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To cite this article:
Castellanos-Vega, R., & González-Reyes, R. (2026). REAPSES: Methodological Innovation for the Integration of Learning Styles in the Age of Artificial Intelligence. *Papeles, 18*(35), e2290.
https://doi.org/10.54104/papeles.v18n35.2290

REAPSES: Methodological Innovation for the Integration of Learning Styles in the Age of Artificial Intelligence

REAPSES: innovación metodológica para la integración de estilos de aprendizaje en la era de la inteligencia artificial

https://doi.org/10.54104/papeles.v18n35.2290

Received: October 3rd, 2025
Approved: March 2nd, 2026
Published: April 27th, 2026



Abstract

Introduction: The evolution of education toward the era of Artificial Intelligence demands teaching and learning processes that directly impact student knowledge and behavior. Therefore, there is a need to innovate in methodologies that involve all students, considering their different abilities and skills. Methodology: The present study aimed to evaluate the effectiveness of the new teaching strategy called REAPSES method (Learning Style Corners for Primary, Secondary and Higher Education, both university and non-university) in the development of key competencies. This intervention was designed exclusively for educators and professionals within the educational sector. A quasi-experimental design with repeated measures, pretest and posttest, was used with a single group, involving professionals and students in the education field. Data were collected using the Honey-Alonso Learning Styles Questionnaire (CHAEA), the Creativity Questionnaire (CREA), and a training evaluation survey. Results and discussion: The results indicate that the REAPSES Method significantly develops creativity, regardless of the participants' predominant learning style. Furthermore, a notable increase in participants' knowledge of the method and high satisfaction with the training were observed. Conclusions: This evidence suggests that methodology transcends disciplinary barriers, fostering essential transversal skills for the current educational context and adapting effectively to the diversity of learning styles.

Keywords:
Teaching method; training; learning; creativity; artificial intelligence; information technology

Resumen

Introducción: la evolución educativa hacia la era de la Inteligencia Artificial, demanda procesos de enseñanza y aprendizaje que impacten directamente en el conocimiento y la conducta del estudiante. Por ello, surge la necesidad de innovar en metodologías que involucren a todos los estudiantes, considerando sus diferentes capacidades y habilidades. Metodología: el presente estudio tuvo como objetivo evaluar la eficacia de la nueva estrategia de enseñanza denominada método REAPSES (Rincones de Estilos de Aprendizaje para Educación Primaria, Secundaria y Superior, tanto universitaria como no universitaria) en el desarrollo de competencias clave. Esta intervención se diseñó exclusivamente para educadores y profesionales del sector educativo. Se empleó un diseño cuasi-experimental de medidas repetidas pretest y postest con un solo grupo, involucrando a profesionales y estudiantes del ámbito educativo. La recolección de datos se realizó mediante el Cuestionario Honey-Alonso de Estilos de Aprendizaje (CHAEA), el Cuestionario de Creatividad (CREA) y una encuesta de valoración de la formación. Resultados y discusión: los resultados indican que el Método REAPSES desarrolla

Palabras clave:
Método de enseñanza; formación; aprendizaje; creatividad; inteligencia artificial; tecnología de la información

significativamente la creatividad, independientemente del estilo de aprendizaje predominante de los participantes. Además, se observó un incremento notable en el conocimiento de los asistentes sobre el método y una alta satisfacción con la formación. Conclusiones: esta evidencia sugiere que la metodología trasciende barreras disciplinarias, fomentando habilidades transversales esenciales para el contexto educativo actual y adaptándose eficazmente a la diversidad de estilos de aprendizaje.

1. Introduction

Current education demands profound transformations that allow for the integration of each student's individual capabilities, with the rise of Artificial Intelligence (AI) being the fundamental catalyst for this need (Strielkowski et al., 2025). The current technological environment and the overstimulation of media and social networks are causing a progressive loss of human contact, dialogue, debate, and critical questioning, while risks of technological over-dependence and the decline of critical and creative thinking are emerging (Ali et al., 2024). In this scenario, the current literature show that in the face of automation and the perceived threat of AI, people tend to revalue creativity as a less automatable skill and one that is more complementary to technology, acting as a "last human refuge" in the labor market and in educational contexts (Gamez-Djokic et al., 2025; Koivisto & Grassini, 2023; Romo-Pérez et al., 2023). Therefore, it is imperative that universities identify how their students learn in order to design classes aligned with their diverse learning styles and leverage the possibilities of AI-supported personalization, without sacrificing the development of autonomy and divergent thinking (Liu & Liu, 2023; Nguyen et al., 2024; Vega-Román et al., 2025). To address this challenge, the REAPSES Method was created (Castellanos, 2020), an innovation designed to enhance skills that technology cannot easily replicate: original thinking, complex problem-solving, and innovation, in line with proposals for interactive models and the critical use of digital tools to foster teaching and professional creativity (Liu & Liu, 2023).

The objectives of this research are to evaluate the effectiveness of the REAPSES method in developing creativity, the use of digital tools, and knowledge of learning styles in a real-world learning environment, providing evidence of its impact on educators and professionals. The hypothesis is that the application of the method significantly increases the creative potential of teachers, regardless of their predominant style, providing essential divergent thinking skills in the age of AI and aligned with the need for curricula that integrate creativity, critical digital literacy and adaptation to hybrid and personalized learning contexts (Ali et al., 2024).

1.1 REAPSES Method

This is a new teaching methodology called the REAPSES Method created by Castellanos (2020). It allows teachers and students to understand their learning styles, how they learn, how they teach, and to foster communication, creativity, and critical thinking in pedagogical activities (Porras-Masero et al., 2023). These are necessary aspects, especially given the rise of artificial intelligence, that must be reinforced in classrooms.

This methodology offers the following benefits:

1. It fosters students' in-depth knowledge.
2. It promotes teachers' self-awareness regarding their own learning style and how they convey information.
3. It facilitates the planning of inclusive lessons, considering the four learning styles.
4. It guides teaching toward the intentional development of communication, critical thinking, creativity, and classroom cohesion.
5. It positions the teacher as a facilitator and guide of the learning process, transcending the role of mere transmitter of knowledge.
6. It integrates the strategic use of 21st-century digital tools, recognizing their role as essential allies in the teaching process and in the context of Artificial Intelligence.

This methodology utilizes four learning style frameworks, according to Alonso et al. (1994a): active, reflective, theoretical, and practical, fostering individualization and inclusive teaching in learning (Brasó-Rius et al., 2025).

1.2 Creativity

According to Jara et al. (2024), creativity is understood as a process of productive thinking and problem-solving. In this sense, divergent thinking is essential for innovation and creativity, and is of great importance for daily life preparation and conflict resolution. This process involves key psychological factors such as working memory, cognitive flexibility, rationality, curiosity, and motivation (Palma & Agramonte, 2024, p. 80).

The REAPSES method seeks to address these aspects through self-knowledge and the identification of individual style. This allows the student to better understand a topic, generating confidence and fostering openness, driven by intrinsic motivation, which gives rise to curiosity and the rational application of what has been learned in real-life situations.

Authors such as Romo-Pérez et al. (2023) point out that, with the emergence of Artificial Intelligence, creativity is the last refuge for experts, where it is necessary to carry out a process of adaptation through innovation to integrate AI into the teaching and learning process (p. 332).

1.3 Artificial Intelligence and Digital Tools in Education

The 21st century is characterized by rapid technological advancement, generating growing concern and a need for teachers to effectively integrate digital tools and Artificial Intelligence (AI) in the classroom. These technologies are crucial for fostering creativity and developing students' critical thinking (Chancusing & Granja, 2023).

To capture the attention of new generations, immersed in what we could call the "ICT Era" (Information and Communication Technologies), it is essential to use these resources as a guide and orientation (Gil-Ruiz & Domínguez-Lloria, 2025; Romo-Pérez et al., 2023). Doing so optimizes the problem-solving process, "improving educational quality and transforming teaching and learning processes" (Jara et al., 2024, p. 651).



2. Methodology

This research is part of a specific training program, a "Diploma," and was an initiative promoted by the Antonio Nariño University, South Campus of Bogotá (Bogotá, Colombia). It was administered within the framework of the Faculty of Education's postdoctoral internships. The objective of this initiative was to train students, principals, and teachers from schools and universities in the application of the REAPSES method.

2.1 Design

This research design is a quasi-experimental, repeated-measures approach, using a single group with pre- and post-test assessments. This approach allowed for the evaluation of the impact of the REAPSES Method training intervention by comparing participants' characteristics and skills before and after the training.

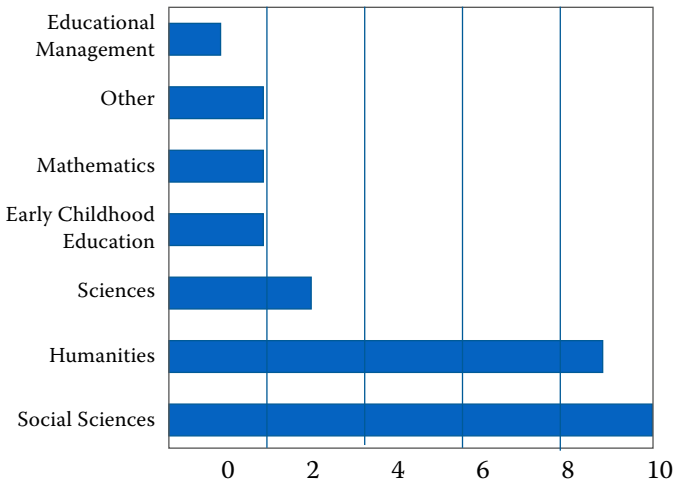
The design is quasi-experimental because, although there were intervention and measurements at different times, no randomized control group were considered. The repeated measures consisted of the administration of assessment instruments: the Creativity Questionnaire (CREA), the Creativity Questionnaire (CREA), and an evaluation survey both at the beginning and end of the training.

The purpose of this design was to evaluate the effectiveness of the REAPSES Method in developing creativity and other key skills in a real-life training environment, providing evidence of its impact on a group of educators and professionals.

2.2 Participants

Initially, 29 participants were enrolled, of whom 21 attended and actively participated. The participants had an average age of 29 years and came from diverse areas and disciplines (Figure 1) representing different educational institutions in Bogotá.

Figure 1. Areas and disciplines of the participants.



Source: own elaboration

2.3 Instruments

The instruments used in this study were as follows:

2.3.1 Learning Styles Questionnaire (CHAEA)

To identify the learning styles of participants in the REAPSES Method training, the Alonso et al., (1994b) Learning Styles Questionnaire (CHAEA) was used. This instrument, widely recognized and validated in the educational field, is emphasized by authors such as Escurra (1992) as allowing individuals to characterize their learning preferences based on Kolb's (1984) learning styles model, adapted and popularized by Honey & Munford (1986) and Sadler-Smith (1996).

The CHAEA questionnaire consists of 80 dichotomous items (true/false or agree/disagree) that assess four main learning styles:

Active: characterized by participation, movement, and sharing knowledge in

the here and now; they are improvisers and like to be protagonists.
Reflective: They tend to observe and analyze information to draw conclusions, requiring time to do so.
Theoretical: They prefer unambiguous information that is logical, rational, and objective.
Pragmatic: They are oriented toward experimentation, that is, putting acquired knowledge into practice and applying it to reality.

2.3.2 Creativity Questionnaire (CREA)

To assess participants' creative potential, a fundamental skill that the REAPSES Method seeks to strengthen, the Creativity Questionnaire (CREA) was administered (Corbalán et al., 2003). This instrument focuses on measuring divergent thinking and the ability to generate original ideas and innovative solutions to various problems or situations (Elisondo & Donolo, 2016).

The CREA does not focus on finished creative products, but rather on fluency, flexibility, originality, and elaboration of thought. It consists of a series of open-ended tasks or questions that invite participants to produce multiple responses or explore different solution paths. The CREA score provides an indicator of individuals' raw creative potential, beyond their specific knowledge (Gil-Ruiz & Domínguez-Lloria, 2025).

2.3.3 Feedback Survey

To assess participants' satisfaction and overall perception of the quality of the REAPSES Method training, a feedback survey was conducted at the end of each session. This instrument was specifically designed to gather feedback from attendees in each session. The survey used a qualitative rating scale, allowing participants to rate their experience overall and in specific components. The response options for the overall training rating were: Excellent, Good, Fair, and Poor. The data collected through this survey is essential for understanding the acceptance and level of satisfaction with the proposed methodology, as well as for identifying potential areas for improvement in future REAPSES Method implementations. Gathering this direct feedback from end-users provides valuable insight into the perceived effectiveness of the training.

2.3.4 Procedure

Applications for the "Diploma in Teaching Based on the REAPSES Method" course were accepted in early June. Once the registration period closed, participants were notified of the course start date. This training is part of the postdoctoral internships for the Doctoral Program in Education and the Bachelor's Program in Social Sciences at the Faculty of Education of the Antonio Nariño University, South Campus, in Bogotá.

The training began on June 26 and concluded on July 4, 2025. Initially, a preliminary understanding of the group was established using digital tools, and the REAPSES method and its learning styles were presented. Subsequently, each day consisted of two-hour sessions focused on a specific learning style, beginning with the reflective, theoretical, and active styles, and concluding with the pragmatic style. The sessions explored the characteristics of each style, the difficulties participants might encounter and provided practical exercises for each style.

Each learning corner was implemented using a rotating station methodology, following a uniform four-phase technical structure: Corner objective: a pedagogical goal aligned with the style's competence was defined (e.g., for the theoretical style, the objective was to provide information about the method itself);

Table 1. Implementation per session.

Corner	Objective	Materials	Development	Final Project
Reflective	To analyze information from diverse perspectives and reflect on personal learning and teaching styles.	CHAEA questionnaires, guiding question sheets, QR codes, and Padlet.	Participants answered metacognitive questions and linked their predominant styles to their teaching practice.	Group poster with consolidated reflections and photographic evidence uploaded to Padlet.
Theoretical	To synthesize information logically and systematically to understand the fundamentals of the REAPSES method.	Explanatory video, "See/Think/Ask" comparative chart, and WordArt tool.	Subgroups applied the "See/Think/Ask" visible thinking technique after watching a video segment to structure key concepts.	A word cloud (WordArt) featuring the most relevant technical concepts, shared with the group.
Active	To experience learning through play, peer communication, and solving immediate challenges.	Gamification tools (Lockee. fr, Educaplay, LearningApps) and digital puzzles.	Groups solved clues hidden in interactive games to obtain learning style initials and unlock a digital padlock.	A record of the playful experience on Padlet, highlighting the importance of spontaneity in learning.
Pragmatic (Experimental)	To connect theory with practice through the design of real-world pedagogical proposals.	REAPSES templates, design tools (Bookcreator/ Canva), and chosen curricular themes.	Each teacher selected a theme from their subject area and designed their own learning corners following the REAPSES structure.	An interactive digital resource (Bookcreator book or Canva presentation) integrating the designed activities.

Source: own elaboration

materials: Specific resources were provided according to the learning style, including digital collaboration tools (Padlet); development: in this phase, the facilitator modeled the REAPSES Method through concrete examples. Participants interacted with the content under the rules of the learning corner, allowing total immersion in the information processing style characteristic of this approach; final work: as evidence of learning, each participant had to create a tangible product that integrated the REAPSES method with their area of knowledge. The details for each session are described in table 1.

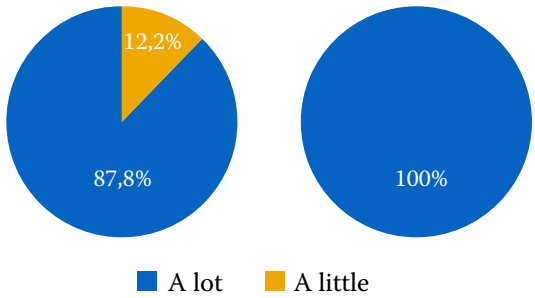
3. Results and discussion

At the beginning of the training, participants indicated that their primary motivation for taking the program was to update and acquire knowledge and skills, particularly in innovative teaching methodologies and tools. They also highlighted their interest in professional growth and, specifically, in the REAPSES method.

3.1 Results

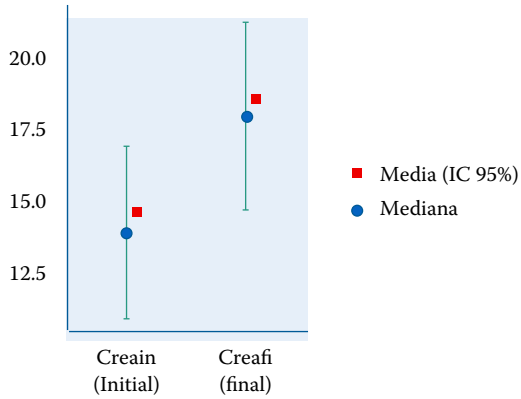
In the initial course evaluation, participants reported limited knowledge of the new REAPSES teaching methodology (However, at the end of the training, they showed a significant increase in their understanding of this methodology (Figure 2).

Figure 2. Initial Understanding of the REAPSES Method (left) and Final preparation of the REAPSES (right).



Source: own elaboration.

Figure 4. Student t-test results for the initial (CREAIN) and final (CREAFI) creativity scores.



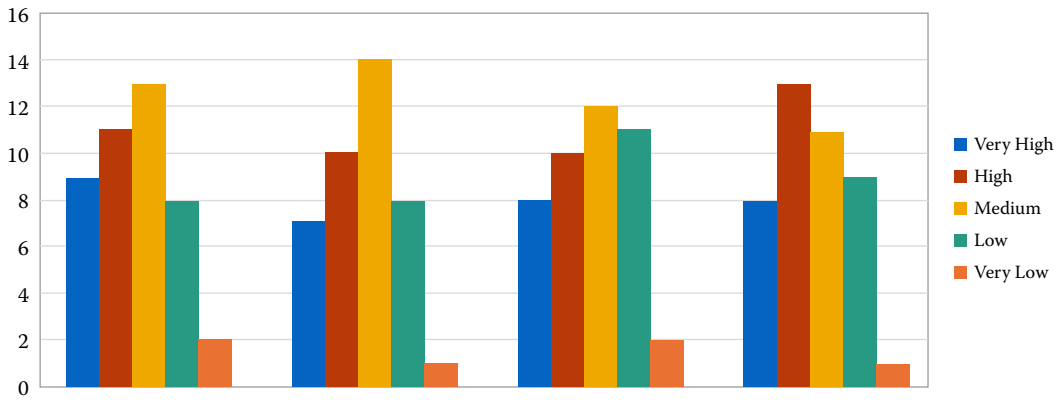
Source: own elaboration.

Regarding knowledge of learning styles, the CHAEA questionnaire provided individual scores for each style, allowing each participant's predominant style to be identified. It was observed that the active and pragmatic styles were the most prevalent in the group, followed by the reflective and theoretical styles. This suggests a diversity in learning and knowledge acquisition preferences among the participants in this group (Figure 3).

Regarding the creativity test (CREA), a consistent and significant improvement was evident between the initial (CREAIN) and final (CREAFI) scores (Figure 4). Participants showed an average increase of 4.1 points in their scores, suggesting that training in the REAPSES Method positively impacted the development of their creative potential. This finding is particularly relevant given the rise of Artificial Intelligence, positioning human creativity as a differentiating skill and an essential competitive advantage in the contemporary workplace (Zuloeta et al. 2021).

To determine the statistical significance of the observed improvement in creativity scores, a paired-samples Student t-test was performed (Figure 4). The results indicated a statistically significant difference between the

Figure 3. Distribution of Learning Styles in the group.



Source: own elaboration

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mean initial (CREAIN) and final (CREAFIN) creativity scores. With a t-value of -5.569 and a p-value of <0.001, it is confirmed that the REAPSES Method exerted a positive and significant effect on the development of participants' creativity.

In addition, training evaluations were collected at the end of each session. Participants expressed overwhelmingly positive satisfaction: 88% rated the training as "Excellent" and 12% as "Good." This high level of approval reflects a favorable perception of the quality and satisfaction with the proposed methodology. In the qualitative observations, participants repeatedly highlighted the pedagogical value of the course for their professional development and positively valued obtaining the certification as a relevant asset for their future teaching careers.

Finally, the survey also gathered information on the use of digital tools. A consolidation and, in some cases, an expansion in the use of platforms and applications was observed. Tools such as Canva, Educaplay, YouTube, ChatGPT, and Google maintained or strengthened their use. Additionally, new tools such as Lockee and Bookcreator were mentioned. The continued use of devices such as cell phones and computers is notable, indicating a greater integration of various technological resources into the learning process (Table 2).

The results of this research, by demonstrating a significant increase in participants' knowledge of the REAPSES method after the training, reaffirm the need and relevance of introducing active and innovative pedagogical methodologies in today's educational context. This progress is particularly relevant considering the challenges and resistance to change that these implementations often face, as noted by Teneda et al. (2025). This increase in initial understanding, which went from limited to substantial knowledge, suggests that the training proposal was clear and effective in its objective of familiarizing educators with this approach.

The diversity of learning styles identified through the CHAEA questionnaire (active, pragmatic, reflective, and theoretical) underscores the inherent heterogeneity of any group of educators. In this context, the effectiveness of the REAPSES method is enhanced by its ability to adapt to these varied preferences. By integrating learning style corners, the methodology facilitates participants' engagement in ways that resonate with their dominant style, while also promoting the exploration and development of less dominant styles. This is crucial for comprehensive training, enabling dynamic, collaborative, inclusive, and meaningful learning environments (Rivas, 2025).

The most striking finding of this research is the statistically significant improvement in participants' creativity scores measured through the CREA questionnaire. This average increase of 4.1 points, validated by a Student t-test ($p < 0.001$), not only confirms one of the program's core objectives but also suggests that the multifaceted structure of

Table 2. Digital tools reported by participants before and after the training.

Digital tools		
Before		**After**
Google	Google Scholar	Canva
Classroom	Padlet	Educaplay
Meet	Moodle	YouTube
Zoom	Outlook	ChatGPT
Teams	Gmail	Google
Canva	Duolingo	Lockee
Genially	Videos	Tv
Kahoot	Podcast	Cellphone
Quizizz	Cellphone	computer
ChatGPT	computer	Padlet
		Bookcreator

Source: own elaboration

the REAPSES method stimulates divergent thinking.

The interaction between different learning styles promoted by REAPSES appears to be a key factor in the development of creativity. This integration fosters cognitive flexibility, essential for creativity, and is the driving force behind innovation in teaching and learning in the face of AI. For example, the experimental nature of the active and pragmatic styles facilitates the generation of ideas and the implementation of solutions, while the analytical depth of the reflective and theoretical styles contributes to the incubation and critical evaluation phase of these ideas. This integration fosters cognitive flexibility essential for creativity.

In an era defined by the rapid advancement of Artificial Intelligence, where many routine tasks are being automated, human creativity emerges as a differentiating and indispensable skill. The results of this study are particularly relevant, as they position the REAPSES method as a pedagogical tool capable of enhancing precisely those skills that AI cannot easily replicate: original thinking, complex problem-solving, and the ability to innovate, as proposed through the use of Challenge-Based Learning (Moreira-Alcivar, 2025).

The overwhelmingly positive satisfaction of participants, with 88 % rating the training as "Excellent" and 12 % as "Good," underscores the high perceived quality and relevance of the REAPSES program. These assessments align directly with the initial motivations expressed by the educators, who sought to update their teaching skills, strengthen their pedagogical competencies, and innovate their practice. The alignment between expectations and lived experience suggests that the method is not only effective in its pedagogical objectives but also resonates with the professional needs of today's teachers.

The analysis of the use of digital tools reveals a consolidation of known platforms and the emergence of new tools, as long as it is done in moderation and teachers are trained in their use in the classroom (Robles & Zambrano, 2025). This evolution in the participants' digital repertoire indicates greater technological fluency and adaptability, which is a desirable outcome in teacher training. The integration of personal devices such as cell phones and computers into learning activities reflects a trend in their use in education and the leveraging of everyday resources for pedagogical purposes (Ordoñez & Marrufo, 2025).

The REAPSES method's ability to integrate tools, as seen in the creation of digital books with Bookcreator, demonstrates how an active methodology can enhance the innovative use of technology in the classroom, transcending mere information consumption to foster content creation. Authors such as García (2025) confirm that the use of these tools overcomes imagination barriers and helps in complex situations.

4. Conclusions

This research aimed to evaluate the effectiveness of the REAPSES method in developing creativity, the use of digital tools, awareness of learning styles, and other key skills in a real-life training environment, providing evidence of its impact on a group of educators and professionals.

The findings of this research confirm the effectiveness of the method as a recommended strategy for other institutions, especially for their ongoing professional development programs for teachers. This allows teachers to adapt their teaching to the diversity of learning styles in the modern classroom. The

results demonstrate that this methodology is suitable for groups with diverse learning styles (active, reflective, theoretical, and pragmatic), which underscores the need for pedagogical approaches that adapt to and foster multiple learning pathways.

By integrating the four corners of learning styles, the REAPSES method presents itself as an ideal strategy for addressing students' varied inclinations. It provides activities that resonate with predominant styles while simultaneously seeking to develop lesser dominant styles. This adaptability is crucial for understanding how students process information and learn, which in turn justifies the relevance of the REAPSES method in promoting teaching that accommodates this diversity of styles (Galarza et al. 2025). This addresses the first and second objectives of this research.

In the context of the rise of Artificial Intelligence, where human abilities for original thinking and complex problem-solving are becoming invaluable, creativity is an essential competency. The results of the CREA questionnaire have made it possible to evaluate the positive impact of REAPSES training on the development of this fundamental competency among educators and, by extension, their students.

Creativity, often linked to divergent thinking, benefits from the integration of learning styles. The active and pragmatic styles can encourage experimentation and the implementation of new ideas, key components of creativity. On the other hand, the reflective and theoretical styles are crucial for the incubation phase, critical analysis, and conceptualization of ideas, elements also inherent to the creative process. The results indicated a widespread improvement in creativity, suggesting that the REAPSES Method, as a methodology that integrates different learning styles in a planned and contextualized way (Collahuazo et al., 2025), manages to stimulate creative potential regardless of the participant's predominant learning style. Exposure to different approaches may even have fostered greater cognitive flexibility and adaptability, skills linked to creativity. This was demonstrated in the classroom by asking participants to create their own digital book using Bookcreator, choosing a topic of interest. The resulting creations, such as: "teaching fractions", "the solar system in English", "graffiti", "living beings", "types of sentences", "foods around the world in English", "daily routine in English", "how to gossip effectively?", "My dream place to live", "democracy", "dance: the language of free dreams", "Graffiti: storytelling" and "knowing my territory", were produced by the participants using the REAPSES method and incorporating digital tools, supporting the need to integrate them into educational processes (Jara et al. 2024). The observed improvement in creativity aligns directly with participants' desire to "learn new things and put them into practice," "strengthen my pedagogical skills," and "learn to innovate my work in the classroom." These motives demonstrate participants' willingness to seek tools that improve their educational practice, and the creativity results suggest that the course met these expectations (Castellanos et al., 2024).

REAPSES training, by enhancing creativity, equips educators with directly applicable skills to find innovative methodologies and expand their fields of knowledge, transcending disciplinary barriers (Chancusing & Granja, 2023). This fosters key transversal skills for the era of Artificial Intelligence, preparing teachers to face the challenges of 21st-century education.

The results of this study have important practical implications for teacher training and curriculum design. The demonstrated effectiveness of the REAPSES method suggests its potential to be implemented in continuing

professional development programs, offering educators concrete tools for adapting their teaching to the diversity of learning styles and to enhance creativity in the classroom. Their ability to foster skills such as divergent learning is especially valuable in an educational ecosystem.

Limitations of the Study

Despite the robustness of the findings, it is important to acknowledge certain limitations of this study. The quasi-experimental design, by not including a randomized control group, prevents establishing a causal relationship as robust as in a pure experiment. Future research could benefit from experimental designs with control groups and larger samples to generalize the results.

Practical Implications and Further Research

For future research, it is recommended to explore the application of the REAPSES method at different educational levels and in different geographical areas. It would be beneficial to conduct longitudinal studies to evaluate the long-term impact of the method on students' academic performance and teachers' professional careers. Likewise, the inclusion of mixed methodologies that combine quantitative analysis with more in-depth qualitative case studies could offer a richer understanding of the teaching and learning processes facilitated by REAPSES. Finally, investigating the specific effect of the method on educators' adoption and innovative use of digital tools would represent a promising line of research.

Funding

This research has no external funding.

Acknowledgment

We would like to thank the Doctoral Program in Education and the Bachelor's Program in Social Sciences, from the Faculty of Education at Antonio Nariño University, and all the participants in the Diploma in Teaching based on the REAPSES method, for their motivation and interest in discovering new methodologies for teaching and learning, which were fundamental to the completion of this study

Conflict of interests

The authors declare that they do not have conflict of interest.

Ethical implications

Informed consent was obtained from the subjects involved in the study.

Authors' contribution

Research design, RCV; Data analysis (RCV, RAG); methodology (RCV, RAG); manuscript review (RCV, RAG). All the authors have read and approved the submitted version.

Declaration of generative AI-assistted technologies in the writing process

During the preparation of this work, the author(s) used Gemini for grammar correction. After using this tool/service, they reviewed and edited the content as needed and assume full responsibility for it.

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