Problem posing, executive function, and attitude toward mathematics in adult education

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Abstract: This study examines the effects of a didactic intervention based on the Problem Posing and Reconstruction Approach (PPRA) on executive function and attitudes toward mathematics among adult learners enrolled in Level IV of Adult Secondary Education (ASE). A quasi-experimental design with a non-equivalent control group (n = 50) was implemented in a public Adult Education Center (AEC) located in the Autonomous City of Ceuta, Spain. For six weeks, the experimental group participated in instructional sessions using models adapted from the PPRA program, while the control group continued with a traditional closed-problem methodology. The instruments used were the EFECO Scale (Ramos-Galarza et al., 2019) to assess executive function and the Mathematics Attitude Scale (EAM) (Palacios, Arias, & Arias, 2014). The results revealed significant improvements in planning, cognitive flexibility, and working memory, as well as an increase in perceived mathematical competence and interest in the subject. It is concluded that the PPRA methodology constitutes an effective approach to enhancing both executive processes and positive attitudes toward mathematics in adult education contexts.

Keyword: Mathematics Education

Introduction

Adult education faces the challenge of addressing a wide diversity of learner profiles, motivations, and life trajectories. In this context, mathematics instruction is often affected by negative attitudes, anxiety, and feelings of incompetence stemming from prior school experiences (Maloney & Beilock, 2012; Pelegrina et al., 2020). These emotional variables influence not only academic performance but also learners' disposition toward learning, persistence when facing difficulties, and self-confidence in their own abilities.

Numerous studies have demonstrated the relationship between the development of mathematical thinking and executive functions, EF, understood as the set of cognitive processes that enable planning, regulation, and goal-directed behavior (Miyake et al., 2000; Diamond, 2013). Planning, working memory, cognitive flexibility, and inhibitory control are essential components of mathematical reasoning, particularly in problem-solving tasks (Gilmore & Cragg, 2014; Blair, Ursache, & Vernon-Feagans, 2015).

At the same time, research on attitudes toward mathematics has highlighted the importance of the affective domain—enjoyment, self-concept, and perceived competence—as a determining factor in performance and engagement (Hannula, 2002; Di Martino & Zan, 2014). Improving attitudes requires active methodologies that integrate emotion, cognition, and meaningful action.

Within this framework, the Problem Posing and Reconstruction Approach, PPRA, proposed by Fernández Bravo and Barbarán Sánchez (2012) emerges as an ideal model for simultaneously fostering metacognitive reflection, logical reasoning, and emotional engagement. Instead of solving pre-defined exercises, students pose and reconstruct mathematical problems, analyze their internal coherence, and explain their reasoning. This dynamic promotes autonomy, self-efficacy, and the transfer of executive processes to mathematical learning (Silver, 2023).

Although the effectiveness of the PPRA has been demonstrated in compulsory education (Barbarán Sánchez & Huguet Ruiz, 2013), there are no recent empirical studies in adult education. Since adult learners often show reduced attentional fluency and greater variability in self-regulation strategies (Coben, O'Donoghue, & FitzSimons, 2000; Gal, 2024), it is pertinent to analyze how a problem-posing methodology affects executive function and attitudes toward mathematics.

Objectives

The general purpose of this research was to analyze the effects of an intervention based on the Problem Posing and Reconstruction Approach, PPRA, on executive function and attitudes toward mathematics among adult students enrolled in Level IV of Adult Secondary Education, ASE.

From this general aim, the following specific objectives were derived:

- To assess whether the systematic application of the PPRA methodology produces significant improvements in the components of executive function: planning, working memory, cognitive flexibility, and inhibitory control.
- To examine whether the intervention positively influences the dimensions of attitude toward mathematics: enjoyment, perceived competence, and attributed importance.
- To explore the relationship between changes in executive function and variations in attitude in order to determine whether there is an association between cognitive improvement and affective change.
- To describe how the different problem-posing and reconstruction models relate to the executive processes activated and to learners' perception of their own learning.

Method

This study employed a quantitative quasi-experimental design with pretest–post-test measures and a non-equivalent control group (Campbell & Stanley, 1963; Shadish, Cook, & Campbell, 2002). This methodological approach was selected to objectively measure the effects of a didactic intervention on psychological and attitudinal variables in a natural educational context. Random assignment of learners to groups was not feasible due to institutional constraints within Adult Secondary Education, ASE. Therefore, two intact groups with comparable academic profiles were used to ensure ecological validity while maintaining regular teaching conditions. The design allowed a comparison of equivalent groups under authentic classroom circumstances, enhancing the external validity of the findings.

Participants

The sample consisted of 50 adult learners enrolled in Level IV of Adult Secondary Education, ASE, at a public Adult Education Center, AEC, located in the Autonomous City of Ceuta, Spain. Participants' ages ranged from 25 to 58 years ($M = 38.4$, $SD = 8.7$), with a gender distribution of 60% women and 40% men. All participants were enrolled in the Scientific-Technological Area, included in the general education module of Level IV of ASE, and attended classes regularly. For the formation of the groups, the natural class structure was maintained: one class group served as the experimental group ($n = 25$) and the other as the control group ($n = 25$). The assignment was not random, as class groupings were predetermined by the academic organization of the AEC. This procedure reinforced the ecological validity of the study by preserving authentic teaching conditions. Both groups shared the same teacher, schedule, and instructional program, ensuring contextual equivalence and minimizing the influence of external variables. Inclusion criteria were: (a) enrolment in Level IV of ASE, (b) attendance of at least 80% of sessions, and (c) completion of both pre- and post-test assessments. No participant was excluded based on gender, age, nationality, or prior level of mathematical competence.

The total sample comprised 50 participants (25 experimental, 25 control). An a priori power analysis conducted with G*Power 3.1 (Faul, Erdfelder, Buchner, & Lang, 2009) for a mixed-design ANOVA indicated that this sample size exceeded the minimum requirement to detect medium effects ($f = 0.25$) with $\alpha = .05$ and $1–\beta = .80$.

Participation was voluntary, and all learners were informed about the aims of the study and the confidential handling of their data, in compliance with Organic Law 3/2018 on Personal Data Protection and the European General Data Protection Regulation, GDPR. Ethical approval was obtained from the Research Ethics Committee of the University of Granada, Ref. EDU-2025-04, following the Code of Good Scientific Practice of the Committee on Publication Ethics, COPE. All procedures complied with the ethical standards for educational research and respected the principles of equality, inclusion, and non-discrimination.

Instruments

Two validated psychometric instruments were used to measure the dependent variables of the study-executive functioning and attitude toward mathematics. Both questionnaires were administered collectively in printed format during class time at two points: pre-test (before the intervention) and post-test (after completion).

- ***Executive Functions Questionnaire, EFECO***

The *Evaluación de las Funciones Ejecutivas en Contextos Cotidianos*, EFECO, (Ramos-Galarza, J, Pérez-Salas, C, Jara-Sánchez, S, & Arias, V, 2019) was employed to assess learners' self-perceived executive processes in daily educational contexts. The instrument comprises 67 items rated on a five-point Likert scale (1 = *never*, 5 = *always*) and evaluates four key dimensions: planning, defined as the ability to organize and sequence actions aimed at achieving goals; working memory, understood as the capacity to retain and manipulate information over short periods; inhibitory control, referring to the ability to suppress automatic or impulsive responses; and cognitive flexibility, the disposition to adapt strategies and responses to new demands or contexts. Higher total scores reflect greater executive self-regulation. Previous validation studies have reported high internal consistency ($\alpha = .89$) and factorial validity for this four-dimensional model. The scale was selected due to its suitability for adult populations and its extensive use in educational research within Spanish-speaking contexts.

- ***Mathematics Attitude Scale, EAM***

The *Escala de Actitudes hacia las Matemáticas*, EAM, (Palacios, A, Arias, J, & Arias, J, 2014) was used to evaluate learners' beliefs, emotions, and perceptions regarding mathematics. It consists of 20 items rated on a five-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*) organized into three dimensions: enjoyment of mathematics, reflecting interest and pleasure in mathematical activities; perceived competence, assessing self-confidence and perceived ability to solve mathematical tasks; and attributed importance, which examines the personal, academic, and social value assigned to mathematics. Higher scores indicate more positive attitudes toward mathematics. The instrument demonstrates high internal reliability ($\alpha = .91$) and convergent validity with related measures, and its concise, accessible language makes it particularly appropriate for adult education contexts.

- ***Scoring and reliability***

Negatively worded items were reverse-scored before computing subscale and total scores. Composite mean scores were calculated when at least 80% of items were answered; otherwise, the participant's score was treated as missing. Internal consistency was examined using Cronbach's alpha (α) and McDonald's omega (ω). For EFECO, reliability was α = .86, ω = .88 at pre-test and α = .90, ω = .91 at post-test. For EAM, reliability was α = .84, ω = .87 at pre-test and α = .89, ω = .90 at post-test. Subscale alphas ranged from .78 to .86 across both instruments, and all item–total correlations exceeded .30. Bootstrap 95% confidence intervals for α and ω (1 000 resamples) were within ± .03, confirming stable and satisfactory reliability for both measures across time.

A detailed description of each dimension was essential to contextualize the constructs under study, strengthen construct validity, and ensure transparency and replicability of the assessment procedure.

Procedure

The study was conducted over a six-week period in the regular classroom corresponding to the Scientific-Technological Area of Level IV in Adult Secondary Education (ASE). The intervention with the experimental group was structured around the progressive application of twelve didactic models selected from the original repertoire of the Problem Posing and Reconstruction Approach (PPRA) (Fernández Bravo & Barbarán Sánchez, 2012), adapted to the cognitive and formal complexity of Level IV in ASE. These models were chosen for their potential to activate processes of planning, inhibitory control, working memory, and cognitive flexibility—core components of executive function—and to improve learners' affective disposition toward mathematics.

Each model was accompanied by a formative assessment rubric that included the criteria of originality, internal coherence, data plausibility, communicative clarity, and mathematical correctness. The rubrics were used to foster self-regulated learning and metacognitive reflection.

To ensure fidelity of implementation, all sessions were conducted by the same instructor following a detailed lesson plan. An external observer used a checklist to verify adherence to the planned sequence and timing, with an average compliance rate of 92% across the twelve sessions. Short post-session reports were completed to document unexpected incidents or deviations, none of which exceeded minor procedural adjustments.

The control group followed the official mathematics curriculum for the same content areas and duration, under identical teacher, schedule, and classroom conditions. Instruction was based on textbook problem-solving activities, without exposure to the PPRA models or explicit executive-function training. This configuration preserved ecological validity while ensuring equivalence in instructional time and objectives.

- ***Selection and adaptation of problem-situation models***

From the 49 original models of the PPRA program, twelve were selected and adjusted to Level IV, incorporating content relevant to adult life and oriented toward the functional understanding of mathematics. The models used were as follows:

1. Multiple-representation models: construction of problems based on graphs or tables.

2. Inference from incomplete information: formulation of problems with partial or ambiguous data.
3. Proportional and functional reasoning: invention of situations involving chained percentages, scales, or linear functions.
4. Open-ended and optimization problems: exploration of multiple solutions or optimal values.
5. Reconstruction from the solution: elaboration of problem statements consistent with given results.
6. Reconstruction from the procedure: creation of original problems derived from algebraic developments.
7. Comparison of models: design of problems that contrast different solution methods.
8. Models with advanced technical vocabulary: incorporation of terms such as amortization, yield, or standard deviation.
9. Models with solution conditions: invention of problems with one, none, or infinitely many solutions.
10. Modeling with real data: formulation of problems based on authentic data (consumption, prices, wages, energy).
11. Interdisciplinary problems: integration of mathematics with other knowledge areas (environment, economics, health).
12. Argumentation and validation: public defense of the problems created, justifying their coherence and mathematical validity.

These models were adapted to everyday and professional contexts relevant to adult learners, fostering the functional transfer of mathematical knowledge and the development of higher-order executive processes.

- ***Structure of the sessions***

Each experimental group session followed the structural sequence characteristic of the PPRA model, composed of five consecutive and complementary phases:

1. Opening: presentation of the model and the real-life context supporting it; objectives are explained, and possible solution strategies are anticipated.
2. Execution: students pose or reconstruct problems individually or in small groups; the teacher guides the process through questions that stimulate planning, working memory, and cognitive flexibility.
3. Contrasting: exchange of problems among peers for critical analysis; coherence, data plausibility, and solution appropriateness are reviewed.
4. Presentation: sharing and defending the problems created before the group, explaining the reasoning and decisions made.
5. Closure: individual and group metacognitive reflection on the process, strategies used, and lessons learned.

This methodological sequence seeks to integrate the cognitive and emotional processes involved in mathematical reasoning, promoting the balanced development of executive functions and a positive attitude toward mathematics.

- ***Timing and curricular integration***

The intervention lasted for six consecutive weeks, with two sessions per week integrated into the regular class schedule. Each week, a pair of conceptually related models was developed, so the twelve models were completed across six microcycles.

The content was aligned with the curricular blocks of Level IV in ASE: numbers and operations, proportionality and functions, measurement, data handling, and logical reasoning. The contexts of application—family budgeting, sustainability, data analysis, energy consumption, and work planning—were selected for their functional and motivational relevance to adult learners.

The EFECO and EAM scales were administered in printed form before (pretest) and after (post-test) the intervention, during collective sessions lasting approximately 40 minutes each.

Data Analysis

Scores were recorded in a coded database and analyzed using IBM SPSS statistical software (version 28.0). Data were treated confidentially and anonymously, in accordance with the ethical standards of educational research and current Spanish legislation (Organic Law 3/2018 on the Protection of Personal Data and the Guarantee of Digital Rights).

Additionally, complementary qualitative records were collected from students' written reflections and teacher observations in order to triangulate information and enrich the interpretation of results.

First, the assumptions of normality (Kolmogorov–Smirnov test) and homogeneity of variances (Levene's test) were verified. Both were satisfactory ($p > .05$ in all cases), allowing the use of parametric procedures. The absence of extreme outliers and the linearity of relationships between variables were also confirmed.

Subsequently, means and standard deviations were calculated for the total and dimensional scores of the EFECO (executive function) and EAM (attitude toward mathematics) scales, for both the experimental group (EG) and the control group (CG). A mixed-design repeated-measures ANOVA was conducted, with one between-subjects factor (group) and one within-subjects factor (time). Additionally, paired-sample t-tests were performed within each group, and effect sizes (partial η^2) and Pearson correlations were calculated for the changes observed in both scales.

Results

- ***EFECO scale results, executive function***

The results show a statistically significant increase in the overall executive function score for the experimental group after the intervention, whereas the control group maintained stable levels (see Table 1).

Table 1.
Means and standard deviations on the EFECO scale (pretest and post-test)

Dimension	EG Pre	EG Post	CG Pre	CG Post	F(1,48)	p	η² partial
Planning	3.12 (0.45)	3.68 (0.39)	3.10 (0.41)	3.16 (0.43)	10.84	.002	.18
Working memory	3.25 (0.50)	3.69 (0.42)	3.20 (0.48)	3.25 (0.46)	8.97	.004	.16
Inhibitory control	3.08 (0.44)	3.52 (0.38)	3.11 (0.40)	3.15 (0.42)	7.15	.010	.13
Cognitive flexibility	3.04 (0.47)	3.66 (0.41)	3.07 (0.45)	3.14 (0.46)	12.03	.001	.20
Total EFECO	3.12 (0.46)	3.63 (0.39)	3.12 (0.44)	3.18 (0.43)	14.28	< .001	.23

Note: EG = Experimental group; CG = Control group.

The analysis revealed a significant main effect of time ($F(1,48) = 15.42$, $p < .001$) and a significant group × time interaction ($F(1,48) = 14.28$, $p < .001$, $\eta^2 = .23$), indicating that improvements in executive function occurred only in the experimental group. The most notable gains were observed in planning and cognitive flexibility, followed by working memory and inhibitory control, consistent with studies showing the differential influence of executive subfunctions on mathematical performance (Van der Sluis, de Jong, & van der Leij, 2007) and with the findings of Passolunghi and Lanfranchi (2012) regarding the predictive role of these processes in mathematical achievement. All 95% confidence intervals for mean differences excluded zero, confirming the robustness of the effects. The observed variations were of medium to large magnitude (η^2 between .13 and .23), reflecting a pedagogically relevant impact of the intervention.

- ***EAM scale results, attitude toward mathematics***

The experimental group showed statistically significant improvements across all three dimensions, whereas the control group displayed no meaningful changes (see Table 2).

Table 2.
Means and standard deviations on the EAM scale (pretest and post-test)

Dimension	EG Pre	EG Post	CG Pre	CG Post	F(1,48)	p	η^2 partial
Enjoyment of mathematics	2.89 (0.54)	3.51 (0.50)	2.91 (0.48)	2.97 (0.46)	13.06	.001	.21
Perceived competence	2.96 (0.52)	3.47 (0.45)	2.94 (0.51)	3.02 (0.47)	10.11	.002	.17
Attributed importance	3.42 (0.58)	3.75 (0.55)	3.40 (0.54)	3.44 (0.57)	6.88	.012	.13
Total EAM	3.09 (0.53)	3.58 (0.49)	3.08 (0.51)	3.14 (0.50)	11.94	.001	.20

The repeated-measures ANOVA revealed a significant main effect of time ($F(1,48) = 12.65$, $p = .001$) and a significant group × time interaction ($F(1,48) = 11.94$, $p = .001$, $\eta^2 = .20$). The greatest improvements were found in enjoyment of mathematics, followed by perceived competence and attributed importance. The ANCOVA confirmed these results after controlling for pretest differences ($F(1,47) = 10.86$, $p = .002$, $\eta^2 = .19$).

Paired-sample t-tests confirmed these trends: in the experimental group, all pre–post comparisons were significant ($p < .01$), whereas none reached significance in the control group ($p > .10$).

- ***Relationship between executive function and attitude toward mathematics***

Pearson correlations between pre–post differences on both scales showed positive and moderate associations between improvements in executive function and attitudes toward mathematics ($r = .46$, $p < .01$), consistent with the findings of Van der Ven, Kroesbergen, Boom, and Leseman (2012) regarding the bidirectional relationship between the two processes. In particular, gains in planning and cognitive flexibility were significantly related to increases in perceived competence and enjoyment of mathematics, respectively.

Table 3.
Pearson correlations between improvements (post–pre) in executive function (EFECO) and attitude toward mathematics (EAM) dimensions.

Dimensions	Enjoyment of mathematics	Perceived competence	Attributed importance
Planning	.42**	.45**	.31*
Working memory	.36**	.39**	.27
Inhibitory control	.28*	.33*	.24
Cognitive flexibility	.48**	.46**	.29*
Total EFECO	.46**	.44**	.30*

Note: *p < .05 **p < .01

Discussion

The results obtained indicate that the systematic implementation of the Problem Posing and Reconstruction Approach (PPRA) had a positive and significant effect on executive function and attitudes toward mathematics among adult learners enrolled in Level IV of Adult Secondary Education (ASE). This conclusion provides empirical evidence for a still scarcely explored research area: the impact of creative and open-ended methodologies on cognitive and affective variables in adult mathematics education (Toh et al., 2023; Cai, 2022).

One of the most relevant findings of the study is the improvement observed in the components of executive function, particularly in planning and cognitive flexibility. These dimensions are closely related to individuals' capacity to anticipate, organize, monitor, and adapt their behavior when solving complex tasks. The results are consistent with research linking non-routine problem solving to the activation of higher-order executive processes (Blair & Razza, 2007; Blair, Ursache, & Vernon-Feagans, 2015; Berkowitz et al., 2022; Cragg & Gilmore, 2014; Diamond, 2013). However, the present study introduces a novel aspect: whereas most prior work has focused on problem solving, the improvement here occurs through problem posing, which broadens the scope of cognitive activity and requires greater autonomy in planning and inhibitory control. This distinction strengthens the contribution of the PPRA, positioning it as a pedagogical model that transcends the traditional problem-solving paradigm by turning learners into active constructors of mathematical meaning.

Problem posing requires selecting relevant information, ensuring the internal coherence of the problem statement, validating relationships among data, and anticipating possible solutions. These operations simultaneously activate working memory and executive control mechanisms, which explains the improvements observed in the experimental group's scores. In this sense, the PPRA can be understood as a natural form of cognitive training, capable of simultaneously stimulating executive function and mathematical creativity within an authentic educational context (Elgrably & Leikin, 2021). The ecological validity of the study reinforces this interpretation, as it was conducted in real classrooms under normal teaching conditions with the center's own teacher, avoiding artificial laboratory settings—consistent with Gilmore and Cragg's (2014) claim about the essential role of executive functions in authentic mathematical learning.

In parallel, the improvement in students' attitudes toward mathematics represents another key contribution. The experimental group exhibited a significant increase in enjoyment, perceived competence, and the importance attributed to mathematics. This result suggests that the PPRA methodology influences not only cognitive aspects but also affective ones, providing a means to overcome the disaffection and mathematics anxiety often reported among adult learners (Hembree, 1990; Beilock & Maloney, 2015; Barroso et al., 2021; Maloney & Beilock, 2012; Pelegrina et al., 2020). These findings align with the work of Di Martino and Zan (2014) and Hannula (2002), who emphasize the roles of autonomy and perceived control as key elements in building a positive attitude toward mathematical learning.

Comparison with previous studies suggests that, although evidence exists on the effects of problem posing in school settings (Silver, 2023), its application in adult education remains an emerging field. Adult learners present specific characteristics—discontinuous academic trajectories, prior experiences of failure, greater variability in self-regulation and motivation—that make the adaptation of the PPRA model particularly valuable. In this regard, the results obtained in the AEC demonstrate that adults can benefit from strategies promoting creativity, metacognitive reflection, and the functional connection of mathematical knowledge to everyday life.

Another noteworthy aspect is the positive relationship between improvement in executive function and enhanced attitudes toward mathematics. This association suggests that strengthening planning, working memory, and cognitive flexibility contributes to greater self-perceived competence and more positive emotional engagement in mathematical tasks. This finding is consistent with Passolunghi et al. (2016), who reported a robust link between mathematics anxiety, working memory, and performance. Thus, the hypothesis of a reciprocal relationship between self-regulated cognition and intrinsic motivation is confirmed: greater cognitive control leads to greater self-confidence, and greater self-confidence, in turn, promotes persistence and effort (Hannula, 2002; Pekrun, 2021). From a neuroeducational perspective, the PPRA acts as a context that simultaneously trains executive functioning and emotion regulation, strengthening the frontostriatal circuits involved in self-regulation and motivation.

These findings reinforce the relevance of integrating emotional and cognitive education into mathematics instruction. Traditionally, mathematics has been taught through a result-oriented and accuracy-driven approach, neglecting reflective and affective processes. The present study shows that methodologies centered on creation, communication, and reflection foster both higher-order thinking and a more constructive attitude toward error and uncertainty. Problem posing transforms the classroom into a shared exploratory space where thinking, feeling, and creating converge within a single educational act.

From a pedagogical standpoint, the main strength of this study lies in demonstrating that the PPRA methodology is both feasible and effective in adult education contexts, a field traditionally characterized by transmissive teaching approaches. Its implementation fostered greater participation, collaboration, and enjoyment of learning—factors that directly influence persistence and academic success. Moreover, the use of validated instruments (EFECO and EAM) adds rigor and enables the examination of relationships between cognitive and affective variables, which have rarely been studied together in this population.

Nonetheless, certain limitations must be acknowledged. The sample size, although sufficient to detect medium-sized effects, limits the generalization of the results to the broader adult population. Furthermore, the intervention lasted only six weeks, preventing conclusions about the long-term persistence of the observed improvements. The measures relied on self-report instruments, which may introduce biases related to social desirability or subjective perception. Future research should combine such scales with behavioral and performance-based indicators—such as Stroop tasks or working-memory updating tests—and with evaluations of mathematical performance in applied situations.

Another avenue for development involves expanding the sample to other adult education centers and exploring the effectiveness of the PPRA across different levels and cultural contexts, analyzing whether the observed impact remains consistent under varying institutional conditions or learner characteristics. Integrating PPRA with complementary methodologies such as project-based learning or mathematical modeling could also help examine potential synergies in fostering creative thinking and knowledge transfer.

In summary, the results of this study provide evidence that problem posing, and reconstruction promote simultaneous improvement in executive functions and attitudes toward mathematics in adult education. These findings support theoretical models that conceive mathematical learning as an interdependent process between cognition and emotion, in which planning, flexibility, and self-confidence play essential roles.

In line with the study objectives, the following conclusions can be drawn:

- Implementation of the PPRA led to significant improvements in components of executive function, particularly in planning and cognitive flexibility.
- The intervention fostered a more positive attitude toward mathematics, increasing enjoyment, self-perceived competence, and the perceived value of the discipline.
- A positive correlation between cognitive and affective progress was found, confirming the bidirectional relationship between executive self-regulation and motivation.
- The PPRA methodology emerges as an effective didactic alternative for teaching mathematics in adult education, as it integrates critical thinking, creativity, and metacognitive reflection within a meaningful learning environment.

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