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

3.2 Lifelong Challenges in Teaching Practice

Throughout their careers, teachers face various challenges that can hinder their professional growth. However, implementing Lesson Study offers a pathway to address these difficulties collaboratively and reflectively. Soto Gómez (2022) notes that it encourages greater openness and flexibility in teaching practices, which enriches the diversity of educational approaches. Moreover, the collaboration promoted by Lesson Study can help overcome barriers such as the limited connection between theory and practice in initial teacher training.

Lesson Study has proven to be an effective tool for addressing the challenges teachers encounter during their careers and for promoting their professional development. As Gómez (2022) points out, it fosters openness and flexibility in pedagogical practices, enhancing the diversity of teaching approaches—especially important as teachers often struggle to connect theory to practice, particularly during early training.

Other studies support these findings. For example, Fernández (2021) highlights that Lesson Study facilitates teacher collaboration, enabling them to overcome individual obstacles and develop a sense of community and shared responsibility. Similarly, Lewis et al. (2006) report that the methodology encourages critical reflection on practice, contributing to the continuous improvement of pedagogical skills.

3.3 Continuing Education and Training

Lesson Study not only benefits teachers in their initial training but also offers opportunities for ongoing professional development. Rubio (2023) states that it contributes to professional growth through collaboration among participants, suggesting its value as a tool in continuing education programs for teachers. Furthermore, Corica et al. (2023) highlight that it has been effective in teacher development across various domains, including moral education. These findings underscore the versatility of Lesson Study as a professional learning strategy that can be adapted to different contexts and educational needs.

3.4 Teacher Learning

Lesson Study impacts not only teaching practice but also student learning processes. Yusella et al. (2023) show that its implementation led to significant improvements in elementary students' writing skills. This suggests that teacher collaboration and the reflective focus promoted by the methodology can lead to more effective and meaningful student learning.

Collaboration among teachers is key to this process. It can play a central role in shaping educational practices, particularly by becoming a mechanism for teacher learning and continuous professional development, embedded in the daily activities of schools. Collaboration can thus be a key driver in defining educational practice (Estrella & Olfos, 2023).

Additionally, student motivation and academic performance are often negatively affected by inefficient teaching practices. The creation of collaborative structures in schools is a useful instructional and training resource. Student engagement in learning activities can have a positive impact on their perception of participation opportunities (Robles & Gómez, 2020).

Lesson Study also emerges as an invaluable tool for enhancing teaching practices and promoting continuous professional development. Usieva (2022) emphasizes that it fosters collaboration and professional growth among teachers, allowing them to improve their teaching through feedback and peer observation. Moreover, Marhayani et al. (2022) highlight that Lesson Study not only affects pedagogical practice but also promotes a collaborative and enriching learning environment.

Conclusions

Throughout this research, it has been confirmed that this methodology significantly enhances teachers' pedagogical competencies, establishing itself as a key mechanism for their ongoing professional development. One of the main benefits identified is the promotion of a culture of critical reflection among educators, enabling them to engage in a systematic cycle that includes the planning, observation, and detailed analysis of lessons. This deep reflection process not only facilitates the improvement of teaching skills but also promotes constant self-assessment, creating an environment that drives the continuous improvement of educational practices.

Teachers' ability to adapt to changing demands and the evolving needs of students is a crucial aspect that is strengthened through Lesson Study. In this sense, identifying the necessary conditions for its effective implementation in various educational contexts is linked to the creation of a school environment that promotes lifelong learning and supports teachers' professional growth. This requires adequate structural and organizational conditions that naturally and effectively integrate the Lesson Study cycle into the daily classroom routine.

Furthermore, collaboration among teachers provides a valuable space for sharing experiences, knowledge, and instructional approaches, thereby enriching the educational process. This collaborative work not only facilitates the exchange of ideas and the co-creation of innovative solutions to pedagogical challenges but also strengthens the sense of professional community. In this way, teachers become researchers of their own practice, reflecting and adjusting their methods based on the observations and analyses of their peers.

One of the most notable benefits of Lesson Study is its capacity to improve students' academic performance, as the lessons designed within this process are carefully planned and adjusted through collaborative observations and discussions. This enables teachers to more effectively identify and meet the individual needs of their students, promoting more personalized and meaningful learning. It has been observed that students in classrooms where Lesson Study is implemented show greater engagement and motivation, indicating the effectiveness of this methodology.

Additionally, Lesson Study contributes to the holistic development of students, a key aspect of 21st-century education. As teachers adjust their instructional strategies based on observations,

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

learning becomes more dynamic and relevant. This not only enhances academic skills but also develops critical competencies such as critical thinking, problem-solving, and creativity, which are essential for facing future challenges.

To ensure the effective implementation of this methodology across different educational contexts, it is essential to create a school culture that values collaboration and continuous learning. This culture should be driven by school leadership and supported by educational institutions, providing the necessary resources, time, and space for teachers to carry out Lesson Study cycles effectively. It is also fundamental that schools and school districts foster an environment in which teachers feel supported and valued in their professional development.

The impact of Lesson Study goes beyond the immediate classroom, as successful practices and lessons learned tend to spread within the educational community, generating a multiplier effect that benefits other teachers and students beyond the team directly involved. The research offers practical recommendations for implementing this methodology in real educational settings, emphasizing the need for institutions to create the conditions required for its sustainability. This includes strong organizational support, training opportunities for teachers, and a continued commitment to educational improvement.

Finally, to enhance the implementation of the Lesson Study methodology in diverse educational contexts—such as rural areas—collaborative networks could be established among teachers from different schools to share resources and experiences, facilitating access to continuous professional development. In urban areas, it is recommended to use digital platforms to share lessons and observations among educators, promoting a collaborative learning culture. For under-resourced schools, forming partnerships with local universities could be beneficial, providing support in lesson planning and the development of innovative pedagogical strategies. In schools with diverse student profiles, it is suggested to adapt lessons to the specific needs of each group, fostering inclusion and personalized learning.

References

Calvo Salvador, A., Haya Salmón, I., & Rodríguez-Hoyos, C. (2021). Aprendiendo el oficio docente. El modelo Lesson Study para mejorar la docencia en la universidad. *Educatio siglo XXI*, *39*(1), 211-234. https://doi.org/10.6018/educatio.469241

Casa, G. C., Herrera, D. G. T., Drouet, S. J. M., & Mejía, E. D. C. (2022). El diagnóstico y sus implicaciones teórico-prácticas en el uso de las TIC en el proceso de enseñanza-aprendizaje de la contabilidad. *Dominio de las Ciencias*, *8*.

Corica, A. R., Parra, V. E., & Figueroa, D. P. (2023). *Una enseñanza por lesson study en la formación de profesores en matemática*.

Córica, J. L. (2020). Resistencia docente al cambio: Caracterización y estrategias para un problema no resuelto. RIED Revista Iberoamericana de Educación a Distancia, 23(2), 255. https://doi.org/10.5944/ried.23.2.26578

Da Silva Pina Neves, R., Fiorentini, D., & Silva, J. M. (2022). Lesson Study presencial y la pasantía curricular supervisada en matemáticas: contribuciones al aprendizaje docente. *Paradigma*, *1*.

Elliott, J. (2015). Lesson y learning Study y la idea del docente como investigador. *Revista interuniversitaria de formación del profesorado*, *29*(3), 29-46. https://www.redalyc.org/articulo.oa?id=27443871003

Garzón, J. E. C. (2021). Planeación de clases en el marco de la enseñanza para la comprensión con metodología de Lesson Study. *Plumilla educativa*, *27*(1), 39-67.

Gómez, Á. I. P., & Gómez, E. S. (2021). *Lesson Study. Aprender a enseñar para enseñar a aprender*. Ediciones Morata.

Gómez, E. (2022). Lesson Study y pensamiento práctico. *Márgenes: Revista de Educación de la Universidad de Málaga*, *3*, 164-180.

Hervas, G. (2023). Formación y desarrollo profesional a través del enfoque japonés del lesson study. Principios para su diseño y aplicación. *Educación médica*, *24*(1), 100784. https://doi.org/10.1016/j.edumed.2022.100784

Jimpikit Unkuch, E. M., Cerpa Flores, J. A., Padilla Gavilanez, K. I., & Pino Jimenez, J. E. (2024). Estrategias de aprendizaje activo en matemáticas: promoviendo el pensamiento crítico y la resolución de problemas. Revista Social Fronteriza, 4(2), e42237. https://doi.org/10.59814/resofro.2024.4(2)237

Llinás Torres, C., & Guerra, D. de J. A. (2022). Pedagogía restaurativa: una propuesta de resignificación educativa para la reconstrucción del tejido social en Colombia. *Estudios Pedagógicos*, *48*(2), 159-178. https://doi.org/10.4067/s0718-07052022000200159

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

López-Larios, C., González-Bello, E. O., & Covarrubias Capaceta, D. (2023). Experiencias de una innovación en estudiantes normalistas: didáctica imaginativa para la planificación de la enseñanza. RIDE revista iberoamericana para la investigación y el desarrollo educativo, 13(26). https://doi.org/10.23913/ride.v13i26.1521

Marhayani, D. A., Zulfahita, Z., Mursidi, A., Basith, A., Mariyam, M., Sunarsih, E., Sumarli, S., Triani, S. N., Buyung, B., Citroresmi, N., Sulistri, E., Mertika, M., Mulyani, S., Fitri, F., Mariana, D., & Setyowati, R. (2022). Lesson study as an effort to improve the quality of learning in freedom to learn. *International Journal of Public Devotion*, *5*(2), 89. https://doi.org/10.26737/ijpd.v5i2.3487

Midgette, A. J., Ilten-Gee, R., Powers, D. W., Murata, A., & Nucci, L. (2018). Using Lesson Study in teacher professional development for domain-based moral education. *Journal of Moral Education*, 1-21. https://doi.org/10.1080/03057240.2018.1445982

Mujica-Sequera, R. M. (2020). La Enseñanza Tecnoemocional en la Educación del Siglo XXI. *Revista Tecnológica-Educativa Docentes 2.0*, *9*(2), 71-78. https://doi.org/10.37843/rted.v9i2.147

Muñiz, L. J. R., Aguilar-González, Á., Alonso-Castaño, M., García-Honrado, I., Lorenzo-Fernández, E., & Muñiz-Rodríguez, L. (2023). Explorando nuevas estrategias de formación del profesorado de matemáticas: un enfoque ampliado del Lesson Study para el desarrollo profesional en la Escuela Andorrana. *Revista Interuniversitaria de Formación del Profesorado. Continuación de la antigua Revista de Escuelas Normales*, *98*.

Padilla Contreras, A. B., & Alcocer Vázquez, E. (2023). Formación continua de docentes de Media Superior en el área de lectoescritura. Una revisión sistemática. Innovaciones educativas, 25(38), 276-291. https://doi.org/10.22458/ie.v25i38.4206

Peña Trapero, N., & Pérez Gómez, Á. I. (2019). Las disposiciones subjetivas de los docentes en la superación de las resistencias al cambio ante procesos cíclicos de formación basados en la investigación (Lesson Study): Estudio de un caso. *Revista complutense de educación*, *30*(2). https://doi.org/10.5209/rced.57780

Pérez, O. (2022). La influencia de la innovación educativa utilizando las metodologías ABP en la cultura institucional de los posgrados de tres universidades paraguayas. Academo, 9(1), 23-37. https://doi.org/10.30545/academo.2022.ene-jun.3

Río Fernández, J. L. D. (2021). *La'Lesson Study'como estrategia formativa para aprender a enseñar en la universidad: algunas reflexiones derivadas de un Proyecto de Innovación Educativa desarrollado en la*.

Rubio, M. N. Á. (2023). *Aprendizaje visible y consciente a través de lesson study y debriefing en la formación inicial docente (Doctoral dissertation)*.

Sarmiento Berrezueta, S. M., García Gallegos, K. H., & Pozo Domínguez, O. E. (2021). Implementación de la metodología Lesson Study en el centro de apoyo San Vicente de Ecuador. *Revista Universidad y Sociedad*, *13*(5), 376-388.

Scheller, M., & Zimdars, E. R. (2022). Lesson study in the continuous education of teachers who teach mathematics: a context view of national scenario. *Revista de Ensino de Ciências e Matemática*, *13*(1), 1-22. https://doi.org/10.26843/rencima.v13n1a07

Simón, C., Echeita, G., & Sandoval, M. (2018). Incorporating students' voices in the 'Lesson Study'as a teacher-training and improvement strategy for inclusion/La incorporación de la voz del alumnado a la 'Lesson Study'como estrategia de formación docente y mejora para la inclusión. *Culture and Education*, *30*(1), 205-225.

Soto Gómez, E. (2022). Lesson Study y pensamiento práctico. La experiencia y la relación como principio de conocimiento. *Márgenes Revista de Educación de la Universidad de Málaga*, *3*(3), 164-180. https://doi.org/10.24310/mgnmar.v3i3.15346

Souza, D. M. de, Backes, V. M. S., Medina, J. L., & Lazzari, D. D. (2021). Formação docente para bacharéis: possibilidades para professores novatos. *Revista Ibero-Americana de Estudos em Educação*, 2427-2441. https://doi.org/10.21723/riaee.v16i4.14046

Sumba Arévalo, V. M., & Mejía Vera, J. G. (2021). Lesson Study: reconstruir el conocimiento práctico en y para la profesionalización docente de la UNAE. Revista Practicum, 6(1), 44-58. https://doi.org/10.24310/revpracticumrep.v6i1.10173

Sumba Arévalo, V. M., Ministerio de Educación del Ecuador, & Ecuador. (2022). La Formación de docentes en ejercicio a través de la Lesson Study: preocupaciones en una realidad compleja. *Praxis educativa*, *26*(1), 1-17. https://doi.org/10.19137/praxiseducativa-2022-260109

Usieva, B. (2022). Lesson Study" as a Tool to Improve Teaching and Learning. *Vestnik ZKU*, 35-37.

Velásquez Murcia, S., & Atehortúa Leguizamón, G. V. (2024). Transformación de la práctica de enseñanza de un profesor de ciencias naturales en formación inicial a través de la metodología de lesson study. *Gondola*, *19*(1), 179-188. https://doi.org/10.14483/23464712.20997

Yusella, Y., Andajani, K., Anggraini, A. E., Untari, S., & Arifin, S. (2023). Implementation of Lesson Study as an attempt to improve elementary students' writing skills. *Primary: Jurnal Pendidikan Guru Sekolah Dasar*, *12*(2), 429. https://doi.org/10.33578/jpfkip.v12i2.9689

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Uisrael
REVISTA CIENTÍFICA

May – August 2025 period
Vol. 12, No. 2
rcientifica@uisrael.edu.ec
https://doi.org/10.35290/rcui.v12n2.2025.1435 • e-ISSN: 2631 - 2786

The impact of artificial intelligence on the personalization of learning and its effects on academic performance and educational inclusión

El impacto de la inteligencia artificial en la personalización del aprendizaje y sus efectos en rendimiento académico e inclusión educativa

Date of receipt: 2024-08-19 Date of acceptance: 2025-03-10 Date of publication: 2025-05-10

Carlos Manuel Núñez-Michuy [1]
Universidad Técnica Estatal de Quevedo, Ecuador
cnunezm@uteq.edu.ec
https://orcid.org/0000-0003-2298-7697

Diego Bonilla-Jurado [2]
Instituto Tecnológico Superior España, Ecuador
diego.bonilla@iste.edu.ec
https://orcid.org/0000-0002-4784-7861

Thalía Isabel Baquedano Moya [3]
Universidad Técnica Estatal de Quevedo, Ecuador
tbaquedanom@uteq.edu.ec
https://orcid.org/0000-0002-5072-3296

Luis Marcial Agualongo-Chela [4]
Universidad Estatal de Bolivar, Ecuador
lagualongo@ueb.edu.ec
https://orcid.org/0000-0003-4804-0522

Abstract

The introduction of Artificial Intelligence (AI) in education is revolutionizing the The introduction of Artificial Intelligence (AI) in education is revolutionizing the personalization of learning, positioning it as a crucial tool for pedagogical progress. This article analyses how AI is transforming the field of education, facilitating the personalization of content and pedagogical strategies according to the individual needs of learners. Through a case study analysis in educational settings, the effects of AI on academic performance were explored, highlighting improvements in comprehension and retention of information. The study employed a quantitative approach with a quasi-experimental design to evaluate the contribution of AI to educational inclusion by providing personalized support to students with special needs and learning difficulties, promoting a more equitable environment. The findings highlight that the integration of this tool in the classroom can enhance academic performance by providing learning experiences tailored to the characteristics of each student. However, challenges are identified that need to be addressed, such as data privacy and bias in the algorithms. The article concludes with recommendations for effective implementation of AI in education and considers ethical and social implications for ensuring responsible integration in education.

Keywords: Feedback, artificial intelligence, academic performance, personalization of learning, inclusion

Resumen

La introducción de la Inteligencia Artificial (IA) en la educación está revolucionando la personalización del aprendizaje, posicionándose como una herramienta crucial para el progreso pedagógico. Este artículo analiza cómo la IA está transformando el ámbito educativo, facilitando la personalización de contenidos y estrategias pedagógicas según las necesidades individuales de los estudiantes. A través de un análisis de caso en entornos educativos, se exploraron los efectos de la IA en el rendimiento académico, destacando mejoras en la comprensión y retención de información. El estudio empleó un enfoque cuantitativo con diseño cuasi-experimental para evaluar la contribución de la IA a la inclusión educativa, proporcionando apoyo personalizado a estudiantes con necesidades especiales y dificultades de aprendizaje, promoviendo un entorno más equitativo. Los hallazgos destacan que la integración de esta herramienta en el aula puede potenciar el rendimiento académico al proporcionar experiencias de aprendizaje ajustadas a las características de cada estudiante. Sin embargo, se identifican desafíos que deben ser abordados, como la privacidad de datos y el sesgo en los algoritmos. El artículo concluye con recomendaciones para una implementación efectiva de la IA en la educación, y considera implicaciones éticas y sociales para asegurar una integración responsable en el ámbito educativo.

Palabras clave: Retroalimentación, inteligencia artificial, rendimiento académico, personalización del aprendizaje, inclusión

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Introduction

Education, in its constant pursuit of improving efficiency and equity, has undergone significant advancements with the incorporation of new technologies. In this context, Artificial Intelligence (AI) has emerged as a powerful and promising tool capable of transforming the educational landscape (Ortiz Muñoz, 2024). AI has the ability to process large volumes of data and learn from them, offering considerable potential to personalize learning, optimize academic outcomes, and promote educational inclusion (García Villaroel, 2021).

In recent years, as Navarrete-Cazales and Manzanilla-Granados (2023) mention, international organizations such as UNESCO and the OECD have promoted the integration of artificial intelligence in education as part of strategies to improve access, equity, and the quality of learning. However, it should not be considered a daily access point. In addition, various government policies have begun incorporating AI tools into curricula and teaching methodologies, evidencing a growing trend toward educational digitalization and automation.

In this regard, artificial intelligence emerges as an innovative solution to overcome these limitations, allowing for more effective personalization of learning through adaptive tools that dynamically adjust content and pedagogical methodologies according to students' performance and preferences. Moreover, its analytical and adaptive capabilities contribute to promoting educational inclusion by providing targeted support for students with diverse needs, ensuring equitable access to education (Morocho Cevallos et al., 2023).

The incorporation of Artificial Intelligence in this process offers a promising solution to overcome these limitations. Through the use of adaptive tools, AI enables dynamic adjustment of both content and pedagogical strategies based on each student's performance and preferences (O.-Y. Aparicio-Gómez & Aparicio-Gómez, 2024).

This study aims to analyze the impact of artificial intelligence on personalized learning, academic performance, and educational inclusion. It evaluates its effectiveness in comparison to traditional teaching methods. Through a quasi-experimental design, the study examines how the use of AI-based adaptive tools allows for dynamic adjustment of content and teaching strategies based on individual student performance and needs.

Literature Review

Artificial intelligence, defined as the ability of computer systems to perform functions that typically require human intelligence, has had a notable influence on various fields, including education (Moreno Padilla, 2019). It has become a fundamental tool for transforming teaching and learning processes in educational contexts, offering applications such as adaptive learning platforms, intelligent tutoring systems, and advanced educational data analysis tools that allow content and pedagogical strategies to be tailored to individual needs and student performance (Romero & Ventura, 2020).

Personalized learning, driven by artificial intelligence, is considered one of the most innovative and promising areas of contemporary education, as this approach aims to align educational content and teaching methodologies with each student's unique characteristics. For example, tools like ChatGPT, where Kirwan (2023) provides initial reflections on teaching academic integrity in the era of large language models.

This personalization by different AI systems is made possible through the use of algorithms that analyze complex data on academic performance, dynamically adjusting the difficulty level and content of tasks (Holmes et al., 2019). These systems collect real-time data, such as chat bot interactions, response times, interaction patterns, and survey answers, enabling personalized recommendations and adjustments that optimize the learning process for each individual (Alshahrani, 2023).

Beyond its benefits in personalized learning, artificial intelligence also plays a key role in educational inclusion. By adapting content and pedagogical strategies to individual needs, AI facilitates more equitable access to education, allowing students with learning difficulties or special needs to receive personalized support and progress at their own pace (Xu et al., 2019).

To illustrate these benefits, two relevant case studies can be considered. The first involves an analysis of an adaptive learning platform focused on mathematics that adjusts exercises based on students' competency levels. This study found a 15% improvement in students' academic performance compared to conventional methods (Pane et al., 2015).

In addition to its influence on academic performance, AI is fundamental in promoting educational inclusion, as AI-based systems can adapt content and pedagogical strategies to individual needs, contributing to the creation of more inclusive educational environments. As Cotton et al. (2024) explain, it is also crucial to preserve academic integrity in the ChatGPT era.

Furthermore, AI systems can provide specialized support to students with special educational needs, enabling a more accessible and equitable learning experience (Kabudi et al., 2021). Technologies such as screen readers and voice recognition applications facilitate more efficient access to educational material for students with visual impairments or writing difficulties (Khan & Khusro, 2021).

Adaptive systems have the ability to provide personalized resources that allow students to progress at their own pace, encouraging greater participation and reducing learning barriers (Zhang et al., 2020). Additionally, the possibility of offering continuous, individualized feedback ensures that students with special needs receive the necessary support in real time, significantly improving their educational experience (Desmond et al., 2018).

Some examples of effective implementation include adaptive reading applications that adjust difficulty levels based on students' abilities and offer personalized feedback, which has proven effective in improving reading skills in students with specific difficulties (Muñoz et al., 2022). Another example is the development of accessible educational material in multiple formats—text,

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

audio, and video—facilitating learning for students with various disabilities (Crisol-Moya et al., 2020).

Despite the substantial benefits that artificial intelligence offers in the education sector, there are also important ethical challenges that must be addressed. Data privacy, algorithmic mining, and increasing dependency on technology are among them (Hoofnagle et al., 2018). Collecting data on student academic performance raises serious concerns regarding privacy and data security, highlighting the need for clear policies and the implementation of comprehensive security measures (Chassignol et al., 2018).

AI systems can reflect biases present in the data they were trained on, potentially disadvantaging specific student groups (Gallent-Torres et al., 2023). To mitigate this risk, it is crucial to use a variety of data sources and conduct regular audits to identify and correct any discrepancies. Moreover, excessive dependence on technology could hinder the development of critical skills, such as critical thinking and problem-solving. Therefore, it is essential to integrate AI tools with traditional teaching methods (Selwyn, 2019).

Methodology

2.1. Research Design

This study employed a quantitative approach to explore the effect of artificial intelligence on personalized learning, academic performance, and educational inclusion based on empirical study data. A quasi-experimental design was developed to analyze the influence of AI tools. Two study groups were selected: one composed of students and teachers using AI-based adaptive learning platforms, and a control group composed of students and teachers using traditional teaching methods. The comparison between these two groups allowed for the measurement of the effects of AI-driven personalized learning on students' academic performance and the promotion of educational inclusion.

2.2. Sample

For this research, the selected participant was the Unidad Educativa del Milenio APCH: San Miguel, located in the city of Bolívar. The sample used for the analysis and development consisted of two classes from the institution, each with 35 students, for a total of 70 students. Within the institution, the two study groups were identified: the experimental group (using AI systems for personalized learning) and the control group (using traditional pedagogical methods).

2.3. Data Collection

To collect quantitative data, three main instruments were used, providing a comprehensive assessment of the impact of artificial intelligence on personalized learning and its effects on academic performance.

First, standardized academic assessments were conducted at the beginning and end of the study period, focusing on key subjects such as mathematics, science, and language. These assessments were designed to maintain equivalence in difficulty and content, allowing for accurate and consistent comparison of students' results, thus providing an objective measure of academic performance changes throughout the study.

In addition, satisfaction surveys were administered to students and teachers to capture their perceptions of the effectiveness and impact of AI tools on learning and teaching. The surveys included questions about the ease of use of the tools, the quality of feedback provided, and the general perception of personalized learning, offering a broad perspective on user experience with the implemented AI tools.

Finally, interaction data was collected by tracking student activity on adaptive learning platforms, including study time, frequency of access, and interaction patterns. The information provided by the AI platforms was used to assess the effectiveness of personalized learning and to identify how student interactions with the platforms influenced their educational experience.

Observations also focused on the two analyzed samples: the experimental group, which used AI-based online platforms such as the free and paid versions of ChatGPT, Gemini, and Copilot to personalize learning; and the control group, which used traditional pedagogical learning methods. The purpose of these observations was to document the implementation of AI tools in the teaching and learning process within these groups. Special attention was given to student-teacher interactions, the use of AI technologies in educational activities, and the general classroom dynamics.

2.4. Data Analysis

To evaluate differences in academic performance between the experimental group, which used AI tools to personalize learning, and the control group, which used conventional pedagogical methods, comparative statistical analyses were performed. Independent sample t-tests and an analysis of variance (ANOVA) were applied to verify the statistical significance of the observed differences. These methods facilitated the identification of whether the use of AI in the educational process produced significant improvements in the evaluated subjects, providing a solid basis for comparing the educational impact of both pedagogical strategies in the selected sample.

Results

The group statistics results are presented in Table 1, which shows significant differences between the experimental group, which used artificial intelligence tools, and the control group, which used conventional pedagogical methods, across several key dimensions.

Before the intervention, both groups had very similar academic performance means (7.26 for the experimental group and 7.23 for the control group), with closely aligned standard deviations

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

and standard errors, indicating that the groups were well balanced before the implementation of artificial intelligence.

However, after the intervention, the academic performance of the experimental group experienced a substantial increase, reaching a mean of 9.00, while the control group's performance decreased to 6.60. This result highlights the significant impact of the intervention on the academic performance of the experimental group.

Improvements in understanding and the perceived quality of feedback were notably higher in the experimental group compared to the control group. In the experimental group, the mean improvement in comprehension was 4.26, in contrast to just 1.37 in the control group, underscoring that AI facilitated a deeper understanding of academic content. Similarly, knowledge assimilation was better perceived by the experimental group, with a mean of 4.23, while the control group scored only 1.40.

The low standard deviations in these measurements emphasize consistency in responses within each study group, reinforcing the effectiveness of the intervention in these areas.

Table 1

Group Statistics – Results

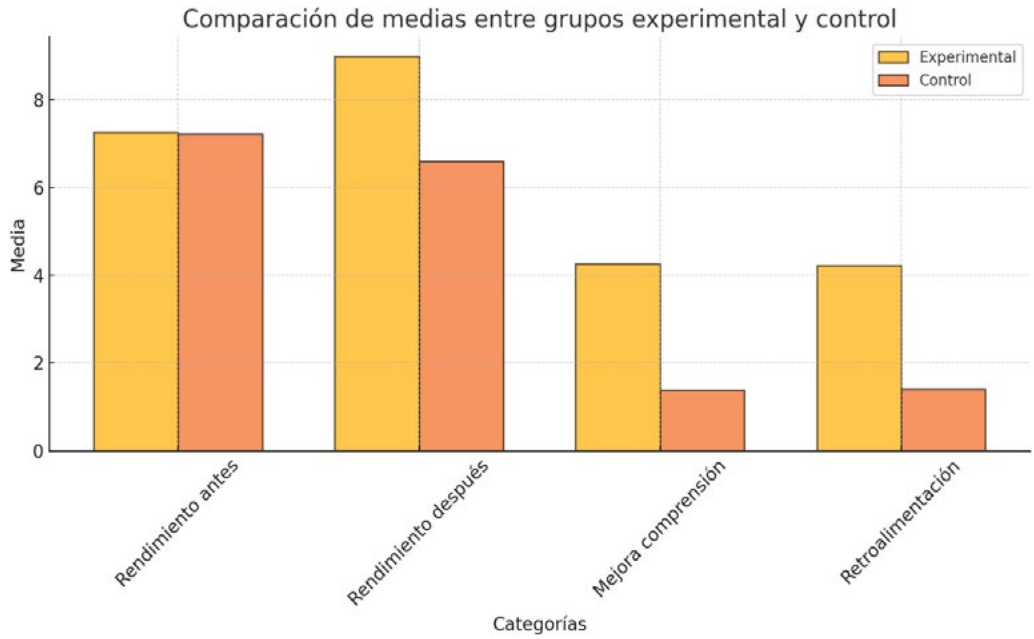
Estadísticas de grupo					
	Es	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
Performance Before	Experimental	35	7.2571	1.12047	0.18939
	Control	35	7.2286	1.16533	0.19698
Performance After	Experimental	35	9.0000	0.93934	0.15878
	Control	35	6.6000	1.41837	0.23975
Comprehension Improvement	Experimental	35	4.26	0.657	0.111
	Control	35	1.37	0.646	0.109
Feedback	Experimental	35	4.23	0.770	0.130
	Control	35	1.40	0.497	0.084

The comparative analysis shows that the experimental group exhibits significantly higher performance than the control group in the evaluated categories after the intervention, highlighting a notable improvement in understanding and feedback. This reflects that the strategies applied to the experimental group generated a measurable positive impact, while the initially similar performance

between both groups confirms that starting conditions were homogeneous, allowing the results to be attributed to the AI-based learning interventions.

Figure 1.

Comparison of Means Between Experimental and Control Groups



The independent samples test in Table 2 shows that, in terms of academic performance before the intervention, there were no statistically significant differences between the experimental and control groups. Levene's test for equality of variances yielded F = 0.026 and Sig. = 0.872, indicating that the variances are homogeneous. Similarly, the t-test (t = 0.105, df = 68, Sig. = 0.917) shows a minimal difference in means between the two groups (0.02857), which is not statistically significant, as confirmed by the 95% confidence interval ranging from -0.51671 to 0.57385. These results suggest that both study groups were balanced in terms of academic performance before the intervention.

Regarding academic performance after the intervention, results show a considerable improvement in the experimental group compared to the control group. Levene's test revealed a significant difference in variances (F = 7.974, Sig. = 0.006), indicating that equal variances should not be assumed. The corresponding t-test (t = 8.346, df = 59.013, Sig. = 0.000) shows a significant mean difference of 2.40000. The 95% confidence interval for this difference ranges from 1.82460 to 2.97540, reinforcing the conclusion that the intervention (use of AI) had a significant impact on the experimental group's performance.

Likewise, improvement in understanding and feedback were significantly higher in the experimental group. For improvement in understanding, Levene's test showed variances could be assumed equal (F = 0.064, Sig. = 0.801), and the t-test (t = 18.531, df = 68, Sig. = 0.000) indicated a mean difference

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

of 2.886, with a 95% confidence interval ranging from 2.575 to 3.196, highlighting a substantial improvement in the experimental group compared to the control.

Similarly, for feedback, Levene's test revealed a variance difference (F = 7.509, Sig. = 0.008), and the t-test (t = 18.255, df = 58.132, Sig. = 0.000) reported a mean difference of 2.829, with a 95% confidence interval ranging from 2.518 to 3.139. These results indicate that the experimental group perceived more effective academic feedback than the control group.

Table 2

Independent Samples Test – Results

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	gl	Sig. (2-tailed) l	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Upper	Superior
Performance Before	Equal variances assumed	.026	.872	.105	68	.917	.02857	.27326	-.51671	.57385
	Equal variances not assumed			.105	67.896	.917	.02857	.27326	-.51672	.57386
Performance After	Equal variances assumed	7.974	.006	8.346	68	.000	2.40000	.28756	1.82619	2.97381
	Equal variances not assumed			8.346	59.013	.000	2.40000	.28756	1.82460	2.97540
Improvement in Understanding	Equal variances assumed	.064	.801	18.531	68	.000	2.886	.156	2.575	3.196
	No se asumen varianzas iguales			18.531	67.978	.000	2.886	.156	2.575	3.196
Feedback	Equal variances assumed	7.509	.008	18.255	68	.000	2.829	.155	2.519	3.138
				18.255	58.132	.000	2.829	.155	2.518	3.139

ANOVA Analysis – Results

The ANOVA analysis reveals significant differences between the groups across several key dimensions, highlighting the relevance of the adopted approach.

Regarding improvement in understanding, the sum of squares between groups is 113.230 with 6 degrees of freedom (df), resulting in a mean square of 18.872. The F-value of 19.378 with a significance (Sig.) of 0.000 indicates a statistically significant difference in comprehension ability between groups, evidencing a substantial impact on student learning following the intervention.

For the sense of inclusion, the sum of squares between groups is 26.144 with 6 degrees of freedom, producing a mean square of 4.357. The F-value of 2.781 and a significance of 0.018 reveal meaningful differences in the perception of inclusion among the various groups within the educational setting. This underscores the importance of considering not only academic outcomes but also student well-being and integration in the learning process.

On the other hand, the participation variable did not show significant differences between groups, with a sum of squares between groups of 2.368, an F-value of 0.812, and a significance of 0.564. This indicates that the intervention did not have a considerable impact on student participation in the classroom.

Lastly, feedback, with a sum of squares between groups of 78.608, a mean square of 13.101, an F-value of 9.173, and a significance of 0.000, reveals significant differences between groups. This indicates that students experienced notable variations in feedback. These differences, along with those observed in comprehension improvement and the sense of inclusion, demonstrate that the intervention had a considerable impact on students' perception and learning processes.

Table 3

ANOVA – Results

ANOVA						
		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Comprehension Improvement	Between Groups	113.230	6	18.872	19.378	.000
	Within Groups	61.355	63	0.974		
	Total	174.586	69			
Participation	Between Groups	2.368	6	0.395	0.812	.564
	Within Groups	30.617	63	0.486		
	Total	32.986	69			
Sense of Inclusion	Between Groups	26.144	6	4.357	2.781	.018
	Within Groups	98.727	63	1.567		
	Total	124.871	69			
Feedback	Between Groups	78.608	6	13.101	9.173	.000
	Within Groups	89.978	63	1.428		
	Total	168.586	69			

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Results

The results demonstrate that the intervention using AI-based tools has a positive influence on various dimensions of the educational process, showing notable improvements in the experimental group compared to the control group. Furthermore, the study highlights the importance of factors such as the sense of inclusion and the quality of feedback, which showed significant differences between groups. However, not all variables analyzed reflected significant changes—as in the case of classroom participation—suggesting that certain aspects of the educational environment may be less influenced by the intervention. Overall, the findings emphasize the potential of personalized learning to enhance students' educational experience while also highlighting the complexity of comprehensively measuring the effects of new methodologies in academic settings.

Discussion

The data indicate that the experimental group, which used AI-based tools, showed a considerable increase in academic performance after the intervention, reaching an average score of 9.00 compared to the control group, whose performance decreased to 6.60. This finding highlights the effectiveness of AI in optimizing learning, as also demonstrated in the study by Ifenthaler et al. (2024), showcasing its potential as a key tool for personalized teaching. This result aligns with previous studies by Lavidas et al. (2024) and Obregón et al. (2023), which point out that AI-based adaptive platforms—by adjusting content to students' progress—improve comprehension and information retention (Holmes et al., 2019; Romero & Ventura, 2020).

One of the most relevant aspects is the improvement in academic understanding, where the experimental group showed an average of 4.26 compared to 1.37 in the control group. This suggests that AI tools, such as intelligent tutoring systems, provide tangible learning benefits, which has also been documented in studies by Álvarez and Cepeda (2024) and Aparicio-Gómez (2023), emphasizing AI's ability to offer learning dynamics that help overcome specific academic difficulties (Xu et al., 2019; Pane et al., 2015). Moreover, this personalization aligns with Moreno Padilla's (2019) view of AI as a transformative technology in educational processes.

Feedback, as perceived by students, also showed significant differences between groups, with an average of 4.23 in the experimental group versus 1.40 in the control group. This supports the findings of Álvarez and Cepeda (2024), who highlight the use of AI in higher education settings. AI's ability to adjust content and teaching strategies in real time reinforces its importance in educational contexts, especially when addressing students' individual needs (Holmes et al., 2019).

Another highlighted result is the sense of inclusion, where the AI-based intervention led to significant differences, showing its potential to improve equity in educational access. AI's ability to adapt content and provide specialized support to students with specific needs—as discussed by Korzynski et al. (2023)—underscores the importance of developing educational policies that promote the use of these technologies in inclusive education contexts (Sanchez-Acedo et al., 2024).

For instance, the implementation of virtual assistants and accessible learning tools could become essential components of special education programs. It is also recommended that Ministries of Education and academic institutions develop strategies to evaluate the effectiveness of AI in reducing educational barriers and promoting more equitable learning experiences (Kabudi et al., 2021; Khan & Khusro, 2021). This impact reinforces the role of AI in fostering educational inclusion as a crucial element of technological transformation (Magallanes Ronquillo et al., 2023).

However, not all analyzed dimensions showed significant changes. In the case of participation, no relevant differences were found between the groups, suggesting that this aspect may depend more on contextual and pedagogical factors not directly influenced by AI (Dwivedi et al., 2021). This finding aligns with Selwyn's (2019) argument for integrating technological tools with traditional pedagogical methodologies to comprehensively address learning challenges.

Addressing challenges related to data privacy is essential, as algorithmic bias and technological dependence highlight the need to ensure that AI serves as a complementary tool that enhances pedagogical capabilities and fosters equitable, sustainable learning (Chassignol et al., 2018; Gallent-Torres et al., 2023). These findings open new opportunities for future research—particularly in the integration of AI with inclusive, sustainable, and ethically responsible educational practices (Nedungadi et al., 2024).

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

References

Álvarez Merelo, J. C., & Cepeda Morante, L. J. (2024). El impacto de la inteligencia artificial en la enseñanza y el aprendizaje. *LATAM Revista Latinoamericana de Ciencias Sociales y Humanidades*, *5*(3). https://doi.org/10.56712/latam.v5i3.2061

Alshahrani, A. (2023). The impact of ChatGPT on blended learning: Current trends and future research directions. *International Journal of Data and Network Science*, *7*(4), 2029–2040. https://doi.org/10.5267/j.ijdns.2023.6.010

Aparicio-Gómez, O.-Y., & Aparicio-Gómez, W.-O. (2024). Innovación educativa con sistemas de aprendizaje adaptativo impulsados por Inteligencia Artificial. *Revista Internacional de Pedagogía e Innovación Educativa*, *4*(2). https://doi.org/10.51660/ripie42222

Aparicio-Gómez, W.-O. (2023). La Inteligencia Artificial y su Incidencia en la Educación: Transformando el Aprendizaje para el Siglo XXI. *REVISTA INTERNACIONAL DE PEDAGOGÍA E INNOVACIÓN EDUCATIVA*, *3*(2), 217–230. https://editic.net/journals/index.php/ripie/article/view/156/143

Chassignol, M., Khoroshavin, A., Klimova, A., & Bilyatdinova, A. (2018). Artificial Intelligence trends in education: A narrative overview. *Procedia Computer Science*, *136*, 16–24. https://doi.org/10.1016/j.procs.2018.08.233

Cotton, D. R. E., Cotton, P. A., & Shipway, J. R. (2024). Chatting and cheating: Ensuring academic integrity in the era of ChatGPT. Innovations in Education and Teaching International, 61(2), 228–239. https://doi.org/10.1080/14703297.2023.2190148

Crisol-Moya, E., Herrera-Nieves, L., & Montes-Soldado, R. (2020). Virtual education for all: Systematic review. *Education in the Knowledge Society*, *21*. https://doi.org/10.14201/eks.20327

Desmond, D., Layton, N., Bentley, J., Boot, F., Borg, J., Dhungana, B., Gallagher, P., Gitlow, L., Gowran, R., Groce, N., Mavrou, K., Mackeogh, T., McDonald, R., Pettersson, C., & Scherer, M. (2018). Assistive technology and people: a position paper from the first global research, innovation and education on assistive technology (GREAT) summit. *Disability and Rehabilitation: Assistive Technology*, *13*(5), 437–444. https://doi.org/10.1080/17483107.2018.1471169

Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., Duan, Y., Dwivedi, R., Edwards, J., Eirug, A., Galanos, V., Ilavarasan, P. V., Janssen, M., Jones, P., Kar, A. K., Kizgin, H., Kronemann, B., Lal, B., Lucini, B., … Williams, M. D. (2021). Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management*, *57*. https://doi.org/10.1016/j.ijinfomgt.2019.08.002

Gallent-Torres, C., Zapata-González, A., & Ortego-Hernando, J. L. (2023). The impact of Generative Artificial Intelligence in higher education: a focus on ethics and academic integrity. *RELIEVE - Revista Electronica de Investigacion y Evaluacion Educativa*, *29*(2). https://doi.org/10.30827/RELIEVE.V29I2.29134

García Villaroel, J. J. (2021). Implicancia de la inteligencia artificial en las aulas virtuales para la educación superior. *Orbis Tertius UPAL*, *5*(10), 31–52. https://doi.org/10.59748/ot.v5i10.98

Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial Intelligence in Education Promises and Implications for Teaching and Learning*. MA: Center for Curriculum Redesign.

Hoofnagle, C. J., Van Der Sloot, B., & Zuiderveen Borgesius, F. (2018). The European Union General Data Protection Regulation: What It Is And What It Means. *SSRN Electronic Journal*. https://doi.org/doi:10.2139/ssrn.3254511

Ifenthaler, D., Majumdar, R., Gorissen, P., Judge, M., Mishra, S., Raffaghelli, J., & Shimada, A. (2024). Artificial Intelligence in Education: Implications for Policymakers, Researchers, and Practitioners. Technology, Knowledge and Learning. https://doi.org/10.1007/s10758-024-09747-0

Kabudi, T., Pappas, I., & Olsen, D. H. (2021). AI-enabled adaptive learning systems: A systematic mapping of the literature. *Computers and Education: Artificial Intelligence*, *2*. https://doi.org/10.1016/j.caeai.2021.100017

Khan, A., & Khusro, S. (2021). An insight into smartphone-based assistive solutions for visually impaired and blind people: issues, challenges and opportunities. *Universal Access in the Information Society*, *20*(2), 265–298. https://doi.org/10.1007/s10209-020-00733-8

Kirwan, A. (2023). ChatGPT and university teaching, learning and assessment: some initial reflections on teaching academic integrity in the age of Large Language Models. *Irish Educational Studies*. https://doi.org/10.1080/03323315.2023.2284901

Korzynski, P., Mazurek, G., Altmann, A., Ejdys, J., Kazlauskaite, R., Paliszkiewicz, J., Wach, K., & Ziemba, E. (2023). Generative artificial intelligence as a new context for management theories: analysis of ChatGPT. Central European Management Journal, 31(1), 3–13. https://doi.org/10.1108/CEMJ-02-2023-0091

Lavidas, K., Voulgari, I., Papadakis, S., Athanassopoulos, S., Anastasiou, A., Filippidi, A., Komis, V., & Karacapilidis, N. (2024). Determinants of Humanities and Social Sciences Students' Intentions to Use Artificial Intelligence Applications for Academic Purposes. *Information (Switzerland)*, *15*(6). https://doi.org/10.3390/info15060314

Magallanes Ronquillo, K. K., Mora Rodríguez, A. J., Aguas Veloz, J. F., & Plúas Pérez, L. del R. (2023). La inteligencia artificial aplicada en la innovación educativa en el proceso de enseñanza y aprendizaje. LATAM Revista Latinoamericana de Ciencias Sociales y Humanidades, 4(2). https://doi.org/10.56712/latam.v4i2.706

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Moreno Padilla, R. D. (2019). La llegada de la inteligencia artificial a la educación. *Revista de Investigación En Tecnologías de La Información*, *7*(14), 260–270. https://doi.org/10.36825/riti.07.14.022

Morocho Cevallos, R. A., Cartuche Gualán, A. P., Tipan Llanos, A. M., Guevara Guevara, A. M., & Ríos Quiñónez, M. B. (2023). Integración de la Inteligencia Artificial en la Educación. *Ciencia Latina Revista Científica Multidisciplinar*, *7*(6), 2032–2053. https://doi.org/10.37811/cl_rcm.v7i6.8832

Muñoz, J. L. R., Ojeda, F. M., Jurado, D. L. A., Peña, P. F. P., Carranza, C. P. M., Berríos, H. Q., Molina, S. U., Farfan, A. R. M., Arias-Gonzáles, J. L., & Vasquez-Pauca, M. J. (2022). Systematic Review of Adaptive Learning Technology for Learning in Higher Education. *Eurasian Journal of Educational Research*, *2022*(98), 221–233. https://doi.org/10.14689/ejer.2022.98.014

Navarrete-Cazales, Z., & Manzanilla-Granados, H. M. (2023). Una perspectiva sobre la inteligencia artificial en la educación. Perfiles Educativos, 45(Especial), 87–107. https://doi.org/10.22201/iisue.24486167e.2023.Especial.61693

Nedungadi, P., Tang, K. Y., & Raman, R. (2024). The Transformative Power of Generative Artificial Intelligence for Achieving the Sustainable Development Goal of Quality Education. Sustainability (Switzerland), 16(22). https://doi.org/10.3390/su16229779

Obregón, L. A., Onofre, C. Y., Ii, B., Pareja, E. J., & Iii, Z. (2023). The impact of artificial intelligence in the educational field O impacto da inteligência artificial na área educacional. *POCAIP*, *8*(39), 342–354. https://doi.org/10.23857/fipcaec.v8i3

Ortiz Muñoz, F. J. (2024). La Inteligencia Artificial como elemento disruptivo para consolidar el cambio del paradigma educativo. *Derecom*, *36*, 65–85. https://dialnet.unirioja.es/servlet/articulo?codigo=9509032

Pane, J., Steiner, E., Baird, M., & Hamilton, L. (2015). *Continued Progress: Promising Evidence on Personalized Learning*. RAND Corporation. https://www.rand.org/pubs/research_reports/RR1365.html

Romero, C., & Ventura, S. (2020). Educational data mining and learning analytics: An updated survey. *Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery*, *10*(3). https://doi.org/10.1002/widm.1355

Sanchez-Acedo, A., Carbonell-Alcocer, A., Gertrudix, M., & Rubio-Tamayo, J. L. (2024). The challenges of media and information literacy in the artificial intelligence ecology: deepfakes and misinformation. *Communication and Society*, *37*(4 Special Issue), 223–239. https://doi.org/10.15581/003.37.4.223-239

Selwyn, N. (2019). *Should robots replace teachers? AI and the Future of Education* (1st ed.). Polity Press.

Xu, Z., Wijekumar, K., Ramirez, G., Hu, X., & Irey, R. (2019). The effectiveness of intelligent tutoring systems on K-12 students' reading comprehension: A meta-analysis. *British Journal of Educational Technology*, *50*(6), 3119–3137. https://doi.org/10.1111/bjet.12758

Zhang, L., Basham, J. D., & Yang, S. (2020). Understanding the implementation of personalized learning: A research synthesis. In *Educational Research Review* (Vol. 31). Elsevier Ltd. https://doi.org/10.1016/j.edurev.2020.100339

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Uisrael
REVISTA CIENTÍFICA

May – August 2025 period
Vol. 12, No. 2
rcientifica@uisrael.edu.ec
https://doi.org/10.35290/rcui.v12n2.2025.1440 • e-ISSN: 2631 - 2786

The influence of reading comprehension on the resolution of mathematical problems in Basic General Education students

La influencia de la comprensión lectora en la resolución de problemas matemáticos en los estudiantes de Educación General Básica

Date of receipt: 2024-09-24 Date of acceptance: 2025-01-20 Date of publication: 2025-05-10

PhD. Héctor Francisco Rojas Avilés[1]
Universidad Central del Ecuador, Ecuador
hfrojas@uce.edu.ec
https://orcid.org/0000-0002-3269-3708

Nadia Estefania Curipallo Peralta[2]
Universidad Central del Ecuador, Ecuador
necuripallo@uce.edu.ec
https://orcid.org/0000-0002-1612-4521

Jacqueline Alejandra Díaz Parra[3]
Universidad Central del Ecuador, Ecuador
jadiazp1@uce.edu.ec
https://orcid.org/0000-0002-2767-3868

Abstract

The research was carried out due to the high rate of difficulties in understanding mathematical problems for their respective resolution, which is why the objective is to determine the influence of reading comprehension on the resolution of mathematical problems in sixth grade students of Education. Basic General of the Diez de Agosto Educational Unit in the 2022-2023 school year. Which, the methodology was used with a positivist paradigm and a quantitative approach, in addition the design was non-experimental because the variables were not manipulated directly, also the type was documentary because a review of the literature that supported the research was carried out. Likewise, the level was descriptive because the dimensions and indicators of the variables were characterized. On the other hand, the study was carried out on 36 parallel sixth grade students "A" and a questionnaire was applied to collect data. Finally, the results that were determined were that reading interpretation influences the resolution of mathematical problems.

Keywords: reading comprehension, problem solving, mathematics, literature

Resumen

La investigación se realizó por el alto índice de dificultades en la comprensión de problemas matemáticos para su respectiva resolución, es por ello que, el objetivo es determinar la influencia de la comprensión lectora en la resolución de problemas matemáticos en los estudiantes de sexto grado de Educación General Básica de la Unidad Educativa Diez de Agosto en el año lectivo 2022-2023. Lo cual, se utilizó la metodología con un paradigma positivista y un enfoque cuantitativo, además el diseño fue no experimental porque no se manipulan las variables directamente, también el tipo fue documental debido a que, se realizó una revisión a la literatura que sustentaron la investigación, así mismo el nivel fue descriptivo porque se caracterizó las dimensiones e indicadores de las variables. Por otro lado, el estudio se realizó a 36 estudiantes de sexto grado paralelo "A" y se aplicó un cuestionario para la recolección de datos. Finalmente, los resultados que se determinaron fueron, que la interpretación lectora influye en la resolución de problemas matemáticos.

Palabras clave: comprensión lectora, resolución de problemas, matemática, literatura

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Introduction

Currently, human beings depend on the information provided by science and the media. Therefore, the ability to read and comprehend texts is essential in daily life. However, recent studies reveal that students have limited reading comprehension, which has led to several learning difficulties, such as poor vocabulary, deficient verbal fluency in reading, and a lack of text interpretation across various subjects. This situation represents a serious challenge for educational systems, as it limits young people's opportunities for personal and professional development.

At an international level, according to the Progress in International Reading Literacy Study (PIRLS, 2021), countries such as Spain scored 521, which is below the required standard, while Ireland, England, and Croatia have an intermediate level of reading comprehension. On the other hand, data from UNESCO, obtained through a Regional and Comparative Study presented in November 2021, indicate that four out of five children in Latin America and the Caribbean cannot understand a simple text. Additionally, it is noted that since 2013, the writing and reading comprehension level of primary education students in Ecuador has not improved.

Under these circumstances, it is important to remember that, as a result of the pandemic, the country has experienced a significant educational delay, particularly in subjects such as Language and Literature and Mathematics. Nationally, various schools in Ecuador exhibit problems stemming from limited reading comprehension, significantly affecting students' learning processes.

According to the National Institute of Educational Evaluation (INEE, 2018):

The average performance in Ecuador is 377, which highlights the severe difficulties that many Ecuadorian students face in situations requiring problem-solving skills in mathematics. A total of 70.9% of Ecuadorian students do not reach level 2, which is categorized as the basic performance level in mathematics (p. 44).

Additionally, regarding reading performance, the following is stated:

Ecuador's average score in reading is 409, placing it at level 2, which corresponds to the minimum competency level. It is important to mention that there are students in Ecuador whose performance is even below level 1a. The proportion of students in Ecuador who reach level 1b at most is 15.5% (INEE, 2018, p. 43).

In this context, these percentages reveal that only a minimum number of students achieve a high level of reading comprehension, while the majority can only complete basic reading comprehension tasks, such as recognizing implicit information in the text—one of the simplest questions in the PISA assessments. This data indicates that Ecuador faces a severe educational lag, which worsened with the arrival of the pandemic, creating a challenge for educators. Teachers must work to bridge this gap and reinforce essential content to help students develop the necessary skills and abilities related to reading comprehension.

Furthermore, during pre-professional teaching practices, this issue has been observed at the “Diez de Agosto” Educational Unit among sixth-grade EGB students. It is therefore essential to evaluate and analyze the influence of these two areas of knowledge and how one affects the other. When students face a contextualized math problem, they need strong reading comprehension skills to understand both the statement and the key terms that will guide them toward a solution. For this reason, teachers must become aware of this problem and implement solutions or methodologies to address these learning difficulties. Various studies indicate that “reading comprehension has a high impact on curricular areas; when students do not understand what they read, they will consequently struggle to comprehend a subject, which affects their academic performance and professional development” (Barrera et al., 2019, p. 28).

This research will be conducted with the aim of determining the impact of reading comprehension on mathematical problem-solving, since “it has been portrayed as the resolution of routine exercises that are more related to mechanical or memorization processes” (Patiño et al., 2021, p. 459). Therefore, analyzing a mathematical problem involves reading and understanding it so that the student can solve it successfully. This is where reading comprehension comes into play because if the student faces difficulties in the mathematical reasoning process, they will struggle to decode the mathematical data provided for solving the given problem.

From another theoretical perspective, this work can serve as a contribution to future research focused on the same subject. From a pedagogical standpoint, it will allow teachers to recognize that reading comprehension may be one of the causes preventing students from solving mathematical problems efficiently. Additionally, it will encourage teachers to reflect and commit to implementing pedagogical strategies such as problem decomposition, the use of graphic representations, collaborative learning, guided questioning, among others, to address this issue. From a practical perspective, it will enable teachers to work alongside the Language and Literature department to emphasize in-class activities that help develop reading comprehension. Meanwhile, the mathematics teaching staff should conduct a self-assessment of their pedagogical practices, including motivational and anxiety-related factors affecting sixth-grade students.

For this reason, a study will be conducted at Unidad Educativa Diez de Agosto, located in the province of Pichincha, canton Quito, to determine how the level of reading comprehension influences mathematical problem-solving. This will help assess the extent to which children can identify unknowns and data, as well as how they formulate solutions to mathematical problems. Furthermore, it is essential to highlight the role of the educational institution in strengthening reading comprehension habits, as it plays a crucial role in helping students develop proper study skills.

Through this research, the direct beneficiaries will be the sixth-grade students of General Basic Education at Unidad Educativa Diez de Agosto, as it will help them develop logical-mathematical reasoning skills through the implementation of reading activities with mathematical components, such as tables, statistical graphs, the Cartesian plane, and the history of mathematics.

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

1. Reading Comprehension

Reading comprehension is a skill that allows students to have a literary interpretation of what they read, infer implicit data and information, and thus optimize their level of critical and reflective analysis. Moreover, it is a process of interpretation through which the reader must identify relevant elements within the text in order to decode the information and understand what they are reading (Anaya et al., 2019).

1.1. Literary Interpretation

Literary interpretation is the first level considered within reading comprehension. Vargas (2020) states that literary interpretation is the foundation for an individual to develop optimal comprehension of any type of text, as it enables the retrieval of explicitly stated data within the text, allowing the formulation of assumptions for problem-solving.

Additionally, at the literary level, the reader recognizes phrases, keywords, main ideas, and secondary ideas. Therefore, this level of reading focuses on identifying elements explicitly presented within the text (Cervantes et al., 2017).

1.1.1. Data Recognition

This refers to the student's ability to identify the information present in a mathematical problem. According to Cimpoies (2019), this involves breaking down a problem into different sequential actions until reaching the correct result. Thus, one of the key components to distinguish in a mathematical problem is the unknown, which represents what needs to be found, as well as the given data, which may appear explicitly or implicitly within the text.

Similarly, data recognition is one of the first steps students must take when solving a mathematical problem, as it allows them to establish the main information that will guide them toward the answer (Arrieta & Montenegro, 2021).

1.2. Inference of Texts

The inferential level is one of the three levels that distinguish reading comprehension. It refers to the "ability to use logical reasoning to link prior ideas with new ones through a schematic mental process in the construction of interpretations, which, in some cases, relies on certain implicit clues present in the text" (Olivares, 2019, p. 9).

This level of comprehension involves establishing relationships between parts of the text to extract information, conclusions, or aspects that are not explicitly written in the text, meaning implicit information that can be accessed through prior knowledge (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2019).

1.2.1. Level of Discovery of the Unknown

"This level is characterized by investigating and becoming aware of meanings that allow the reader to read between the lines, assume, and deduce the implicit" (Cervantes et al., 2017, p. 78). For this reason, relationships that go beyond the literal reading are sought, broadening the explanation of the text, adding information and previous experiences, connecting what is read with prior knowledge, formulating hypotheses, and generating new ideas—in other words, the objective is to draw conclusions.

In this way, the student is able to recognize and identify the existence of an unknown value in a problem that can be determined (Diosa, 2019). In this regard, the unknown in a problem is the unknown value that is intended to be found.

1.2.2. Level of Recognition of Mathematical Operations

This refers to distinguishing one mathematical operation from others within a mathematical problem. Therefore, it is necessary to develop the ability to think, reason, communicate, apply, and assess the relationships between mathematical problems and mathematical operations (Ministry of Education, 2018).

Furthermore, this level is aimed at enabling students to construct definitions of different operations to achieve the objective of the activity and to learn the corresponding operations in a meaningful way (Guzmán et al., 2021). For this reason, recognizing operations allows for solving various real-life situations by applying logical abilities and reasoning appropriately.

1.3. Critical Thinking

Critical thinking is the ability of human beings to be responsible and aware of why they act in certain ways and the limits of their actions (Parra & Crespo, 2020). Therefore, critical thinking develops with practice and is demonstrated by observing situations and reflecting on them.

Similarly, critical thinking enables students to analyze, organize, comprehend, learn to take a stance, and argue about a topic presented by the teacher (Romero & Chávez, 2021). For this reason, in mathematics, it is used to arrive objectively at the correct response to a specific mathematical topic.

1.2.3. Application of Methods for Solving Mathematical Problems

Numerous authors have contributed methods for problem-solving to stimulate the development of mathematical thinking. That is, their application helps students find the solution that best fits their specific situation and then solve a problem efficiently (Díaz & Díaz, 2018).

Currently, there are various procedures for solving mathematical problems, including Pólya's Method (1945) (as cited in Oliveros et al., 2021), which establishes four phases: understanding the

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

problem, devising a plan, executing the plan, and reflecting on the solution and the problem-solving process. Each phase includes a series of questions intended to guide the student correctly on how to solve a mathematical problem.

2. Mathematical Problem Solving

Mathematical problem solving is a process based on an analysis of concepts through logical-mathematical reasoning and disciplinary knowledge, stimulating skills that enable the development of basic learning.

Furthermore, problem solving is a skill that involves engaging in cognitive activities. For this reason, solving mathematical problems is a complex process that ranges from reading comprehension to the formulation and solution of equations (Gualdrón et al., 2020). A mathematical problem, therefore, consists of elements such as unknowns and given data, which are provided through a clear and precise statement.

2.1. Process

The term mathematical process is understood as “a set of actions performed by a person pursuing the achievement of an objective” (Naveira & Valdivia, 2022, p. 2). In other words, it is a series of ordered steps that students must follow to solve a problem based on mathematical statements.

Likewise, it is recognized as a sequence executed through a series of steps to achieve meaningful learning, considering that it always follows a structured order and requires a thorough understanding of the problem itself (García, 2019).

2.2. Application of Logical Procedures for Problem Solving

According to Díaz & Díaz (2018), the following logical procedures should be applied:

- Read the problem carefully.
- Identify keywords that express relationships in the problem.
- Identify the variables involved in the problem.
- Express the fundamental idea of the problem in your own words.
- Which of the given data are necessary to find the solution? Are these data sufficient?
- In what units should the result be expressed, or is it dimensionless?

Through these questions, the teacher can guide students’ cognitive activity to help them solve the given mathematical problem efficiently.

2.3. Reasoning

Reasoning is a mental process in which cognitive skills are developed, allowing humans to understand the phenomena around them. It is a capability that enables learning, problem-solving, and reaching logical conclusions. According to Jaramillo & Patiño (2022), not all people have the same ability to reach solutions to problem situations, and these skills must be developed through practice. Reasoning is applied differently by each individual, but everyone possesses this capacity, which develops over time as knowledge is acquired throughout life.

2.3.1. Application of Numerical Language

Numerical language is based on the use of numbers of any type—natural, decimal, fractional, rational, irrational, and even imaginary—with the purpose of expressing magnitudes combined with mathematical symbols.

This language has its own alphabet and composition rules, allowing us to perform mathematical operations and solve various mathematical problems. Núñez & Tuesta (2020) state that mathematical competence is not acquired all at once, suddenly, or spontaneously, but rather accumulatively from an early age. This is why one of the first things taught in early education relates to quantity—even before learning letters. It is essential for children to be familiar with this language since it is widely used in the field of mathematics.

3. Learning

Learning is a cognitive process through which individuals acquire or change their skills, abilities, knowledge, or behaviors through direct experience, observation, reasoning, or instruction. Learning, in essence, is the process of building experience and adapting it to future situations. García (2019) mentions that learning consists of acquiring knowledge and skills based on daily experiences, which can be applied in various aspects of life. Human learning is closely related to personality development and occurs optimally when the individual is motivated, meaning when they want to learn and actively try to do so. To achieve this, they use their memory, attention span, and capacity to acquire and enrich their knowledge.

3.1. Interpretation of Problem Solutions

When solving a mathematical problem, it is essential to provide a clear and concise explanation for better understanding. This requires not only considering mathematical concepts and operations but also linguistic and semantic knowledge. Additionally, understanding the context in which the problem is framed is crucial to giving coherent meaning to the statements (Blanco & Mancilla, 2021).

Furthermore, for a student to arrive at the solution to a problem, they must be able to answer the given question in their own words. This requires taking into account the provided data, the context,

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

the mathematical operation performed, and connecting prior knowledge with newly acquired classroom concepts (Gualdrón et al., 2020).

3.2. Reading Comprehension and Mathematical Problem Solving

Reading comprehension is closely related to mathematical problem solving, as it provides students with the necessary tools to properly interpret problem statements, identify relevant information, and select appropriate strategies for solving and communicating results (Ramírez, 2023).

Moreover, when solving a mathematical problem, comprehension must be prioritized because "these are not isolated processes assigned to a specific discipline; rather, they complement and integrate with each other. A strong comprehension process facilitates understanding problem statements" (Montero & Mahecha, 2020, p. 15). Therefore, reading comprehension and mathematical problem-solving are interconnected and should be taught in a constructive and participatory manner to ensure that children understand what they are solving and achieve meaningful learning.

Objective of the Study:

To determine the influence of reading comprehension on problem-solving in mathematics among sixth-grade students of General Basic Education at Unidad Educativa Diez de Agosto during the 2022-2023 academic year.

Methodology

2.1. Type of Research

The type of research was documentary since primary and secondary sources supporting the study were consulted. This research is based on the positivist paradigm with a quantitative approach because statistical measurements were applied, and statistical tables and graphs were created, given that reading comprehension plays a crucial role in mathematical problem-solving.

2.2. Research Level

The research level was descriptive because the characteristics of reading comprehension and mathematical problem-solving were detailed along with their respective indicators.

2.3. Research Design

A non-experimental design was used because the variables were not directly manipulated. It was also observational, as it allowed for the use of observation and the recording of all events involved, starting from identifying educational problems present in the educational institution where pre-professional practices were carried out.

2.4. Population

The research population consisted of sixth-grade students in General Basic Education, section "A," at Unidad Educativa Diez de Agosto during the 2022-2023 academic year. The distribution was as follows:

Table 1

Sixth Grade of General Basic Education

Gender	Number of Students
Female	21
Male	15
Total	36

2.5. Sample

Since the population did not exceed 200 participants, a non-probabilistic convenience sample was used, and the study was conducted with all 36 students from Unidad Educativa Diez de Agosto. The following inclusion and exclusion criteria were considered:

Inclusion criteria:

- 10-year-old students
- Regular class attendance
- Students with difficulties in reading comprehension that affect mathematical problem-solving
- Possession of informed consent and assent certificates

Exclusion criteria:

- Students older than 10 years
- Irregular class attendance
- Students without difficulties in reading comprehension for mathematical problem-solving
- Lack of informed consent and assent certificates.

2.6. Unit of Analysis

The unit of analysis consists of sixth-grade students in section "A" of General Basic Education at Unidad Educativa Diez de Agosto since the research aims to determine how reading comprehension affects their ability to solve problems.

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

2.7. Operationalization of Variables

Table 2

Operacionalización de variables

VARIABLES	DEFINITION	DIMENSION	INDICATOR	TECHNIQUES & INSTRUMENTS	ITEMS	TYPE
Reading Comprehension	A skill that allows students to obtain a textual explanation of what they read, infer implicit information, and thus develop critical thinking.	Literary Interpretation	- Level of data recognition - Level of unknown discovery - Level of recognition of mathematical operations - Application of methods for problem-solving	Technique: Pedagogical evaluation Instrument: Questionnaire Scale: Estimative	1 2,3 4,5	Quantitative
Mathematical Problem-Solving	A process based on analyzing concepts through reasoning and knowledge, stimulating skills that allow students to develop learning.	Process Reasoning Learning	- Application of logical procedures for problem-solving - Application of numerical language - Interpretation of the problem's solution	Technique: Pedagogical evaluation Instrument: Questionnaire Scale: Estimative	6 7 8	Quantitative

2.8. Technique and Instrument

The research employed the test technique with a questionnaire as the instrument. The questionnaire was designed with eight questions based on the indicators of each dimension of the variables—five questions on reading comprehension and three questions on problem-solving, each with its respective items.

Additionally, an estimative scale was developed to evaluate the process used by students in completing the questionnaire. This scale considered the criteria, which in this case were the indicators of each dimension, as shown in Table 3.

2.8.1. Validity

The validity of the instrument ensured that it effectively measured the characteristic it was intended to assess. In this research, content validity was used to measure domain knowledge.

Content validity was established through expert judgment, where a panel of three professors from Universidad Central del Ecuador participated. These experts had different professional backgrounds and were specialists in their respective fields:

- One expert in Language and Literature
- One expert in Mathematics
- One expert in Research and Language

To validate the content, the following formula was applied. If the result falls within a range of 0.5 to 1, the questionnaire items are considered valid:

Figure 1

Content Validity Formula

$$CVR = \frac{n_e - N/2}{N/2}$$

Note: Content Validity Formula

Where:

ne = Number of experts who consider an item essential or necessary for measurement.

N = Total number of experts participating in the evaluation.

The formula is applied to determine whether the questionnaire items are valid. If the result falls within the range of 0.5 to 1, the items are considered valid.

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Table 3

Estimative Scale for the Questionnaire

ESTIMATIVE SCALE			
School: Unidad Educativa Diez de Agosto **Subject: Mathematics** **Grade: Sixth** **Student's Name: _____** **Purpose: To evaluate the procedure used in solving the applied questionnaire.**			
Item No.	Criterion	YES (2)	NO (1)
1	Identifies the problem's data		
2	Recognizes the problem's unknown		
3	Identifies the mathematical operations		
4	Solves the mathematical problem using its methods		
5	Solves the problem by applying logical procedures		
6	Matches the columns using numerical language		
7	Completes the table using everyday and mathematical language		
8	Explains the answer obtained from the problem		
Total Columns			
TOTAL			

Table 4

Qualitative Scale

Level	Interval	Description
High	13–16 points	Masters the required learning
Medium	9–12 points	Achieves the required learning
Low	5–8 points	Is close to achieving the required learning
Insufficient	1–4 points	Does not achieve the required learning

Data Processing

Once the results were collected on the rating scale, statistical tables and graphs were created to process the data from the applied questionnaire. This allows the information to be organized in order to determine the influence of the variables, as seen in Table 7 and Figure 2.

Statistical Model

To determine the influence of reading comprehension on the resolution of mathematical problems, the Chi-square statistical modeling was used. This involves proposing an alternative hypothesis and a null hypothesis, and if the result is less than 0.05, the alternative hypothesis is accepted.

Ho = Null Hypothesis

Reading comprehension does not influence the resolution of mathematical problems.

Ha = Alternative Hypothesis

Reading comprehension influences the resolution of mathematical problems.

Table 5

Influence of reading comprehension on the resolution of mathematical problems.

Chi-square tests			
	Value	df	Asymptotic significance (two-sided)
Pearson Chi-square	21,750[a]	2	,000
Likelihood ratio	24,423	2	,000
Linear-by-linear assoc.	1,458	1	,227
Number of valid cases	36		

Analysis

According to the results in Table 5, the Chi-square analysis yielded a value of 0.000. This means that the result is less than 0.05; therefore, the alternative hypothesis is accepted, which states that reading comprehension influences the resolution of mathematical problems. Consequently, it can be inferred that, in order for a student to solve a problem, they must identify the data, recognize the unknown, deduce which mathematical operation to use, and apply the appropriate procedure to solve it. Thus, employing literal, inferential, and critical reading comprehension within the presented problem.

Ethical Aspects

The research process was carried out by the researchers, and the participants were sixth-grade students of General Basic Education from the “Unidad Educativa Diez de Agosto” in the city of Quito, who directly took part in the study. It was ensured that the individuals involved would not be subject to discrimination based on their origin, ethnic or cultural identity, or any limitations they may have. Additionally, no information regarding their religion, political beliefs, or other personal aspects could be demanded or used without the consent of the individual or their legal representatives.

Furthermore, participation was entirely voluntary. The participant or their legal representative could withdraw consent at any time. Likewise, if the participant/legal representative chose to withdraw, their decision was respected, and their opinions and perceptions collected were to be deleted and could not be used for any purpose. The benefits included access to the results of the research analysis. It is worth mentioning that the study posed no risk. Confidentiality of the collected information was ensured by anonymizing personal data. Once the instrument was applied

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

to the participants, data tabulation followed, after which a Zoom meeting was held with the legal representatives and students to present the research findings.

It is emphasized that no names of the participants were used in the study to maintain anonymity. Identification was done using codes created for each participant, which were based on the initials of the first names and the first two initials of the last names. The group of researchers was responsible for handling the results and study documents. Finally, it is important to note that the research complies with current national and international laws and regulations.

Results

Table 6

Validez del cuestionario

	Correspondence between objectives, variables, indicators, and items								**Technical quality and representativeness**								**Language and clarity**							
Expert	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
1 MSc. Dayana Chicaiza	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
2 MSc. Fernando Garcés	4	4	4	4	4	4	4	4	4	3	4	3	4	3	4	4	4	4	4	4	4	4	4	4
3 MSc. Francisco Rojas	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
#Judges who rated 3	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0
#Judges who rated 4	3	3	3	3	3	3	3	3	3	2	3	2	3	2	3	3	3	3	3	3	3	3	3	3
ne	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CVR	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

As Borromeo (2023) mentions, “The result of the content validity operation will be an index ranging between -1 and 1. In general, an item can be accepted if its value is greater than zero and rejected if it is less than zero” (p.18). In this sense, it can be determined that the questionnaire is valid for application since the result is 1.

Table 7

Results of the Applied Questionnaire

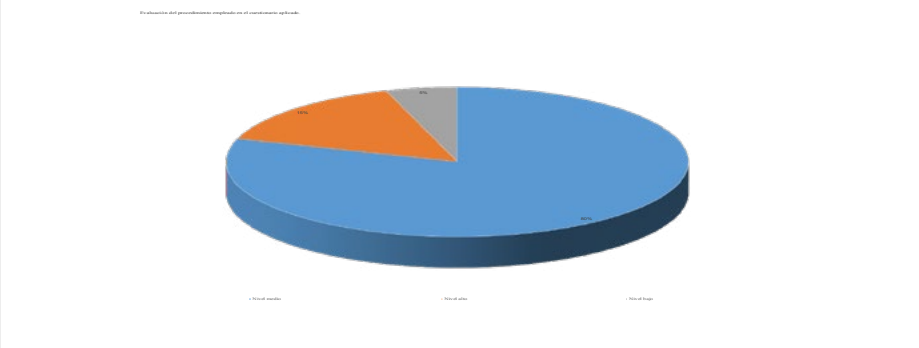
Criteria	Identifies the problem data		Recognizes the problem's unknown		Identifies the mathematical operations		Solves the mathematical problem using their methods		Solves the problem by applying logical procedures		Matches the columns using numerical language		Completes the chart using everyday and mathematical language		Explains the answer obtained from the problem		TOTAL
Number of Students	Si	No	Si	No	Si	No	Si	No	Si	No	Si	No	Si	No	Si	No	
AMGH	2	0	2	0	0	1	2	0	2	0	0	1	0	1	0	1	12
AMOL	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	16
APGD	2	0	2	0	0	1	2	0	0	1	0	1	0	1	0	1	11
APML	2	0	2	0	0	1	2	0	2	0	0	1	0	1	0	1	12
ARFP	2	0	2	0	0	1	2	0	2	0	0	1	0	1	0	1	12
BCEF	2	0	2	0	0	1	2	0	0	1	0	1	0	1	0	1	11
BMMR	2	0	2	0	0	1	2	0	2	0	0	1	0	1	0	1	12
CESM	2	0	2	0	0	1	2	0	0	1	0	1	0	1	0	1	11
CGGR	2	0	2	0	0	1	2	0	2	0	0	1	0	1	0	1	12
CTSE	2	0	2	0	0	1	2	0	0	1	0	1	0	1	0	1	11
DLMR	2	0	2	0	0	1	2	0	2	0	0	1	0	1	0	1	12
DTAT	2	0	2	0	0	1	2	0	0	1	0	1	0	1	0	1	11
ERPF	2	0	2	0	0	1	2	0	2	0	0	1	0	1	0	1	12
FRGB	2	0	2	0	0	1	2	0	0	1	0	1	0	1	0	1	11
IGMT	2	0	2	0	0	1	2	0	2	0	0	1	0	1	0	1	12
JMPI	2	0	2	0	0	1	0	1	0	1	0	1	0	1	0	1	10
JRGP	2	0	0	1	0	1	0	1	0	1	0	1	0	1	0	1	9
LSRC	2	0	2	0	0	1	2	0	0	1	0	1	0	1	0	1	11
LSTV	2	0	2	0	0	1	0	1	0	1	0	1	0	1	0	1	10
LTMF	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	8
MAVS	2	0	2	0	0	1	0	1	0	1	0	1	0	1	0	1	10
MGPR	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	16
MHLS	2	0	2	0	0	1	2	0	2	0	0	1	0	1	0	1	12
NFRG	2	0	2	0	0	1	2	0	2	0	0	1	0	1	0	1	12
NJCP	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	8
NLSA	2	0	2	0	2	0	2	0	2	0	2	0	2	0	0	1	15
RAFT	2	0	0	1	0	1	0	1	0	1	0	1	0	1	0	1	9
RTPC	2	0	2	0	2	0	2	0	2	0	0	1	0	1	0	1	13

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

SAPT	2	0	2	0	0	1	2	0	2	0	0	1	0	1	0	1	12
SMLA	2	0	0	1	0	1	0	1	0	1	0	1	0	1	0	1	9
SPTA	2	0	2	0	0	1	2	0	2	0	0	1	0	1	0	1	12
SRTD	2	0	0	1	0	1	0	1	0	1	0	1	0	1	0	1	9
TMMF	2	0	2	0	0	1	2	0	2	0	0	1	0	1	0	1	12
VDPS	2	0	2	0	0	1	2	0	0	1	0	1	0	1	0	1	11
VGRD	2	0	2	0	0	1	2	0	2	0	0	1	0	1	0	1	12
VHYP	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	16
Total, de las columnas	34	2	30	6	5	31	27	9	19	17	4	32	4	32	3	33	

Figure 2

Evaluation of the Questionnaire Used



Note: Evaluation of the questionnaire used.

Interpretation of Results

According to the results obtained in Table 7 and Figure 2, based on the rating scale, 80% of the population achieved an intermediate level, which corresponds to a range of 9 to 12 points out of a total of 16. This means that students have acquired the required learning outcomes and are able to identify the data, recognize the problem's unknown, identify the mathematical operations, solve problems using their own methods, as well as employ both everyday and mathematical language, and finally, relate numerical language.

On the other hand, 15% reached a high level, corresponding to a range between 13 and 16 points, which indicates that these students have mastered the required learning outcomes and are capable of explaining and solving mathematical problems.

Lastly, 5% of the students are at a low level, which represents a range of 5 to 8 points. This indicates they are close to achieving the required learning outcomes and can only perform the following processes: identify the problem's data, identify the mathematical operations, recognize the problem's unknown, and solve the problem using their own methods.

Discussion of Results

The research results align with what Condori and Sosa (2019) mention in their study titled "Reading Comprehension and Its Relationship with the Resolution of Mathematical Problems", which addressed the relationship between the level of reading comprehension and the resolution of mathematical problems among sixth-grade students in primary schools under the Local Educational Management Unit (UGEL) of Puno in 2015.

In the same vein, Blanco and Mancilla (2021), in their research "Reading Comprehension in the Interpretation of Mathematical Problems", concur with the present study that reading comprehension and the translation of textual language into mathematical language enhance students' problem-solving and reasoning skills.

Conclusions

It was concluded that reading comprehension and the resolution of mathematical problems are closely related, as mathematical problems require reading comprehension to understand what is being asked in the exercise, such as identifying relevant data and discarding irrelevant ones. It also allows students to find data or unknowns through prior reading and understanding. This process helps detect errors in the interpretation of the problem, and good reading comprehension enables students to clearly and coherently explain the process and their answers in solving mathematical exercises, which is essential in learning and mathematical assessment.

Moreover, the data obtained reflect that students develop reading comprehension to successfully complete the proposed mathematical exercises. Therefore, children are prepared to explain and solve mathematical problems. In this sense, both variables should be taught in a balanced way so that students understand what they are solving and achieve meaningful learning. Finally, the results will serve as a foundation for future scientific research.

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

References

Anaya, E., Muro, A. y Núñez, L. (2019). Comprensión lectora y el rendimiento académico en Educación Primaria. *Investigaciones sobre lectura*, 12. https://dialnet.unirioja.es/servlet/articulo?codigo=7183785

Arrieta, O. y Montenegro, S. (2021). *Resolución de problemas matemáticos desde la comprensión lectora una gestión necesaria con docentes de educación básica*. [Maestría en educación, Universidad de la Costa]. Archivo digital. https://hdl.handle.net/11323/8023

Barrera, H., Hidalgo, C., Alulema, N., Telenchana, L y Ninacuri, R. (2017). Lectura y niveles de comprensión lectora en estudiantes universitarios**.** *LATAM Revista Latinoamericana De Ciencias Sociales Y Humanidades. 4(1),* 3383–3394. https://doi.org/10.56712/latam.v4i1.494

Blanco, J. y Mancilla, E. (2021). La comprensión lectora en la interpretación de problemas matemáticos. *Aulas Sin Fronteras*, 6. https://manglar.uninorte.edu.co/handle/10584/9491

Borromeo, C. (2023). Validación de instrumentos de recolección de información: implementando el modelo Tristán/Lawshe. *Univerciencia, 21(62),* 13-24. https://revista.soyuo.mx/index.php/uc/article/view/250/371

Cervantes, C., Pérez, R. y Alanís, M. (2017). Niveles de comprensión lectora**.** *Revista social de ciencias sociales y humanidades, XXVII* (2). https://www.redalyc.org/pdf/654/65456039005.pdf

Cimpoies, A. (2019). *La Comprensión Lectora en la resolución de problemas en Matemáticas: Implementación de una Propuesta Didáctica en 4º de Primaria*. [Trabajo de fin de grado]. Archivo Digital. https://uvadoc.uva.es/bitstream/handle/10324/30519/TFG-B%201120.pdf?sequence=1

Condori, W. y Sosa, F. (2019). La comprensión de lectura y su relación con la resolución de problemas matemáticos. *Escuela de posgrado, 8(2),* 1037-1047. https://revistas.unap.edu.pe/epg/index.php/investigaciones/article/view/895/252

Díaz, J. y Díaz, R. (2018). Los Métodos de Resolución de Problemas y el Desarrollo del Pensamiento Matemático. *Boletín de Educación Matemática,32(60),* https://www.scielo.br/j/bolema/a/r6wHhRqPGHkJgX7y8Jt46vF/?lang=es

Diosa, H. (2019). *Comprensión del concepto de variable como incógnita en el marco de la enseñanza para la comprensión en estudiantes del grado quinto de básica primaria.* https://goo.su/39gPR

García, M. (2016). *Comprensión lectora y resolución de problemas matemáticos en los alumnos del segundo grado de educación primaria de una institución educativa privada del distrito de Santiago de surco perteneciente a la ugel 07*. [Tesis para optar el grado de maestra en psicología mención en problemas de aprendizaje, Universidad Ricardo Palma, Perú]. Archivo digital. http://surl.li/ggenty

García, J. (2019). Desarrollo de Comunicación Asertiva mediante el aprendizaje cooperativo en alumnos de telesecundaria. https://www.uv.mx/pozarica/mga/files/2012/11/Tesis-GarciaGuzman-Joselin.pdf

Gualdrón, E., Pinzón, L., y Ávila, A. (2020). Las operaciones básicas y el método heurístico de Pólya como pretexto para fortalecer la competencia matemática resolución de problemas. *Espacios*, *41*(48), 106-116. https://revistaespacios.com/a20v41n48/a20v41n48p08.pdf

Guzmán, A., Ruiz, J. y Sánchez, G. (2021). Estrategias pedagógicas para el aprendizaje de las operaciones matemáticas básicas sin calculadora. *Ciencia y Educación, 5*(1). https://dialnet.unirioja.es/descarga/articulo/7839934.pdf

Instituto Nacional de Evaluación Educativa. (2018). *Resultados de PISA para el desarrollo*. https://issuu.com/ineval/docs/cie_informegeneralpisa18_20181123

Jaramillo, E. y Patiño, D. (2022). *Estrategia socioemocional para favorecer el razonamiento matemático en estudiantes de grado décimo*. [Tesis para optar el grado de magíster en Educación, Universidad Cooperativa, Colombia]. Archivo digital. http://surl.li/tdppfc

Ministerio de Educación. (2018). *Área de Matemática.* https://lc.cx/srArUD

Montero, L. y Mahecha, J. (2020). Comprensión y resolución de problemas matemáticos desde la macroestructura del texto. *Praxis y Saber*, *11*(26). https://doi.org/10.19053/22160159.v11.n26.2020.9862

Naveira, W. y Valdivia, M. (2022). Los procedimientos de solución de la Matemática y la dirección de su proceso de enseñanza-aprendizaje. *ROCA. Revista Científico-Educacional de la provincia Granma*, *18(*2). http://portal.amelica.org/ameli/journal/440/4402900030/html/

Núñez, R. y Tuesta, G. (2021). Desarrollo del lenguaje y pensamiento numérico en educación inicial: una revisión bibliográfica. *Conrado*, *17*(78), 230-233. http://scielo.sld.cu/pdf/rc/v17n78/1990-8644-rc-17-78-230.pdf

Olivares, A. (2019). *Desarrollo comunicativo.* https://www.calameo.com/books/007380313012681e3ca7a

Oliveros, D., Martínez, L. y Barrios, A. (2019). Método de Pólya: una alternativa en la resolución de problemas matemáticos. *Ciencia e Ingeniería*, *8*(2). https://dialnet.unirioja.es/descarga/articulo/8742480.pdf

Patiño, K., Prada, R. y Hernández, C. (2021). La resolución de problemas matemáticos y los factores que intervienen en su enseñanza y aprendizaje. *Boletín Redipe*, *10*(9). https://dialnet.unirioja.es/servlet/articulo?codigo=8114577

Parra, C. y Crespo, A. (2020). Métodos de Análisis de Criticidad y Jerarquización de Activos. *Ingeman, II* (1). https://n9.cl/9l9vy

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Ramírez, K. (2023). *La comprensión lectora en la resolución de problemas matemáticos en los estudiantes de sexto grado de la IE Asociación Presbiteriana Colegio Americano de Girardot, Cundinamarca.* [Tesis de pregrado, Universidad Nacional Abierta y a Distancia - UNAD]. Archivo digital. https://n9.cl/429pc6

Romero, G. y Chávez, B. (2021). El Pensamiento Crítico en el Desarrollo Personal de los Adolescentes. *Dominio de las Ciencias*, 7(6). https://dominiodelasciencias.com/ojs/index.php/es/article/view/2408/5306

UNESCO. (2021). *Estudio Regional Comparativo y Explicativo (ERCE 2019)*. https://unesdoc.unesco.org/ark:/48223/pf0000380246

Vargas, L. (2020). *Fortalecimiento de los tres niveles de lectura.* [Trabajo de grado como requisito requerido para optar al título de Licenciada en Educación con énfasis en Humanidades y Lengua Castellana, Corporación universitaria minuto de dios]. Archivo digital. https://lc.cx/vYDA0x

Uisrael
REVISTA CIENTÍFICA

May – August 2025 period
Vol. 12, No. 2
rcientifica@uisrael.edu.ec
https://doi.org/10.35290/rcui.v12n2.2025.1444 • e-ISSN: 2631 - 2786

Digital tools for the development of basic competencies in mathematics learning

Herramientas digitales para el desarrollo de competencias básicas en el aprendizaje de la matemática

Date of receipt: 2024-09-28 Date of acceptance: 2024-10-18 Date of publication: 2025-05-10

Johnny Félix Farfán Pimentel [1]
Universidad César Vallejo, Perú
felix13200@hotmail.com
https://orcid.org/0000-0001-6109-4416

Raúl Delgado Arenas [2]
Universidad César Vallejo, Perú
rdelgadoa@ucv.edu.pe
https://orcid.org/0000-0003-4941-4717

Diana Eulogia Farfán Pimentel [3]
Universidad César Vallejo, Perú
diana75_farfan@hotmail.com
https://orcid.org/0000-0002-1555-1919

Rosa Irene, Chero Castillo [4]
Universidad César Vallejo, Perú
rosachero@gmail.com
https://orcid.org/0000-0002-3567-4123

Abstract

In these times of continuous change, the advancement of technology is increasingly accelerated in all fields of human knowledge and is impacting the various areas of social, economic, educational, political and other development; in this sense, the use of digital tools in the process of developing mathematical competencies of high school students helps to improve the learning levels of students in an active, participatory, collaborative, motivating and creative way that generates in students the impulse to strengthen mathematical knowledge in a didactic way. The objective was to analyze the use of digital tools in the development of basic competencies for learning mathematics. The methodology was of non-experimental design, basic type, quantitative approach and the study population consisted of 82 high school students. The results show that there is a significant relationship between the study variables with rho=0.436 and p=0.000<0.05. It was concluded that the use of digital tools helps significantly in the development of mathematical competences in students and to deepen the knowledge of numbers, their properties and applications in the socio-educational context.

Keywords: Digital tools, Digital learning, Mathematical learning, Mathematical competence, Problem solving

Resumen

En estos tiempos de cambios continuos el avance de la tecnología es cada vez más acelerada en todos los campos del conocimiento humano y va impactando en los diversos ámbitos del desarrollo social, económico, educativo, político entre otros; en tal sentido el empleo de las herramientas digitales en el proceso de desarrollo de las competencias matemáticas de los estudiantes de secundaria ayuda a mejorar los niveles de aprendizaje de los educandos de un modo activo, participativo, colaborativo, motivador y creativo que genera en los educandos el impulso para afianzar en los conocimientos matemáticos de una forma didáctica. El objetivo fue analizar el empleo de herramientas digitales en el desarrollo de competencias básicas para el aprendizaje de la matemática. La metodología fue de diseño no experimental, de tipo básica, de enfoque cuantitativo y la población de estudio estuvo constituida por 82 estudiantes de secundaria. Los resultados evidencian que existe una relación significativa entre las variables de estudio con un rho=0.436 y p=0.000<0.05. Se concluyó que, el uso de las herramientas digitales ayuda de manera significativa en el desarrollo de las competencias matemáticas en los estudiantes y a profundizar en el conocimiento de los números, sus propiedades y aplicaciones en el contexto socioeducativo.

Palabras clave: Herramientas digitales, Aprendizaje digital, Aprendizaje de la matemática, Competencia matemática, Resolución de problemas

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Introduction

In these times of constant and incessant change, education must adapt auspiciously to these processes of digital transformation in order to implement digital learning and the use of digital tools for the development of mathematical skills in educational institutions. In this regard, schools must adopt significant improvements in teaching strategies that include modern educational resources and materials in learning processes that respond to the significant demands of the educational community to enhance capabilities, skills, and abilities in problem-solving in the area of mathematics.

From this perspective, Bendezú (2023) points out that one of the major concerns in the educational sector is related to the learning of mathematics, taking into consideration that the acquisition of this knowledge is decisive and necessary for the lives of people in a society that constantly experiences changes.

Likewise, Mollo et al. (2023) point out that the use of digital tools for learning has beneficial effects on the learning process of students; since it contributes to the development of capacities, abilities and skills; likewise, an improvement is evident in the application of didactic strategies, strengthening the training of students in a comprehensive manner, with the pedagogical use of digital technologies, educational software, learning platforms, digital tools and internet access being very necessary for the development of basic competencies in students.

Along these lines, Arriaga et al. (2021) point out the need to implement innovative means such as virtual tools in students' learning processes; Teachers must also be trained in the use of information and communication technologies to effectively optimize teaching work, achieving greater improvement in the application of learning and motivation strategies for students.

Consequently, Area et al. (2020) point out that digital transformation processes are a highly complex process that requires a set of factors of diverse nature such as technological resources, organizational resources, digital infrastructure, employee training, management commitment, digital skills, among other essential factors for achieving organizational purposes in the educational development of the population.

1.1. Digital tools

In the educational field, digital learning tools are a determining factor, as they enable access to new knowledge, facilitate the creation of content, and significantly aid the work of teachers in educational institutions (Cámara & Hernández, 2022). Digital tools are valuable in the teaching and learning process as they provide interactive resources and facilitate the development of basic skills, requiring a higher level of teacher preparation (Brescó & Verdú, 2014). In this sense, these technologies involve a set of virtual media and computer applications that help develop basic learning skills effectively in students (Yépez et al., 2020).

Similarly, the use of educational resources in mathematics teaching has a positive effect because it effectively contributes to teaching and significantly enhances students' learning processes. The incorporation of virtual resources in mathematics teaching and learning also demonstrates substantial improvements in mathematical content and concepts, as well as in the development of mathematical skills (Murillo et al., 2016). In this sense, the efficient and productive use of educational resources has a decisive impact on students' teaching and learning processes (Vargas, 2017). Below are some digital tools that contribute to the development of mathematical competence in secondary school students:

1.1.1. Geogebra

In mathematics learning, it should be noted that Geogebra is one of the teaching tools widely used by students due to its variety of components that motivate problem solving in an enjoyable way, among which the applications in the field of dynamic geometry stand out (Sánchez, 2022). Therefore, the incorporation of technology enables the development of mathematical skills in students and helps to better conceive the problematic situation to be solved (Surichaqui et al., 2022). In this sense, Geogebra is a powerful tool for teaching and learning geometric objects in their two-dimensional and three-dimensional forms. Combined with a set of functions, it allows students to have a broader perspective, facilitating problem solving (Cedeño & Valdez, 2022). Consequently, the use of digital tools enhances students' abilities in the way they think and solve mathematical problems (Campos et al., 2021).

1.1.2. Wolfram Alpha

Wolfram Alpha is a mathematical tool that allows a large number of operations to be performed dynamically, presenting information in numerical, graphical, and symbolic form in a relatively short time with a high level of efficiency (Campuzano & Gonzabay, 2022). Likewise, Wolfram Alpha is a computational search engine that helps solve highly complex equations and problems in real time, being an important support for students in the mathematical area (Solorzano et al., 2023). Consequently, the use of Wolfram Alpha enhances mathematical capabilities to face complex situations and its application generates optimal results in the achievement of mathematical competencies in students (Vergel et al., 2015).

1.1.3. Khan Academy

The Khan Academy platform offers virtual resources that enable access to a range of mathematical situations, taking into account students' learning needs (Pacuruco et al., 2020). Thus, the implementation of this pedagogical resource optimizes mathematical learning by positively contributing effectively to students' mathematical learning processes (Santillán, 2021). Therefore, the Khan Academy learning platform contains environments and tools for online teaching, such as textual material, images, sounds, animations, and educational videos to support educational work (Ramírez & Barajas, 2017). Consequently, the essential purpose of the Khan Academy platform is to facilitate learning in an active, motivating, participatory, challenging, and creative way to

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

consolidate learning and achieve mathematical competencies, encouraging teachers to use Khan Academy as an online learning strategy (Pérez, 2018).

1.1.4. Mathway

In the field of teaching and learning, the Mathway application allows students to solve a variety of mathematical problems of varying degrees of complexity, addressing fields of knowledge such as algebra, trigonometry, statistics, and other scientific areas (Castro et al., 2020). Likewise, the use of technological resources generates motivation in students and promotes the development of skills, abilities, and attitudes to face problematic situations in the field of mathematics by applying innovative and creative strategies (Pozo & Vega, 2022).

1.1.5. Dièdrom

Dièdrom is an educational software that aims to graphically develop polyhedral geometric figures through perspective views and in which the construction of solids can be carried out creatively through the virtual environment. It has a wide range of tools and editing options; it also has the ability to generate geometric animations and simulations in real time, being of great support to students (García et al., 2023).

1.1.6. Blutick

Blutick is an educational resource that explains mathematical content and provides contextual feedback automatically, using a platform for machine learning. This platform is designed to complement good classroom teaching and maximize students' confidence and mathematical progress (Quiroz, 2023). Likewise, the use of educational resources facilitates the teaching and learning process effectively, sparking students' interest in exploring mathematical content in more depth (Morales, 2012).

1.1.7. Scilab

Scilab is a free mathematical software with multiple applications, it has a high-level programming language including a variety of mathematical functions to perform numerical calculations with vectors and matrices, rational functions, two- and three-dimensional graphing, solving differential equations, simulation of dynamic systems, statistics and computational programming (Pérez et al., 2021).

1.1.8. Octave

Octave is a free software that provides a satisfactory experience in teaching mathematics by providing a list of applications such as solving linear equations, geometry problems and programming with proven effectiveness (Erausquin, 2017).

1.1.9. Maple

This software is a mathematical calculation system: symbolic, numerical, and graphical. It allows for programming routines and mathematical operations, the organization of texts, the processing of images, and the development of customized executable applications (Pernía et al., 2014). Furthermore, the use of Maple provides an enriching experience for students, serving as a valuable teaching resource that enhances problem-solving skills due to its effectiveness and positive experience in addressing problematic situations (Méndez, 2004).

1.2. Aprendizaje de la matemática

Learning mathematics is fundamental for students, providing them with the capacities, abilities, and skills to cope with the multiple situations in the socio-educational context, providing the essential elements to address complex mathematical situations through numerical strategies and methods that will aid in the process of interpretation and production of resulting information (Intriago & Naranjo, 2023). In this sense, learning mathematics requires means and resources that enable the understanding of the mathematical discipline and that generate motivation in the student in their formative and comprehensive process (Palma & Rodríguez, 2022).

1.2.1. Competencia matemática

In the educational field, the development of mathematical skills in students is crucial. These skills integrate mathematical knowledge and scientific disciplines to resolve everyday situations with varying degrees of complexity and the mobilization of cognitive resources (Arreguín et al., 2012). In this sense, mathematical competencies are evidenced through the skills and abilities associated with identifying and interpreting problematic situations in a variety of socio-educational contexts (Goñi, 2008).

1.2.2. Aprendizaje digital

In these times of great changes in all spheres of knowledge, digital learning is one of the ways to access new knowledge constructs and is positively impacting human development (Rollin, 2001). Consequently, digital learning is closely related to the digital transformation, in which it is considered a flexible learning that prioritizes the needs and interests of students at their own pace and analyzes specific content for their educational development (Flores & Meléndez, 2024).

Methodology

The methodology is basic, because it contributes to the knowledge of technological tools in learning mathematics. Its approach is quantitative since it establishes a numerical relationship between the study variables in order to perform a statistical measurement (Huamán et al., 2022). The study population consisted of secondary school students from an educational institution and the study sample consisted of 82 students in the third year of secondary education (Arias et al.,

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

2016). The inclusion criteria considered were that their age ranged between 13 and 16 years, they were officially enrolled, their attendance was regular at the educational institution, they expressed informed consent and resided in the city of Lima (Corona and Fonseca, 2023). The research instruments were validated by the criterion of expert judgment in research instruments and the reliability by Cronbach's alpha coefficient; For the variable Digital Tools (Alpha=0.891) and for the variable Mathematics Learning (Alpha=0.840) it is considered good (Oviedo & Campo, 2005).

Results

Among the results obtained, it can be seen in Table 1 that a good level predominates in the Digital Tools variable in students with 63.4%, for the Digital Educational Resources dimension it is at a good level with 56.1%, for the Digital Technology for Learning dimension it is at a good level with 59.8% and for the Digital Autonomy in the Student dimension it is at a good level with 52.4%, highlighting the need to improve learning processes for the development of digital competences in students. In this sense, the implementation of Digital Tools represents an essential support for the development of capacities, skills and abilities related to virtual environments, online teaching resources, virtual applications, online tutorials, self-learning laboratories that will decisively complement the formative process and academic performance of students.

Table 1.

Level of the variable Digital tools and their dimensions

Level	V1: Digital tools		Dimension 1: Digital educational resources		Dimension 2: Digital technology for learning		Dimension 3: Digital autonomy in learning	
	f	%	f	%	F	%	f	%
Low	1	1.2	1	1.2	1	1.2	1	1.2
Regular	29	35.4	35	42.7	32	39.0	38	46.4
Good	52	63.4	46	56.1	49	59.8	43	52.4
Total	82	100.0	82	100.0	82	100.0	82	100.0

Note: Database

Among the results obtained, it can be seen in Table 2 that a regular level predominates in the variable Mathematics Learning in students with 53.7%, for the Teaching Methodology dimension it is at a regular level with 87.8%, for the Problem Solving dimension it is at a regular level with 64.6%, for the Use of Strategies dimension it is at a regular level with 73.2% and for the Development of Competencies dimension it is at a regular level with 59.8%; Based on the evidence, it is essential to implement actions aimed at improving the processes that affect Mathematics Learning in secondary school students, this being a central axis of educational policy and curricular implementation of current contents; as well as strengthening the continuous training process of teachers of the mathematics specialty in accordance with current approaches, use of teaching resources, teamwork, participatory motivation and greater commitment to pedagogical processes.

Table 2.

Level of the variable Mathematics learning and its dimensions

Level	V1: Learning mathematics		Dimension 1: Teaching Methodology		Dimension 2: Problem Solving		Dimension 3: Use of strategies		Dimension 4: Competence development	
	f	%	f	%	f	%	f	%	f	%
Low	1	1.2	8	9.8	1	1.2	1	1.2	1	1.2
Regular	44	53.7	72	87.8	53	64.6	60	73.2	49	59.8
Good	37	45.1	2	2.4	28	34.2	21	25.6	32	39.0
Total	82	100.0	82	100.0	82	100.0	82	100.0	82	100.0

Note: Database

Table 3 shows the analysis of data normality. Significance values were less than 0.05, meaning they did not show normality. Spearman's rho coefficient was applied, as it best fits the statistical data processing process.

Table 3.

Normality test

	Kolmogorov-Smirnov[a]		
	Statistical	gl	Sig.
Digital tools	,404	82	,000
Digital educational resources	,366	82	,000
Digital technology for learning	,390	82	,000
Digital autonomy in the student	,352	82	,000
Learning mathematics	,365	82	,000
Teaching methodology	,487	82	,000
Troubleshooting	,404	82	,000
Use of strategies	,446	82	,000
Skills development	,396	82	,000

Note: Database

Table 4 shows a relationship between the variables of Digital Tools and Mathematics Learning with a rho=0.436 and p=0.000<0.05, which means a moderate relationship between these constructs. In relation to the dimensions of Digital Tools and Mathematics Learning, a rho=0.410 and p=0.000<0.05 were obtained for the Digital Educational Resources dimension, a rho=0.394 and p=0.000<0.05 for the Digital Technology for Learning dimension, and a rho=0.373 and p=0.001<0.05 for the Digital Autonomy in the Student dimension. The results suggest the need to implement digital tools in educational institutions. These days, it is vital for students to develop digital skills to address a variety of socio-educational situations, while actively and collaboratively impacting the

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

mathematics learning process, employing strategies and resources that optimize their capabilities in problem-solving and decision-making.

Table 4.

Correlation of variables and dimensions

	Learning Mathematics	
	ρ	Sig.
Digital tools	0.436	0.000
Digital educational resources	0.410	0.000
Digital technology for learning	0.394	0.000
Digital autonomy in the student	0.373	0.001

Note: Research database.

The objective was to analyze the use of digital tools in developing basic competencies for learning mathematics. The results showed a significant relationship between these variables, with a rho of 0.436 and p of 0.000 < 0.05. Likewise, the dimensions of the digital tools variable were significantly related to learning mathematics.

The research agrees with the scientific contributions of Márquez (2022) in his research work, he pointed out the importance of the application of digital tools since it affects the improvement in the learning of mathematics in students of an educational institution. The results show that there is a direct and significant relationship between digital tools and mathematics learning (rho = 0.333 and p = 0.002 < 0.05). Additionally, digital tools promote the development of creativity and meaningful learning (Padilla et al., 2022)

The agreement with Pérez's research (2022) is evident. His research work indicated the need to implement virtual tools in the achievement of mathematics learning in sixth-grade students; these media help to understand problem-solving situations in an active and creative way in a didactic way. The results show a significant relationship between digital tools and mathematics learning achievement (rho = 0.712 and p = 0.000 < 0.05). Likewise, the incorporation of virtual tools significantly impacts student learning in an effective and productive way (Blanco et al., 2022).

There is also correspondence with the research by Torres (2023), who indicated that the use of digital tools and innovative teaching strategies directly impact the learning process of students in a positive way, helping to improve their mathematical skills and abilities in problem solving. The results were that there is a relationship between digital tools and teaching strategies in the area of mathematics (rho = 0.495 and p = 0.000 <0.05). In this sense, digital tools combine dynamic functional elements that enhance students' learning in an efficient and motivational way (Tipismana, 2023).

In this line, it is agreed with the results of Criollo (2023), who indicated that the use of mathematics is decisive in the learning process and is essential for the development of life skills. It contributes decisively to the cognitive processes of reasoning and solving mathematical problems related

to daily life and the socio-educational environment. The results confirm the influence of the use of digital tools in the learning of mathematics, highlighting autonomous learning with 67.5%, collaborative work with 52.5% and skills assessment with 75%.

Likewise, it coincides with the assessments of Aliaga (2022), who pointed out that the use of virtual environments influences the development of mathematical skills in students, being of vital importance in the achievement of learning since access to information and educational resources reinforces the acquired knowledge and skills for problem solving, being incorporated as part of the teaching strategies in the school. The results show a significant relationship between virtual environments and achievement in mathematical skills (rho = 0.862 and p = 0.000 <0.05). Furthermore, teaching action is aimed at improving the learning process of students in an active and motivating way (Abad, 2021).

Therefore, the assessments of researchers Orellana & Erazo (2022) are reaffirmed, indicating that the management of technological tools is essential in the formative process of students to deepen and expand their cognitive capacities; these technologies for learning contribute substantially to the improvement of digital skills and the promotion of an innovative culture in the application of active strategies with greater agility and motivational dynamism. Likewise, Tarazona (2021) points out that the use of digital tools has a significant effect, providing a better understanding of the content to be studied in an enjoyable and active way.

Conclusion

It is concluded that the use of digital tools significantly contributes to the development of mathematical skills in students, helping them deepen their knowledge of numbers, their properties, and applications. This is in a context where technology significantly supports the achievement of essential learning in solving mathematical problems and in finding alternative solutions to the many situations in the socio-educational context. It also generates higher levels of motivation, performance, organization, and creativity, strengthening their mathematical abilities, creating collaborative learning strategies, and increasing their academic potential. Finally, this study will allow for further exploration as a contribution to future research.

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

References

Abad, A. (2021). Reflexiones sobre los procesos de enseñanza/ aprendizaje en la educación a distancia. *Revista Electrónica en Educación y Pedagogía*, 5(9). DOI: https://doi.org/10.15658/rev.electron.educ.pedagog21.11050910

Aliaga Batich, G.A. (2022). *Entornos virtuales de aprendizaje y logros en las competencias matemáticas en estudiantes de una institución educativa primaria pública - Huancayo, 2021*. [Tesis de maestría, Universidad César Vallejo]. https://n9.cl/c8de7

Area, M., Santana, P.J., & Sanabria, A.L. (2020). The digital transformation of schools. Obstacles and resistances. *Digital Education Review*, 37: 16-31. DOI: https://doi.org/10.1344/der.2020.37.15-31

Arias-Gómez, J., Villasís-Keever, M.A., Miranda-Novales, M.G. (2016). El protocolo de investigación III: la población de estudio. *Revista Alergia México*, 63(2): 201-206. https://n9.cl/5l1g7

Arreguín, L.E., Alfaro, J.A., & Ramírez, M.S. (2012). Desarrollo de competencias matemáticas en secundaria usando la técnica de aprendizaje orientado en proyectos. *REICE*, 10(4): 264-284. https://n9.cl/kow7

Arriaga Delgado, W., Bautista Gonzales, J. K., & Montenegro Camacho, L. (2021). Las TIC y su apoyo en la educación universitaria en tiempo de pandemia: una fundamentación facto - teórica. *Revista Conrado*, 17(78): 201-206. https://n9.cl/wgn9q

Bendezú, R.M. (2023). Herramientas didácticas innovadoras para la enseñanza de la matemática en la educación superior. Una revisión sistemática, 2018–2023. [Tesis de maestría, Universidad César Vallejo]. https://n9.cl/gjk4p

Blanco, L.E., Blanco, S., Vicuña, L.A., Meneses, A., & Oseda, D. (2022). Herramientas digitales en el proceso de aprendizaje semipresencial en la Educación Dental Peruana durante la Pandemia COVID-19. *Rev Estomatol Herediana*. 32(3):319-328 DOI: https://doi.org/10.20453/reh.v32i3.4291

Brescó Baiges, E., & Verdú Surroca, N. (2015). Valoración del uso de las herramientas colaborativas Wikispaces y Google Drive, en la educación superior. *Edutec, Revista Electrónica De Tecnología Educativa*, 49: 1-12. DOI: https://doi.org/10.21556/edutec.2014.49.39

Cámara-Cuevas, N., & Hernández-Palaceto, C. (2022). Using digital tools for teaching at higher education during COVID-19 pandemic: a pilot study. *Eduscientia*, 5(9): 43-57. https://n9.cl/1fs91

Campos Nava, M., Torres Rodríguez, A., & Morales Maure, L. (2021). GeoGebra como medio para identificar patrones en la clase de Álgebra Lineal: una propuesta concreta. *Revista Universidad y Sociedad*, 13(2), 528-537. http://scielo.sld.cu/pdf/rus/v13n2/2218-3620-rus-13-02-528.pdf

Campuzano G., & Gonzabay, E. (2022). Evaluación del uso de Wolfram Alpha en el Aprendizaje de Algebra Lineal en Teleducación. *Sinergias Educativas*, 7(3): 1-17. DOI: https://doi.org/10.37954/se.v7i2.372

Castro Morales, L.G., Arciniegas Paspuel, O.G., Carrera Cuesta, P.Y., & Valenzuela Chicaiza, C.V. (2020). Evaluación de la utilización de herramientas tecnológicas en la enseñanza de la matemática. *Revista Dilemas Contemporáneos: Educación, Política y Valores,* 8(1): 1-22. http://www.dilemascontemporaneoseducacionpoliticayvalores.com/

Cedeño-Menéndez, R.R., & Valdez-Trejo, V. (2022). The use of Geogebra as a tool to improve academic performance in high school students. *Polo del conocimiento,* 7(2): 2412-2435. DOI: https://doi.org/10.23857/pc.v7i2.3776

Corona-Martínez L, Fonseca-Hernández M. (2023). Uso y abuso de los criterios de inclusión y exclusión en el proyecto de investigación. *Medisur.* 21(5): 1144-1146 https://medisur.sld.cu/index.php/medisur/article/view/5744

Criollo Chamba, N. (2023). *Gestión de herramientas digitales para el aprendizaje en el área de matemática de estudiantes de un colegio particular, Chiclayo.* [Tesis de maestría, Universidad César Vallejo]. https://n9.cl/pzgsd6

Erausquin, M. (2017). *Introducción a la programación numérica con GNU Octave para Matemáticas de 2° de bachillerato.* [Trabajo fin de máster, Universidad Internacional de La Rioja]. https://n9.cl/5agwg

Flores, L. & Meléndez, C. (2024). Digital learning strategies in virtual educational environments. *Revista Innova Educación,* 6(2): 7-22. DOI: https://doi.org/10.35622/j.rie.2024.02.001

García, N.E., Chiliquinga, A.I., Román, G.N., Zurita, E.M., & Haro, A.F. (2023). Information and communication technologies (ICT) in university learning in the area of mathematics. *LATAM,* 5(1): 4342-4353. DOI: https://doi.org/10.56712/latam.v4i1.570

Goñi, J. M. (2008). *3^2 - 2 ideas clave. El desarrollo de la competencia matemática.* Barcelona, España: Graó.

Huamán, J.A., Treviños, L.L., Medina, W.A. (2022). Epistemology of Quantitative and Qualitative Research. *Horizonte de la Ciencia*, 12(23): 27-47. DOI: https://doi.org/10.26490/uncp.horizonteciencia.2022.23.1462

Intriago Proaño, S. M., & Naranjo Flores, C. A. (2023). El aprendizaje de la matemática en estudiantes de educación general básica. *RECIMUNDO*, *7*(1): 640-653.DOI: https://doi.org/10.26820/recimundo/7.(1).enero.2023.640-653

Márquez-Osorio, F.M.V. (2022). *Herramientas digitales y aprendizaje en el área de matemática en estudiantes de un colegio de Villa El Salvador, 2022*. [Tesis de maestría, Universidad César Vallejo]. https://n9.cl/7ihz2

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Méndez, J.A. (2004). Impacto del uso de Maple en el proceso de enseñanza y aprendizaje del álgebra lineal. *SUMA,* 45: 53-58. https://revistasuma.fespm.es/sites/revistasuma.fespm.es/IMG/pdf/45/053-058.pdf

Mollo-Torrico, J.P., Lázaro-Cari, R.R., & Crespo-Albares, R. (2023). Implementación de Nuevas Tecnologías de Información y Comunicación para la Educación Superior: Revisión sistemática. *Revista Científica Ciencia & Sociedad*, 3(1): 16-30. https://n9.cl/ui2251

Morales, P (2012). *Elaboración de Material Didáctico*. México: Red Tercer Milenio Tlalnepantla.

Murillo, J., Román, M., & Atrio, S. (2016). Los Recursos Didácticos de Matemáticas en las Aulas de Educación Primaria en América Latina: Disponibilidad e Incidencia en el Aprendizaje de los Estudiantes. *Education Policy Analysis Archives*, 24(67): 1-22. DOI: http://dx.doi.org/10.14507/epaa.24.2354

Orellana-Campoverde, J.A., & Erazo-Álvarez, J.C. (2022). Digital tools for the teaching of Mathematics in a pandemic: Uses and applications of Teachers. *EPISTEME KOINONIA*, 4(8): 109-119. DOI: https://doi.org/10.35381/e.k.v4i8.1348

Oviedo, H.C., & Campo-Arias, A. (2005). An Approach to the Use of Cronbach's Alfa. *rev.colomb.psiquiatr*. 34(4): 572-580. http://www.scielo.org.co/pdf/rcp/v34n4/v34n4a09.pdf

Pacuruco-García, N.J., García-Herrera, D.G., Guevara-Vizcaíno, C.F., & Erazo-Álvarez, J.C. (2020). Khan Academy and mathematics learning in upper basic students. *EPISTEME KOINONIA,* 3(3): 144-162. DOI: http://dx.doi.org/10.35381/e.k.v3i6.819

Padilla, J.E.A., Valderrama, C.A., Rojas, L.M., Ruíz, J.R., & Cabrera, K. (2022). More effective digital tools in the teaching-learning process. *HORIZONTES,* 6(23): 669-678. DOI: https://doi.org/10.33996/revistahorizontes.v6i23.367

Palma-Posligua, C. A., & Rodríguez-Álava, L. A. (2023). Estrategia didáctica para la enseñanza-aprendizaje de las matemáticas en estudiantes de Educación General Básica. *MQR Investigar*, *7*(2): 1304–1314. DOI: https://doi.org/10.56048/MQR20225.7.2.2023.1304-1314

Pérez, J. (2022). *Uso de herramientas virtuales y aprendizaje de matemática en estudiantes de primaria de una Institución educativa de Comas, 2022.* [Tesis de maestría en Docencia y Gestión Educativa, Universidad César Vallejo]. https://n9.cl/1z9mf

Pérez, M., López, Z.S., & Ramas, J. (2021). Potencialidades del software SCILAB en el proceso de enseñanza–aprendizaje de la asignatura de circuitos eléctricos. *Tecnología Educativa*, 6(1): 34-42. https://tecedu.uho.edu.cu/index.php/tecedu/article/view/259/201

Pérez, R., Ortega-Gómez, E., Carrasco, G., & Coba, E. (2018). Evaluación estadística de la plataforma virtual Khan Academy como herramienta de apoyo para el aprendizaje de estudiantes de décimo grado del colegio Beatriz Miranda de Cabal: Un análisis multivariante. *Scientia*, 28(2): 51-57. https://n9.cl/gs5eb

Pernía, L.A., Figueredo, A.E., Álvarez, D., Fonseca, Y., & Ulloa, M. (2014). Maple, herramienta didáctica para la enseñanza de la matemática numérica. *Didasc@lia: Didáctica y Educación*,5(3):189-198. https://n9.cl/dmmo12

Pozo, F.X., & Vega, S.C. (2022). Las apps y el aprendizaje de matemática de números reales. *MQRInvestigar*, 6(3): 1668-1685. DOI: https://doi.org/10.56048/MQR20225.6.3.2022.1668-1685

Quiroz, V. (2023). Aplicaciones de Inteligencia Artificial Aliadas en la Enseñanza de las Matemáticas. *Ciencia Latina Revista Científica Multidisciplinar*, 7(4): 10547-10560. DOI: https://doi.org/10.37811/cl_rcm.v7i4.8070

Ramírez, W., & Barajas, J.I. (2017). Uso de las plataformas educativas y su impacto en la práctica pedagógica en instituciones de educación superior de San Luis Potosí. *Edutec. Revista Electrónica de Tecnología Educativa*, 60, 1–13.DOI: https://doi.org/10.21556/edutec.2017.60.798

Rollin, K. (2001). El aprendizaje digital. *Sinéctica*,18: 77-83. https://n9.cl/n3jd2

Sánchez-Balarezo, E.W. (2022). Geogebra in the Mathematics Teaching-Learning Process. *Dominio de las Ciencias,* 8(2): 33-52. DOI: http://dx.doi.org/10.23857/dc.v8i2.2737

Santillán, R.H. (2021). *Uso de Khan Academy en el aprendizaje de las matemáticas en estudiantes de secundaria. Revisión sistemática.* [Tesis doctoral, Universidad César Vallejo]. https://n9.cl/whhqq

Solorzano, L. Choez, C. Castillo, J. Castillo C. Macias, A. (2023). Rompiendo barreras en la enseñanza de las matemáticas: cómo las aplicaciones y tecnologías pueden mejorar el desempeño académico y la confianza del estudiante. *Revista G-ner@ndo*, 4 (1): 888– 911. https://revista.gnerando.org/revista/index.php/RCMG/article/view/100

Surichaqui, F., Quispe, H.A., Surichaqui, M., Torpoco, D., Ticse, D.D., & Suarez, C.A. (2022). *Uso del software GeoGebra en el aprendizaje de las funciones cuadráticas.* Perú: INUDI. https://n9.cl/m9ysk

Tarazona, C. (2021). *Herramientas digitales y el proceso de enseñanza aprendizaje de los docentes de la institución educativa Virgen de la Merced de la Caleta Carquín 2021* [Tesis, Universidad Nacional José Faustino Sánchez Carrión]. http://repositorio.unjfsc.edu.pe/handle/UNJFSC/5946

Tipismana, L.Y. (2023). Digital tools and the teaching-learning process in regular elementary school teachers. *UCV-Scientia*, 15(2): 62-73. https://doi.org/10.18050/revucv-scientia.v15n2a6

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Torres-Hernández, N.E. (2023). *Herramientas digitales y estrategias didácticas para el aprendizaje de las matemáticas en estudiantes de una universidad de Ica, 2023.* [Tesis de maestría, Universidad César Vallejo]. https://n9.cl/euyhwo

Vargas, G. (2017). Educational resources in the process teaching Learning. *Revista Cuadernos,* 58(1): 68-74. https://n9.cl/3losk

Vergel Ortega, M., Martínez Lozano, J.J., & Zafra Tristancho, S.L. (2015). Apps en el rendimiento académico y autoconcepto de estudiantes de ingeniería. *Revista Logos, Ciencia & Tecnología*, 6(2): 198-208. https://n9.cl/vkvpy

Yépez-Ormaza, P.R., García-Herrera, D.G., Cárdenas-Cordero, N.M., & Erazo, J.C. (2020). Digital platforms: Primary world as a strategy for language development in children. *Revista Arbitrada Interdisciplinaria KOINONIA*, 5(5): 358-376. DOI: https://doi.org/10.35381/r.k.v5i5.1048

Uisrael
REVISTA CIENTÍFICA

May – August 2025 period
Vol. 12, No. 2
rcientifica@uisrael.edu.ec
https://doi.org/10.35290/rcui.v12n2.2025.1473 • e-ISSN: 2631 - 2786

Evaluation of the professional and scientific development of graduates of a PhD in Educational Sciences in Cuba

Evaluación del desarrollo profesional y científico de egresados de un doctorado en Ciencias de la Educación en Cuba

Date of receipt: 2024-11-20 Date of acceptance: 2025-01-08 Date of publication: 2025-05-10

Bárbara Maricely Fierro Chong [1]
Universidad de Matanzas, Cuba
barbara.fierro@umcc.cu
https://orcid.org/0000-0002-7177-1860

Maira Alejandra Pulgarín Rodríguez [2]
Corporación Universitaria Minuto de Dios, Colombia
https://orcid.org/0000-0001-6885-9442

Haydee Acosta Morales [3]
Universidad de Matanzas, Cuba
haydee.acosta@umcc.cu
https://orcid.org/0000-0001-9869-8141

Caridad Alonso Camaraza [4]
Universidad de Matanzas, Cuba
caridad.alonso@umcc.cu
https://orcid.org/0009-0005-6004-3445

Abstract

Objective: Describe the professional and scientific performance of graduates in the Doctorate Program in Educational Sciences, developed at the University of Matanzas, during the period 2016-2023. Method: A type of survey was used to collect information about the relevant aspects of the doctoral training of the graduates. Results: In the responses to the survey, information was obtained on intellectual growth, professional growth and level of satisfaction that facilitates revealing their levels of development as graduates. Discussion: the critical assessment of the information offered in the closed and open responses facilitated an evaluation of the results in the case of the University of Matanzas that have applicability for the improvement of the training process. Conclusions: The need to improve the procedures for monitoring graduates of doctoral training processes is recognized, which would ensure their qualit.

Keywords: professional growth, intellectual growth, satisfaction, doctorate, education

Resumen

Objetivo: Describir el desempeño profesional y científico de los graduados del Programa de Doctorado en Ciencias de la Educación, desarrollado en la Universidad de Matanzas, durante el período 2016-2023. Método: Se empleó una encuesta tipo de recopilación de información acerca de los aspectos relevantes de la formación doctoral de los egresados. Resultados: En las respuestas a la encuesta, se obtuvo información del crecimiento intelectual, crecimiento profesional y nivel de satisfacción que facilita revela sus niveles de desarrollo como egresados. Discusión: la valoración crítica de la información ofrecida en las respuestas cerradas y abiertas facilitó una evaluación de los resultados en el caso Universidad de Matanzas que poseen aplicabilidad para la mejora del proceso formativo. Conclusiones: Se reconoce la necesidad de perfeccionar los procedimientos, para el seguimiento de egresados de los procesos formativos doctorales, lo que permitiría asegurar su calida.

Palabras clave: crecimiento profesional, crecimiento intelectual, satisfacción, doctorado, educación

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Introduction

The accelerated processes of social, ecological and digital transformation mark the singularities of doctoral training in the world, therefore, it is necessary to generate permanent evaluation processes that allow identifying the training needs of doctoral students who graduate from the programs and their positioning in the scientific and labor context in different parts of the world; Hence, it is essential to consider and assess the features of university education in Cuba, in a necessary and essential articulation of research and innovation, as expressed by García (2006) López et.al. (2008) and Saborido (2018), but based on service to society, which is the result of a deep process of reflection and study (González and Castillo, 2020), which must be addressed from the perspective of multi processes, which as part of the postgraduate program "must contribute with their impact, both to the training of a highly qualified professional, and to the solution of problems linked to social practice" (García and Addine, 2024, p. 2).

In this sense, achieving professional, intellectual and human qualities in the graduates of a doctoral program implies the existence of a high level of awareness and commitment to the immediate and medium-term future, as a way of sustainability, while the training process "enables them to develop complex research projects and to fulfill a role of intellectual leadership that allows them to radiate in concrete situations, an appreciable amount of knowledge" (Hernández, et.al., 2009, p. 1).

In the quest to assess the quality of university processes, studying graduate behavior through monitoring professional activity is essential, as it facilitates the evaluation of programs in educational institutions in order to refine training strategies at a specific level. In this regard, it is becoming increasingly necessary to monitor the management of this process within the responsible institutions (Vargas et al., 2023). Added to this is the consideration that knowledge must be accompanied by personal and professional qualities that enhance leadership work to solve specific problems in the field in question.

Training at this level demands research as one of the substantive activities since "having academics, professionals and technicians of excellence, who acquire the skills for scientific and technological development, innovation and entrepreneurship" (González and Jiménez, 2014, p. 133), in conjunction with the teaching-administrative functions in the workplace, creates a suitable, integral professional who can face the requirements of the social environment in which he or she is linked.

Monitoring the processes and their results in postgraduate training activities, according to Valencia-Gutiérrez et.al. (2015), allows for their reproduction and an impact on scientific-technological development, supported by theoretical, methodological and investigative preparation (Matos-Columbié et. al., 2019).

In the graduate profile referred to by Valencia et al. (2015), it corresponds to what Núñez et al., (2019) highlights: "a tool to evaluate the acquisition of competencies of a specific professional" (p. 164), with activities aimed at facilitating this process (Vargas et. al., 2023); it is important to consider the intellectual growth that accompanies the acquisition of these competencies, as well

as the levels of satisfaction that must be generated with this type of activity of high reflective, analytical, ethical capacity that are basic and essential for social transformation.

An interesting perspective is the one that identifies that "the university of the 21st century assigned a place of great relevance to research, constituting this as a trademark" (Núñez and González, 2019, p. 166), and the orientation of the doctorate based on improvement, research at the undergraduate and postgraduate levels, attending to different training scenarios, the necessary collaboration and alliance and focused on scientific work within research projects and the achievement of levels of satisfaction to the extent that academic and professional excellence are linked to social transformation (Matos, et. al., 2019).

Undertaking doctoral studies is assuming it as a life project (González, et. al., 2019), while its subsequent involvement requires giving continuity to what has been studied, which confers high levels of satisfaction.

In the sociocultural contexts of Cuban education in the 21st century, a graduate of the doctoral program must achieve in the formative process a professional and scientific development in which intellectual growth is identified (Pacheco, 2014; Ortiz, 2019; Matos, et al., 2019, Vargas, et. al., 2023) research as a substantive activity, a professional growth, as agreed with Díaz (1998), González and Jiménez, (2014), Santos, et. al., (2018); Vargas, et. al. (2023), and the level of satisfaction of the referents (Figueredo, 2012; Núñez, et. al., 2019, González et. al., 2019), show that satisfaction is an emotional and cognitive response, which is produced from its subsequent activity, which impacts quality academic professional performance, namely:

Intellectual Growth: with criteria for essential aspects between knowledge and practical demonstration, which reveals the creative appropriation of knowledge in the doctoral training process: namely: knowledge of regulatory documents related to the process of obtaining a scientific degree in the Republic of Cuba; the use of technological resources that enable access to and processing of scientific information; development of research competencies as a continuation of the doctoral training process; and management activities related to science, technology, and innovation.

Professional Growth: This is expressed in the process of providing feedback through systematic action to improve the activity in which they work and their academic career. This is expressed in: participation in academic and/or scientific networks, as well as in scientific events, leadership in research projects, and scientific publications in medium- and high-impact databases.

For its part, the level of graduate satisfaction referred to is related to the perception held by the graduate, linked to the motivation that involves what is provoked at a personal level in which they identify: relevance of the training received for the work they do, levels of motivation with the training received.

The synergy between the newly acquired skills is a function of professional training that enables us to respond to the needs of social transformation. This study contributes to the improvement of the scientific and methodological work of the doctoral program in Educational Sciences at

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

the University of Matanzas by offering guidelines for an evaluation based on three aspects that enhance the improvement of the activity carried out.

Methodology

The type of research assumed in this study is mixed, qualitative and quantitative, with a census sample, considering the period to the graduates in representativeness of the years and the functions they perform, a descriptive study was carried out based on the application basically of two recognized techniques (González, 2024): a questionnaire to graduates organized in three dimensions that collected 10 items, in four categories: “agree”, “disagree”, “neither agree nor disagree” and “totally agree”, and open questions that made it possible to complement the information from the answers to the closed questions. (table 1).

1. On Intellectual Growth

Indicators	4	3	2	1
Knowledge of the regulatory documents related to obtaining a scientific degree in the Republic of Cuba.				
The use of technological resources for the access and processing of scientific information.				
Development of research skills as a continuation of the doctoral training process				
Development of management activities, science, technology and innovation management				

Other ideas to express:

2. Professional Growth Dimension (Indicators):

Indicators	4	3	2	1
Participation in academic and/or scientific networks.				
Participation in a research project				
Scientific publications in medium and high impact databases				
Participation in scientific events				
Admission to a postdoctoral training program, as part of your growth				

Other considerations to keep in mind about:

a. Academic and scientific networks, you participate in:

1_____, 2____, more than two, mention them

b. Research projects:

1___, 2____,mention level to which it belongs_____

c. From the publications: Databases:

3. Dimensión Nivel de Satisfacción

Indicadores	4	3	2	1
Pertinencia de la formación recibida para la labor que realizan				
Niveles de motivación con la formación recibida.				

4. Three aspects to consider in doctoral postgraduate activity

A sample of 24 graduates of the program was taken between 2016 and 2022 over a period of time, to whom a survey was administered using a Google form. The questionnaire was validated using Cronbach's alpha coefficient, obtaining a value of 0.95, which indicates an excellent level of reliability (Tuapanta et al., 2017). Excel programs were used for data management..

One of the program's assessment mechanisms for verifying the relevance of the training of PhDs who graduate from the Education Sciences program is the objective evaluation by graduates. This allows for a consolidated input that becomes an assessment tool for developing a continuous improvement plan to reconfigure quality perspectives.

It was considered appropriate to learn the graduates' opinions on the content and methods of their doctoral training, as well as their appreciation and assessment of how much they contributed to intellectual and professional growth, and their level of satisfaction, in their performance, commitment, and motivation to participate in social transformation based on scientific foundations, given by the acquired capabilities.

The processing of the information captured in the survey is informed by the reflections of members of the doctoral committee that manages the program, as well as the authors, based on the challenges posed to Cuban higher education in response to the country's aspirations and aligned with the UNESCO Roadmap for Higher Education.

Results

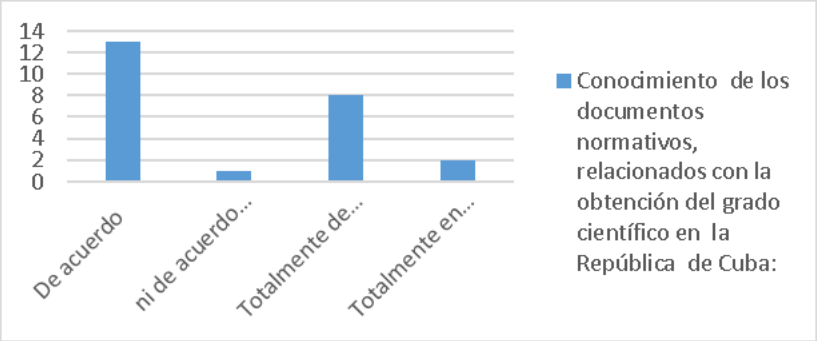
As explained in the Methodology section, a survey was sent via Google forms, which was answered in a timely manner by 24 graduates of the program, whose origins were as follows: 5 from Ecuador and 19 from Cuba. When asked whether the program from which they graduated contributed to their intellectual growth, professional growth, and level of satisfaction, the responses behaved as shown in the graphs.

Regarding Intellectual Growth, the responses for each item behaved (Graph 1 a, b, c, d) with a predominance of the responses "agree" and "Totally agree" (1 a, b, c).

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

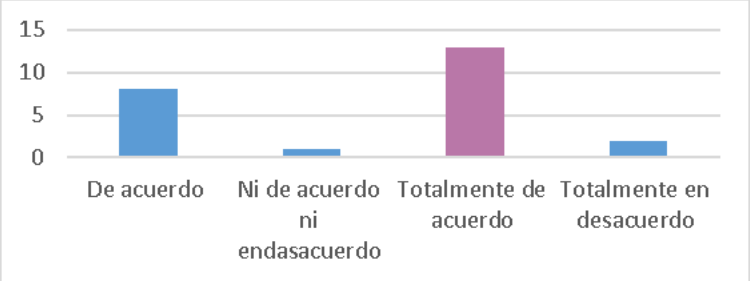
Graph 1ª

Knowledge of the regulatory documents related to obtaining a scientific degree in the Republic of Cuba



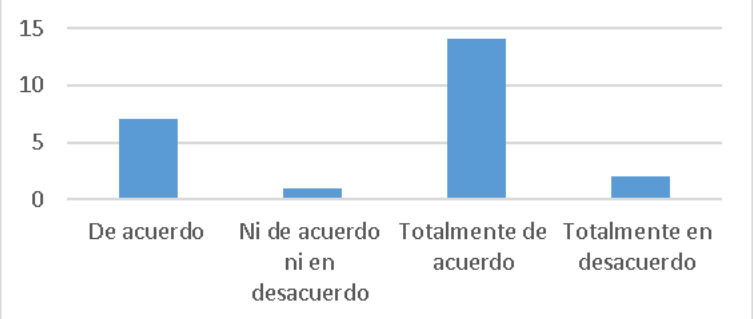
Graph 1b.

Use of technological resources for accessing and processing scientific information



Graph 1c.

Development of research skills as a continuation of the doctoral training process

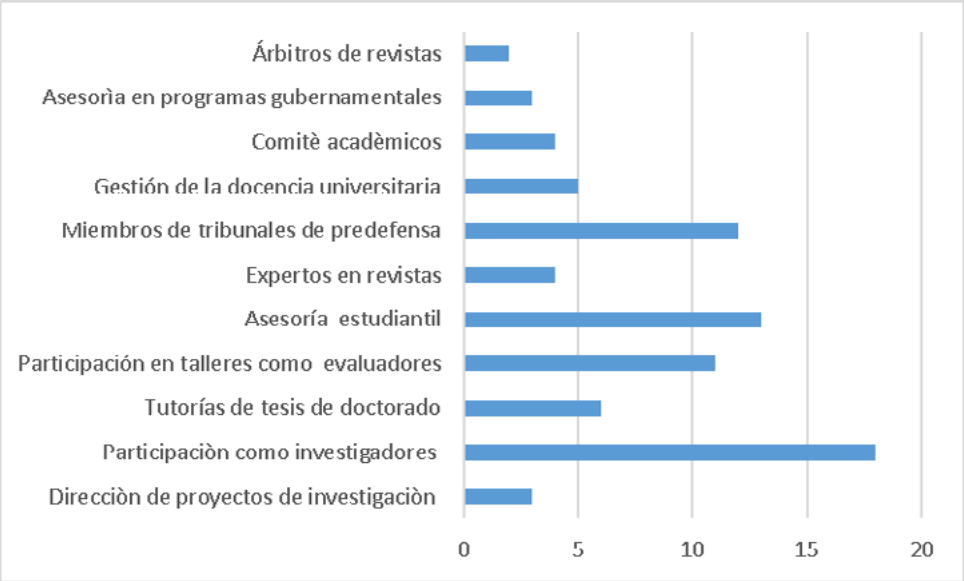


Regarding knowledge of the regulatory documents for obtaining a scientific degree, the highest percentage of affirmative responses stands out. Likewise, the results collected in the remaining items of this dimension revealed the rise in the use of technologies to access and process information. Regarding how the training process contributed to the development of research skills in the continuity of the doctoral training process (Chart 1c), in the responses to the open

question of this item, 87.5% stated: advising on undergraduate and postgraduate work, member of evaluation committees for master's and doctoral work, direction of research projects, member of the editorial committee of journals, Scientific Councils and other activities (Chart 1d).

Graph 1d.

Direction and management of science, technology and innovation activities



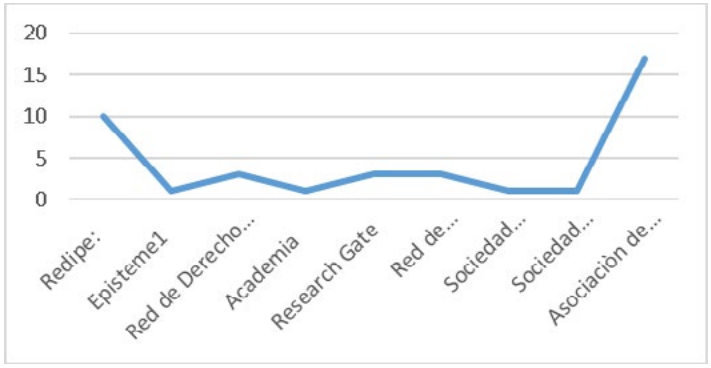
As shown in Figure 1d, there is an increase in participation in new research projects. Although the results in project management, academic committee membership, and doctoral thesis supervision are concentrated in a small group of trained doctors, two key aspects are distinguished: members of evaluation committees for doctoral projects at different stages, and evaluators in the program's thesis workshops. Participation as advisors on government programs is also highlighted as a favorable aspect, in line with Cuba's policy of government management based on science, technology, and innovation.

Regarding Professional Growth, the survey on participation in academic networks showed a membership rate of 87.5%, with Redipe (Red iberoamericana de Pedagogía y Educación (Ibero-American Network of Pedagogy and Education)) and the APC (Asociación de Pedagogos de Cuba (Association of Cuban Pedagogues)) being the most frequent. Interesting in this regard is the active participation in the networks, which was confirmed in the events and publications: Ibero-American Network of Pedagogy, Association of Pedagogues of Cuba, Episteme, International Network of Research on Educational Law, Society of Psychology, Cuban Society of Internal Medicine, as shown in graph 2.a:

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Graph 2.a

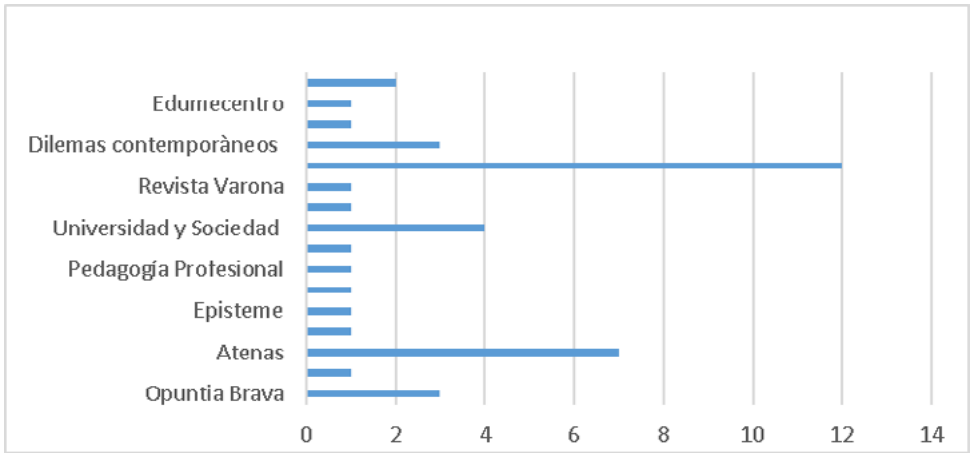
Academic networks with which graduates associate



The data in Figures 2b and 2c show that a high percentage of articles were published in journals indexed by SciELo, followed by Scopus and Redalyc, while the group of journals from other prominent databases (Doaj, Latindex, and nationally certified journals) accounted for 29.26%. The productivity of graduates who have pursued careers in research/teaching/management demonstrates a qualitatively superior integration of functions and new activities.

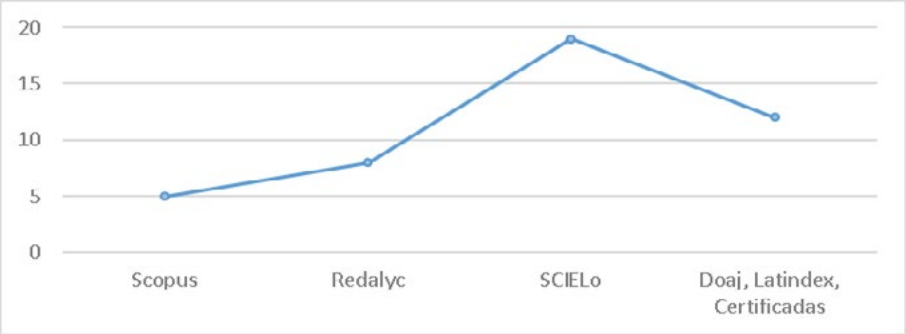
Graph 2b.

Journals in which graduates' articles are published



Graph 2c.

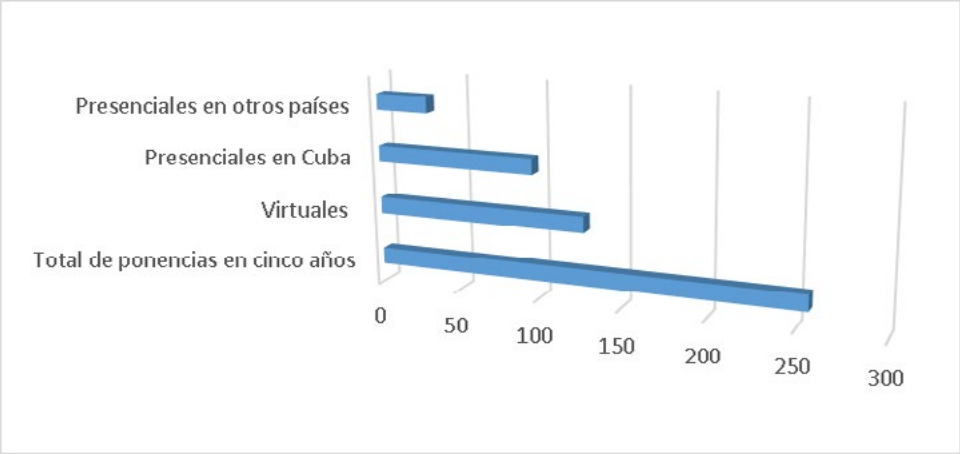
Behavior of publications in databases



Graph 2d shows the behavior of speakers at events over five years. It is one of the most dynamic indicators. As can be seen, there is a high percentage of participation in virtual events, corresponding to the years of the Covid-19 pandemic, given that virtuality was presented as a response to maintain the vitality of the program. In-person participation in events outside of Cuba is shown to be insufficient, mostly only possible for the majority of foreign doctoral students (of the five, one of them did not participate), and a lower number of Cubans, only two, which represents data to be considered in training strategies.

Graph 2d.

Event participation behavior

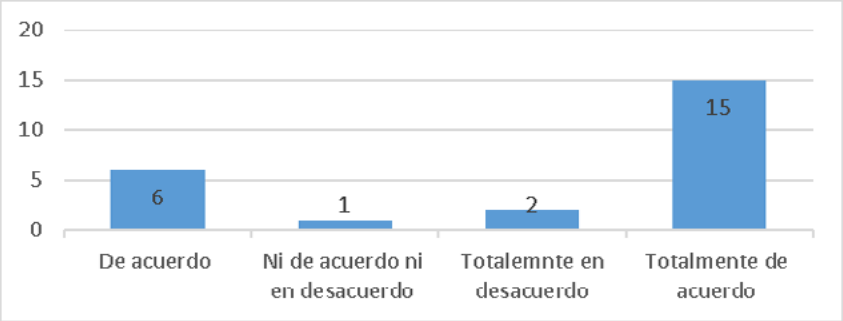


Regarding the level of satisfaction with the training received, two items related to relevance and motivation were included. Both items show a high percentage of favorable responses, which corresponds to the previous dimensions: 87.55 (“Strongly agree” and “Agree”) in each case, confirming the idea that this level is associated with success in the work they perform and high motivation for the activity they perform, in which the positive impact of doctoral training is appreciated.

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

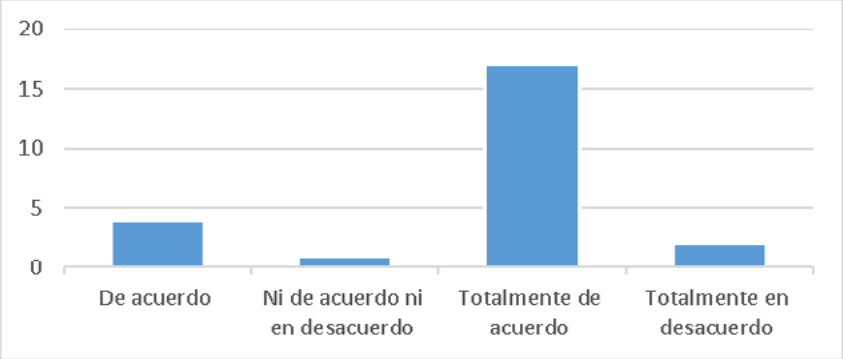
Graph 3 a.

Relevance of the training received for the work they do



Graph 3b.

Motivation levels with the training received



In response to the open question about aspects that should be taken into account in doctoral postgraduate activities, the responses offered various ideas for improving the program, levels of professional and intellectual growth, as well as satisfaction. The greatest emphasis was placed on postdoctoral studies, increasing preparation regarding the country's scientific policy in the face of its new challenges, monitoring, personalized attention, and access to up-to-date information to develop adequate management based on science, technology, and innovation.

In the scientific career of graduates, it is an excellent finding that a high percentage of them express in their responses an intellectual growth given by the knowledge of the country's scientific policy that they apply to their performance. An increase in scientific and academic management activities that they face is highlighted, articulated with the research skills they demonstrate, as well as the systematic and growing participation in research projects, and as government advisors for the application of science and technology to government management, although greater involvement as leaders of new projects is desirable.

Significantly, the results indicate a high percentage, 87% in all cases, of professional growth, by participating in scientific events with work derived from their doctoral thesis research and publishing scientific articles in national and international journals, as a result of research projects.

Likewise, it is identified that a percentage of theses, serving as master's thesis advisors at their respective institutions and at other institutions in the country, are integrated into doctoral training activities within the program, serving as advisors, members of evaluation committees for the partial results of doctoral research in thesis workshops, and as final versions at pre-defense events and on scientific degree defense panels. The indicator of active membership in scientific associations and societies both within the country and abroad is noteworthy.

Conclusions

According to the evaluation process conducted regarding the professional and scientific development of the PhD graduates from the Doctorate in Educational Sciences at the University of Matanzas, issues related to the program's value proposition were identified. The population participating in the study is currently performing roles consistent with those studied, which allows us to affirm that the program aims to enhance the professional development of each individual. Similarly, it was possible to identify that academic and scientific activities continue to be carried out, including participation in academic networks and presentations at academic events where PhDs can disseminate the results of their research.

On the other hand, regarding the scientific output of the PhD graduates, it was possible to identify that the graduates remain active in terms of academic output derived from the research they conduct in their workplaces. What is necessary to verify is the impact and frequency with which they achieve publications in high-impact journals worldwide.

In exploring the training process of the Doctoral Program in Educational Sciences at the University of Matanzas, from the perspective of its graduates, new aspects were identified for continuous improvement in the management of the program: the need to perfect the mechanisms so that publications reach a higher level of visibility and ensure the changes that contribute to raising their quality, promote the management of leadership in research projects in accordance with the priorities of the Ministry of Science, Technology and Environment of Cuba, and international calls, to produce new qualities in graduates that enhance the sustainability of the teaching staff and the quality of the educational processes they develop.

As an expression of the levels of satisfaction with the postdoctoral training process, improving the management and granting of doctoral scholarships, the direction of research projects, and participation in international calls for proposals, in accordance with the country's scientific policy, is an issue that requires attention.

Based on the results of the items, a correlation of responses and a grouping were performed, which imply new challenges to be considered in professional and scientific development in doctoral training:

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Regarding Intellectual Growth, the need to plan actions aimed at calling for research grants for knowledge updating and periodic postdoctoral training activities is highlighted; competition for publication of the best theses by the publisher; participation in the program through mentoring and scientific debates; expanding access to other academic networks and maintaining exchanges with graduates from other programs; and projecting the offer of postdoctoral fellowships and scholarships abroad.

Regarding Professional Growth, the emphasis is on open-minded responses regarding the assignment of tasks that contribute to professional and personal development, fostering the sustainability of the doctoral program, inclusion in research projects, diverse sharing of scientific results, and joint publications by graduates and doctoral students from different institutions.

Finally, regarding the level of satisfaction, the responses refer to the sharing among faculty members or research lines of research advances presented by doctoral students at each workshop, the intentional promotion of postdoctoral studies, and the monitoring of the introduction of scientific results.

Acknowledgements: to all those who participated in the development of the Doctoral Program at the University of Matanzas and to the graduates who agreed to answer the surveys.

References

Figueredo, C., Huet, I. y Pinheiro, MR. (2012). Construction of scientific knowledge and meaning: perceptions of Portuguese doctoral students. [Percepciones de los estudiantes portugueses de doctorado: construcción del conocimiento científico y del significado]. Social and Behavioral Sciences, 69, 755–762. www.sciencedirect.com

García, J. L. (2006). Investigaciones y doctorados en la universidad cubana. Reflexiones en el nuevo siglo. En Colectivo de Autores Gestión de Ciencia y Tecnología en las Universidades. La experiencia cubana, pp. 33-42. La Habana: Editorial Félix Varela.

García-Batista, G y Addine-Fernández, F. (2024). Las Ciencias de la Educación y los multiprocesos de la formación de posgrado. En; VARONA, Revista Científico-Metodológica, No. 79 enero-abril 2024. ISSN: 1992-8238.

González-Isasi, RM; Pariente-Fragoso, J L y Schmelkes-del Valle, C (2019). El doctorado como proyecto de vida: visión del doctorado en educación internacional de la UAT, México: Universidad Autónoma de Tamaulipas/ Colofón.

González, H. y Jiménez, A. (2014). Inserción Laboral de Nuevos Investigadores con Grado de Doctor en Chile. Journal of Technology Management & Innovation, 9 (4), 132-148. http://dx.doi.org/10.4067/S0718-27242014000400010

González-Pérez, M.M., Castillo-Estrella, T. (2020). "El taller de tesis en el proceso de formación doctoral". Revista MENDIVE Vol. 18 No. 4 (p. 940-953). Disponible en: http://mendive.upr.edu.cu/index.php/MendiveUPR/article/view/2126

González-Rivera, P.L. (2024). "Criterios actualizados sobre la metodología de la investigación educativa: Una aproximación bibliográfica", https://mendive.upr.edu.cu/index.php/MendiveUPR/article/view/3154

Hernández-Herrera, R., Rodríguez-Pendás, M., Piñón-González, J. del Canto-Colls, C., Guerra-Gómez, S., y Portela-Falgueras, R. (2009). Política y estrategia para la formación doctoral y posdoctoral en el sistema nacional de Educación en Cuba/: curso 67. La Habana: Sello editor Educación Cubana. Disponible en: http://www.cubaeduca.cu/media/www.cubaeduca.cu/medias/pdf/4798.pdf

Jiménez-Vázquez, MS. (2014). Trayectorias profesionales de egresados del Doctorado en Educación de la Universidad Autónoma de Tlaxcala. Un análisis de las funciones, productividad y movilidad en el mercado académico. Perfiles Educativos.; 36 (143).IISUE-UNAM. Disponible: http://www.elsevier.es/es-revista-perfiles-educativos-85-articulo-trayectoriasprofesionales-egresados-del-doctorado-S0185269814706087

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

López-Yépez, J., Fernández-Bajón, M., Orera-Orera, L., Sánchez-Vigil, J., Martínez-Montalvo, E., Hernández-Pacheco, F. J., Prat-Sedeño,J y Sánchez, C. (2008). Criterios para la evaluación de tesis doctorales. Revista General de Información y Documentación, 18, 293-322. Recuperado de: https://goo.gl/wdSDQt

Matos-Columbié, Z de la C, Pastrana, SA, Matos-Columbié, C. (2019). La formación doctoral y su impacto académico-social en el desarrollo local. Revista INVURNUS, Vol. 14 No. 1 28-33

Núñez Valdés, K y González-Campos, JA. (2019). Perfil de egreso doctoral: una propuesta desde el análisis documental y las expectativas de los doctorandos. IE Revista de Investigación Educativa de la REDIECH, 10(18), pp. 161-175. http://dx.doi.org/10.33010/ie_rie_rediech.v10i18.604https://www.scielo.org.mx/pdf/ierediech/v10n18/2448-8550-ierediech-10-18-161.pdf

Ortiz-Torres, E A. (2019). La calidad en la formación de doctores en Ciencias Pedagógicas: una evaluación desde sus egresados y propuestas de mejora. Revista Educación, vol. 43, núm. 1, pp. 1-15, DOI: https://doi.org/10.15517/revedu.v43i1.24326

Pacheco-Méndez, T (2014). Tradición, contexto y objeto de estudio en las tesis doctorales en Educación de tres universidades. Revista Iberoamericana de Educación Superior, vol. V, núm. 12, pp. 46-69. Instituto de Investigaciones sobre la Universidad y la Educación, Méx.

Saborido-Loidi, J. R. (2018). Universidad, investigación, innovación y formación doctoral para el desarrollo en Cuba. Revista Cubana de Educación Superior. No.1, p 4-18.

Santos-Padrón, H, Rodríguez-Cabrera, A, y Martínez-Calvo, S (2018). Desempeño de egresados del Doctorado en Ciencias de la Salud en Tabasco, México. Revista Cubana de Educación Médica Superior.;32(2) https://creativecommons.org/licenses/by-nc/4.0/deed.es_ES https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=http://scielo.sld.cu/pdf/ems/v32n2/a11_1364.pdf&ved=2ahUKEwjM3NKxqMmFAxXAibAFHdlfCU4QFnoECCQQAQ&usg=AOvVaw2hUHRjk4B-QINr2OqOdOQ0

Valencia-Gutiérrez, MC, Alonzo, Rivera, DL y Moguel Marín, SF. (2015). Estudio de egresados, un indicador de pertinencia y calidad. Estudio de caso. Revista Iberoamericana para la Investigación y el Desarrollo Educativo (RIDE). 6 (11): 129-145. https://www.ride.org.mx/index.php/RIDE/issue/view/11

Vargas-Fernández, T., Ordaz-Hernández, M., Marín-Cuba, L., y González-Pérez, M. (2023). Análisis del proceso de gestión de la formación doctoral en tres universidades cubanas. e3271, https://mendive.upr.edu.cu/index.php/MendiveUPR/article/view/3271

Tuapanta-Dacto, J. V., Duque-Vaca, M. A., y Mena-Reinoso, A. P. (2017). Alfa de cronbach to validate a questionnaire for the use of ict in university teachers. [S.l.], v. 1, n. 10, p. 37 – 48 http://revistas.espoch.edu.ec/index.php/mktdescubre/article/view/141

Declaración de originalidad

Los autores declaran que el manuscrito es original, no contiene elementos clasificados ni restringidos para su divulgación ni para la institución en la que se realizó, no han sido publicados con anterioridad, ni están siendo sometidos a la valoración de otra editorial. Asumen la responsabilidad absoluta del contenido recogido en el artículo y confirman que en él no existen plagios, conflictos de interés ni éticos.

Contribución autoral

Las autoras contribuyeron a la idea, así como a la recopilación de la información conceptual y de campo, la búsqueda bibliográfica y la redacción de las diferentes versiones.

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Uisrael
REVISTA CIENTÍFICA

May – August 2025 period
Vol. 12, No. 2
rcientifica@uisrael.edu.ec
https://doi.org/10.35290/rcui.v12n2.2025.1593 • e-ISSN: 2631 - 2786

The role of communication skills in comprehensive university education

El rol de las competencias comunicacionales en la formación universitaria integral

Date of receipt: 2025-03-07 Date of acceptance: 2025-03-28 Date of publication: 2025-05-10

Sara Elena Marín [1]
Ube Universidad César Vallejo, Piura, Perú.
semarinm@ucvvirtual.edu.pe
https://orcid.org/0000-0001-5063-6398

Noemi Elizabeth Cerna Miranda [2]
Universidad Católica de Santiago de Guayaquil, Ecuador.
noemi.cerna@cu.ucsg.edu.ec
https://orcid.org/0000-0002-4445-9812

Jhair Vladimir Jiménez Aldaz [3]
Universidad de Guayaquil, Ecuador.
jhair.jimeneza@ug.edu.ec
https://orcid.org/0000-0002-9760-9108

María Eugenia Rodríguez Rodríguez [4]
amer_8_98@hotmail.com
https://orcid.org/0000-0002-8229-5783

Abstract

Education is one of the strategic pillars for a society to evolve, which is why the integral formation of students is of vital importance. During the academic stage, students acquire cognitive bases that allow them to generate more knowledge, being communication skills the main resources that facilitate the teaching and learning process; the development of verbal and nonverbal language is evident from basic education until reaching higher education, at this stage people are able to generate and acquire large amounts of information by reading or making use of oral and written expressions, currently, the digital has also favored communication and knowledge construction. In academic training, it is necessary to stimulate communicative competencies so that students improve their form of expression, which is why teachers must intervene to encourage the development of language through techniques and methodologies that generate a feedback process in the classroom. In this sense, this work proposes a review of the role of communicational competencies in integral university education, opting for a documentary type of research to gather information and develop the proposed study.

Keywords: education, communication competences, comprehensive education, language

Resumen

La educación es uno de los pilares estratégicos para que una sociedad evolucione, razón por la cual, la formación integral de los estudiantes es de vital importancia. Durante la etapa académica el estudiantado adquiere bases cognitivas que les permite generar mayor conocimiento, siendo las competencias comunicacionales los principales recursos que facilitan el proceso de enseñanza y aprendizaje; el desarrollo del lenguaje verbal y no verbal se lo evidencia desde la enseñanza básica hasta alcanzar la educación superior, en esta etapa las personas son capaces de generar y adquirir grandes cantidades de información mediante la lectura o haciendo uso de las expresiones orales y escritas, actualmente, lo digital también ha favorecido la comunicación y la construcción de conocimiento. En la formación académica es necesario estimular las competencias comunicativas para que el estudiante mejore su forma de expresión, razón por la cual el docente debe intervenir para incentivar el desarrollo del lenguaje mediante técnicas y metodologías que generen un proceso de retroalimentación en la clase. En este sentido, este trabajo propone una revisión del rol de las competencias comunicacionales en la formación universitaria integral, se opta por una investigación de tipo documental para recopilar información y desarrollar el estudio propuesto.

Palabras clave: educación, competencias comunicacionales, formación integral, lenguaje

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Introduction

Education is one of the most important pillars of a productive society. Educational institutions train individuals to become professionals with the qualities and capabilities that enable them to lead the world in its various strategic fields. The teaching and learning process is essential for students to develop their cognitive capacity and be able to face the challenges of a more modern and digitizedz generation. Comprehensive education focuses on learning that instills responsible attitudes and critical, ethical, and creative thinking in students, with implications for efficiency, efficacy, and effectiveness in addressing the world's various problems (Fajardo and Hernández, 2022). The academic stage of life is a period in which individuals acquire a large amount of information, for which they use reading, oral or written expressions. Currently, the digital age is being leveraged to improve and expand communication processes that enable socialization and the construction of knowledge.

During the teaching and learning process, students acquire new knowledge, and their preparation becomes more complex as they progress through the various educational levels until they reach university, where their training focuses on more specific areas. However, there are topics that are common to any academic field. Communication skills are developed from basic education and are the foundation for students to acquire skills and know how to read, write, listen, and speak adequately, so that their level of linguistic expression gradually improves and the message can be correctly delivered and understood.

Communication skills are embedded in every action teachers take during class. Their ability allows them to direct and execute tasks according to academic plans. These tasks have the primary objectives of generating knowledge and training students to acquire the cognitive resources necessary to advance to higher levels of learning. Verbal and nonverbal language are the primary means of communication that allows people to exchange ideas, thoughts, reasoning, and any content of social interest. Higher education institutions are responsible for creating participatory educational environments to ensure a positive teaching and learning process, thereby stimulating students' cognitive abilities.

Individuals begin their academic preparation through basic education. This allows them to develop language skills and abilities to develop effective communication skills, improving their oral, written, and gestural language skills. This allows them to integrate into society and provide feedback for the teaching and learning process. The educational foundations in the initial stage help improve individuals' language, and their evolution is noticeable until reaching the higher education stage. During the university period, communication becomes more technical since more scientific and technological terms are used. Knowing how to convey understandable content is the best way to apply the communication skills acquired during academic training. The university requires trained, competent students with a remarkable educational foundation, necessary requirements to receive, assimilate, and convey scientific or technological content of various kinds. For this reason, the application of communication skills is important, since choosing an appropriate language allows information to be exchanged in a way that is understandable for both the sender and the receiver.

Educational institutions, through teachers and collaborators, train students personally and academically. Their professional involvement through educational tasks and actions allows improving people's verbal and non-verbal language skills. Pereira et al. (2022, p. 366) mention that communication competence should focus on: "developing reading and writing comprehension and production skills, that is, the statement of oral, written and body communication, based on cognitive and human development." The cognitive activation of the human being through debates, presentations, oral or written evaluations are the main means to encourage communication skills. Additionally, the digital age has motivated the application of resources such as gamification and social media to take advantage of new technologies and develop more interactive learning spaces.

Methodology

The research reflected in the proposed work is documentary in nature. Relevant information is collected through the search and analysis of scientific content available in various physical or digital media. The modern era has facilitated the exchange and acquisition of major works of social impact, regardless of location or language of origin. This allows for supporting the work and generating new knowledge. For the development of the study, it is necessary to investigate and work with information that has scientific and academic support because the content must be credible and up-to-date, which is why databases hosted in libraries or specialized journals are used.

The research needed for this study requires existing input; the information is found in sources such as books, presentations at scientific events, statistics, scientific articles, among others. These types of physical or digital documents constitute the database for documentary research. By conducting the research, novel content can be discovered and new knowledge generated (Arias, 2023).

Given this premise, we now present research contributions that have stood out and are aligned with the proposed topic to answer important questions such as: What has been researched? Why has it been researched? Which communication skills are appropriate in academic training? How are communication skills assimilated? These and other questions will be addressed during the study, which focuses on the role of communication skills in comprehensive university education. This will allow us to understand the impact of language skills and to understand which communication skills are most effective in this modern, digitalized era.

Development of the proposal

Adequate university education is one that focuses on the comprehensive development of the student, since their growth as a human being depends on how they evolve as a person and professional to become competent individuals in society. Education is one of the strategic pillars of the world; its importance lies in preparing students to adequately integrate into the productive sphere. During their time, students learn, perfect, and improve their skills through their cognitive ability. At the university stage, by possessing a considerable level of knowledge, communication skills are important to transmit, understand, and discern large amounts of information. The use of language is an important resource in the academic process. Muevecela and Fuentes (2024, p.

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

639) add that these skills are "skills that facilitate interaction between people, highlighting the two-way nature of the process." On the other hand, González and Robalino (2024, p. 38) add, regarding communication skills, that it is essential to integrate verbal, non-verbal, and digital dimensions "to improve the teaching-learning process, since they allow teachers to interact effectively with their students and promote active participation, critical thinking, and reflection." Comprehensive academic training should focus on developing and enhancing the different communication skills of students, so that they know when and which communication skill is most appropriate to use.

Communication skills are the essence of how a person stands out through correct communication, since they have the knowledge and ability to use verbal or non-verbal language and construct a message that responds to the needs or requirements that a certain context requests to share information; due to new technologies, the term: digital must be included, since virtual platforms and spaces have been developed to expand and diversify communication. Students and teachers are the main actors in the educational process. In their daily activities, they carry out activities that allow them to analyze, understand, interpret, critique, and reflect on issues of social impact. To develop cognitive capacity, it is necessary to explain and present ideas among class members, in a conference or in a seminar to debate the different reasonings (Vila et al., 2023).

Human beings are unique and distinguished from the rest, which is why the mastery of linguistic skills varies depending on the personality and training of each person and this is reflected in the existence of groups that excel or dominate certain communication skills, in this sense we can mention:

1. People whose spoken language excels, making them great speakers.
2. Individuals whose writing proficiency allows them to produce significant works of social impact.
3. Human beings whose nonverbal communication has allowed them to convey messages without the need to use oral or written language.

These groups of people have differentiated themselves by specializing in or preferring certain ways of communicating. It should be noted that there are also those who have received training or whose skills allow them to use different communication skills together. The importance of academic training, especially at the university level, must be framed by building on the foundations and comprehensively training students to master the various language skills and become professionals capable of reading critically, listening attentively, speaking and writing effectively, and understanding nonverbal language to understand and communicate appropriately in different social contexts.

Oral language predominates in the academic field due to the immediacy and clarity with which information can be conveyed. Additionally, writing and reading are the main complements that strengthen the educational process. University academic curricula should focus on activities that require listening, reading, speaking, writing, and other skills to develop the student's well-rounded development.

During the teaching and learning process, there are different ways of transmitting the message and building knowledge, with oral and written language being the communicative means that have stood out over the years, their results are the main argument when establishing a certain educational methodology. The communication skills associated with oral language have facilitated the exchange of information in a faster and more dynamic way, dialogue is the most used among people because the tonality of voice and the gestural expressions that directly or indirectly accompany the words generate an environment of greater trust or familiarity, Cuestas (2022, p. 610) adds that: "The ability to express oneself orally and competently is a requirement of today's world, this from communicative situations in everyday life, which is why it is so necessary to develop and strengthen oral skills." Oral communication is the means by which two or more people exchange information. It is a language used daily in different contexts due to its immediacy. Knowing how to express oneself orally is a necessary requirement, especially when a person aspires to excel in a more competitive world of work.

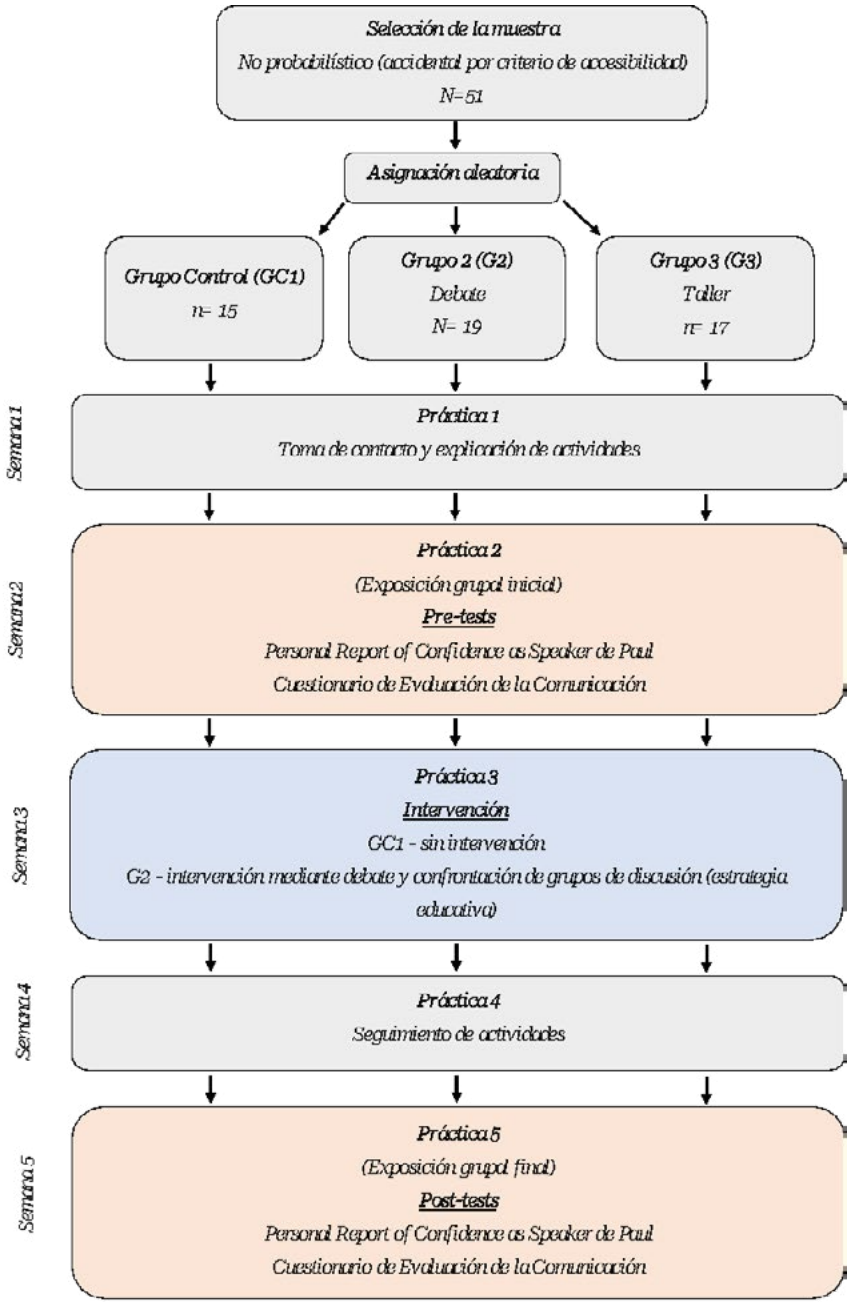
Maldonado et al. (2022, p. 405) applied a (pre-post) experiment with the participation of 51 students of the subject of Psychology of Organizations and Work Teams, which is evidenced in Figure 1; their work reflects an effective communication workshop in which they applied psychoeducational strategies to improve oral competence and generate an environment of active participation in the classroom, positive results were achieved by exposing and motivating students to intervene during classes, in such a way that anxiety and fear are reduced, which also generates an improvement in the expression of ideas, arguments and opinions and encourages active participation and group work, the authors also point out that they carried out "a continuous evaluation throughout the teaching-learning process using as strategies systematic observation, registration and corrections with feedback to the students of all the activities carried out during the development of the subject."

Communicative competence focused on oral language requires the joint participation of two or more people to exchange information. Several factors are necessary for the message to be properly transmitted and interpreted. For example, those involved in the communication process must speak the same language, share knowledge, or have communicative intentions for the dialogues to be understandable. Academic institutions are made up of students with different skills and personalities, which is why it is necessary for teachers to use spoken language with different tones of voice to attract attention and convey a message. By generating active dialogue during the teaching and learning process, an environment of trust is created, in which the class leader monitors and encourages knowledge building.

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Figure 1

Sample allocation and phases of the applied experiment..



Note. From "Competencia oral y ansiedad: entrenamiento y eficacia en estudiantes universitarios" ("Oral Competence and Anxiety: Training and Effectiveness in University Students,") by Maldonado et al., 2022, RLCS, Latin American Journal of Communication, 80, p. 407

González (2024, pp. 240-241) in her work regarding language skills and their importance in strengthening communicative competencies, conducts semi-structured interviews and observation sessions to analyze communicative behavior in real situations. The results show

that the development of communication skills is important in education and that language skills enrich social interaction. In this study, participants indicated that using clear oral language helps them convey confidence and authority. Additionally, those who developed outstanding writing skills mention that this helped them when writing reports and emails, important requirements in the workplace. The author of this work adds that oral expression is "The ability to express ideas verbally", while writing is "The ability to write in a clear and structured manner". These communication skills are appreciated for their importance in negotiation and conflict resolution in different contexts and are necessary for academic and professional communication. For their part, Saredo et al. (2024, p. 897) point out the importance of academic literacy, with writing and reading being the main communication skills that must be developed, for which university teaching practices were enhanced through the creation of spaces for dialogue, reflection and construction of knowledge. The authors add that in the classes that were observed, reading was developed "collectively in small groups, under the guidance of questions, paying attention to paratexts, and in printed books, which as a whole constituted one of the most enriching contributions of the experience."

Communication skills focused on oral skills are important to improve teaching and learning processes; clarity and direct communication between teachers and students dynamizes the transmission of messages by stimulating verbal language, which is why it is essential to encourage practice and dialogue, however, there are university students who have developed a low level of oral language, and it is necessary to correct through the intervention of the teacher by implementing methods or strategies that encourage the oral participation of those involved, this is necessary for adequate academic performance, Belduma, (2021, p. 270) mentions that the teacher must depart from the educational practices of the past and focus on "resorting to didactic strategies in which the student works as a team, in this way self-directed teaching is triggered, the student learns to make decisions, propose strategies and participate by sharing their experiences through communication." New methodologies and academic resources contribute to the comprehensive development of university students. Students improve their writing and speaking skills as they complete their activities. Writing skills are generally practiced in homework assignments, while oral skills are used to generate dialogue and share information.

Vásquez (2022, p. 4398) faced with the problem of university students in Peru, referring to the poor development of communication skills, states that, by applying public speaking, the development of oral language improves, adding that "public speaking programs are closely related to the improvement of communication skills in university students, which will allow them to achieve correct academic and professional performance", his assertion is supported by the studies that supported his research, since it is evident that in the literature the authors carried out comparison tests of communication skills before and after the application of public speaking programs to university students, improvisation spaces were also carried out and as a result it is shown that, in all cases there is a significant improvement in oral expression, this is because these activities contribute to improving confidence when speaking in public. By carrying out a public speaking activity, it is possible to transmit messages with high informative content so that the receiving audience absorbs and learns new knowledge.

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

Education, through its teachers, is responsible for the comprehensive development of the student; throughout the different academic stages, knowledge is developed and strengthened through the use of communication skills, since exchanging information requires listening, reading, writing, speaking, gesturing, among other forms of communication. In the university academic setting, oral and written expressions need to be fundamentally developed to energize and communicate ideas and reasoning more clearly. Fernández et al. (2025, pp. 1246, 1253) propose a study to strengthen these communication skills through the implementation of innovative teaching strategies. This is because it is possible to comprehensively develop linguistic skills that favor the construction of knowledge. The authors add that "The application of strategies focused on oral and written expression has proven to be an effective tool for optimizing learning, promoting greater participation, understanding, and applicability of knowledge in different contexts." Additionally, they point out that digital spaces, writing applications, podcasts, videos, and other interactive resources "allow students to improve their communication skills in a dynamic and engaging way." New technologies have improved the interaction between teachers and students during the teaching and learning process. The use of multimedia content, virtual reality spaces, augmented reality, gamification, and other virtual resources makes education more dynamic. Currently, there are multiple academic resources available to develop and improve language skills. Reading comprehension, oral and written expression, monologues, and other activities have been used to help reduce fear or insecurities when socializing and communicating.

There are modern alternatives for improving and developing oral expression in the academic field. This communicative competence is developed through activities where spoken language is the primary resource for communication. Podcasts are an innovative resource for fostering oral communication due to their dynamic and spontaneous nature, Mulero et al. (2024, p. 24) by incorporating the podcast as a seminar resource, 218 students from different degrees from a European university transmit contents prepared by them or their teacher, in this communicative space the debate and the evaluation of the experiences on the different topics elaborated in class were established, it is evident that the students have a positive perception of the podcast since it fosters the interest and satisfaction of the participants, the authors mention that the podcast "emerges as a horizontal medium with a minimal hierarchical structure representing a cultural practice that shapes communication instead of simply transmitting it", additionally, the recordings of the different programs made by the students can be recorded, in such a way that they can be used to provide feedback on the verbal and non-verbal language used in each work session, which helps develop skills such as listening and speaking.

Daher et al. (2022, p. 9) in their study regarding ICT and active methodologies to promote comprehensive university education, report the results of the implementation of an audiovisual device (ICT) and support material, for which 87 students from two Chilean universities belonging to Psychology, Sociology and Social Communication courses created a micro documentary and support material with didactic capsules to consolidate the contents addressed in class. Among their conclusions, the authors point out that active methodologies improve student participation, when applied it is possible to improve the use of dialogue "product of sharing and contrasting different points of view, the need to reach agreements and the greater depth with which the contents were worked on." The implementation of interactive or multimedia resources favors

academic training and the development of oral expressions; this occurs when teachers direct the class to generate debate and share ideas or criteria by appreciating and listening to the content reflected through technological devices. The teacher is responsible for providing updated information, summarizing concepts, pointing out problems and guiding students in their learning process, so that knowledge is transferred appropriately, educators must use understandable language and apply resources that stimulate cognitive capacity, in addition, students can improve their understanding and retention using oral and written expressions (Astudillo, 2023).

Communication skills are important for comprehensive university education. Oral and written expression are especially important during the academic stage. These skills are the foundation for generating knowledge and communication. However, reading and listening skills are essential to complement the teaching and learning process.

Discussion

Communication skills are necessary for the comprehensive education of university students, which is why it is necessary to develop skills such as listening, speaking, reading, writing, among others. Communicative expression must be developed throughout academic life to generate better opportunities at a professional and social level; the knowledge built in higher education institutions is largely based on the exchange of information carried out in the teaching and learning process. Teachers, being responsible for guiding the training of students, need to use methodologies and resources that allow them to provide feedback on academic content to generate knowledge. Valdez and Pérez (2021, p. 438) mention that “Communicative skills in the educational field are of great importance and significance; academic and school results largely depend on them.”

By investigating the selected information, one understands the importance of knowing how to use different forms of language to find the primary means of conveying concepts, ideas, and reasoning. Verbal and nonverbal language used in the teaching and learning process are utilized in such a way that there are spaces to develop oral competence and other moments to utilize written skills. These two competencies are the ones used recurrently and have the greatest influence on teachers and students. Oral language is used to convey a message quickly and clearly and to establish more dynamic communication, while writing helps reinforce learning through tasks and activities that require writing so that knowledge persists in physical or digital form.

Writing and speaking are the communication resources predominantly used in university academic training. This is evident when observing classes taught in higher education institutions, where dialogue, writing, and student participation can be observed under the guidance of instructors. Oral and written language develops and evolves until interpreters acquire the necessary knowledge to assimilate scientific terms and concepts specific to each professional field.

Oral language is a skill that facilitates communication between two or more people. The opportunities for dialogue fostered during class encourage students to participate, ask questions, and answer questions. Teachers are responsible for generating interaction in the classroom. Their participation is based on methodologies and activities that contribute to the comprehensive

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

development of students. The literature supporting this study shows that students improve their oral expression when participating in interactive learning activities and that the use of technological resources helps complement their learning.

By implementing innovative technology and teaching methods in education, academic teaching has been improved and made more dynamic. The tools available through platforms, applications, and especially social media, favor the development of communication skills. A clear example is the podcast, a resource that has been used to improve oral expression, so that communication, being spontaneous and interactive, helps counteract negative factors such as fear, anxiety, and insecurity when speaking.

Writing is another means of generating knowledge and communicating. At the university level, this skill is used to reinforce knowledge through tasks and activities where the message must persist, either physically or digitally. Written expression allows students to reflect on what they've learned through reports, texts, and even assessments. Writing skills and reasoning allow for quality writing to be considered even for developing scientific content that contributes to society in its various areas of knowledge.

Oral and written expression are communication skills that complement each other during the teaching and learning process. Human beings have an innate capacity for communication and have used speech and writing as their primary means of sharing information. In the academic field, verbal and nonverbal language allow teachers to transfer their knowledge to students, generating engagement and reinforcing knowledge through feedback. The digital age has diversified the teaching and learning process, providing resources for improving communication skills. Audiovisual materials and digital spaces such as social media are elements that students have preferred to use, abandoning traditional education.

Communication skills are a fundamental part of comprehensive university education. Spoken and written language are widely used in teaching and learning because they are complementary. Furthermore, it is important to consider that skills such as reading and listening are resources that consolidate education and develop knowledge. The literature that has complemented this study reflects that the digital age and new technologies generate new discoveries and methodologies at every turn, which is why it is necessary to update information and understand how these resources contribute to students' comprehensive education.

Conclusions

The various educational levels have relied on communication skills to transfer knowledge from teachers to students, which is why language development is important for establishing communication foundations that support the teaching and learning process. Students must acquire the necessary elements to function in all areas, with writing and speaking being the skills that are developed to the point of mastering scientific conclusions and technical content specific to each professional career.

There are communication skills that human beings develop better than others. Some are skilled at writing, others excel at their oral language, there are individuals whose strengths are listening and reading, and there are even those who are compatible and jointly use the different communication elements to convey or understand a message. In this sense, comprehensive academic training focuses on harnessing these virtues to educate capable and competent people so they can function in the various strategic and productive sectors of society.

Oral and written expression are the communication skills that university students use most regularly in their academic training. This is because they are communicative elements that allow students and instructors to continuously share relevant information to build knowledge. Additionally, skills such as reading and listening are competencies that enhance the teaching and learning process.

The digital age and new technologies have been introduced into education to innovate the way the teaching and learning process is developed. Social media, interactive resources such as podcasts, and audiovisual media are appreciated by students due to their dynamism and immediacy. However, traditional resources such as public speaking are functional strategies that help develop communication skills and reduce fear and insecurities when communicating.

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

References

Arias, F. (2023). Investigación documental, investigación bibliométrica y revisiones sistemáticas. *RED-HECS: Revista Electrónica de Humanidades, Educación y Comunicación Social*, *31*(22), 9–28.

Astudillo, J. (2023). La alfabetización académica en la educación superior. *Ciencia Latina Revista Científica Multidisciplinar*, *7*(2), 812–827. https://doi.org/10.37811/cl_rcm.v7i2.5368

Belduma, R. (2021). Aprendizaje basado en problemas como estrategia para mejorar los procesos comunicacionales en el aula. *Polo Del Conocimiento*, *6*(3), 267–276. https://doi.org/10.23857/pc.v6i3.2362

Cuestas, B. (2022). La competencia oral en educación superior: Una revisión sistemática. *Revista de La Universidad Del Zulia*, *13*(38), 609–625. https://doi.org/10.46925//rdluz.38.33

Daher, M., Rosati, A., Hernández, A., Vásquez, N., y Tomicic, A. (2022). TIC y metodologías activas para promover la educación universitaria integral. *Revista Electrónica de Investigación Educativa*, *24*, 1–13. https://www.youtube.com/watch?v=g4-99wjMzfU

Fajardo, E., y Hernández, F. (2022). La formación integral universitaria desde el contexto de las humanidades y su aporte al aprendizaje experiencial para el servicio. *Revista Humanidades*, *12*(2). https://doi.org/10.15517/h.v12i2.51289

Fernández Sánchez, M. J., Orquera Saavedra, D. S., y Guañuna Minango, C. A. (2025). Innovación educativa para el fortalecimiento de las competencias comunicativas en la educación superior: estrategias didácticas para el desarrollo de habilidades lingüísticas y su impacto en el ámbito profesional. *Reincisol.*, *4*(7), 1245–1267. https://doi.org/10.59282/reincisol.V4(7)1245-1267

González, N. (2024). Las destrezas lingüísticas y su importancia en el fortalecimiento de competencias comunicativas. *EPISTEME KOINONIA*, *7*(14), 225–247. https://doi.org/10.35381/e.k.v7i14.4202

González, V., y Robalino, G. (2024). Modelo teórico de competencias comunicacionales para mejorar la enseñanza-aprendizaje de la lengua y literatura en la formación de docentes de la Universidad Estatal de Milagro, Ecuador. *Revista Científica Ciencia y Educación*, *5*(10), 38–52.

Maldonado, M., García, A., Armada, J., Alós, F., y Moreno, E. (2022). Competencia oral y ansiedad: entrenamiento y eficacia en estudiantes universitarios. *Revista Latina de Comunicacion Social*, *80*, 401–434. https://doi.org/10.4185/RLCS-2022-1800

Muevecela, S., y Fuentes, C. (2024). Tejiendo futuros brillantes: Estrategias pedagógicas innovadoras para potenciar competencias matemáticas y comunicacionales, impulsando el turismo comunitario que respalden el desarrollo local. *LATAM Revista Latinoamericana de Ciencias Sociales y Humanidades*, *5*(2), 634–644. https://doi.org/10.56712/latam.v5i2.1905

Mulero, I., Álamo, A., y Pérez, M. (2024). Una experiencia innovadora a través del podcast en la educación superior. *Formacion Universitaria*, *17*(1), 23–32. https://doi.org/10.4067/S0718-50062024000100023

Pereira, M., Romero, M., Panchi, W., Panchi, R., y Gualpa, S. (2022). Liderazgo pedagógico: una visión del currículo con énfasis en competencias. *Revista Educare*, *26*(2), 362–375. https://orcid.org/0000-0003-0770-2171

Saredo, F., Kanovich, S., Grattarola, S., Estévez, J., Molinelli, R., y Ferreira, R. (2024). Enseñanza de la lectura y la escritura en la universidad. *Revista Mexicana de Investigación Educativa*, *29*(103), 885–911.

Valdez, W., y Pérez, M. (2021). Las competencias comunicativas como factor fundamental para el desarrollo social. *Polo Del Conocimiento*, *6*(3), 433–456. https://doi.org/10.23857/pc.v6i3.2380

Vásquez, A. (2022). Oratoria y competencias comunicativas orales en estudiantes universitarios. *Ciencia Latina Revista Científica Multidisciplinar*, *6*(1), 4398–4417. https://doi.org/10.37811/cl_rcm.v6i1.1806

Vila, P., Velasco, J., y Vila, P. (2023). Desarrollo de la competencia comunicativa en educación superior. *Horizontes. Revista de Investigación En Ciencias de La Educación*, *7*(31), 2583–2596. https://doi.org/10.33996/revistahorizontes.v7i31.686

e-ISSN: 2631 - 2786
rcientifica@uisrael.edu.ec

PUBLICATION GUIDELINES FOR UISRAEL SCIENTIFIC JOURNAL

The UISRAEL Scientific Journal is an academic publication of the Universidad Tecnológica Israel, which, since its first issue in 2014, has covered a wide range of topics, including tourism, administrative and economic sciences, engineering, as well as arts and humanities. However, it currently focuses on social sciences and their interdisciplinary fields (such as communication, education, sociology, anthropology, contemporary visual arts, psychology, ICT, law, etc.).

Published every four months—in January, May, and September—the journal accepts submissions in both Spanish and English to enhance its international reach. It is open-access and free of charge, including original research articles, essays, and reviews.

It is important to note that all submissions undergo a double-blind peer review process to ensure objectivity and quality in the publications.

1. SCOPE AND POLICY

Submissions must be original and must not have been previously published or be under review in another journal.

Submissions may be in the form of:

- **Articles:** These are theoretical and empirical works with a length of 12 to 16 pages, including the title, abstracts, keywords, tables, and references. The structure must follow this format: Title, Author(s), Institution, Email address of each author, ORCID code (https://orcid.org/), Abstract (translations from automated translators will not be accepted), Keywords, Introduction, Methodology, Results, Conclusions, and References..
- **Essays:** These are comprehensive reviews of the current state of research on a specific topic, justified through a systematic review of authors addressing the issue. Essays should be between 12 and 16 pages, including the title, abstracts, keywords, tables, and references. The structure must follow this format: Title, Author(s), Institution, Email address of each author, ORCID code (https://orcid.org/), Abstract (translations from automated translators will not be accepted), Keywords, Introduction, Development, Discussion/Debate/ Conclusions, and References..
- **Reviews:** Reviews provide a critical assessment of an author, book, or artistic work, offering an evaluation or constructive critique. The maximum length is 12 pages, including the title, abstracts, keywords, tables, and references. The structure must follow this format: Title, Author(s), Email address of each author, ORCID code (https://orcid.org/), Abstract

(translations from automated translators will not be accepted due to their low quality), Keywords, Introduction, Development, Discussion/Debate/Conclusions, and References..

2. EDITORIAL PROCESS

Authors are informed that the works to be published must respect the format of the established template and must be submitted exclusively via OJS (Open Journal System): https://revista.uisrael.edu.ec/index.php/rcui, through which the process of acceptance/ rejection and estimation/ devaluation will be handled, as well as, in the case of acceptance, the review process.

Within a maximum period of 30 days from the receipt of each work, authors will receive a notification. In case the manuscript presents formal deficiencies or is not included in the thematic focus of the publication, the Editor-in-Chief or Scientific Director will formally or thematically dismiss the work without the possibility of appeal by the author. On the contrary, if there are superficial formal deficiencies, the work will be returned to the author for correction before the evaluation process begins. For this, the following categories are established: accepted, accepted with minor changes, accepted with major changes, rejected.

Authors are requested to send the corrected document within no more than 30 days for a second review, except for those authors who have been notified that their document was rejected.

The manuscripts will be scientifically evaluated anonymously by expert peers in the topic, in order to guarantee the objectivity and independence of the Journal.

The criteria for the acceptance/rejection of works by the Editorial Board are the following:

a. Timeliness and novelty.
b. Relevance and significance: advancement of scientific knowledge.
c. Originality.
d. Reliability and scientific validity: proven methodological quality.
e. Organization (logical coherence and formal presentation).
f. Co-authorship and degree of internationalization of the proposal and the team.
g. Presentation: good writing.

3. SUBMISSION AND STRUCTURE OF ORIGINALS

The works should be submitted in Times New Roman font, size 12, single-spaced, with left alignment and no tabulators or line breaks between paragraphs. Only major blocks (author, title, abstract, descriptors, credits, and epigraphs) should be separated with a line break.

The works should be submitted in Word format for PC. The citation and bibliography standards are based on APA 7th edition.

Below, the detailed structure for the academic text is described:

- Full names and surnames of each author (maximum 4) in order of priority; the number of authors should be justified by the theme, complexity, and extension. Along with the names, the institution, email of each author, and ORCID code should follow.
- Abstract in Spanish with a maximum of 200 words, which will concisely describe the reason and objective of the research, the methodology used, the most significant results, and main conclusions, with the following structure: justification of the topic, objectives, methodology of the study, results, and conclusions. It should be written impersonally in the third person: "The present work was analyzed…".
- Abstract in English with a maximum of 200 words. For its elaboration, as with the title and keywords, the use of automatic translators is not allowed. Reviewers will also consider this factor when evaluating the work.
- 4-6 keywords in Spanish / 4-6 keywords in English.
- Introduction: should include the foundations and purpose of the study, using bibliographic citations, as well as the review of the most significant literature from valid and high-quality sources.
- Methodology: should be presented with enough detail for the reader to understand and confirm the development of the research. The adopted methodological approach, population and sample, and selected techniques should be described.
- Results: should present the information gathered during the research process. If necessary, the results should be presented in figures and/or tables.
- Conclusions: should summarize the findings, relating the observations to other studies of interest, pointing out contributions and limitations without repeating data already discussed in other sections.
- References: citations should be listed as references to the text. Bibliography not cited in the text should not be included. The number of bibliographic references should be at least 12 and no more than 20, the necessary amount to contextualize the theoretical framework, methodology used, and research results. References should be presented alphabetically by the first author's last name (adding the second name only if the first is too common). APA 7th edition guidelines should be followed.
- Financial support (optional): The Council Science Editors recommends that authors specify the source of funding for the research. Works backed by national or international competitive projects will be considered a priority. In any case, for the scientific evaluation of the manuscript, it must be anonymized with XXXX only for the initial evaluation, so as not to identify authors and research teams, which should be explicitly mentioned in the final manuscript.

4. COPYRIGHT

Authors participating in the evaluation and publication processes retain their copyright, granting the journal the right to the first publication, as established by the conditions of recognition in the Creative Commons License 4.0 International (CC BY), where authors authorize free access to their works, allowing readers to copy, distribute, and transmit through various media, ensuring broad dissemination of the published scientific knowledge.

5. SUBMISSION CHECKLIST

Researchers must complete the submission checklist in OJS. If any requirement is not met, the author will not be able to upload the file. Therefore, it is necessary to review the following parameters before submitting the document.

- The submission has not been previously published nor is it under consideration by any other journal (or an explanation has been provided in the editor's comments).
- The submission file is in Microsoft Word format, according to the established style template.
- Whenever possible, URLs for references are provided.
- The text is left-aligned with single spacing; Times New Roman font, size 12.
- The text adheres to the stylistic and bibliographic requirements summarized in the Author Guidelines.
- If submitted to a peer-reviewed section of the journal, the instructions for ensuring anonymous evaluation should be followed.

6. DISHONEST PRACTICES: PLAGIARISM AND SCIENTIFIC FRAUD

In case of any infringement against intellectual property rights, the actions and procedures arising from this situation will be the responsibility of the authors. In this regard, the following serious infractions should be noted:

- Plagiarism: copying ideas or works from others and presenting them as one's own, such as adopting words or ideas from other authors without due recognition, not using quotation marks for a literal quote, giving false information about the true source of the quote, paraphrasing a source without mentioning it, abusive paraphrasing, even if the source is mentioned.
- Scientific fraud: the fabrication, falsification, or omission of information, data, as well as duplicate publication of the same work and authorship conflicts.

CITATION AND BIBLIOGRAPHIC REFERENCES

The citation and bibliographic reference system should follow the American Psychological Association (APA, 7th edition) standards.

- The order of authors as listed in the original document submitted will be implicitly respected.

Francisco Pizarro E4-142 and Marieta de Veintimilla
Phone: (593) 2 255-5741
rcientifica@uisrael.edu.ec
Quito - Ecuador