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Cognitive and metacognitive self-regulated, academic challenges, and coping strategies among student teachers[1]

Autorregulação cognitiva e metacognitiva, desafios acadêmicos e seus enfrentamentos em futuros professores

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Abstract

This study investigated the relationship between self-reported use of learning strategies (for cognitive and metacognitive self-regulation), the presence of academic challenges, and the coping strategies mentioned by pre-service teachers in Brazil. A mixed-methods design was adopted, combining content analysis with descriptive-correlational analysis. Participants included 796 pre-service teachers from various courses who responded to an online questionnaire regarding cognitive and metacognitive learning strategies, academic challenges, and their coping repertoire. Qualitative analyses revealed a wide range of academic challenges and coping responses, with most participants reporting one or two challenges and describing one or more adaptive coping strategies. Quantitative results revealed significant and weak correlations between variables (positive and negative). Students who reported experiencing no challenges showed higher means in cognitive strategies, while the reported use of non-adaptive coping strategies showed a weak negative association with both cognitive and metacognitive strategies. Findings suggest that the relationships between the variables examined were subtle and likely influenced by other personal and contextual factors. Furthermore, the importance of educational practices based on the explicit instruction about self-regulated learning, aimed at promoting learning strategies and adaptive coping is highlighted.

Keywords: self-regulated learning. cognitive and metacognitive strategies. academic challenges.

Resumo

Este estudo investigou a relação entre o autorrelato de uso de estratégias de aprendizagem (para autorregulação cognitiva e metacognitiva), a presença de desafios acadêmicos e as estratégias de enfrentamento mencionadas por licenciandos no Brasil. Adotou-se um delineamento de métodos mistos, combinando análise de conteúdo com análise descritivo-correlacional. Participaram 796 licenciandos de diferentes cursos, que responderam a um formulário online sobre estratégias cognitivas e metacognitivas de aprendizagem, desafios acadêmicos e repertório de enfrentamento. As análises qualitativas evidenciaram uma ampla diversidade de desafios acadêmicos e respostas de enfrentamento, tendo a maioria dos participantes mencionado um ou dois desafios e uma ou mais estratégias adaptativas. Os resultados quantitativos revelaram correlações significativas e fracas (positivas e negativas) entre as variáveis. Estudantes que relataram não ter desafios apresentaram maiores médias em estratégias cognitivas. Já o uso de estratégias de enfrentamento não adaptativas mostrou associação negativa e fraca com as estratégias cognitivas e metacognitivas. Evidenciou-se que as relações entre as variáveis investigadas foram sutis e que devem ser provavelmente influenciadas por outros fatores pessoais e contextuais. Ademais, destaca-se a importância de práticas educativas baseadas no ensino explícito da autorregulação da aprendizagem, que promovam estratégias de aprendizagem e enfrentamento adaptativo.

***Palavras-chave**: aprendizagem autorregulada. estratégias cognitivas e metacognitivas. desafios acadêmicos.*

Resumen

Este estudio investigó la relación entre el uso autorreportado de estrategias de aprendizaje para la autorregulación cognitiva y metacognitiva, la presencia de desafíos académicos y las estrategias de afrontamiento mencionadas por estudiantes de licenciatura en Brasil. Se adoptó un diseño de métodos mixtos, combinando análisis de contenido y análisis descriptivo-correlacional. Participaron 796 estudiantes de diferentes carreras, quienes respondieron un formulario en línea sobre estrategias cognitivas y metacognitivas de aprendizaje, desafíos académicos y repertorio de afrontamiento. Los análisis cualitativos evidenciaron una amplia diversidad de desafíos académicos y respuestas de afrontamiento; la mayoría de los participantes percibió uno o dos desafíos y reportó una o más estrategias adaptativas. Los resultados cuantitativos revelaron correlaciones significativas y de baja magnitud (positivas y negativas) entre las variables. Los estudiantes que informaron no presentar desafíos mostraron medias más altas en estrategias cognitivas, mientras que el uso de estrategias de afrontamiento no adaptativas se asoció de manera negativa y débil con las estrategias cognitivas y metacognitivas. Las relaciones observadas fueron sutiles y probablemente influidas por factores personales y contextuales. Se destaca la relevancia de prácticas educativas basadas en la enseñanza explícita de la autorregulación del aprendizaje, orientadas a promover estrategias de aprendizaje y afrontamiento adaptativo.

***Palabras clave**: aprendizaje autorregulado. estrategias cognitivas y metacognitivas. desafíos académicos.*

1. Introduction

Teacher education is a strategic field for the educational and social development of a country, particularly in a time of continuous technological, cultural and instructional change (Pekrun, 2021; Sarti et al., 2025; Vosniadou et al., 2020). In Brazil, access to and persistence in higher education, including teacher education programs, are marked by a range of challenging demands, including structural and socioeconomic difficulties, career uncertainty and limited mastery of effective study and learning strategies, particularly those related to reading and writing (Arcoverde & Boruchovitch, 2022; Casiraghi et al., 2022; Marques, 2025; Sarti et al., 2025). Therefore, understanding how future teachers manage their studies and perceive and cope with academic challenges is essential for designing more effective teacher education interventions (Arcoverde et al., 2020; Boruchovitch, 2014; Góes et al., 2025; Vosniadou et al., 2020).

The ability to manage one's own learning process and cope with the complexities of university life has become a distinguishing factor associated with academic and professional success (Casiraghi et al., 2020; Weinstein et al., 2011). This ability is referred to as Self-Regulated Learning (SRL), a construct that has gained prominence in contemporary Educational Psychology (Boruchovitch, 2014; Kitsantas et al., 2025; Polydoro & Azzi, 2009). According to Bandura's (1986) Social Cognitive Theory, human behavior is guided by self-regulatory mechanisms that enable individuals to plan, monitor and adjust their actions in response to environmental demands. This perspective departs from mechanistic views by conceptualizing learning as an intentional process mediated by the interaction between the individual and the environment (Bandura, 1986; Polydoro & Azzi, 2009). Zimmerman (2000, 2013) expanded this perspective by proposing SRL as a dynamic cycle comprising the phases of forethought, performance and self-reflection, in which self-efficacy beliefs, personal goals and cognitive and metacognitive strategies interact to promote academic success (Weinstein et al., 2011; Zimmerman, 2000, 2013).

Recent studies have shown that the use of self-regulatory strategies is associated with better academic performance, higher psychological well-being and more positive attitudes toward learning (Davis & Hadwin, 2021; De La Fuente & Kauffman, 2025; Kaiser et al., 2020). In teacher education contexts, SRL plays a twofold role: besides enhancing learning processes, it also contributes to the development of teaching competencies that will support future instructional practices aimed at fostering more autonomous and reflective learning among students (Arcoverde & Boruchovitch, 2022; Boruchovitch et al., 2020; Brenner, 2022; Portilho et al., 2023; Simão & Frison, 2013). Among other skills, mastering SRL involves the use of various learning strategies (LS), defined as intentional procedures that favor the acquisition, organization and effective use of information (Seli & Dembo, 2020; Weinstein et al., 2011). In general, LS are classified as cognitive or metacognitive (Seli & Dembo, 2020; Weinstein et al., 2011).

Cognitive strategies involve actions directed toward understanding and retaining information and comprise rehearsal, elaboration and organizational strategies (Flavell, 1979; Weinstein et al., 2011). Whereas active rehearsal and elaboration and organizational strategies promote deeper and more meaningful information processing, passive rehearsal tends to result only in the mechanical repetition of the content (Boruchovitch et al., 2020; Pintrich, 2004; Seli & Dembo, 2020). Metacognitive strategies, in turn, concern the regulation and control of one's own learning process. They include planning—setting goals and selecting study methods; monitoring—self-assessing comprehension and attention; and regulation—adjusting strategies in response to difficulties, such as rereading, reviewing or modifying the pace of study (Seli & Dembo, 2020; Zimmerman, 2008). The use of learning strategies, particularly metacognitive strategies, supports the autonomous and flexible application of knowledge, contributing to more conscious and consistent learning (Portilho et al., 2023).

It is important to recognize that, at any educational level, learning is influenced by environmental conditions that may either enhance or constrain students' self-regulatory capacity. In this regard, university students may perceive a variety of academic challenges—such as excessive academic workload, difficulties adapting to university life, poor time management, interpersonal conflicts, and institutional and/or socioeconomic demands—that can interfere with engagement and the effective use of study strategies (Altarawneh et al., 2023; Bargmann & Kauffeld, 2023; Osiesi et al., 2023; Paula et al., 2022; Sarti et al., 2025; Viana et al., 2026).

When these demands exceed the resources available to or perceived by students, experiences of academic stress emerge, requiring the use of coping strategies, as noted by Guiomar and Costa e Silva (2025). Coping refers to the set of cognitive and behavioral efforts deployed to manage internal or external demands perceived as stressful (Antoniazzi et al., 1998; Guiomar & Costa e Silva, 2025). Coping strategies are traditionally classified as adaptive (focusing on problems, planning, seeking social support) or maladaptive (e.g., avoidance, denial and escape). The coping repertoire employed by students is crucial for academic success, particularly in stressful situations, since the use of maladaptive strategies tends to intensify psychological distress and hinder engagement in learning (Antoniazzi et al., 1998; De La Fuente et al., 2017; Guiomar & Costa e Silva, 2025; Pekrun, 2021).

Based on Self-Regulated Learning Theory, one of the present authors and collaborators (De La Fuente et al., 2017) proposed the Self- vs. External-Regulation Behavior (SR vs. ER), which emphasizes the role of contextual variables, such as regulatory teaching and institutional conditions, in shaping individual self-regulatory processes. This approach broadens the understanding of self-regulation by integrating both personal and environmental factors in explaining academic behavior (De La Fuente et al., 2022; De La Fuente & Kauffman, 2025). This perspective is particularly valuable for teacher education because it helps explain how the ability to self-regulate may promote more adaptive responses to adverse academic situations, including learning difficulties, emotional overload, interpersonal conflicts, and other challenges (De La Fuente et al., 2017; De La Fuente & Kauffman, 2025). Despite the relevance of this interrelationship, the Brazilian literature still lacks empirical studies that systematically and comprehensively investigate the triad of Learning Strategies–Academic Challenges–Coping Repertoire for Academic Challenges within the specific context of teacher education in Brazil (Viana & Boruchovitch, 2026).

1.1 Research question, objectives and hypotheses

Accordingly, this study addressed the following research question: "Is there a relationship between self-reported use of learning strategies (cognitive and metacognitive), academic challenges and the repertoire of coping strategies reported by pre-service teachers in Brazil?" The main objective of this study was to examine the relationship between self-reported use of learning strategies (cognitive and metacognitive), academic challenges and coping strategies among pre-service teachers. It was hypothesized that students who reported experiencing academic challenges and employing adaptive coping strategies would demonstrate higher levels of self-reported use of learning strategies. Conversely, it was expected that those who relied on maladaptive coping strategies would exhibit lower engagement in self-regulatory behaviors, reflected in lower self-reported use of learning strategies (Amponsah et al., 2020; Antoniazzi et al., 1998). The study also examined differences in the use of learning strategies (cognitive and metacognitive) according to academic challenges and repertoire of coping strategies, and in academic challenges and repertoire of coping strategies according to pre-service teachers' sociodemographic and academic characteristics.

2. Methodology

This descriptive-correlational, cross-sectional study adopted a mixed-methods design, as this approach enables the complementary integration of quantitative and qualitative data (Creswell & Creswell, 2017). The aim was to achieve a more comprehensive understanding of the relationship between the use of learning strategies, academic challenges and the coping repertoire of student teachers.

2.1 Participants

A total of 796 undergraduate students enrolled in teacher education programs across Brazil participated in this study, ranging in age from 18 to 66 years (M = 24.35, SD = 7.55). The convenience sample comprised 610 students who identified as women (76.63%), 176 who identified as men (22.11%) and 10 participants (1.25%) who identified as

non-binary or chose not to disclose their gender. Most participants were enrolled in teacher education programs located in the Southeast (n = 274; 34.67%), Northeast (n = 224; 28.14%) and South (n = 181; 22.73%) regions of Brazil, followed by the North (n = 80; 10.05%) and Midwest (n = 35; 4.39%) regions. The sample represented a wide range of fields of knowledge, with a predominance of students in the Humanities (n = 454; 57.03%), followed by Linguistics, Languages and Arts (n = 142; 17.83%), Mathematics and Physical Sciences (n = 101; 12.68%), Biological Sciences (n = 74; 9.29%) and, to a lesser extent, Health Sciences (n = 23; 2.88%) and Social Sciences (n = 2; 0.25%). Regarding stage of study, most participants were in the early semesters of their programs, accounting for 46.23% (n = 368) of the sample. Students in the middle semesters represented 28.01% (n = 223), whereas those in the final semesters or nearing program completion accounted for 25.75% (n = 205) of the sample.

2.2 Instruments

The variables investigated in this study were self-reported use of learning strategies, sociodemographic characteristics (age, gender and geographic region) and academic characteristics (field of study, semester of study, academic challenges and coping strategies). Self-reported use of learning strategies was assessed using the Learning Strategies Scale for University Students (*Escala de Estratégias de Aprendizagem para Estudantes Universitários – EEA-U*), which comprises three learning strategy factors identified through exploratory factor analysis (Boruchovitch & Santos, 2015). Only the Cognitive and Metacognitive Self-Regulation factor of the scale was used in this study, consisting of 23 items rated on a four-point Likert scale ranging from “never” (1 point) to “always” (4 points), with no reverse-scored items. Examples of EEA-U items representing cognitive and metacognitive strategies, respectively, include: “Writing in own words what was understood from the text” (Item 7) and “Rereading the material to understand it better” (Item 34). Higher scores indicate more frequent use of learning strategies. The instrument has demonstrated adequate psychometric properties (Boruchovitch & Santos, 2015). In this sample, Cronbach’s alpha coefficients were 0.78 for cognitive strategies and 0.77 for metacognitive strategies.

Sociodemographic and academic data were collected using questionnaires developed by the authors. The former gathered participants' sociodemographic characteristics through closed-ended questions (gender and geographic region of Brazil) and an open-ended question (age). The latter questionnaire was designed to characterize participants’ academic background using both closed-ended (semester of study) and open-ended questions (degree program, academic challenges and coping strategies). The reported degree programs were subsequently classified by the authors according to their respective fields of study. The remaining open-ended questions were: “What are the main academic challenges (difficulties that interfere with your studies and learning) you are currently facing as a student in your program? Please describe them in detail” and “What strategies have you been using to cope with these challenges?”

2.3 Data collection

The study was approved by the Human and Social Sciences Research Ethics Committee (Approval No. 5,833,582) and was conducted between May 2023 and June 2024. The participating public and private higher education institutions (HEIs) were selected based on data from the Brazilian Ministry of Education (MEC) and contacted by email or telephone. In addition, university faculty members facilitated contact with program coordinators and department chairs. Before the main data collection, two pilot studies were conducted to refine the research instruments. Data were collected primarily during class sessions, both in person and remotely. When the principal researcher was unable to be present, collaborating faculty members followed the same administration protocol under the remote supervision of the principal researcher. In some classes, professors used instructional videos recorded by the first author to guide participants and standardize the administration procedures. The study objectives and the content of the Informed

Consent Form were briefly presented. Participants were also informed that there were no right or wrong answers, in order to reduce apprehension, encourage honest responses and reinforce the voluntary nature of participation.

At institutions where data collection during class time was not feasible, students received an invitation by institutional email containing a link to the questionnaire. The survey, administered through Google Forms, could only be accessed after participants provided informed consent. Most respondents completed the questionnaire using a cell phone, tablet or computer. In a few exceptional cases, hard copy versions were administered and subsequently entered into the online survey database.

2.4 Data analysis

Responses to the open-ended questions concerning academic challenges and coping strategies were analyzed using Content Analysis procedures, following Bardin's (2016) guidelines. First, a random subsample comprising 25% of the participants (n = 199) underwent the pre-analysis stage, which involved an exploratory reading of the responses and the identification of recurring terms, expressions and ideas relevant to the topic under investigation. Next came the material exploration stage, during which categories representing the meanings emerging from the participants' reports were developed. This phase aimed to identify patterns, contrasts and distinctive features in participants' perceptions. In the third stage, the data were processed and interpreted by systematically applying the categories to the full set of responses, allowing the researchers to synthesize participants' conceptions of academic challenges and coping strategies.

To ensure the validity and reliability of the analytical process, the categories were operationally defined using clear coding criteria. Responses could be assigned to more than one category whenever they contained more than one distinct idea. The coding system was developed through consensus among the researchers and subsequently evaluated by independent judges—graduate students in Education familiar with the topic. These judges analyzed a representative subsample of the responses (10.1%), ensuring that all emergent categories were represented. Inter-rater agreement between the judges and the researchers ranged from 83.33% to 95.12%.

In this study, the categories developed from the 25% subsample, previously published by Viana et al. (2026), were applied to the responses of the entire sample (n = 796) using ATLAS.ti 25 (2025). The software was used to support data organization and coding, enabling the calculation of code frequencies and facilitating the visualization of coding patterns. The initial qualitative analysis identified nine thematic categories related to academic challenges and three categories comprising ten subcategories related to coping strategies (Viana et al., 2026). When the responses from the full sample were analyzed using the previously established coding scheme, no additional categories emerged, further supporting the validity of the original content analysis.

The qualitative data were subsequently quantified to enable correlational and comparative analyses with the other study variables using Microsoft Excel (Microsoft Corporation, 2021). For the academic challenges variable, participants' responses were classified into four mutually exclusive categories: (a) students who reported no academic challenges; (b) students who reported one or two academic challenges; (c) students who reported three or more academic challenges; and (d) students who provided vague responses or left the question blank. A response was considered vague when it did not address the question posed, e.g., "Yes, we are very important" or simply "Yes." A response was considered blank when the participant entered only symbols, such as periods, dashes or random characters, solely to proceed through the online questionnaire without providing analyzable content. For the coping strategies variable, responses were classified into six mutually exclusive categories: (a) students who reported no coping strategies because they experienced no academic challenges; (b) students who reported one or two adaptive coping strategies; (c) students who reported three or more adaptive coping strategies; (d) students who reported one to three maladaptive coping strategies; (e) students who reported a combination of adaptive and maladaptive coping

strategies; and (f) students who provided vague responses or left the question blank. The same criteria used to classify vague and blank responses in the analysis of academic challenges were applied to the coping strategies data.

All remaining quantitative analyses were conducted using JASP version 0.18.1 (JASP Team, 2023). First, Pearson's correlation coefficients were calculated to assess the linear relationships between the study variables. Differences in mean scores between independent groups were examined using Student's *t* test and analysis of variance (ANOVA). Corresponding effect sizes were calculated to estimate the magnitude of the observed differences (Cohen, 1992).

3. Results

In the qualitative analysis of the full sample, 1,510 responses related to academic challenges and 1,196 responses related to coping strategies were identified. Because participants could mention multiple categories, the number of responses exceeded the number of participants (n = 796). Among the challenges perceived by pre-service teachers, the most frequent categories were: "Learning and Program Demands" (n = 300; 19.87%); "Management of Multiple Demands" (n = 269; 17.81%); "Mobility and Financial Resources" (n = 239; 15.83%); and "Physical and Emotional Well-being" (n = 226; 14.97%). Figure 1 presents all challenge categories, arranged alphabetically, along with their respective frequencies and percentages, based on the occurrence of codes analyzed in ATLAS.ti (2025).

Figure 1 - Content analysis of the responses from the full sample to the question: "What are the main academic challenges (difficulties that interfere with your studies and learning) you are currently facing as a student teacher in your program? Please describe them in detail."

	1: Challenges_DATA	
Absence of challenges	25	1.66%
Physical and Emotional Well-being	226	14.97%
Learning and Program Demands	300	19.87%
Institutional challenges and interpersonal conflicts	198	13.11%
Difficulties with the physical environment	37	2.45%
Management of Multiple Demands	269	17.81%
Time management	204	13.51%
Mobility and Financial Resources	239	15.83%
Vague/No answer	12	0.79%
Total	**1510**	**100.00%**

Source: Research data (2025).

Among the coping strategies reported, the most prominent adaptive categories were: "Effective Time Management" (n = 257; 21.49%); "Practical Management of the Environment and Resources" (n = 185; 15.47%);

"Emotion and Motivation Regulation" (n = 158; 13.21%); and "Investment in Study Methodologies" (n = 148; 12.37%). Among maladaptive strategies, the categories "Absence of Strategies" (n = 101; 8.44%) and "Harmful Trade-offs and Overload" (n = 59; 4.93%) were the most frequent. Figure 2 presents all categories related to coping strategies, arranged alphabetically, along with their respective frequencies and percentages, also based on code occurrence analysis in ATLAS.ti (2025).

Figure 2 - Content analysis of the responses from the full sample to the question: "What strategies have you been using to cope with these challenges?"

	3: Strategies_DATA_...	
Avoidance of tasks and Procrastination	11	0.92%
Absence of Strategies	101	8.44%
Self-care and leisure	61	5.10%
Seeking support	125	10.45%
Intentional and generic strategies	52	4.35%
Effective time management	257	21.49%
Practical management of the environment and resources	185	15.47%
Investment in Study Methodologies	148	12.37%
Harmful Trade-offs and Overload	59	4.93%
Emotion and Motivation Regulation	158	13.21%
No CS for lack of challenges	25	2.09%
Vague/Blank	14	1.17%
Total	**1196**	**100.00%**

Source: Research data (2025).

Further details regarding the qualitative categories can be found in Viana et al. (2026). Most participants (n = 507; 63.69%) reported perceiving one or two academic challenges, whereas 31.66% (n = 252) indicated experiencing three or more challenges in the frequency analysis. Only 3.14% (n = 25) stated that they did not identify any challenges at the time of the study, and 1.51% (n = 12) provided vague or blank responses. Regarding coping strategies, the most prevalent pattern was the report of one or two adaptive strategies (n = 510; 64.70%), followed by students who reported one to three maladaptive strategies (n = 103; 12.94%) and those who reported three or more adaptive strategies (n = 84; 10.55%). In addition, 7.54% (n = 60) reported using mixed strategies and 3.14% (n = 25) reported no strategies because they did not identify any challenges. Vague or blank responses accounted for 1.76% (n = 14).

Table 1 presents Pearson correlation between the study variables in the quantitative analyses. Regarding learning strategies and academic challenges, only one significant, positive and weak correlation was identified between cognitive strategies and participants who reported experiencing no challenges (Challenges A).

Table 1 - Pearson correlation between Learning Strategies, Academic Challenges and Coping Strategies for Academic Challenges

	1	2	3	4	5	6	7	8	9	10	11
1. Cognitive											
2. Metacognitive	0.67***										
3. Challenges A	0.10**	0.05									
4. Challenges B	0.03	−0.02	−0.24**								
5. Challenges C	−0.07	−0.01	−0.12**	−0.90**							
6. Challenges D	−0.01	0.01	−0.02	−0.16**	−0.08**						
7. CS-A	0.09*	0.05	0.96***	−0.22**	−0.12**	−0.02					
8. CS-B	0.04	0.06	−0.23**	0.22***	−0.11**	−0.14**	−0.24**				
9. CS-C	0.04	0.05	−0.06	−0.19**	0.23***	−0.04	−0.06	−0.46**			
10. CS-D	−0.10*	−0.14**	−0.07*	0.05	−0.04	0.04	−0.07*	−0.52**	−0.13**		
11. CS-E	−0.03	−0.02	−0.05	−0.06	0.09**	−0.04	−0.05	−0.38**	−0.10**	−0.11*	
12. CS-F	−0.04	−0.03	−0.02	−0.08*	−0.07*	0.61***	−0.02	−0.18**	−0.05	−0.05	−0.04

Notes. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

Challenge A: No challenges reported; Challenge B: One or two challenges reported; Challenge C: Three or more challenges reported; Challenge D: Vague or blank responses. CS-A: No strategies reported because no challenges were identified; CS-B: One or two adaptive strategies reported; CS-C: Three or more adaptive strategies reported; CS-D: One to three maladaptive strategies reported; CS-E: Mixed strategies reported; CS-F: Vague or blank responses.

Source: Research data (2025).

The analysis of correlations between learning strategies and strategies for coping with academic challenges revealed three significant associations. A weak, positive correlation was found between cognitive strategies and students who reported not using coping strategies because they did not perceive any challenges (r = .09; p < .05). This finding suggests a subtle relationship between the absence of perceived challenges and engagement in cognitive learning strategies. This association is possibly mediated by other factors. In addition, weak, negative correlations were observed between the self-reported use of cognitive strategies (r = −.10; p < .01) and metacognitive strategies (r = −.14; p < .001) and the report of one to three maladaptive coping strategies. These results indicate that, despite the low magnitude of these associations, there is a trend for associating the use of less adaptive coping strategies with lower self-reported use of cognitive and metacognitive learning strategies (LS).

Mean comparisons were conducted between the use of learning strategies and academic challenges, as well as between the use of learning strategies and strategies for coping with academic challenges. Significant results were found between cognitive LS and Challenge A (no challenges reported), with $M_{Absence}$ = 2.98 and $M_{Presence}$ = 3.24; $t(794) = -2.60$; p = .009; $d = -0.53$, indicating a medium effect size. Significant differences were also found between cognitive LS and CS-A (no coping strategies because no challenges were reported), with $M_{Absence}$ = 2.98 and $M_{Presence}$ = 3.22; $t(794) = -2.45$; p = .015; d = −0.49, also indicating a medium effect size. Differences were observed between cognitive LS and CS-D (one to three maladaptive coping strategies reported), with $M_{Absence}$ = 3.01 and $M_{Presence}$ = 2.87; $t(794) = 2.69$; p = .007; d = 0.28, indicating a small effect size. Finally, differences were found between metacognitive LS and CS-D (one to three maladaptive coping strategies reported), with $M_{Absence}$ = 3.15 and $M_{Presence}$ = 2.96; $t(794) = 3.86$; $p < .001$; d = 0.40, indicating a medium effect size.

Additionally, mean comparisons were conducted between men and women regarding academic challenges and coping strategies. Men presented significantly higher means for Challenge B (M_{Men} = 0.73; M_{Women} = 0.61; $t(784)$ = −3.07; p = .002; d = −0.26), referring to the report of one or two challenges, whereas women presented significantly higher means for Challenge C (M_{Men} = 0.19; M_{Women} = 0.34; $t(784)$ = 3.88; p < .001; d = 0.33), referring to the report of three or more challenges. Effect sizes were small in both cases. No significant associations were found between age, semester of study, or field of knowledge and academic challenges or strategies for coping with academic challenges in this sample.

4. Discussion

The findings of this study, which investigated the relationship between self-reported use of learning strategies, perceptions of academic challenges and coping strategies among pre-service teachers, reveal a complex and multifaceted picture of personal experiences in teacher education contexts. The frequency and variability of the main academic challenges and coping strategies identified among these students are consistent with the dynamics and diversity of these variables previously highlighted in the literature (Altarawneh et al., 2023; Amponsah et al., 2020; Osiesi et al., 2023; Sarti et al., 2025). Overall, a pattern of weak correlations and few significant effects was observed, suggesting that the variables under investigation are less directly related than initially hypothesized. These findings are consistent with previous studies indicating the multidetermined nature of self-regulated learning, which is influenced not only by individual factors but also by contextual and institutional factors (De La Fuente et al., 2022; Pintrich, 2004; Seli & Dembo, 2020; Simão & Frison, 2013; Zimmerman, 2013).

Initially, a weak positive association was identified between cognitive strategies and the group of students who did not report any academic challenges (the same group that reported not using coping strategies because they had no challenges). This finding indicates that teacher education students who perceive fewer difficulties tend to employ cognitive strategies slightly more often. This result is supported by research suggesting that students with higher mastery of cognitive strategies tend to experience more positive perceptions of their academic trajectories, lower levels of stress and a stronger sense of self-efficacy (Bargmann & Kauffeld, 2023; Casiraghi et al., 2020; Kaiser et al., 2020; Seli & Dembo, 2020; Weinstein et al., 2011). Nevertheless, the modest strength of these correlations indicates that the absence of challenges does not substantially explain the use of these strategies, suggesting that other factors—such as motivation, self-efficacy and institutional support—may also be involved (Bandura, 1986; De La Fuente & Kauffman, 2025; Polydoro & Azzi, 2009; Zimmerman, 2000, 2013).

The negative correlation between the use of cognitive and metacognitive strategies and one to three maladaptive coping strategies (CS-D) was another relevant finding. Although weak, this result is consistent with research on coping and self-regulated learning, according to which maladaptive strategies, such as avoidance, escape or emotion dysregulation, tend to undermine self-regulation, resulting in lower cognitive engagement and difficulties in monitoring and adjusting one's own learning process (Amponsah et al., 2020; Antoniazzi et al., 1998; Pekrun, 2021). Contemporary models of self-regulation emphasize that effective regulatory behaviors require monitoring, decision-making and emotion management; however, these processes are weakened when dysregulatory or maladaptive responses predominate, such as procrastination, avoidance or apathy resulting from negative emotions (De La Fuente et al., 2022; De La Fuente-Arias, 2017). Thus, this finding provides additional support for the theoretical plausibility of a link between maladaptive coping strategies and lower use of cognitive and metacognitive strategies.

The mean comparison analyses further support this interpretation. Students who did not report coping strategies because they had no challenges—the same students who reported no academic challenges at the time of the study—showed higher mean scores for cognitive strategies, with medium effect sizes (d = −0.49; d = −0.53). Conversely, students who reported using one to three maladaptive coping strategies obtained significantly lower scores in both cognitive and metacognitive strategies, with small to medium effect sizes (d = 0.28; d = 0.40). These findings

are consistent with studies indicating that students with broader self-regulatory repertoires tend to cope with adverse situations through more adaptive strategies, such as planning, time management, environmental management and seeking support (Amponsah et al., 2020; Bargmann & Kauffeld, 2023; Brenner, 2022; Osiesi et al., 2023; Seli & Dembo, 2020). In contrast, maladaptive coping strategies tend to intensify negative automatic thoughts, rumination and avoidance of academic tasks, impairing cognitive investment and self-regulatory engagement (Amponsah et al., 2020; Antoniazzi et al., 1998; Osiesi et al., 2023; Pintrich, 2004).

It is important to emphasize that despite the hypothesis that students who used adaptive strategies to cope with academic challenges would make higher use of learning strategies, the results did not robustly confirm this expectation. The predominance of weak effects suggests that, in the context examined, the relationship between adaptive coping and self-regulated learning may be mediated by other variables not directly assessed in this study, such as intrinsic motivation, the quality of regulatory teaching, and previous experiences of success and failure, among others (De La Fuente & Kauffman, 2025; Pekrun, 2021; Zimmerman & Schunk, 2011). Researchers argue that self-regulatory strategies are still being consolidated among students enrolled in teacher education programs, which may lead to inconsistent expression of these academic skills when students face multiple demands (Arcoverde & Boruchovitch, 2022; Vosniadou et al., 2020). Thus, self-regulatory processes for learning need to be more explicitly fostered during initial teacher education.

Furthermore, the analysis revealed a small but statistically significant difference between male and female students regarding the number of academic challenges reported. Men tended to report fewer challenges, more frequently mentioning only one or two academic difficulties, whereas women were more likely to report a higher number of challenges, more frequently indicating three or more academic obstacles. Although the effect size was small, this finding is consistent with studies suggesting that female students tend to report higher perceptions of academic and emotional stressors throughout teacher education, particularly during periods of increased demands, such as the completion of practical activities, undergraduate theses or supervised internships (Altarawneh et al., 2023; Amponsah et al., 2020; Osiesi et al., 2023). According to Amponsah et al. (2020), in educational contexts, women frequently report higher sensitivity to multiple sources of pressure—including academic workload, interpersonal conflicts and institutional demands—and a higher tendency to recognize and communicate these challenges. For Altarawneh et al. (2023), differences in the perception of stressors may be attributed to the multifaceted nature of the demands faced by women in higher education, which often involve the accumulation of domestic responsibilities and pressure to achieve academic success.

However, it is important to note that the observed effect was statistically modest. Therefore, although female students reported slightly more challenges, these differences do not appear to determine, by themselves, the perception of academic challenges or the coping strategy repertoire used by pre-service teachers. This finding reinforces the need for analyses that focus more closely on psychological and contextual processes, as well as studies that include a broader range of students' sociodemographic characteristics beyond traditionally studied variables such as gender and age.

Taken together, the findings suggest that although there is an association between learning strategies and coping approaches, this relationship is modest, indicating a scenario in which teacher education students combine self-regulatory practices that are still developing with varied and, at times, maladaptive coping repertoires. Studies in this field have identified persistent weaknesses in pre-service teachers' mastery of study strategies when facing academic challenges (Altarawneh et al., 2023; Amponsah et al., 2020; Arcoverde & Boruchovitch, 2022; Boruchovitch et al., 2020; Vosniadou et al., 2020).

In summary, the findings of this study reinforce the importance of specific teaching interventions aimed at promoting the development of learning strategies and adaptive coping with academic challenges, particularly in teacher education programs. Previous research has shown that systematic interventions targeting self-regulation can produce significant improvements in students' well-being, academic performance and engagement (Arcoverde et al.,

2020; De La Fuente-Arias, 2017; Kaiser et al., 2020). Therefore, understanding the relationships identified in this study may guide teaching practices aimed at preparing more autonomous, resilient and better-equipped pre-service teachers to cope with the demands of academic and professional life.

5. Conclusion

Overall, the research question guiding this study—regarding the relationships between self-reported use of learning strategies, academic challenges and coping strategies—was addressed. Although statistically significant, the associations identified were weak in magnitude, indicating modest relationships between these constructs within the context of initial teacher education. The proposed hypotheses were partially supported: no higher use of learning strategies was observed among students who reported experiencing academic challenges and using adaptive coping strategies. However, the use of maladaptive strategies was found to be associated, albeit modestly, with lower scores in cognitive and metacognitive strategy use, a finding consistent with theoretical assumptions from the literature on coping and self-regulated learning. Thus, the findings suggest that, beyond perceived challenges, factors such as motivation, self-efficacy beliefs and the quality of external support may play a more decisive role in pre-service teachers' self-regulatory learning.

Nevertheless, methodological limitations inherent in the study's design should be considered when interpreting its conclusions. The cross-sectional nature of the research prevents the establishment of causal relationships, limiting inferences regarding the directionality of the associations. In addition, although the study quantified the frequency of challenges and coping strategies, it did not assess the perceived intensity of each challenge (i.e., the extent to which students considered each challenge detrimental) or the effectiveness of the strategies reported for addressing them. The use of self-report questionnaires also makes the data susceptible to biases. In particular, social desirability bias should be considered, as participants may have tended to report higher use of adaptive strategies and lower use of maladaptive strategies. Furthermore, recall bias may have affected data accuracy, as participants' self-evaluations relied on retrospective recollection of events and behaviors, which may not always accurately reflect their experiences.

Although the correlations identified were weak to moderate in magnitude, the findings indicate the need for institutions and professionals involved in initial teacher education to implement initiatives capable of: (1) strengthening the use of cognitive and metacognitive strategies; (2) expanding resources that support the use of adaptive coping strategies; (3) reducing reliance on maladaptive coping strategies; and (4) establishing actions and partnerships that help mitigate the excessive academic challenges perceived by students.

Investment in the development of self-regulation strategies and adaptive coping strategies among pre-service teachers should be undertaken institutionally. It should include explicit instruction of self-regulated learning, which aknowledges metacognition as a key component for the development of autonomous professionals equipped to deal with the complexity of educational practice (De La Fuente et al., 2017; Portilho et al., 2023). By incorporating these practices, institutions can support students in developing more effective repertoires for learning and coping with academic challenges, with positive implications for their educational trajectories and professional development.

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