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Active methodologies in pre-university Courses in the Educational Sciences program at UPEA

Metodologías activas en los cursos preuniversitarios de la Carrera de Ciencias de la Educación (UPEA)

Adolfo Jose Apaza Condori
adol3jose@gmail.com
https://orcid.org/0009-0009-4611-3565
Universidad Pública de El Alto. La Paz, Bolivia

Mariluz Julissa Quispe Mamani
julissaquispe271@gmail.com
https://orcid.org/0009-0003-4555-6192
Universidad Pública de El Alto. La Paz, Bolivia

Grover Felix Laime Machaca
grovher869@gmail.com
https://orcid.org/0009-0000-8907-9197
Universidad Pública de El Alto. La Paz, Bolivia

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Abstract

Pre-university courses are often delivered through teacher-centered, lecture-based classes and memorization-focused assessments that limit student participation and the transfer of learning. This study aimed to determine whether implementing a comprehensive program of active methodologies—including flipped classroom, problem-based learning (PBL), inquiry-based learning (IBL), guided learning, collaborative learning, and gamification—improves the formative process in pre-university courses in the Educational Sciences program at UPEA. A quantitative, quasi-experimental design was employed (experimental group [EG]: O_1 X O_2; control group [CG]: O_3–O_4) with 118 students (EG = 60; CG = 58), using formative achievement tests in a pretest–posttest format. The EG showed a significant gain of 18.7 points (pretest: 56.2; posttest: 74.9), whereas the CG increased by only 1.3 points. Differences were statistically significant ($p < .001$) with large effect sizes (between-group $d = 2.14$; within-group $d = 1.59$), demonstrating the effectiveness of the intervention. These findings provide strong evidence that the systematic implementation of active methodologies is substantially more effective than traditional models for optimizing the formative process in pre-university courses.

Keywords: Active methodologies; Collaborative learning; Flipped classroom; Formative process; Pre-university.

Resumen

Pre-university courses are often delivered through teacher-centered, lecture-based classes and memorization-focused assessments that limit student participation and the transfer of learning. This study aimed to determine whether implementing a comprehensive program of active methodologies—including flipped classroom, problem-based learning (PBL), inquiry-based learning (IBL), guided learning, collaborative learning, and gamification—improves the formative process in pre-university courses in the Educational Sciences program at UPEA. A quantitative, quasi-experimental design was employed (experimental group [EG]: O_1 X O_2; control group [CG]: O_3–O_4) with 118 students (EG = 60; CG = 58), using formative achievement tests in a pretest–posttest format. The EG showed a significant gain of 18.7 points (pretest: 56.2; posttest: 74.9), whereas the CG increased by only 1.3 points. Differences were statistically significant ($p < .001$) with large effect sizes (between-group $d = 2.14$; within-group $d = 1.59$), demonstrating the effectiveness of the intervention. These findings provide strong evidence that the systematic implementation of active methodologies is substantially more effective than traditional models for optimizing the formative process in pre-university courses.

Palabras clave: Active methodologies; Collaborative learning; Flipped classroom; Formative process; Pre-university.

INTRODUCTION

Pre-university courses represent a crucial stage in the transition to higher education, where pedagogical approaches traditionally centered on expository lecturing have predominated. This modality limits student participation and hinders the development of essential competencies for academic success at the university level. In this regard, Reilly et al. (2025) corroborate that, in pre-university populations, emotional factors have a greater impact than purely cognitive ones, while Mladenovici et al. (2024) identify terminological inconsistencies that affect pedagogical quality in higher education.

Furthermore, the specialized literature evidences profound gaps in teacher preparation to implement educational innovations, constituting a critical core for pedagogical transformation at the pre-university level. In this respect, Fernández et al. (2024) show that 68% of teachers possess only basic digital competencies, severely limiting their capacity to design and facilitate active, collaborative, and technology-mediated learning experiences. This digital gap translates into practical resistance to methodological change.

In parallel, Scortescu and Sava (2024) identify five predominant training models in initial teacher education, characterized by scarce and ineffective theory–practice integration. This disconnect between abstract pedagogical knowledge and its concrete classroom application directly affects teachers' preparation and self-efficacy in implementing innovative methodologies with confidence and depth, thereby perpetuating traditional models.

It is noteworthy that the development of complex skills at this critical stage goes beyond mere content transfer, requiring a pedagogical approach centered on building competencies for university success. In this line, Simón et al. (2025) argue that metacognitive strategies are more effective for self-regulated learning, enhancing students' ability to plan, monitor, and evaluate their cognitive processes.

Complementarily, Berciano et al. (2024) show that qualitative assessments within STEAM approaches better capture competency development by prioritizing argumentation, creativity, and the application of knowledge in real contexts over rote memorization. These convergent findings highlight the pressing need to move beyond traditional transmissive models, which are insufficient for developing the critical thinking, problem-solving, and autonomous learning skills demanded by higher education.

Within the spectrum of active methodologies, the flipped classroom emerges as a promising pedagogical alternative to restructure classroom time and roles in pre-university education. In this regard, Shaari and Kamsin (2024) note that successful implementation goes beyond technical aspects and requires a profound cultural change and sustained institutional support that legitimize the teacher's new role as a facilitator.

In this regard, Alwi (2020) demonstrates the effectiveness of problem-based learning (PBL) as a formative assessment tool through a review of 19 implementations, evidencing critical thinking in action. However, the study also underscores that this potential is often limited by the need for more extensive and specialized teacher training. The convergence of both findings suggests that the effectiveness of any active methodology depends on a support ecosystem that develops reflective teachers and transforms institutional culture.

Likewise, inquiry-based learning (IBL) is gaining increasing relevance for developing essential academic competencies in the transition to higher education, such as critical thinking, question formulation, and source management. To this end, Stan et al. (2022) propose an integrated framework for research competencies after comparing 23 training models, offering a structured roadmap for their progressive development.

This perspective aligns coherently with the findings of Oliveira and Bonito (2023), who document that practical and inquiry-based activities significantly improve retention and deep understanding of concepts, although they are still underutilized in traditional contexts centered on student passivity. The synergy between a robust framework and evidence of effectiveness consolidates IBL as a fundamental pillar for quality pre-university education.

Regarding collaboration, it is consolidated as an indispensable component for developing complex socioformative competencies. Šorgo et al. (2022) propose transversal curricular models to develop

entrepreneurial competencies, arguing that these cannot be cultivated in isolated subjects but must permeate the training structure.

This view is substantially complemented by Kopnina and Saari (2019), who emphasize the need for interdisciplinary approaches, based on their study of 120 business students, which found significant improvements in active citizenship learning and social responsibility. Their research suggests that collaborative work in diverse, real-world contexts not only improves academic outcomes but also forms more aware and committed citizens. Thus, structured collaboration transcends its methodological value to become a pillar of holistic education.

With respect to gamification, Arufe et al. (2022) document motivational and participatory improvements in their review of 54 studies, while also critically warning of the need for more robust pedagogical designs that go beyond mere badge and point accumulation, integrating these elements into meaningful learning strategies. These results align with those of Martín et al. (2024), who report that STEAM approaches, grounded in playful, applied problem-solving, improve mathematical competencies and reduce gender gaps by being more inclusive, engaging, and motivating for all students. The convergence of both studies suggests that the potential of playful and innovative strategies does not lie in superficial novelty but in their capacity to create pedagogical scaffolds that intrinsically promote equity and deep cognitive engagement.

Nevertheless, effective technological implementation faces significant structural challenges that condition the success of any pedagogical innovation in the pre-university context. In this sense, Schweighart et al. (2024) establish that success in distance education critically depends on robust technological infrastructure and sustained institutional support that ensures teacher training and project sustainability.

Simultaneously, Sánchez et al. (2024) identify persistent socioeconomic and geographic accessibility deficiencies in rural areas despite general technological improvements, generating risks of educational exclusion and deepening preexisting inequalities. The conjunction of these studies reveals that going beyond mere device provision is essential; a comprehensive educational policy addressing infrastructure, teacher professional development, and equity of access is required for technology to truly become a bridge rather than a new barrier to learning.

Accordingly, this study aims to determine whether the application of a comprehensive program of active methodologies including flipped classroom, PBL, IBL, guided learning, collaborative learning, and gamification—improves the formative process in pre-university courses in the Educational Sciences program at UPEA.

METHODOLOGY

The research was conducted using a quantitative, descriptive–explanatory approach, aimed at determining the causal relationship between the implementation of active methodologies and improvements in the formative process. The study was carried out in pre-university courses of the Educational Sciences program at the Universidad Pública de El Alto (UPEA), Bolivia, during the first academic semester of 2024. This context was selected for its relevance in observing the transition to higher education and the application of pedagogical innovations at a critical educational stage.

Subsequently, a quasi-experimental design with non-equivalent groups and pretest–posttest measurements was adopted, represented as EG: O_1 X O_2 / CG: O_3 — O_4. This design allowed comparison of the evolution of a group exposed to the intervention with that of another group that maintained the traditional approach, controlling extraneous variables and thereby strengthening internal validity. Non-random group assignment was due to the natural formation of pre-university sections, a common aspect in real educational research.

The study population consisted of all students enrolled in the program's pre-university courses. The final non-probabilistic, intentional sample by availability comprised 118 participants, distributed into an Experimental Group (EG, n = 60) and a Control Group (CG, n = 58). Initial equivalence between the groups was controlled through a pretest, confirming that baseline scores were not significantly different prior to the intervention.

Additionally, the sample was formed according to the following inclusion criteria: official

enrollment in the pre-university courses of the Educational Sciences program at UPEA during the first academic semester of 2024, regular attendance at scheduled sessions, and provision of written informed consent. It was also indispensable that all participants completed both the pretest and posttest of formative achievement to ensure data integrity. Students with prior experience in structured, active methodology programs were excluded to preserve internal validity and avoid bias arising from familiarity with the intervention.

Regarding the intervention (X), the EG received a structured program of 12 sessions lasting 90 to 120 minutes, implemented over six weeks. Each session synergistically integrated various active methodologies: a flipped classroom with micro-videos and prior-reading guides; problem-based learning with cases contextualized to education; micro-inquiries with specific rubrics; scaffolding and worked examples for guided learning; collaborative dynamics with defined roles and co-assessment; and gamification elements such as challenges and badges with immediate feedback.

For data collection, standardized techniques with duly validated instruments were employed. The main instrument was a Formative Achievement Test of 40 multiple-choice and short-answer items, whose reliability was calculated using the Kuder–Richardson 20 coefficient (KR-20 ≈ 0.82). Additionally, a Performance Rubric was used to assess argumentation, problem-solving, and collaboration, showing high internal consistency ($\alpha \approx 0.85$), along with checklists to record active participation in sessions.

In data analysis, descriptive and inferential statistics were applied. Descriptively, means (M) and standard deviations (SD) of pretest and posttest scores were calculated. Inferentially, Student's t-test for paired samples was used to compare pre–post means within each group, and the independent samples t-test was used to compare posttest results between EG and CG. The significance level was set at $\alpha = 0.05$, complemented by effect size calculation (Cohen's d) to determine the practical magnitude of differences.

Finally, rigorous ethical principles were observed throughout the research. Written informed consent was obtained from all participants, ensuring the confidentiality of the data in accordance with the principles of the Declaration of Helsinki. Additionally, aggregated results were returned to the institution and students, ensuring transparency and academic benefit for the involved community.

RESULTS

The results obtained from the formative achievement test, detailed in Table 1, demonstrate a substantial improvement in the Experimental Group (EG) after the intervention. The pretest mean (M = 56.2, SD = 8.5) increased significantly in the posttest (M = 74.9, SD = 7.9), representing a gain of 18.7 points. This quantitative advance suggests that the systematic application of active methodologies had a direct positive impact on students' academic performance, aligning directly with the objective of evaluating their effect on the formative process.

By contrast, the Control Group (CG), which maintained the traditional pedagogical model, showed minimal variation in scores. The pretest mean was 55.8 (SD = 9.0) and the posttest mean was 57.1 (SD = 8.7), with an increase of only 1.3 points. This stability in CG performance reinforces the notion that conventional lecture-based approaches have a limited ceiling for promoting substantial learning improvements in pre-university contexts (Table 1).

Consequently, the marked divergence in learning trajectories between EG and CG, quantified through pretest–posttest measurements, establishes a plausible causal relationship between the application of active methodologies and improvement in the formative process. Thus, the results not only describe a statistical change but also outline a promising pedagogical pathway for university-level courses (Table 1).

Table 1. *Means (M) and standard deviations (SD) of achievement scores (0–100)*

Group	n	Pretest M (SD)	Posttest M (SD)	Δ (Post–Pre)
Experimental (EG)	60	56.2 (8.5)	74.9 (7.9)	+18.7
Control (CG)	58	55.8 (9.0)	57.1 (8.7)	+1.3

Inferential analyses in Table 2 demonstrate that the active methodology intervention has statistically significant effects. The within-group comparison for the EG using a paired t-test reveals a highly significant difference between the pretest and posttest ($t(59) = 12.3$, $p < .001$), supporting the intervention's effectiveness. The large effect size ($d = 1.59$) far exceeds Cohen's 0.8 threshold, indicating a pedagogically relevant magnitude of change in students' formative process and aligning directly with the study objective.

By contrast, the CG showed no significant progress over the same period ($t(57) = 1.20$, $p = 0.235$), with a trivial effect size ($d = 0.16$). This statistical stability in the group maintaining the traditional methodology reinforces the notion that conventional lecture-based approaches have inherent limitations in generating substantial learning improvements, providing a valuable contrast for evaluating the real impact of the experimental intervention (Table 2).

Additionally, the between-group posttest comparison confirms the superiority of the EG over the CG ($t(116) = 11.9$, $p < .001$). Statistical significance in this direct comparison strengthens internal validity and establishes a plausible causal relationship between the implementation of an active methodology and improvement in the formative process, directly addressing the study objective (Table 2).

It is noteworthy that the very large effect size ($d = 2.14$) in the between-group comparison represents an exceptional result in educational research. This magnitude, which doubles the standard for large effects, suggests that the synergistic implementation of multiple active methodologies produces substantially greater impacts than isolated interventions, offering robust evidence of their transformative potential in university-level courses (Table 2).

The consistency of significance levels ($p < .001$) across all key comparisons, together with the reported effect sizes, provides convergent evidence of intervention effectiveness. This triangulation strengthens the conclusion validity and empirically supports the hypothesis that active methodologies significantly improve the formative process in the investigated context (Table 2).

Moreover, these results gain greater relevance when considered in the specific pre-university context of Educational Sciences. The documented effects not only reach statistical significance but also represent pedagogically meaningful improvements, establishing an empirical benchmark for transforming teaching practices in transition programs to higher education (Table 2).

Table 2. *Significance tests — Active methodologies (UPEA)*

Comparison	Test	df	t	p
GE (Pre vs. Post)	Paired t-test	59	12.3	< .001
GC (Pre vs. Post)	Paired t-test	57	1.20	0.235
Posttest GE vs. GC	Independent t-test	116	11.9	< .001

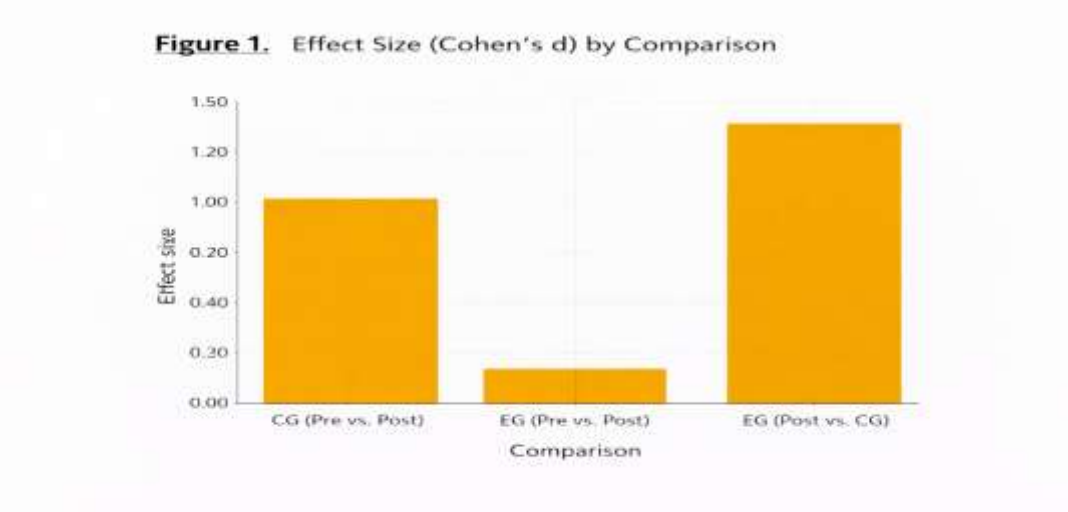
Figure 1, which presents effect sizes (Cohen's d) for the different statistical comparisons, shows the differential impact of the pedagogical intervention. The most prominent value corresponds to the between-group posttest comparison (d = 2.14), which is classified as a very large effect according to Cohen's criteria. This exceptional magnitude suggests that the difference in formative achievement between the experimental and control groups exceeds statistical significance, representing a substantial practical and educational difference that directly addresses the objective of evaluating the effectiveness of active methodologies (Figure 1).

Complementarily, the within-group comparison for the experimental group (d = 1.59) confirms the magnitude of progress in students' formative process under the intervention. This large effect, which nearly doubles the conventional cutoff for educationally relevant effects (d = 0.8), pedagogically validates the synergistic combination of flipped classroom, PBL, IBL, and gamification implemented in the program. Consistency in direction and magnitude reinforces the robustness of the study's main findings (Figure 1).

In contrast, the trivial effect size observed in the control group (d = 0.16) for the pre–post comparison provides the necessary counterfactual to causally attribute improvements to the intervention. This minimal variation in the group maintaining traditional methodology underscores the inability of conventional lecture-based approaches to generate significant progress over the same period, thus reinforcing the internal validity of conclusions regarding the effectiveness of active methodologies in the pre-university context (Figure 1).

Parallelly, progression from a trivial effect in the control group to a very large effect in the between-group comparison constitutes persuasive visual evidence of the capacity of active methodologies to substantially transform formative processes in pre-university Educational Sciences courses, thus fulfilling the central purpose of the research (Figure 1).

Figure 1. *Effect size (Cohen's d) by comparison*



DISCUSSION

The results of this study conclusively demonstrate that the systematic implementation of active methodologies in pre-university courses produces significant and pedagogically relevant improvements in the comprehensive formative process. These findings align closely with the systematic review by Simón et al. (2025), which documented that interventions based on metacognitive strategies are more effective at improving learning self-regulation, a key component of autonomous academic performance. However, the magnitude of the effect in the present study with a very large between-group effect size (d = 2.14) exceeds average estimates in the literature. This superiority can plausibly be attributed to the synergistic and articulated integration of multiple methodologies (flipped classroom, PBL, IBL, collaboration, and gamification) within a coherent pedagogical design with defined scaffolding, thus amplifying impact beyond isolated interventions.

When comparing results with Alwi's (2020) findings on problem-based learning (PBL), a clear consistency emerges regarding its effectiveness as a formative assessment tool that reveals students' thinking processes in action. However, the present study significantly expands and nuances this result by demonstrating that PBL functions optimally and yields more robust effects when explicitly articulated with instructional scaffolding principles identified by Scortescu and Sava (2024). These principles, highlighted as essential for bridging the theory–practice gap in teacher education, provide the progressive support structure pre-university students need to successfully address complex problems.

Regarding gamification, the findings fundamentally concur with Arufe et al.'s (2022) meta-analysis in confirming substantial improvements in intrinsic motivation and active student participation. However, a crucial divergence is identified: whereas their review found widespread limitations in pedagogical designs often reduced to extrinsic reward systems, the intervention demonstrated that gamification, when structurally integrated with qualitative evaluation principles proposed by Berciano et al. (2024) such as analytic rubrics and process-oriented feedback—significantly enhances not only behavioral engagement but also deep academic achievement.

Regarding collaborative learning, the results strongly support Šorgo et al. (2022) postulates on the critical importance of implementing transversal curricular models that permeate training structures. Additionally, this study not only replicates but also significantly extends this evidence by empirically demonstrating that structured collaboration through explicit role assignment, interaction protocols, and co-assessment systems specifically enhances higher-order cognitive and social skills, such as reasoned argumentation and collaborative problem-solving, in the pre-university context.

It is crucial to highlight that these performance dimensions, now quantified, were previously identified by Kopnina and Saari (2019) as core competencies for developing active and responsible citizenship. Thus, collaborative learning transcends being a mere group technique to become a fundamental pedagogy that articulates immediate academic success with ethical and civic formation of future educators.

Regarding the flipped classroom, the results fully align with Shaari and Kamsin's (2024) warnings that successful implementation requires profound cultural change in classroom home dynamics and sustained institutional support to validate this new paradigm. However, these findings show that maximum effectiveness is achieved not only through such structural requirements but also when integrated synergistically with personalization principles documented by de Andrade et al. (2021) in their systematic mapping of 112 applications. The present intervention demonstrated that combining the flipped classroom with mechanisms that adapt to individual students' rhythms, interests, and needs yields the greatest benefits. This articulation allows liberated classroom time to be devoted not to homogeneous activities but to differentiated interventions and personalized tutoring, thus maximizing impact on both individual and collective formative processes.

Contrary to Oliveira and Bonito (2023), full agreement emerges with their fundamental premise that practical activities substantially improve student retention by anchoring knowledge in concrete experiences. However, this study reveals that this cognitive effect is qualitatively enhanced

when such activities are framed and structured within genuine inquiry approaches, such as the integrated research competence framework proposed by Stan et al. (2022). This strategic integration transcends mere physical manipulation or guided demonstration typical of many traditional practices. By converting activities into micro-research tasks requiring students to formulate questions, design procedures, analyze evidence, and construct conclusions, both conceptual retention and scientific thinking are simultaneously developed.

Regarding pre-university education, the results align with Reilly et al. (2025) in highlighting the prominent role of emotional factors such as academic self-efficacy and anxiety in learning processes at this transitional stage. However, while their study focused mainly on characterizing these variables as potential barriers, this research empirically demonstrates that active methodologies can transform such factors into learning facilitators.

This transformation is achieved particularly through specific pedagogical mechanisms identified by Sitar and Rusu (2023) as highly effective in promoting metacognitive awareness and deep engagement, such as contextualizing learning, establishing personal goals, and creating a supportive classroom climate. Thus, anxiety toward the unknown can be converted into curiosity, and perceived incapacity into strengthened self-efficacy through successive achievements.

Regarding technological integration, the findings differ in part from Schweighart et al. (2024), who emphasize advanced technological infrastructure as a critical determinant of educational success. The present intervention achieved significant formative effects by compensating for contextual technological limitations through strategically mediated, well-designed pedagogical interventions.

This result suggests that instructional design quality can, to some extent, offset technological deficiencies, pragmatically addressing concerns about digital divides identified by Sánchez et al. (2024). The effectiveness of the proposal lies in prioritizing meaningful integration through well-structured pedagogy, fostering guided collaboration and critical analysis, even with limited resources. This presents a model of pedagogical resilience applicable to contexts with unequal technological access, where teacher mediation and human interactions regain their central role in learning processes.

Comparing results with Zamfiroiu and Georgescu (2024) on social media integration in education, fundamental agreement emerges regarding the imperative need for pedagogical guidelines that transcend technical aspects. However, this study advances the premise by demonstrating that effectiveness and adoption of such guidelines substantially increase when designed to structurally incorporate two critical elements: peer mentoring systems and reduction of teachers' administrative workload, which Grigoriţă (2025) identified as key needs of early-career teachers. By explicitly integrating these supports, guidelines cease to be prescriptive documents and become support ecosystems addressing teachers' holistic reality.

Regarding teacher training, the findings consistently support Ionescu and Vrăsmaş's (2024) findings on the superior effectiveness of hybrid models that systematically combine theoretical grounding with supervised practice in real contexts. Specifically, this study empirically demonstrates that facilitators can effectively and sustainably implement active methodologies when they receive continuous, collaborative, and contextualized professional development of the type identified by Marin and Macri (2018) as fundamental not only for improving pedagogical competencies but also for revaluing teachers' professional prestige. Such development must go beyond sporadic courses to become a permanent community of practice where reflection on action, peer mentoring, and collaborative classroom problem-solving strengthen both teacher self-efficacy and professional identity.

Regarding research competencies, the findings on inquiry-based learning (IBL) fully align with those of Stan et al. (2022) on the critical importance of an integrated framework for structuring skill development. However, this study makes a singular contribution by demonstrating that it is possible to develop incipient research competencies such as guided question formulation, systematic information searching, and basic data interpretation—at the pre-university level, thereby significantly expanding the scope and applicability

of their original framework, designed for master's programs. This suggests that research literacy can and should begin early, using progressive adaptations appropriate to students' cognitive development.

Contrasting these results with Fernández et al. (2024) on teachers' digital competencies suggests that facilitators can effectively implement active methodologies even with basic digital competence when institutional design provides robust support structures and well-defined pedagogical scaffolding. This significantly nuances conclusions by Fernández et al. and limitations identified by Basilotta et al. (2022), demonstrating that the critical variable is not exclusively individual technological mastery but the existence of a support ecosystem compensating such limitations. When institutions offer curated resources, clear protocols, techno-pedagogical tutoring, and reduce logistical barriers, teachers can focus efforts on the pedagogical dimension of active methodologies.

Regarding assessment, the findings align substantially with Berciano et al. (2024) on the superiority of qualitative evaluations particularly analytic rubrics for capturing the processual and competency-based dimensions of learning. However, this study demonstrates that the maximum evaluative potential is achieved through a strategic combination of these qualitative instruments with standardized quantitative tests, thereby providing a dual, more comprehensive view of student progress. This methodological triangulation captures both quantifiable achievements in specific knowledge domains and progressive development of transversal competencies such as argumentation and problem-solving.

Regarding the sustainability of pedagogical innovations, the findings fundamentally concur with Gartland et al. (2020), who argue that medium-term success critically depends on explicit institutional support in the form of resources, recognition, and coherent policies. However, this research identifies that scalability across other educational system areas additionally requires proactive addressing of complex ethical challenges associated with AI-driven personalized learning identified by Inuwa et al. (2025), particularly regarding data privacy, algorithmic transparency, and equity of access. Implementing solid ethical frameworks and continuous evaluation protocols thus emerges as an indispensable condition to ensure that expansion of these methodologies does not reproduce or amplify existing inequalities.

Moreover, comparing results with those of Mladenovici et al. (2024), full agreement emerges on the critical need to establish unified, consensual taxonomies for fundamental pedagogical concepts. This study significantly contributes by empirically demonstrating that terminological consistency is not merely an academic issue but also directly supports the effective implementation of active methodologies in pre-university contexts, particularly in initial teacher education. Conceptual precision enables trainee facilitators to more clearly understand the underlying principles of each methodology, reduce ambiguity in application, and design more coherent instructional sequences.

CONCLUSIONS

The results presented in this research conclusively validate that the systematic implementation of active methodologies constitutes a pedagogical strategy significantly more effective than traditional models for optimizing the formative process in pre-university courses. The synergistic integration of approaches such as problem-based learning, the flipped classroom, and collaborative learning demonstrated substantial improvements that transcended immediate academic performance, fostering competencies fundamental to success in higher education. This pedagogical transformation represents a crucial advancement in the quality of university transition programs.

Accordingly, the findings establish the imperative to transition from educational paradigms centered on expository lecturing to constructivist approaches in which active participation, inquiry, and collaboration serve as structuring axes of the learning process. This reorientation implies comprehensively rethinking curricular design, teacher–student roles, and assessment systems, prioritizing development of metacognitive, research, and social skills over mere content retention. The empirical evidence provides solid foundations for this transformation.

Ultimately, the sustainability and scalability of these innovations necessarily require institutional commitment beyond isolated interventions. It is

essential to implement continuous professional development programs, design specific support resources, and establish evaluation systems coherent with active methodology principles. Simultaneously, adequate technological infrastructure must be ensured, and implementation gaps proactively addressed to guarantee equity in access to these pedagogical improvements.

Furthermore, this study establishes a significant precedent for restructuring university-level programs in Educational Sciences and beyond. The conclusions outline promising horizons for future research exploring the transferability of this model to other disciplinary contexts, as well as long-term impacts on university retention and performance. The transformation toward competency-centered pre-university education is revealed not only as possible but also pedagogically necessary.

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