

Intervention in learning strategies: A proposal for in-service teacher training

ABSTRACT

This study aimed to analyze the effects of an intervention developed in the format of a curricular overlay related to the teaching of learning strategies for high school teachers in a public school in Paraná, Brazil. Fourteen teachers participated in the research until its conclusion. The teachers participated in a hybrid format intervention that lasted for 5 months and was composed of 17 intervention sessions, totaling 50 hours. The research followed a pre-experimental design, following the stages of pre-test, intervention, and post-test. During the intervention stage, cognitive, metacognitive, internal and contextual resource learning strategies were taught to the educators. The results showed statistically significant differences when comparing the pre- and post-test for the sub-scales of self-regulation: cognitive and meta-cognitive, internal and contextual resources, and total self-regulation of the scale. There is a need for more studies with teachers in initial or continued formation, as they play an important role in the formation of students, as well as with other participants, school levels, cultures, and contexts.

Keywords: High School; Continuing Education; Learning Strategies; Professional Development; Self-Regulation.

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1. INTRODUCTION

Positive contributions of using learning strategies can be observed with elementary school students in their early and final years (Oliveira et al., 2009; 2011; Santos & Alliprandini, 2023), basic high school students (Santos, 2016; Palitot et al., 2019; Santos & Alliprandini, 2018a, 2018b), technical school students (Scacchetti et al., 2015), higher education students (Martins & Santos, 2018; Silva & Alliprandini, 2020), and students who have learning difficulties (Darroz et al., 2018; Lombardi & Santos, 2023). The contents of Cognitive Psychology, especially learning strategies, should be taught not only in initial training courses but also in continuing education courses (Santos & Boruchovitch, 2011) and integrated into the curriculum at different school levels (Fooladvand et al., 2017, Winn et al., 2019) from the beginning of the schooling process (Moreira, 2014). Researchers who dedicate themselves to research on learning strategies have recognized their importance in learners' self-regulatory processes, as they can promote personal

and academic success for students (Azevedo et al., 2012; Zimmerman & Schunk, 2011; Hayat et al., 2020; Fabri et al., 2022).

Achieving student autonomy is one of the challenges faced by schools, since self-regulation is influenced by various internal factors, such as intelligence, motivation, and learning strategies, as well as external factors, such as the learning environment, teachers, the educational system, etc. An autonomous learner is able to take responsibility for their own studies, with this active attitude by students being the first step towards advancing to autonomous learning and becoming self-regulated (Benson, 2005; Wang & Han, 2020).

Self-regulation is perceived as a process in which the learner exhibits an active and conscious stance towards learning strategies, taking responsibility for their own performance. It is a complex phenomenon that involves metacognition, motivation, attention, emotion control, and the use of learning strategies by students (Bakhtiar & Hadwin, 2021).

In this sense, it is possible to promote learning self-regulation in different school levels and learning contexts, especially in initial and continuing teacher education courses (Santos & Boruchovitch, 2011; Machado & Boruchovitch, 2018; Dias & Boruchovitch, 2020), as they contribute to their own academic performance and their students' learning process (Boruchovitch, 2007; Dignath & Sprenger, 2020). It is important for educators not only to know teaching methodologies, but also how to teach their students to learn how to learn, through the teaching of learning strategies (Simpson, 2002). This is a means that favors students' proactivity, participation, and autonomy while promoting self-regulated learning. Therefore, investments in these contents in teacher education courses are necessary (Dembo, 2001; Cunha & Boruchovitch, 2016; Busnello et al., 2012; Ismail et al., 2023).

Research focusing on teacher education has shown that self-regulated learning is a relevant construct for stimulating educators' learning skills and also indicate how teacher education programs bring benefits by promoting self-regulated learning and teaching them to use it as a teaching method. Therefore, there are indications in the literature for interventions promoting academically successful students and educators, as well as for developing professionals who are better prepared to promote self-regulated learning in their future classrooms (Dembo, 2001; Busnello et al., 2012; Dörrenbächer & Perels, 2016; Steinbach & Stoeger, 2016; Baars & Wijnia, 2018; Wang, 2021).

2. LITERATURE REVIEW

Students often face difficulties in learning academic content included in their courses because, throughout their academic lives, people learn and use few or no learning strategies (Lodge et al., 2018). Modern educational systems are designed to receive students with a higher level of autonomy. These individuals are expected to demonstrate initiative in the learning processes, analyze the materials to be learned, and select the best strategy and skill to achieve personal goals and objectives based on their own planning (Wegner et al., 2013).

Efficient development both inside and outside school is possible if students learn skills that involve seeking, guiding, and controlling their information processing, and teachers are responsible for teaching or improving the use of learning strategies from the early years, taking teaching of learning strategies as a pedagogical principle (Barrot et al., 2021).

It is important that educators not only know how to teach, but also how to guide their students regarding what to learn and, mainly, how to learn. There is a need for teachers to teach their students how to learn, through the teaching of learning strategies, as this is a way to stimulate students to become more participative, active, and autonomous in their self-regulated learning process. This will generally only happen with investments in teacher education courses (Cunha & Boruchovitch, 2016; Arcoverde et al., 2022; Costa et al., 2022; Santos & Alliprandini, 2023).

However, some studies show that teachers generally know little or are unaware of learning strategies (Santos & Alliprandini, 2018a; Góes & Boruchovitch, 2022).

Self-regulated educators are able to monitor their students' understanding, observe, and redirect them when they realize that they are not comprehending. However, without adequate professional training, these professionals struggle to implement explicit comprehension explanations (Block & Duffy, 2008; Fabri et al., 2022).

Teachers have been particularly successful in promoting self-regulation when they also promote self-regulation strategies in their classroom (Dignath & Veenman, 2021). Educators should adapt their learning environments to the self-regulation level of their students (Dignath & Sprenger, 2020). However, many educators have reported not knowing how to provide effective comprehension instruction; others believe that students can learn to comprehend simply by reading (Block & Pressley, 2007). Educators need to be taught to understand that good teaching involves doing the right thing, the right way, at the right time, in response to problems posed by specific people in specific places and on specific occasions (Dignath & Sprenger, 2020). There are no two exactly identical situations; there are no two identical days, and in this sense, practices that work one day may not work the next. Therefore, planning, executing, and evaluating become important needs inherent to the pedagogical practice of the teaching professional, and training courses in this sense should be implemented aiming to teach these strategies in this educational context (Arslan et al., 2020). This study aimed to analyze the effects of an intervention developed in the form of a curricular overlap related to the teaching of learning strategies to high school teachers in a public school in the state of Paraná, Brazil.

3. METHOD

3.1 RESEARCH TYPOLOGY

This is a pre-experimental research, comprising the phases of pre-test, intervention, and post-test, developed by the same researcher, who is also the lead author of this work, within a quantitative approach. The pre-experimental design investigates the impacts of specific variables on study subjects in controlled environments. Researchers select a study subject, identify relevant variables, and establish control and observation techniques to record variable effects. The use of pre-experimental design may offer valuable insights into the relationship between variables. However, it is important to note that this method often lacks the same scientific rigor found in more controlled experimental studies. Thus, the results produced from this design should be interpreted with caution, as the validity can be impacted by various uncontrolled variables (Osborne & Banjanovic, 2020).

The quantitative approach considers that everything can be quantified, which means translating opinions and information into numbers to classify and analyze them. Furthermore, it requires the use of resources and statistical techniques, formulation of hypotheses, and classification of the relationship between variables to ensure the accuracy of results and avoid contradictions in the process of analysis and interpretation (Prodanov & Freitas, 2013).

Regarding the intervention mode, the curricular overlap model was selected (Rosário & Polydoro, 2014). These interventions usually occur outside of the curriculum, in the form of projects and extension courses, and are structured in a space specifically created for instruction in the area of self-regulated learning strategies, regardless of the professional or academic training context. They are also called curricular juxtaposition activities. This model can facilitate the process of teachers' participation because the intervention takes place outside of regular disciplines, work or study environments, and can be taught to a large group of participants in a specific course format.

3.2 RESEARCH SCENARIO

The research was conducted in a State Public School located in a Municipality in the North of Paraná, Brazil, which offers regular education in the level of Elementary II in the afternoon and evening shifts, and High School in the morning, afternoon, and evening shifts. The community attending the school is mainly composed of students from middle and lower classes.

The faculty of the school is composed of legally qualified teachers who, through updating and/or training courses, constantly introduce new methodologies and technologies with continuous improvement in relation to pedagogical practice, however, the teachers have never taken a course focused on learning strategies. Nonetheless, the teachers have not participated in any courses that specifically address learning strategies.

3.3 PARTICIPANTS

All 57 (100%) educators from the studied State Public School were invited to participate in the research. Twenty-five (43.85%) educators accepted to participate by registering for the course. However, after the definition of the day and time for the intervention, only sixteen (28.07%) teachers remained, including fourteen (87.5%) women and two (12.5%) men, with an age range of 29 to 66 years old and an average age of 45.5 years old. It is important to note that two participants dropped out of the course after Session 8, one woman and one man. The data of these participants were excluded from the characterization of participants, as well as from the quantitative analysis of the research results.

The fourteen participants who remained until the end of the process had academic backgrounds in the following courses: Sociology and Philosophy (1), Mathematics (3), Geography (2), Pedagogy (1), Biological Sciences (2), Chemistry (1), Literature (3), Arts and Biology (1). The duration of their academic training ranged from 8 to 40 years, with an average of 19.25 years. The duration of their professional experience as teachers ranged from 7 to 42 years, with an average of 19.68 years. Of these, twelve (85.71%) were permanent educators and two (14.29%) were hired on a temporary basis through a simplified selection process.

All teachers had some form of specialization; of them, five (35.71%) had already taken the PDE (Educational Development Program of the State of Paraná). Regarding the weekly workload, most educators reported working 40 hours per week (85.71%), 30 hours per week (7.14%), and 20 hours per week (7.14%). This information is reported in Table 1 below.

Regarding continuing education related to Educational Psychology offered free of charge by government agencies, as well as private educational institutions, six (42.85%) participants reported having already taken courses in this area, while eight (57.15%) of the participating educators stated that they have never taken a training course related to this area of knowledge, whether offered by the government or private institutions. Additionally, when asked about their current studies and the mode of study, six (37.5%) participants replied that they were not studying at the time of the pre-test application, five (31.25%) were taking continuing education courses, two (12.5%) were pursuing a Master's degree, two (12.5%) were pursuing a second undergraduate degree, and one (6.25%) of them was participating in courses and workshops.

Table 1
Sociodemographic characteristics of the participants

Participant	Age	Gender	Degree	Year of conclusion	Works since	Subject taught	Complementary Training Lato Sensu Graduate Studies	Weekly workload	Continuing Education in Psychology
P1	32	F	Arts and Biology	2018 e 2012	2013	Arts and Biology	<i>Lato Sensu</i> Graduate Studies	40 hours	No
P2	33	F	Literature	2008	2008	English and Portuguese	<i>Lato Sensu</i> Graduate Studies	40 hours	Yes
P3	35	F	Literature	2005	2008	English and Portuguese	<i>Lato Sensu</i> Graduate Studies	40 hours	Yes
P4	42	F	Pedagogy and Philosophy	2007	2007	Philosophy	<i>Lato Sensu</i> Graduate Studies	40 hours	No
P5	43	F	Geography	2001	2001	Geography	<i>Lato Sensu</i> Graduate Studies	40 hours	Yes
P6	43	F	Literature	2000	1997	English and Portuguese	<i>Lato Sensu</i> Graduate Studies and PDE	40 hours	Yes
P7	45	F	Mathematics	2003	1995	Mathematics	<i>Lato Sensu</i> Graduate Studies	40 hours	Yes
P8	45	M	P.E.	2005	2001	P.E.	<i>Lato Sensu</i> Graduate Studies	30 hours	No
P9	47	F	Science Teaching with a Major in Mathematics and Pedagogy	1980	1995	Mathematics	<i>Lato Sensu</i> Graduate Studies and PDE	40 hours	No
P10	49	F	Science Teaching with a Major in Chemistry	1992	1995	Science and Chemistry	<i>Lato Sensu</i> Graduate Studies and PDE	40 hours	No
P11	50	F	Science Teaching with a Major in Chemistry	1992	1992	Science and Chemistry	<i>Lato Sensu</i> Graduate Studies	40 hours	No
P12	50	F	Geography	1993	1997	Geography	<i>Lato Sensu</i> Graduate Studies	40 hours	No
P13	57	F	Mathematics	1993	1997	Mathematics	<i>Lato Sensu</i> Graduate Studies and PDE	40 hours	No
P14	66	F	Pedagogy	1980	1978	Pedagogy and Sociology	<i>Lato Sensu</i> Graduate Studies	20 hours	Yes

3.4 INSTRUMENTS

Two instruments were used in this research. The first instrument applied to the teachers contained sociodemographic questions, including the following questions: age, gender, academic background, continuing education courses, and information about their professional experience, such as: time of experience, teaching level, subject, and weekly workload as educator. The second instrument applied to the teachers was the Assessment Scale of Learning Strategies for University Students – EEA-U (Boruchovitch & Santos, 2015). This scale consists of 35 items, and the response options were structured on a four-point Likert scale, with four proposed alternatives: "always, sometimes, rarely, and never." According to the proposal of the EEA-U authors, four points were assigned for "always," three points for "sometimes," two points for "rarely," and one point for "never." For item 26, the score was inverted, meaning that "always" received one point, "sometimes" received two points, "rarely" received three points, and "never" received four points. Thus, the score achieved can range from 35 to 140 points, and the higher the score achieved, the more strategic the educator is.

The EEA-U is organized into three subscales that correspond to Cognitive and Metacognitive Self-Regulation (items: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 20, 24, 25, 27, 29, 30, 31, 34, 35); Internal and Contextual Resource Self-Regulation (items: 11, 17, 18, 19, 21, 22, 23, 26); and Social Self-Regulation (items: 16, 28, 32, 33), consisting of 23, 8, and 4 items, respectively. According to Boruchovitch and Santos (2015), the internal consistency of the scale and its subscales, measured by Cronbach's Alpha, demonstrate acceptable levels of internal consistency, with a total scale result of ($\alpha = 0.87$), Cognitive and Metacognitive Self-Regulation ($\alpha = 0.86$), Internal and Contextual Resource Self-Regulation ($\alpha = 0.71$), and Social Self-Regulation ($\alpha = 0.65$).

Examples of items that make up the Cognitive and Metacognitive Self-Regulation subscale include: repeating information orally as you read the text; taking full notes on the teacher's explanations; summarizing the texts recommended for study; reading supplementary texts in addition to those recommended by the educator; creating a sketch, diagram, or drawing to better understand the relationships between them; and creating questions about the subject being studied and trying to answer them. To illustrate the items in the Internal and Contextual Resource Self-Regulation subscale, the following items are listed: controlling anxiety in evaluation situations; planning, managing, and organizing your environment and study time; and being able to complete a task even when it is difficult or tedious. Finally, items such as asking classmates for help when in doubt and studying in groups are examples of the Social Self-Regulation subscale. It is important to emphasize that all procedures for applying and modifying the scale were carried out in consultation with the authors of the scale.

3.5 ETHICAL PROCEDURE AND DATA COLLECTION

The research project initially went through the Ethics Committee for Research Involving Human Subjects at the State University of Londrina, Paraná, Brazil, and was approved according to substantiated opinion number 3,762,483 issued on December 11, 2019. On February 4, 2020, when going to the field to collect data, the teachers were invited to participate in the research, and necessary clarifications were provided on the relevance, objectives, justification, risks, and benefits of the research, which included the participation in a short course of 50 hours to be certified by PROEX/UEL (Pro-Rectorate for Extension, Culture, and Society of the State University of Londrina). Upon agreeing to participate by signing the Informed Consent Form (ICF), the educators registered for the training course and indicated their availability for in-person meetings.

The commitment was made to other educators that, if the results showed a positive effect regarding the use of learning strategies due to the intervention, a short-term course would be offered to promote the use of learning strategies, especially on when and how to use them more efficiently, in order to make them more self-regulated learners. Several adjustments to the dates of the face-to-face meetings were made in collaboration with the participants until it was defined with the availability of the majority to hold the face-to-face meetings on Tuesdays, with the first face-to-face meeting scheduled for March 3, 2020, when the pre-test data collection of the teachers also took place.

3.6 PRE-TEST

The pre-test took place on March 3, 2020, in person, in the following order: completion of the Sociodemographic Questionnaire and the Assessment Scale of Learning Strategies for University Students - EEA-U (Boruchovitch & Santos, 2015), which included instructions and clarifications on how to fill them out. During the application of the instruments, the participants had no doubts regarding the scale but requested help with filling out the socio-demographic questionnaire. The average duration of the application of the Sociodemographic Questionnaire and the EEA-U was 1 hour and 20 minutes. After the application of the instruments, the next phase began.

3.7 INTERVENTION

The course was designed to last one academic semester (from March to July 2020) with a total of 50 hours, including 25 hours of face-to-face meetings and 25 hours of distance activities. The sessions took place weekly, with face-to-face meetings and distance activities alternated. However, due to the COVID-19 Pandemic, face-to-face meetings were held only in the first two intervention sessions.

In view of the need for readjustment, the planned 50 hours were divided into six hours of face-to-face meetings, with dates and times defined according to the availability presented by the participants, and 44 hours

in the remote teaching format (Synchronous and Asynchronous), through the Google Classroom platform, considering that its interface was simple and accessible to its users. Thus, the 50 hours planned for the intervention were distributed into seventeen sessions, with the first two meetings being face-to-face and the remaining fifteen being 100% in the remote format. Rare exceptions occurred in which the researcher had to assist a few teachers regarding the functioning of Google Classroom and the development and submission of activities in a face-to-face manner.

The continuing education course was organized into seventeen intervention sessions from March 3 to July 14. Each intervention session lasted three hours, with the exception of the 17th session on July 14, 2020, which lasted two hours to fit the total workload of 50 hours. Several cognitive, metacognitive, internal and contextual resources, and social self-regulation strategies were taught individually in each session; however, as opportunities and needs arose, they were addressed in several sessions according to the actions and behaviors to be developed.

Most sessions were organized as follows: one hour of reading basic literature (prior to the class), one hour for theoretical teaching (expository and dialogic when synchronous), and one hour for practical activity development. The selection of the quantity and order of the texts worked on followed the rhythm and indications presented by the group. Each intervention session had a specific topic on Google Classroom, organized sequentially (1st, 2nd, 3rd, ...), with the date of the meeting and content. Materials were included in each topic, such as: texts from the basic bibliography with the subject of the class, a pre-recorded video class by the researcher with the content of the text (approximately 30 minutes), slides used in class, and activities to be developed with their instructions. The seventeen sessions that composed the intervention followed the same dynamics reported in Table 2, below.

Table 2
Organization of the sessions in the continuing education course.

Session	Modality	Content	Objectives	Activities
Session 1	In person	Pre-test, and instructions on how to use Google Classroom.	<ul style="list-style-type: none"> • Administer the pre-test; • Explain how Google Classroom works. 	<ul style="list-style-type: none"> • Administer the post-test; • Practice using Google Classroom.
Session 2	In person	Introduction to learning strategies, and time management planning.	<ul style="list-style-type: none"> • Present the theoretical foundations that support Learning Strategies; • Promote discussion on the subject; • Teach how to develop a monthly planning; 	<ul style="list-style-type: none"> • Attend the Theoretical Class (Expository and Dialogic); • Answer about teaching strategies and learning strategies; • Discuss the lesson text.
Session 3	Synchronous and Asynchronous	Learning strategies and teaching strategies.	<ul style="list-style-type: none"> • Review the content of the last session. • Explain the differences between Learning Strategies and Teaching Strategies; • Give examples of Learning and Teaching Strategies; • Encourage reflection on the topic. 	<ul style="list-style-type: none"> • Read the lesson text; • Watch the video lecture; • Respond to questions about teaching and learning strategies; • Answer reflective questions on the topic.

Session 4	Asynchronous	Metacognitive monitoring and control.	<ul style="list-style-type: none"> • Review the content from the last session; • Teach about the importance of metacognitive monitoring and control strategies; • Provide examples of metacognitive monitoring and control strategies; • Encourage reflection on the topic. 	<ul style="list-style-type: none"> • Read the lesson text; • Watch the video lecture; • Respond to a challenge; • Answer reflective questions on the topic.
Sessions 5 and 6	Asynchronous	Self-regulation of motivation.	<ul style="list-style-type: none"> • Review the content from the last session; • Explain the theoretical foundations and strategies for self-regulation of motivation; • Provide examples of self-regulation of motivation strategies; • Encourage reflection on the topic. 	<ul style="list-style-type: none"> • Read the lesson text; • Watch the video lecture; • Answer self-reflective questions about self-regulation of motivation; • Answer reflective questions on the topic.
Session 7	Asynchronous	Regulation of emotions.	<ul style="list-style-type: none"> • Review the content of the last session; • Instruct about the theoretical basis of emotional regulation strategies; • Provide examples of emotional regulation strategies; • Encourage reflection on the topic. 	<ul style="list-style-type: none"> • Read the lesson text; • Watch the video lecture; • Answering self-reflective questions about Emotion Regulation; • Answer reflective questions on the topic.
Session 8	Asynchronous	Review of metacognitive strategies.	<ul style="list-style-type: none"> • Review the content of the Strategies for Cognitive and Metacognitive Learning session; • Encourage reflection on the topic. 	<ul style="list-style-type: none"> • Answer questions about previous content and self-evaluate; • Answer reflective questions on the topic.
Session 9	Synchronous	Metacognitive strategies feedback, and highlighting.	<ul style="list-style-type: none"> • Review the content of the last session; • Receive general feedback on the activities; • Teach the characteristics of the highlighting strategy; • Provide examples of the highlighting strategy; • Encourage reflection on the topic. 	<ul style="list-style-type: none"> • Participate in the Meeting; • Discussion and feedback on the content; • Answer reflective questions on the topic.
Session 10	Asynchronous	Summarizing.	<ul style="list-style-type: none"> • Review the content of the last session; • Teach about the peculiarities of summarizing strategies; • Exemplify the summarizing strategy; • Promote reflection on the subject. 	<ul style="list-style-type: none"> • Read the lesson text; • Watch the video lecture; • Summarize the lesson text of Session 3; • Answer reflective questions on the topic.
Session 11	Asynchronous	Tanking notes.	<ul style="list-style-type: none"> • Review the content of the last session; • Teach about the types of notes; • Provide examples of the note-taking strategy; • Promote reflection on the subject. 	<ul style="list-style-type: none"> • Read the lesson text; • Watch the video lecture; • Wake Notes on the lesson text of Session 4; • Answer reflective questions on the topic.

Session 12	Asynchronous	Questions and Answers.	<ul style="list-style-type: none"> • Review the content from the last session; • Teaching how to create questions and answers for studying; • Exemplifying the strategy of creating questions and answers; • Promote reflection on the topic. 	<ul style="list-style-type: none"> • Read the lesson text; • Watch the video lecture; • Build Questions with Answers on the Session 5 lesson text; • Answer reflective questions on the topic.
Session 13	Asynchronous	Flashcards/Post-its.	<ul style="list-style-type: none"> • Review the content from the last session; • Teaching how to create flashcards/post-its; • Exemplifying the strategy of flashcards/post-its; • Promote reflection on the topic. 	<ul style="list-style-type: none"> • Read the lesson text; • Watch the video lecture; • Create Flashcard/Post-its on the lesson text of Session 6; • Answer reflective questions on the topic.
Session 14	Asynchronous	Concept maps.	<ul style="list-style-type: none"> • Review the content from the last session; • Teach about the stages and characteristics for developing Concept Maps; • Provide examples of the Concept Map strategy; • Promote reflection on the topic. 	<ul style="list-style-type: none"> • Read the lesson text; • Watch the conceptual video lecture on the main concepts of the course; • Answer reflective questions on the topic.
Session 15	Asynchronous	Information on Post-test, and Course Evaluation.	<ul style="list-style-type: none"> • Review the content from the last session; • Inform about the post-test procedures. 	<ul style="list-style-type: none"> • Watch the video lecture.
Session 16	Synchronous	Post-test.	<ul style="list-style-type: none"> • Review the content from the last session; • Administer the post-test. 	<ul style="list-style-type: none"> • Answer the Post-Test.

3.8 POST-TEST

To fulfill this phase, on June 23, 2020, participants were called to participate in a meeting via Google Meet. During the meeting, the same instructions as the pre-test were presented, along with necessary clarifications, and the teachers were instructed to make sure they had no distractions while answering. They were advised to read the questions slowly and reread them if they did not understand any item. Then, the Assessment Scale of Learning Strategies for University Students - EEA-U (Boruchovitch & Santos, 2015) was applied through Google Forms. The educators responded to the scale without the researcher's assistance in reading the items. The average time for applying the instruments in this phase of the research was 1 hour and 20 minutes.

3.9 DATA ANALYSIS

Statistical descriptive and inferential analyses were performed on the data obtained through the application of the Assessment Scale of Learning Strategies for University Students - EEA-U (Boruchovitch & Santos, 2015), including frequency calculation, position and dispersion measures such as: mean, standard deviation, minimum and maximum values, and median. Due to the sample size (n=14), data obtained through the application of the EEA-U scale

were subjected to the Shapiro-Wilk normality test to verify the normal distribution of scores. The results showed that Boruchovitch and Santos' (2015) Assessment Scale of Learning Strategies for University Students had a lack of normal distribution in the pre-test ($W=0.894$; $p=0.091$) and post-test ($W=0.953$; $p=0.613$), suggesting the selection of non-parametric statistical tests to support the analyses.

Based on these results, the Wilcoxon-Mann-Whitney test was selected and used for within-group comparison, that is, the median results of teachers in the pre-test and post-test were compared. This test was selected considering the small sample size (less than 20, 30 or 40 participants), being a non-parametric test that does not rely on a distribution of parameters to obtain the p-value, nor on equality of variances, as it compares each person with themselves (before and after an intervention). Therefore, the hypothesis was that there would be a significant difference between their results when comparing data obtained before and after participating in the teacher training course (Osborne & Banjanovic, 2020).

The internal consistency analysis was also performed regarding the results presented by the instrument applied to the participants in the pre-test and post-test, and the respective Cronbach's alpha values were extracted, which were satisfactory in the pre-test ($\alpha = 0.899$) and post-test ($\alpha = 0.846$). The Cognitive and Metacognitive Self-Regulation subscale presented a Cronbach's alpha of (Pre-test $\alpha = 0.863$ and Post-test $\alpha = 0.796$), Internal Resource Self-Regulation (Pre-test $\alpha = 0.528$ and Post-test $\alpha = 0.597$), and Social Self-Regulation (Pre-test $\alpha = 0.731$ and Post-test $\alpha = 0.620$). Therefore, overall, the constructs have acceptable Cronbach's alpha values (values above 0.60 indicate acceptable consistency), indicating reasonable internal consistency and suggesting that the use of the scale can produce reliable interpretations.

4. RESULTS AND DISCUSSIONS

Table 3 below shows the mean, standard deviation, median, and minimum and maximum values obtained by the teachers ($n=14$) for each of the subscales (cognitive and metacognitive self-regulation, internal and contextual resource self-regulation, and social self-regulation) in the pre-test and post-test, where a significance level of 5% ($p < 0.05$) was adopted.

Table 3
Comparative analysis of the averages of the EEA-U, between pre-test and post-test.

Subscale	Mean		Median		Standard deviation		Values				p-value*
	Pre	Post	Pre	Post	Pre	Post	Minimum		Maximum		
							Pre	Post	Pre	Post	
Cognitive and Metacognitive Self-Regulation	3.22	3.37	3.33	3.43 a	0.45	0.32	2.26	2.65	3.65	3.83	p=0.019*
Internal and Contextual Resource Self-Regulation	2.99	3.30	2.94	3.38 a	0.46	0.37	2.25	2.75	4.00	3.88	p=0.007*
Social Self-Regulation	2.63	2.86	2.75	2.75 b	0.68	0.35	1.50	2.25	3.75	3.50	p=0.157
TOTAL Self-Regulation	2.95	3.18	3.10	3.21	0.45	0,9	2.19	2.55	3.63	3.65	p=0.005*

As shown in Table 3, regarding the total self-regulation scale, the median increased from 3.10 in the pre-test to 3.21 in the post-test. The analysis performed using the probability test of significance showed significant differences between the pre-test and post-test for total self-regulation ($p=0.005$). It can also be observed that some subscales that make up the scale showed significant differences, such as the cognitive and metacognitive self-regulation subscale ($p=0.019$) and the internal and contextual resources self-regulation subscale ($p=0.007$), with no statistically significant difference observed between the pre-test and post-test for the social self-regulation subscale ($p=0.157$).

The overall results presented in each subscale corroborate those found by Ekrem et al. (2007), who recorded a significant difference indicating that social self-regulation strategies are the least used, followed by cognitive strategies, and finally metacognitive strategies, which are the most used for learning mathematics. Social self-regulation is an important component for learners to demonstrate higher levels of self-regulation because when they obtain the necessary help to overcome difficulties, they ask for explanations or "tips" instead of receiving direct help, which can improve learning and understanding and decrease the need for help and, consequently, subsequent dependence on others (Karabenick & Berger, 2013; Ismail et al., 2023). According to the findings, the participating educators resort little to the use of social self-regulation strategies.

It was also identified that the teachers use fewer strategies of internal and contextual resource self-regulation than metacognitive and cognitive ones, with social self-regulation being the least used subscale by the educators. These results are also observed in the research of Cazan (2013) and Wang (2021), which reveals that investment in teaching cognitive and metacognitive strategies can promote better self-regulation of motivation and social skills, which could not be confirmed by the data collected in this study.

For the subscale of cognitive and metacognitive self-regulation, an increase in the median score from 3.33 to 3.43 was observed. According

to the analysis of the 23 items that make up this subscale, it was found that for the twelve items that evaluate cognitive strategies of rehearsal, elaboration, organization, and planning, the median score was 2.00 in the pre-test, and in the post-test, this average increased to 2.38. For the metacognitive strategies, the median was 2.65 and increased to 3.00. The Wilcoxon test showed that the results indicate significant differences between the data ($p=0.00$).

The increase in the median for metacognitive strategies can be explained by Veiga-Simão and Frison (2013), Beluce and Oliveira (2018), Hayat et al., (2020) and Arcoverde et al. (2022) due to the difficulty that educators have in measuring metacognitive strategies, which could explain the low score in the pre-test. This idea is supported by Fulmer and Frijters (2009), who describe that some students may have difficulty interpreting terminologies, multiple concepts, or even common words inserted in the scale items, leading to biased responses. However, in the post-test, they are able to understand them better, which may have reflected in the results, since the participants were able to think more about their thought processes, and this happens when they are led to a higher level of self-regulation (Zimmerman & Schunk, 2011; Winn et al., 2019; Arslan et al., 2020).

Through the analysis of responses, it was evident that in the post-test, teachers resorted to metacognitive monitoring and control, as they were more able to become aware of their own knowledge (monitoring) and take greater cognitive responsibility, developing behaviors that will lead them to greater control of their actions (Darling-Hammond et al., 2020). These data corroborate the findings presented by Wagener (2016), who, after intervention in the experimental group, identified that participants expressed high levels of monitoring and cognitive control over their actions, establishing a positive correlation with academic performance.

From these discussions, it is possible to infer that the instructions, suggestions, and examples presented in the training course classes contributed to the participants' reflection on their cognitive and metacognitive processes, as there were statistically significant differences. These data reinforce the considerations of Cruvinel and Boruchovitch (2019), who describe this subject as poorly discussed and taught in the educational context. The statistically significant differences between the pre-test and post-test, both for cognitive and metacognitive strategies, can be justified due to the interrelationships that can be established between them (Bzuneck & Boruchovitch, 2020), which is also considered by the models of Boekaerts (2011) and Zimmerman (2013), indicating certain complementarity between these components. These data consolidate the findings in Puspitasari's (2012) research, which conducted a time management intervention study and obtained a positive effect on the increase of metacognitive self-regulation in different courses, where participants began to plan, monitor, and evaluate their learning. Thus, she argues that this content can be taught in training courses to assist students in making a study plan, setting weekly learning goals, monitoring the achievement of goals, and self-reflecting on their weekly learning.

Regarding self-regulated learning, positive results on the association of metacognitive monitoring with learners' reading comprehension

were identified, revealing that the less students rely on metacognitive monitoring, the lower the levels of linguistic and propositional comprehension and textual coherence in expository texts (Coelho & Correa, 2017; Barrot et al., 2021). Metacognitive training, as done in the early sessions, is crucial for academic success and is an integral component of self-regulated learning. It is necessary not only to learn about these concepts but also to apply metacognitive strategies and interventions, which should occur frequently in students' academic careers. Gaining metacognitive awareness and self-regulation has a significant impact on learning in any course or life skill (Terlecki & McMahon, 2018).

Table 3 also reveals positive results regarding the Internal and Contextual Resource Self-Regulation. The average score obtained in the pre-test was 2.99 and 3.30 in the post-test, with a standard deviation of 0.46 and 0.37, respectively. These findings reinforce the indications of Cruvinel and Boruchovitch (2019) who state that little is discussed about emotional regulation learning strategies, and we are rarely taught in educational contexts to think and act on our feelings and emotions. The authors suggest that emotion management is not something innate and can be developed and refined throughout life, and that teachers can develop their students' affective skills and promote greater emotional regulation. These discussions are important because these skills can be taught not only in the family context but also in the school setting, as teachers acknowledge and recognize the importance to teach them to their students and contribute to minimizing behavioral and psychosocial problems.

The studies by Dell'Agli (2008), Turner and Husman (2008) and Oliveira et al. (2019) go against these results and point out that emotional self-regulation strategies are among the least used and known by several groups of participants. However, Pekrun et al. (2011) found good levels of use of emotional regulation strategies in university students and relate these results to greater development of metacognitive monitoring and control skills, motivation, use of learning strategies, self-regulation of learning, and academic performance.

The data presented in the post-test shed light on the observations of Duhachek (2005), who states that a self-regulated learner with regard to their motivations is capable of seeking emotional support from others, recognizing and expressing their own emotions, avoiding thinking about the situation, having positive thoughts, denying, and, according to Yi and Baumgartner (2004), Bakhtiar and Hadwin (2021) and Ismail et al. (2023) exhibiting behavioral engagement and emotional self-control.

The individual feedback provided to educators at the end of each activity may have also played an important role in promoting teacher self-regulation. This strategy has been suggested by several authors, including Bzuneck (2010), Hayat et al. (2020), (Costa et al. (2022), Wang and Han (2020) and Maieski et al. (2013). According to Fong et al. (2019), negative feedback can reduce someone's intrinsic motivation under certain conditions, so feedback should be consbaitructive, supportive, and instructive to have a positive effect on students' motivation. Feedback is much better received and used by teachers than by students, and this can have implications for

educators' classroom practices. Moreover, the author suggests that individual feedback generated by learners themselves plays a critical role in students' performance levels, and thus, this tool helps learners formulate action plans based on self-judgment to take necessary courses of action that are important for the self-regulation process (Van der Kleij, 2019; Hayat et al., 2020).

In addition to Baliram and Ellis (2019), and Cañabate et al. (2019) have also demonstrated positive results of feedback on academic performance, both at the higher education and high school levels, respectively. Feedback cannot be understood as a single consistent form of treatment, as its impact is substantially influenced by the content of the conveyed information (Wisniewski et al., 2020).

Based on these considerations, it is possible to revisit the discussions highlighted by Wegner et al. (2013) about the importance of training and encouraging the use of learning strategies so that learners can gradually incorporate them into their practice, making them automated in the learning process. This implies a learner who is able to be more proactive and autonomous, as they plan, execute, and evaluate their own learning.

Social self-regulation did not show statistically significant differences. The median total score obtained by the sample in this subscale in both the pre-test and post-test was 2.75, with a standard deviation of 0.68 and 0.35, respectively. This subscale includes strategies such as studying in a group, asking for help, and discussing the material with classmates to see if they understood. In the studies of Silva & Alliprandini (2020) participants report using this subscale as the least frequent among those evaluated by the scale. Patrick (1997) and Bakhtiar and Hadwin (2021) affirms social self-regulation is a complex phenomenon, often associated with social self-efficacy, past experiences, academic performance, and environmental emotional and motivational factors and responses.

Promoting discussions and teachings about social self-regulation is extremely important, as it is closely associated to academic performance for the promotion of academic success. This is because a socially self-regulated learner is capable of managing, executing, and evaluating strategies such as studying in groups, asking for help when necessary, and discussing material with peers to ensure understanding, which indicates higher levels of self-regulated learning (Rogers, 2019).

It is important to highlight that throughout their academic life, these learning strategies should be incorporated into the initial training curriculum (Boruchovitch, 2007; Santos & Boruchovitch, 2011; Dias & Boruchovitch, 2020) and in the continuing education of teachers (Machado & Boruchovitch, 2018), as they contribute to the promotion of self-regulation. This is because there may be implications not only in their own performance during the undergraduate course, but also to reflect on the learning process of their future students.

This systematic teaching promotes a conscious application of learning strategies that are gradually incorporated into the learner's behaviors and reflections, which implies higher levels of self-regulated learning (Wegner et al., 2013; Winn et al., 2019).

Educators need to be made aware of their own self-regulatory processes, in an attempt to create a space not only for learning to learn, but primarily for experiencing learning to learn and for teaching this process. There is a need for better organization and planning of activities, courses, workshops, and cycles of reflection to promote in these undergraduate students or teacher training courses the fundamental self-regulatory processes of learning to learn, which can result in the emergence of generations of self-reflective, metacognitive, and self-regulated educators (Boruchovitch, 2014; Winn et al., 2019; Santos & Alliprandini, 2023).

Therefore, the results of this study indicate positive effects in relation to the intervention program aimed at teaching learning strategies, especially in promoting the self-regulation of participating teachers. Peeters et al. (2014) report that self-regulated educators adjust their teaching approach to their own skills, better understand self-regulatory processes, and become more effective in promoting self-regulation in the classroom (Randi, 2004; Navarro & McGrath, 2021; Berlin & Weavera, 2022).

Based on the authors' considerations, it is possible to infer that the teachers participating in this research came to understand the importance of reflecting on their own learning process in order to facilitate, improve, retain, memorize, monitor, control, motivate, choose the best strategy, and better plan themselves in the face of learning situations. According to Zimmerman (2013), these are the characteristics of a self-regulated learner.

The school, therefore, plays a fundamental role in developing the cognitive, metacognitive, strategic, motivational, and emotional skills of its students, encouraging them to be improved (Busnello et al., 2012; Fabri et al., 2022; Santos & Alliprandini, 2023). In this sense, educators can promote self-regulated learning by teaching strategies that contribute to planning, monitoring, controlling, and evaluating their learning process (Andrzejewski et al., 2016; Arslan et al., 2020; Dignath & Sprenger, 2020).

It should be highlighted the researcher's attitude towards the teachers participating in the intervention, with a self-regulated and welcoming approach, seeking the best way to solve the adversities that arose throughout the process, always planning, executing, and evaluating their actions in each of the intervention sessions, which may also have favored the positive results achieved by this study.

According to Block and Duffy (2008) and Winn et al., (2019), a self-regulated educator can monitor students' understanding, observe and redirect them when they do not understand a topic, a posture adopted by the researcher during the sessions. However, without adequate professional training, teachers struggle to explain, understand, and solve problems properly in their classrooms. Therefore, before teaching learning strategies, educators need to properly know them, know when and how to use them correctly, know their own self-regulation processes and strategies so that they can teach learning strategies and promote them in the educational process (Buzza & Allinotte, 2013; Wang & Han, 2020; Lombardi & Santos, 2023).

The implementation of remote instruction sessions focused on teaching strategies for instructors was crucial in the attainment of favorable outcomes in this research. The web-based methodology provided incom-

parable adaptability, permitting involvement of a diverse array of educators, irrespective of their physical location or occupation schedules. This provided an inclusive chance for educators to participate in the sessions, share their perspectives and experiences, and enhance discussions while fostering a collaborative learning environment. Additionally, the online format of the sessions allowed for greater accessibility to relevant resources and materials, facilitating the exploration and practical application of the discussed learning strategies. This level of engagement is supported by other authors in online courses (Navarro & McGrath, 2021; Berlin & Weaver, 2022). Furthermore, educators should receive support through initial and continuing education courses to enhance their knowledge on the subject, become self-regulated learners, and subsequently promote self-regulated learning (George, 2020).

5. CONCLUSIONS

The present study evaluated the effects of an intervention related to the teaching of learning strategies to high school teachers in a public school in Paraná, Brazil. The intervention had positive effects on the self-regulation of educators' learning, as evidenced by statistically significant differences in the overall score of the scale applied, especially in the subscales that include cognitive and metacognitive self-regulation and internal and contextual self-regulation resources. There were no differences in relation to social self-regulation strategies, indicating the possibility of successful interventions carried out through remote teaching and highlighting the need for studies focused on social self-regulation, which may have been influenced by social distancing, leading to greater difficulty in establishing group activities and the need to simplify activities, considering the pandemic context.

One of the aspects that may have contributed to the positive results was the flexibility of the training course offering, as there was constant replanning during the intervention sessions to adapt to the needs and specificities of the group of educators. Moreover, the researcher's mastery of the content and technological tools used for the development of the sessions may have also contributed, especially to the use of platforms, which may have reduced anxiety and been a stimulus for the persistence in the course by those who had greater difficulty with the use of the Classroom application. The fact that the intervention took place in an asynchronous format may have contributed to the positive results achieved in this study, as this model allows participants to tailor the course to their schedule according to their time availability, which enabled greater engagement.

As limitations of the study, we highlight self-report, as self-referred responses may be exaggerated, participants may feel pressured or ashamed to disclose private details, and various biases may have affected the results, such as social desirability.

We suggest that future research with educators include in the planning of intervention sessions a time for study or lesson synthesis, in order to minimize difficulties and lack of time availability for studying,

as well as including qualitative instruments for data analysis that allow for observation of details and circumstances that may not appear in quantitative analyses. Additionally, we also recommend the inclusion of a control group for greater control of variables.

Finally, we emphasize that further studies should be conducted with teachers in initial or continuing training courses, as they play an important role in their students' education, helping them become more self-regulated through the use of learning strategies. Moreover, it is necessary to extend these studies to other participants, school levels, cultures, and contexts.

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Intervenção em estratégias de aprendizagem: Uma proposta de formação de professores em serviço

RESUMO

Este estudo teve por objetivo analisar os efeitos de uma intervenção desenvolvida no formato de uma sobreposição curricular relacionada ao ensino de estratégias de aprendizagem aos professores do Ensino Médio de uma escola pública estadual do Paraná/Brasil. Participaram da pesquisa até à conclusão 14 professores. Os professores participaram da intervenção no formato híbrido que durou 5 meses e foi composta por 17 sessões de intervenção, totalizando 50 horas. A pesquisa seguiu um delineamento quase-experimental cumprindo as etapas de pré-teste, intervenção e pós-teste. Na intervenção foram ensinadas aos professores estratégias de aprendizagem cognitivas, metacognitiva, de recursos internos e contextuais. Os resultados apontaram diferenças estatisticamente significantes ao comparar o pré e pós-teste para as subescalas de autorregulação: cognitiva e metacognitiva, de recursos internos e contextuais e autorregulação total da escala. Ressalta-se a necessidade de mais estudos com professores em formação inicial ou continuada, pois eles desempenham um importante papel na formação de seus alunos, bem como com outros participantes, níveis escolares, culturas e contextos.

Palavras-chave: Ensino Médio; Formação Continuada; Estratégias de Aprendizagem; Desenvolvimento profissional; Autorregulação.

Intervención en estrategias de aprendizaje: Una propuesta para la formación del profesorado en activo

RESUMEN

El objetivo de este estudio fue analizar los efectos de una intervención desarrollada en formato de superposición curricular relacionada con la enseñanza de estrategias de aprendizaje a profesores de Educación Secundaria de una escuela pública estatal en Paraná/Brasil. Participaron en la investigación un total de 14 profesores. Los profesores participaron en la intervención en formato híbrido que duró 5 meses y constó de 17 sesiones de intervención, totalizando 50 horas. La investigación siguió un diseño cuasi-experimental cumpliendo las etapas de pretest, intervención y postest. En la intervención se enseñaron a los profesores estrategias de aprendizaje cognitivas, metacognitivas, de recursos internos y contextuales. Los resultados señalaron diferencias estadísticamente significativas al comparar el pretest y el postest para las subescalas de autorregulación: cognitiva y metacognitiva, de recursos internos y contextuales y autorregulación total de la escala. Se destaca la necesidad de más estudios con profesores en formación inicial o continua, ya que desempeñan un papel importante en la formación de sus alumnos y también con otros participantes, niveles escolares, culturas y contextos.

Palabras clave: Educación Secundaria; Formación Continua; Estrategias de Aprendizaje; Desarrollo Profesional; Autorregulación.