



Promoting Self-regulated Learning of Brazilian Preservice Student Teachers: Results of an Intervention Program

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Self-regulation is the process by which individuals monitor, control, and reflect on their learning. Self-regulated students have motivational, metacognitive, affective, and behavioral characteristics that enhance their learning. As the importance of self-regulated learning is well acknowledged by research nowadays, the aim of this study is to examine the effectiveness of an innovative course designed to promote self-regulated learning among Brazilian preservice student teachers. The innovative approach was developed in the format of a program of intervention based heavily on self-reflection. The content involved student exposure to self-reflexive activities, lectures on the self-regulated learning framework, and theoretical tasks aimed at fostering self-regulation of students in a double perspective: as a student and as a future teacher. The efficacy of the approach was tested by comparison with both the results of students who had taken a course with theoretical content only and those who had not taken any course at all. The sample consisted of 109 students in 4 different freshman classes in a Teacher Education Program in a Brazilian public university in an inner city in the state of São Paulo. The research was conducted using a quasi-experimental design with three stages: pretest, intervention, and posttest. The classes were randomly assigned to experimental and control conditions as follows: an experimental group involving intervention, an experimental group exposed to theory, and two control groups not taking the course. Before and after the intervention program, all the participants responded to the Learning and Study Strategies Inventory and the Self-efficacy for Self-regulated Learning scales. Overall, the results showed that the intervention program format had a positive impact in enhancing student self-regulation. Moreover, students in both the experimental groups reported both higher gains in self-efficacy for self-regulated learning scores and an increase in employment of learning strategies when compared to the control groups.

Keywords: self-regulated learning, learning strategies, self-efficacy, teacher education, teacher training

INTRODUCTION

Self-regulation, defined as the process of monitoring, controlling, and reflecting on learning is essential for the promotion of quality education (Bandura, 2003; Zimmerman and Schunk, 2008; Bembenu, 2011). According to the study by Panadero (2017), self-regulated learning can be compared with an umbrella that aggregates major factors which promote learning and

allow studying them in a broad and integrated framework. Self-regulated learning can be considered as a form of cultural capital, which may compensate for gaps in opportunity and achievement. Interventions to promote self-regulated learning can empower students at risk and raise the educational level of a society (Schmitt et al., 2015; Andrzejewski et al., 2016). Self-regulated students tend to be more organized, hard working, interested, and self-critical. They are able to set study goals, analyze their performance, persist in the face of difficulties, and identify the behaviors that affect their learning (Zimmerman, 2000; Schunk and Zimmerman, 2008).

Panadero (2017), in an extensive review, highlighted different theoretical models available for the understanding of self-regulation (Winne and Hadwin, 1998; Zimmerman, 2000; Pintrich, 2004; Boekaerts and Cascallar, 2006; Efklides, 2011; Hadwin et al., 2011). We have chosen the Zimmerman's model (1998, 2000, 2002) as a theoretical framework for this study due to its conceptual breadth and applicability in programs of educational intervention. Moreover, as stated by Panadero (2017), the Zimmerman's model presents a broad vision of the key subprocesses involved in self-regulation. It also addresses very clearly the interrelationship between cognitive, metacognitive, motivational, and emotional variables involved in learning. According to the study by Zimmerman (1998), academic self-regulation is cyclical with three interrelated phases: (1) forethought: planning and setting goals, (2) performance control: attention and action, and (3) self-reflection: self-assessment and reaction. More precisely, the first phase of Zimmerman's model (2000) involves task analysis and emotions and beliefs about self-motivation. Self-efficacy beliefs, goal orientation, interest, and task value are key variables during this phase of sustaining initial efforts to achieve a goal. The second phase is characterized by the use of self-control strategies and self-observation. These self-control strategies include self-instruction, attention control, and environmental structuring, while self-observation is characterized by systematic metacognitive monitoring and self-recording of specific aspects of performance. The third and final phase requires learner evaluation of performance during the completion of a task, specifically self-judgments about satisfaction and success. It is the moment when students think about the outcomes, analyze reactions, and interpret causes for those outcomes, as well as consider possible adjustments in behavior on the basis of their experience. This final phase directly influences the way in which the individual will engage in similar academic activities in the future, revealing dynamic and cyclical connections throughout the learning process (Zimmerman, 1998; Schunk, 2001; Schunk and Zimmerman, 2008).

Research shows that self-regulated learners have cognitive, metacognitive, motivational, and behavioral characteristics that enhance learning. In fact, they are more prone to employ deep processing learning strategies to be intrinsically motivated and to be confident of their self-efficacy in performing academic tasks (Sitzmann and Ely, 2010; Zimmerman, 2011; Bertrams and Dickhauser, 2012). Evidence also suggests that learners do not always engage spontaneously in self-regulated learning (Zimmerman and Schunk, 2008; Klassen and Kuzucu, 2009). Even at the college level, many present deficiencies in the

way they learn and have problems with time management, as well as with motivation and anxiety. However, most of the time they are unaware of their learning problems (Dembo, 2001; Bembenuddy, 2011).

Research in Brazil also reveals that many college students face learning difficulties and perform poorly academically when they enter college (Boruchovitch and Ganda, 2013; Marini and Boruchovitch, 2014; Alcará and Santos, 2015; Araújo et al., 2016). These students usually have the knowledge and basic skills necessary for admission, but most of them lack the ability to be successful in their courses once they have been accepted at the university. According to many researchers, college students' poor academic performance may be due to their inability to self-regulate their learning (Schunk and Zimmerman, 2008; Lee et al., 2010; Brunstein and Glaser, 2011).

Self-regulatory skills are of paramount importance for students. Although it is a complex process, self-regulation can be taught and improved in the educational context (Zimmerman, 2000; Zimmerman and Schunk, 2008). Instructional programs focused on the promotion of self-regulation converge in three main points: they can be blended in a course content, implemented at all educational levels, and effective for a variety of types of students (Wolters, 2010; Bembenuddy and White, 2013). Intervention studies in self-regulation have revealed that it is possible to teach students to develop better learning strategies, foster positive belief in themselves, and minimize behaviors that hinder learning (Boekaerts and Corno, 2005; Cartier et al., 2010; Brunstein and Glaser, 2011; Andrzejewski et al., 2016). Self-reflective activities, self-assessment questionnaires, and structured diaries, especially in conjunction with portfolios, are important instruments for the development of self-awareness and self-regulation. Such tools provide assistance for individuals in the examination, monitoring, and adjustment of their behavior. Indeed, to be aware of one's thoughts, beliefs, cognitions, emotions, and actions is an essential condition for self-regulation (Rodgers, 2002; Dembo and Seli, 2004; Schmitz et al., 2011; Machado and Boruchovitch, 2015; Panadero et al., 2016).

Much has already been written about self-regulatory intervention in higher education, especially about students in teacher education programs (Bernacki et al., 2012; Bembenuddy and White, 2013; Boruchovitch and Ganda, 2013; Fabriz et al., 2013). Overall, these studies pinpoint the importance of not only improving students' learning strategies but also strengthening their awareness of the benefits of self-monitoring, self-reflection, and self-regulation. More positive research results were found among those studies in which cognitive, metacognitive, motivational, and affective components of self-regulation were combined.

In the past decade in Brazil, there has also been an increase in research on the impact of self-regulated learning intervention on student learning (Frison and Moraes, 2010; Frison and Veiga Simão, 2011; Boruchovitch and Ganda, 2013; Fantinel et al., 2013) although work in this area is at the beginning. Moreover, it is of concern that teachers in general have no access to the theoretical and methodological foundations of self-regulated learning during their Teacher Education Programs nor are they encouraged to reflect on their own behavior and apply self-regulatory strategies

during their academic and professional activities (Dembo, 2001; McKeachie and Svinicki, 2006; Brunstein and Glaser, 2011). However, knowledge about self-regulated learning is essential especially for those who aspire to be teachers (Schunk and Zimmerman, 2008; Lee et al., 2010; Cleary, 2011; Middleton et al., 2011). According to the studies by Staley and Dubois (1996) and Dembo (2001), it is of paramount importance to look at preservice teachers as students and help them examine their beliefs and behavior. Self-regulated learning courses for future teachers should thus include the theoretical foundations of self-reflection and the use of self-reflective practices so that students will be involved in self-reflection about their own learning. As Randi (2004) has pointed out, it is highly advantageous for teachers and students to be part of a reflective community in which they can have the opportunity to examine and self-study their own learning.

The design of the intervention program described in this study was motivated by the relevance of self-regulated learning for the area of education, the importance of self-reflection to foster self-regulated learning, and the scarcity of Brazilian studies on this topic among preservice teachers. The program was based on the Self-Regulated Learning Model by Zimmerman (2000, 2002) and the literature in the area (Dweck, 2006; Costa and Boruchovitch, 2009; Trindade, 2009; Weiner, 2010; Wolters, 2010; Gomes and Boruchovitch, 2011; Bembenuitty and White, 2013; Rodríguez et al., 2014). The objective was to examine the effectiveness of an innovative course designed to promote self-regulated learning among Brazilian preservice student teachers in comparison to a traditional course format and to control groups (CGs) with no course focusing on self-regulated learning. The following research questions were addressed:

Research Question 1: Can an innovative course format focusing on self-regulated learning based largely on self-reflection promote more benefits in relation to beliefs of self-efficacy of preservice teacher students and their reports of the use of learning strategies than does a traditional theoretical course about self-regulated learning?

Hypothesis 1: We expect students who took part in the course with an intervention program format [Experimental Group I (EG I)] to show a significant higher increase in self-efficacy beliefs for self-regulated learning and in the report of use of learning strategies than those who took part in the course with the traditional format (EG II).

Research Question 2: Which of the two EGs will show a significantly higher increase in self-efficacy beliefs for self-regulated learning scores and in the report of use of learning strategies scores? EG I which will take part in the innovative course format or EG II which will attend the course in a traditional format?

Hypothesis 2: We expect students who took part in the course with an intervention program format (EG I) to show a significantly higher increase in self-efficacy beliefs for self-regulated learning and in the report of use of learning strategies than students who did not take part in the course (CGs).

Research Question 3: Will both of the EGs (I or II) show a significantly higher increase in self-efficacy beliefs for

self-regulated scores and in the report of use of learning strategies scores compared to the CGs?

Hypothesis 3: We expect students who took part in the course with an intervention program format (EG I) and those in the course with the traditional format (EG II) to show a significantly higher increase in self-efficacy beliefs for self-regulated learning and in the report of use of learning strategies than students who did not take part in either of these courses (CGs).

MATERIALS AND METHODS

Participants

The sample was composed of 109 students from four classes of full-time and evening periods who entered a Pedagogy course of a Brazilian public University in the state of São Paulo between 2013 and 2014 years. In fact, of a total of 162 students of the 4 classes available, 130 (80.24%) signed the informed consent form. However, only 109 students (67.28%) were included in the final sample, as they were present in both pretest and posttest data collection phases and had signed the form.

Participants' age ranged from 18 to 42 years, with an average of 20.62 years. Of the 109 students, 101 (92.7%) were female and 8 (7.3%) were male. Most participants attended high school in a public institution (52.29%), did not attend a university admission preparation course (51.38%), were in the first-graduate course (87.16%), and did not do extra activities (63.30%). **Table 1** shows demographic data by sample group.

Table 1 shows that the groups were very similar, composed by students who did not attend university admission preparation course, who were in their first graduation and were predominantly females. The few students ($n = 14$, 12.84%) taking a second degree belonged more often to evening classes: Class A ($n = 5$; 35.71%) and Class D ($n = 6$; 42.85%). Classes A and D of the evening period were formed mostly by students who attended high school in the public school and are engaged in extra activities (work, internships), including workload greater than 24 h/week. No significant differences were found comparing the groups on pretest phase in the dependent variables of this study: self-efficacy scale and Learning and Study Strategies Inventory (LASSI; see Instruments).

Instruments

During the pretest and posttest phases, students responded to a set of instruments consisting of two Likert type scales and three open questionnaires. This study will focus only on the quantitative results of these two scales.

Self-Efficacy for Learning Form (Zimmerman and Kitsantas, 2005—Translated by Boruchovitch and Ganda, 2010)

This Likert type scale consisted of 19 items that refer to the self-efficacy beliefs related to 3 academic activities: study, preparation for tests, and taking of notes in class. The options assumed values ranging from 0 to 100%, according to the following gradation: 0% (Definitely cannot do it), 30% (Probably cannot), 50% (Maybe), and 70% (Probably can) to 100% (Definitely can do it).

TABLE 1 | Demographic data of the four classes.

Variables	Class A		Class B		Class C		Class D	
	N	%	N	%	N	%	N	%
Sex								
Female	24	88.89	33	100	26	92.86	18	85.71
Male	3	11.11	0	0.00	2	7.14	3	14.29
High school								
Public	19	70.37	13	39.39	11	39.29	14	66.67
Private	8	29.63	20	60.61	17	60.71	7	33.33
University admission preparation course								
Did not do	12	44.44	17	51.52	17	60.71	10	47.62
≤1 year	13	48.15	13	39.39	11	39.29	8	38.10
≥2 years	2	7.41	3	9.09	0	0.00	3	14.29
Previous graduation								
First graduation	22	81.48	30	90.91	28	100	15	71.43
Second graduation	5	18.52	3	9.09	0	0.00	6	28.57
Extra activities								
Does not do	11	40.74	25	75.76	25	89.29	8	38.10
≤24 years	3	11.11	6	18.18	3	10.71	4	19.05
25–40 h	9	33.33	2	6.06	0	0.00	7	33.33
>40 h	4	14.81	0	0.00	0	0.00	2	9.52

The total score ranged from 0 and 100. A participant score was the mean of the sum of all items (Simmons and Lehmann, 2013). Higher scores reflect more positive beliefs in self-efficacy for self-regulated learning. The questionnaire was translated into Portuguese by Boruchovitch and Ganda (2010) after obtaining formal consent from the authors. To ensure accuracy, the form was independently translated by two fluent English speakers. The translations were then compared and discussed to determine the final Brazilian version. Back translation procedures were also employed.

The internal consistency of the scale, measured by Cronbach's alpha, was 0.97 in a study conducted with 223 undergraduate students (Zimmerman and Kitsantas, 2007). In Brazilian study carried out with a sample of 884 undergraduate students (Boruchovitch, 2015), the alpha value was high ($\alpha = 0.99$) and similar to that obtained by the original authors. The temporal stability was also measured in another study (Balsas and Boruchovitch, 2015). A high and significant correlation between the two applications was found ($\alpha = 0.89$; $p < 0.001$).

Some examples of items are: Item 07: "When you are trying to understand a new topic, can you associate new concepts with the old ones sufficiently well to remember them?" and Item 18: "When you think you did poorly on a test you just finished, can you go back to your notes and locate all the information you had forgotten?"

LASSI (Weinstein et al., 1987)

LASSI is a Likert type scale designed to assess study skills, learning strategies, and attitudes in the academic context. It has five options for answers ranging from 1 (Not at all typical of me) to 5 (Very much typical of me). The original version has 77 items, organized into 10 subscales: information processing, anxiety, time management, concentration, attitude, selecting main ideas, study aids, motivation, self-testing, and test strategies. The version

used in this research was adapted and validated for the Brazilian context in a study conducted by Bartalo (2006), with a sample of 833 undergraduate students from the states of Paraná and São Paulo. In the study by Bartalo (2006), the analysis of internal consistency of the subscales, measured by Cronbach's alpha, ranged from 0.64 to 0.82. After factorial and content analyses of the items, the Brazilian version of the scale ended up with 71 items. These items were organized into nine subscales, with the first eight in accordance with the original scale of Weinstein et al. (1987).

A set of 11 items about study habits on the Internet was added in the Brazilian version. If the students did not use the Internet for study, they were asked to provide this information at the beginning of the test and did not have to answer these questions. This addition was introduced by Bartalo (2006) in the Brazilian version of her adaptation of the LASSI because learning through Internet use has become quite common in Brazil, yet is not much investigated. As in this study, students who were in the EGs did some learning activities using the Internet, these items were kept.

Higher scores on the LASSI scale and its subscales indicate that students report better study skills and use of learning strategies. Some examples of items include: Item 03: "After a lecture, I revise my notes to recall the subject"; Item 33: "I do not want to learn many different things at the university. I want to learn only the necessary to get a good job"; and Item 57: "I get so nervous and confused when I take a test that the answers I give are not my best."

Data Collection Procedure

The project was submitted to the Research Ethics Committee of School of Medical Sciences of the public Brazilian university where this research took place, in compliance with the current standards of the National Health Council, Resolution no. 466/12,

which establishes the ethical issues of research conducted with human beings in Brazil; it was approved (CAAE Protocol: 11633312.7.0000.5404). After this approval, the research was carried out within an Educational Psychology course for students of Pedagogy.

The four classes of students were randomly assigned to one of the three conditions of the study (Experimental I, Experimental II, and Control). Class A (2013), of the evening group, was the EG I for which was used an Intervention Program format. Class B consisted of full-time students (2013) and was the EG II, which took the course with the traditional format. Classes C and D were composed of students who, respectively, attended classes full time and evening classes of the following year (2014). These two latter groups were CGs who did not take the course neither in the Intervention Program Format nor as a traditional course. They only responded to the pretest and posttest scales. Pretest data collection was carried out at the beginning of the semester. Then, classes started in both course formats. At the end of the semester, participants answered the same initial scales as a posttest. Pretest and posttest data collection for the CGs took place the next year. It is important to mention that the four groups were from different classes because only two classes in Pedagogy (one full time and one part time in the evenings) are admitted per year at this university.

The intervention program was conducted throughout the first semester, with six fortnightly meetings of 2 h each. The intervention planning included in-class oral presentations in class, theoretical tasks, and self-reflection activities carried out both in the classroom and at home. All online activities and tasks (videos and internet searches) were chosen because of their theoretical relevance, adequacy for the stimulation of self-regulated learning, and interest aroused in similar students in a previous pilot study. The classes were organized into three parts, with the initial activity involving an experiential or self-reflective activity. The second part of the class involved students exposure to theoretical content, as well as to relevant research evidence and its relation to successful learning introduced *via* power point slides. The final part consisted of a discussion about the theme and homework was assigned. All the activities provided during the intervention focused on working with a double perspective of making the participant reflect on himself or herself both as a student and as a future teacher (Boruchovitch and Ganda, 2013).

The intervention program and the traditional course were planned to cover the main variables of the theoretical model proposed by Zimmerman (2000, 2002). In the classroom, the concepts of self-regulated learning and related variables were presented as follows: learning strategies, motivation to learn, self-handicapping strategies, time management strategies, causal attributions, self-efficacy belief, emotional regulation, anxiety, and Implicit Theories of Intelligence. The classes were taught for students of the EGs I (intervention program) and II (and traditional course) by the authors of this study. What differed in the course for the EG I (Class A) was that these participants received activities focused on the development of self-regulation, such as self-reflective activities, metacognitive tasks, and explicit guidelines on how to apply the content to their own

learning and future practice. The students of the EG II (Class B) participated in a traditional course format, only with lectures and theoretical activities of strictly cognitive type, focused just on the learning of content with no stimulation of self-reflection and self-awareness. **Tables A1** and **A2** show, respectively, the themes, goal targeted, and activities of each class for EGs I and II showing how the content and variables taught featured both the intervention and the traditional course approach (see Appendix). Although the instructional setting was similar to all groups, the CGs were not taught by the authors of this study and did not attend a course on self-regulated learning before the pretest and posttest.

Data Analysis Procedure

Data were examined quantitatively, using descriptive and inferential non parametric statistical procedures. Calculation of frequency, percentage, mean, and SD, as well as of repeated measures of analysis of variance (ANOVA) was carried out. Cronbach's alpha was employed to estimate the internal consistency of the scales. Effect sizes were examined using the Glass Delta (Δ).

RESULTS

The main hypothesis of this study was that the intervention program developed would be effective to increase the self-regulation of the students who received it (EG I) when compared with those who did not participate in the Intervention (EG II and CGs). **Table 2** shows the test results of the ANOVA (Repeated Measures ANOVA) between the EG I (Class A) and the EG II (Class B).

The analysis showed statistically significant differences between the pretest and posttest phases for both groups. The scores of self-efficacy scale increased for EG I and EG II, revealing that the students of both classes felt more confident in carrying out academic activities at the end of the semester. The EG II also showed increase in the scores of subscales 2 (Anxiety) and 8 (Study aids) of LASSI, indicating that the students of this group reported more frequent use of strategies to control anxiety and good study habits, from the beginning to the end of the research. The comparison between EG I and EG II revealed a very small effect size ($\Delta = 0.12$) for anxiety subscale, a moderate effect ($\Delta = 0.53$) for study habits subscale, and a small effect ($\Delta = 0.30$) for self-efficacy scale.

As shown in **Table 3**, significant differences were also found between the pretest and posttest times in both variables on the comparison between the EG I—Class A and the CG—Class D. There was an increase in the scores of the self-efficacy scale for the EG I and a reduction in the values of subscale 4 (Concentration) of LASSI to the CG.

These results showed that students in the EG I—Class A reported an increase in the belief in their ability to accomplish the academic activities comparing with Class D. The students of CG—Class D showed a decrease in concentration during the study and in performance of academic tasks. The comparison between EG I and CG—Class D revealed a very small effect size ($\Delta = 0.16$) for concentration subscale and a small effect ($\Delta = 0.23$) for self-efficacy scale.

TABLE 2 | ANOVA results for comparison between the Experimental Group (EG) I—Class A and EG II—Class B scores.

Variables ^a	Analyses		
	Comparison between groups (EG I and EG II)	Comparison between phases (pre and post)	Interaction: groups × phases
Information processing	$F(1.58) = 0.94; p = 0.337$	$F(1.58) = 0.00; p = 0.963$	$F(1.58) = 0.00; p = 0.950$
Anxiety	$F(1.58) = 0.00; p = 0.975$	$F(1.58) = 8.69; p = 0.005^b$	$F(1.58) = 0.90; p = 0.346$
Time management	$F(1.58) = 0.05; p = 0.822$	$F(1.58) = 2.33; p = 0.132$	$F(1.58) = 4.00; p = 0.051$
Concentration	$F(1.58) = 0.25; p = 0.617$	$F(1.58) = 1.27; p = 0.264$	$F(1.58) = 0.06; p = 0.805$
Attitude	$F(1.58) = 0.10; p = 0.757$	$F(1.58) = 0.00; p = 0.981$	$F(1.58) = 0.62; p = 0.435$
Studying concerns	$F(1.58) = 0.06; p = 0.807$	$F(1.58) = 3.86; p = 0.054$	$F(1.58) = 0.22; p = 0.644$
Selecting main ideas	$F(1.58) = 0.01; p = 0.914$	$F(1.58) = 0.97; p = 0.772$	$F(1.58) = 0.08; p = 0.772$
Study aids	$F(1.58) = 1.52; p = 0.222$	$F(1.58) = 7.97; p = 0.007^c$	$F(1.58) = 1.13; p = 0.293$
Motivation	$F(1.58) = 0.01; p = 0.933$	$F(1.58) = 3.13; p = 0.082$	$F(1.58) = 0.37; p = 0.545$
Study habits on the Internet	$F(1.58) = 0.32; p = 0.571$	$F(1.58) = 0.03; p = 0.871$	$F(1.58) = 0.15; p = 0.701$
Total LASSI scale	$F(1.58) = 0.05; p = 0.819$	$F(1.58) = 2.90; p = 0.094$	$F(1.58) = 0.22; p = 0.642$
Self-efficacy scale	$F(1.58) = 2.06; p = 0.156$	$F(1.58) = 12.91; p < 0.001^d$	$F(1.58) = 0.12; p = 0.735$

^aVariables transformed into ranks in the analysis due to the absence of Normal distribution.

^bSignificant differences between times (profile test by contrast): pre ≠ post for the EG II.

^cSignificant differences between times (profile test by contrast): pre ≠ post for the EG II.

^dSignificant differences between times (profile test by contrast): pre ≠ post for EG I and EG II.

TABLE 3 | ANOVA results for comparison between the Experimental Group (EG) I—Class A and control group (CG)—Class D scores.

Variables ^a	Analyses		
	Comparison between groups (EG I and CG)	Comparison between phases (pre and post)	Interaction: groups × phases
Information processing	$F(1.46) = 0.36; p = 0.552$	$F(1.46) = 0.08; p = 0.774$	$F(1.46) = 0.00; p = 0.952$
Anxiety	$F(1.46) = 0.01; p = 0.929$	$F(1.46) = 0.19; p = 0.668$	$F(1.46) = 0.94; p = 0.170$
Time management	$F(1.46) = 0.87; p = 0.355$	$F(1.46) = 0.07; p = 0.789$	$F(1.46) = 0.47; p = 0.496$
Concentration	$F(1.46) = 0.17; p = 0.678$	$F(1.46) = 1.37; p = 0.249$	$F(1.46) = 5.43; p = 0.024^b$
Attitude	$F(1.46) = 0.00; p = 0.982$	$F(1.46) = 0.57; p = 0.455$	$F(1.46) = 2.08; p = 0.156$
Studying concerns	$F(1.46) = 0.02; p = 0.901$	$F(1.46) = 1.55; p = 0.219$	$F(1.46) = 0.79; p = 0.380$
Selecting main ideas	$F(1.46) = 0.00; p = 0.983$	$F(1.46) = 0.74; p = 0.393$	$F(1.46) = 0.15; p = 0.704$
Study aids	$F(1.46) = 0.02; p = 0.900$	$F(1.46) = 0.48; p = 0.493$	$F(1.46) = 0.77; p = 0.383$
Motivation	$F(1.46) = 0.06; p = 0.815$	$F(1.46) = 4.01; p = 0.051$	$F(1.46) = 0.00; p = 0.963$
Study habits on the Internet	$F(1.46) = 0.56; p = 0.456$	$F(1.46) = 1.37; p = 0.248$	$F(1.46) = 3.60; p = 0.064$
Total LASSI scale	$F(1.46) = 0.00; p = 0.972$	$F(1.46) = 0.19; p = 0.665$	$F(1.46) = 2.52; p = 0.120$
Self-efficacy scale	$F(1.46) = 0.01; p = 0.942$	$F(1.53) = 0.04; p = 0.846$	$F(1.53) = 7.40; p = 0.009^c$

^aVariables transformed into ranks in the analysis due to the absence of Normal distribution.

^bSignificant differences between times (profile test by contrast): pre ≠ post for the CG II.

^cSignificant differences between times (profile test by contrast): pre ≠ post for the EG.

When comparing students of the EGs (Classes A and B) who participated in the course in the intervention program format or in the traditional format with the ones in the CGs (Classes C and D), who did not participate, significant differences were observed, as well. While EG students reported greater sense of self-efficacy and use of anxiety control strategies, students of CG groups showed a decline in the use of strategies to keep the attention and to manage time to study (Table 4). The comparison between the EGs and the CG showed a very small effect size ($\Delta = 0.04$) for time management subscale and small effects for anxiety subscale ($\Delta = 0.27$), concentration subscale ($\Delta = 0.20$), and self-efficacy scale ($\Delta = 0.24$).

In summary, the results showed that the hypotheses of the study were partially confirmed. The students who were in the Intervention Program (EG I) reported an increase in the self-efficacy beliefs for self-regulated learning when compared to the students of CGs. However, no significant change emerged regarding other self-regulated variables. Students of the EGs had improvements in reporting self-efficacy beliefs for self-regulated

learning and in the use of strategies to control anxiety, when compared with their CGs counterparts. Overall, the effects sizes ranged from very small to moderate.

DISCUSSION

This research was designed to evaluate the effects on self-regulation of a program of intervention (EG I) and a theoretical course (EG II) to promote the self-regulated learning of college students. We expected that students participating in the intervention program, heavily based on self-reflection, (EG I) would show a significantly higher increase in self-efficacy beliefs for self-regulated learning and in the report of use of learning strategies than both students participating in a course about self-regulated learning in a traditional format (EG II) and those who did not participate in any course promoting self-regulated learning (CGs). This hypothesis was partially confirmed. Overall, the analysis between times and groups revealed that both EGs (EGs I and II) showed an increase in the

TABLE 4 | ANOVA results for comparison of scores between the participating groups (EG) and the non-participating groups (CG) on course.

Variables ^a	Analyses		
	Comparison between groups (GE and CG)	Comparison between phases (pretest and posttest)	Interaction: groups × phases
Information processing	$F(1,107) = 1.12; p = 0.293$	$F(1,107) = 0.27; p = 0.604$	$F(1,107) = 0.47; p = 0.496$
Anxiety	$F(1,107) = 0.05; p = 0.827$	$F(1,107) = 3.14; p = 0.079$	$F(1,107) = 6.11; p = 0.015^b$
Time management	$F(1,107) = 0.14; p = 0.711$	$F(1,107) = 7.96; p = 0.006^c$	$F(1,107) = 0.25; p = 0.620$
Concentration	$F(1,107) = 0.05; p = 0.821$	$F(1,107) = 0.65; p = 0.422$	$F(1,107) = 5.46; p = 0.021^d$
Attitude	$F(1,107) = 0.00; p = 0.967$	$F(1,107) = 0.29; p = 0.588$	$F(1,107) = 0.13; p = 0.724$
Studying concerns	$F(1,107) = 0.87; p = 0.354$	$F(1,107) = 1.83; p = 0.179$	$F(1,107) = 1.26; p = 0.265$
Selecting main ideas	$F(1,107) = 0.06; p = 0.808$	$F(1,107) = 0.21; p = 0.646$	$F(1,107) = 0.84; p = 0.363$
Study aids	$F(1,107) = 0.47; p = 0.227$	$F(1,107) = 3.84; p = 0.053$	$F(1,107) = 3.23; p = 0.075$
Motivation	$F(1,107) = 0.00; p = 0.952$	$F(1,107) = 2.78; p = 0.099$	$F(1,107) = 0.27; p = 0.603$
Study habits on the Internet	$F(1,100) = 1.36; p = 0.246$	$F(1,100) = 1.63; p = 0.204$	$F(1,100) = 1.87; p = 0.175$
Total LASSI scale	$F(1,107) = 0.85; p = 0.359$	$F(1,107) = 0.00; p = 0.946$	$F(1,107) = 3.89; p = 0.051$
Self-efficacy scale	$F(1,107) = 0.08; p = 0.778$	$F(1,107) = 0.78; p = 0.379$	$F(1,107) = 12.28; p < 0.001^e$

^aVariables transformed into ranks in the analysis due to the absence of Normal distribution.

^bSignificant differences between times (profile test by contrast): pre ≠ post for group A + B.

^cSignificant differences between times (profile test by contrast): pre ≠ post for group C + D.

^dSignificant differences between times (profile test by contrast): pre ≠ post for group C + D.

^eSignificant differences between times (profile test by contrast): pre ≠ post for group A + B.

self-efficacy score for self-regulated learning and in the anxiety subscale of the LASSI. Students who did not participate in these courses (CGs) scored lower for the two subscales of time management and concentration. In fact, scores in self-efficacy for self-regulated learning were significantly higher for students who were in EG I than those in EG II and in CGs. However, students who attended the course in a traditional format (EG II) showed higher scores than students of EG I for two subscales of LASSI (anxiety control and study aids), as well as greater gains in self-efficacy for self-regulated learning when compared to students who had not attended the course (CGs).

Although overall effect sizes ranged from very small to moderate, as in previous intervention research (Wentzel and Wigfield, 2007; Andrzejewski et al., 2016; Magno, 2016), these results suggest that explicit activation of self-reflection and the use of self-reflective activities may have an impact on perceived self-efficacy for self-regulated learning. Nonetheless, this was not as strong as initially hypothesized in this study. As described by Panadero and Romero (2014), even though self-assessment is considered to occur in the final phase of the Zimmerman's model (self-reflection phase), it was in the forethought and in the performance phases that the highest effects emerged in their study. Accordingly, it is possible to suppose that the impact of the explicit activation of self-reflection of the intervention in our study might have spread across the different self-regulatory phases. Panadero (2017) also argues that there is a need for understanding how self-reflection works more precisely. Furthermore, certain differences between the participants of the two EGs were noted, and these may help explain some of the results found. Students in the EG II showed greater interest in the content of the course and a strong involvement during lectures. Even though no self-reflective activities were assigned to students in this group, many of them read the assigned texts, did all the theoretical tasks, and discussed the themes on the basis of their own academic experience. Some students even spontaneously sought strategies for study at home, an approach

that reflects the proactive and self-reflective behavior essential for the self-regulatory process. This greater interest in the content of the course on the part of the EG II may be due to the fact that they were full-time students, in contrast to situation of the students in EG I, who usually worked during the day and attended evening classes.

Moreover, after the posttest, some of the students of the EG II reported that they had attended several lectures and participated in activities designed to develop self-regulated learning promoted by the university student assistance center during the day because of their interest in the topic of the class and the time they had available. Given the difficulty in fully controlling this variable, none of the students were excluded from the sample. Therefore, this unexpected occurrence may have contributed to the similarity in the results of the two EGs (EG I and EG II), because both reported gains in certain self-regulatory variables. Another possible explanation is that the content of a self-regulated learning course is self-reflective by nature (Bembunty, 2011; Fabriz et al., 2013). It was clear that a spontaneous self-reflection happened in EG II. Fabriz et al. (2013) pointed out that even participation in a theoretical course on self-regulation can lead to increased self-efficacy beliefs and greater frequency in the use of cognitive and emotional control strategies that can enhance learning. It is possible that courses on self-regulation in both the intervention program format and the traditional format may have helped the students improve in relation to certain self-regulatory variables. Such a result was not found for the participants of the CGs. Further research should devote attention to pinpoint the actual impact of activation of self-reflection in the development of self-regulatory processes.

Despite the difficulty in controlling many of the variables when conducting research in an actual educational setting, the research reported here provided important results. It showed the positive impact that a course on self-regulation can have whether offered as a program of intervention or as a traditional series of lectures on improvement in student study habits and self-regulation. This

finding becomes even more relevant when we look more specifically at the results obtained with the CGs, in which a decline in performance from the beginning to the end of the semester in relation to time management and concentration emerged. These variables are very relevant for self-regulated learning. At the university where the present research was conducted, there is no formal courses on self-regulated learning in the curricula of Teacher Education courses (Boruchovitch and Ganda, 2013; Ganda, 2016). Therefore, there is a need to expand initiatives focusing on the promotion of self-regulation for students at the university, especially for freshmen and for those who intend to become future teachers (Zimmerman and Schunk, 2008; Fabriz et al., 2013).

Nonetheless, the study did involve several limitations that must be addressed carefully and overcome by further research. Many possible confounding factors were present, and these could have affected the self-regulated learning of preservice teacher students rather than the intervention as such. First, in studies carried out with samples composed of intact classes with the absence of randomization, the possibility always exists that some critical differences in background variables not reflected in the pretest could have contaminated the posttest data (Isaac and Michael, 1982). This might have been the case in this study because there is one full-time class and one evening class of students entering Pedagogy every year, which made it necessary to recruit CGs from students of the following admission year.

Second would be the degree of teacher fidelity to the implementation of intervention. Both the intervention program and the traditional classes were taught by the authors of this study, each of them acting as the judge of the other. The lack of the presence and evaluation of external judges can be seen as a weak point and attention to this point in future research is recommended.

Moreover, the same data collection instruments were used for the pretest and posttest, and it is possible that the increase in scores observed for some dependent variables could be the result of previous testing effect. In addition, the long period of time between each session and from the beginning until the end of the courses meant that the gains obtained could possibly be due to maturation and or history effects. Meeting weekly, rather than every 15 days might be important when considering the design of new courses and intervention studies.

Furthermore, all the instruments used were scales and self-report questionnaires. Therefore, the answers reflect the perception of the participants, but this may reflect a certain bias. According to Edwards (1990), people tend to give answers they consider to be socially desirable. The answers to self-report instruments should, therefore, be considered with caution. To deal with this problem, we suggest that further studies use instruments that measure actual student progress in self-regulation of their learning (Panadero et al., 2016). The data collection procedure reported by Bernacki et al. (2012) is an interesting example among others. These authors have developed a virtual platform for recording student actions in real time during the implementation of activities aimed at fostering self-regulation. Examining only the differences between pretest and posttest scores may also make it difficult to uncover the exact impact of interventions. In addition, self-report measures may not be sensitive enough to

capture change (Almeida, 1992; Andrzejewski et al., 2016). It is thus recommended that future studies examine the intervention sessions qualitatively from the beginning to the end, so that the actual progress of participants can be examined more precisely. Panadero et al. (2016) also highlight the need for studies combining measurement and intervention within the same tools.

Finally, the sample used here consisted of students at a public university, i.e., individuals who had had to be selected in a difficult admission process to enter the university. This means they were already very good students, with a degree of knowledge and study skills superior to those of the majority of the Brazilian population (Bartalo, 2006; Alcará and Santos, 2015; Araújo et al., 2016). It would be interesting to carry out a similar project with a sample composed of preservice teachers from private universities or from other regions of Brazil with different characteristics. It would be especially interesting to investigate students in teacher education programs of private Brazilian universities because of the recognized ease in the admission process and lower educational quality. Such groups might be important targets for self-regulated learning intervention (Cleary, 2011; Bembenuity and White, 2013; Alcará and Santos, 2015).

As educational practical implications, data from this study suggest that teachers need to help students reflect upon their learning. The inclusion of self-reflection and self-assessment activities in their classes can be powerful tools to increase the students' awareness of their behaviors and attitudes toward learning. It is equally important to invest efforts on teaching preservice teachers strategies to calibrate their efficacy beliefs, to maintain their concentration and motivation during classes, to manage their time, and to better control their emotions in academic contexts.

There is evidence that self-regulated learning can bring benefits to students not only in the academic context but also in future professional practice. Principles that guide self-regulation, such as monitoring, control and reflection, can be applied in various areas of a person's life (VanderStoep and Pintrich, 2003; Pintrich, 2004; Schunk and Zimmerman, 2008; Wolters, 2010), but self-regulation becomes especially important for students in teacher education programs (Dembo, 2001; Bembenuity, 2008). Researchers have suggested that teacher education programs should include educational proposals that help students both to reflect on their academic performance and to learn strategies to become more self-regulated students. In this way, preservice teachers can be exposed to important information and become experts in self-regulated learning during their preservice preparation in such a way that they can be motivated to promote the self-regulated learning of their future students (McKeachie et al., 2004; Cleary, 2011; Middleton et al., 2011; Moos and Ringdal, 2012; Boruchovitch and Ganda, 2013; Panadero, 2017).

ETHICS STATEMENT

The project was submitted to the Research Ethics Committee of the School of Medical Sciences of a public Brazilian university where this research took place, in compliance with the current standards of the National Health Council, Resolution no. 466/12, which establishes the ethical issues of research conducted with

human beings in Brazil and obtained approval (CAAE Protocol: 11633312.7.0000.5404). After the approval of the Committee, the research was carried out within an Educational Psychology course for Pedagogy students.

AUTHOR CONTRIBUTIONS

This article is a part of a doctoral dissertation research carried out by the first author under the supervision of the second author.

REFERENCES

- Alcará, A. R., and Santos, A. A. A. (2015). Avaliação e desenvolvimento da compreensão de leitura em universitários. *Estudos de Psicologia* 32, 63–73. doi:10.1590/0103-166X2015000100006
- Almeida, L. A. (1992). Inteligência e Aprendizagem: Dos seus relacionamentos à sua promoção. *Psicologia* 8, 277–292.
- Andrzejewski, C. E., Davis, H. A., Bruening, P. S., and Poirer, R. R. (2016). Can a self-regulated strategy intervention close the achievement gap? Exploring a classroom-based intervention in 9th grade earth science. *Learn. Individ. Differ.* 49, 85–99. doi:10.1016/j.lindif.2016.05.013
- Araújo, A. M., Santos, A. A. A., Noronha, A. P. P., Zanon, C., Ferreira, J. A., and Almeida, L. (2016). Dificuldades antecipadas de adaptação ao ensino superior: Um estudo com estudantes do primeiro ano. *Revista de Estudos e Investigações y Educación* 3, 102–111. doi:10.17979/reipe.2016.3.2.1846
- Balsas, M., and Boruchovitch, E. (2015). “A autoeficácia na formação de professores,” in *Paper presented at Congresso de Iniciação Científica* (Campinas, Brazil).
- Bandura, A. (2003). “Observational learning,” in *Encyclopedia of Learning and Memory*, 2nd Edn, ed. J. H. Byrne (New York: Macmillan), 482–484.
- Bartalo, L. (2006). *Mensuração de estratégias de estudo e aprendizagem de alunos universitários: Learning and study strategies inventory (LASSI)- Adaptação e validação para o Brasil*. Doctoral thesis, Educational Post-graduation Program, Paulista State University, Marília, Brazil.
- Bembenutty, H. (2008). The first word: a letter from the guest editor on self-regulation of learning. *J. Adv. Acad.* 20, 6–16. doi:10.4219/jaa-2008-884
- Bembenutty, H. (2011). New directions for self-regulation of learning in post-secondary education. *N. Direc. Teach. Learn.* 126, 117–124. doi:10.1002/tl.450
- Bembenutty, H., and White, M. C. (2013). Academic performance and satisfaction with homework completion among college students. *Learn. Individ. Differ.* 24, 83–88. doi:10.1016/j.lindif.2012.10.013
- Bernacki, M., Byrnes, J., and Cromley, J. (2012). The effects of achievement goals and self-regulated learning behaviors on reading comprehension in technology-enhanced learning environments. *Contemp. Educ. Psychol.* 37, 148–161. doi:10.1016/j.cedpsych.2011.12.001
- Bertrams, A., and Dickhauser, O. (2012). Passionate thinkers feel better: self-control capacity as mediator of the relationship between need for cognition an affective adjustment. *J. Individ. Differ.* 33, 69–75. doi:10.1027/1614-0001/a000081
- Boekaerts, M., and Cascallar, E. (2006). How far have we moved toward the integration of theory and practice in self-regulation? *Educ. Psychol. Rev.* 18, 199–210. doi:10.1007/s10648-006-9013-4
- Boekaerts, M., and Corno, L. (2005). Self-regulation in the classroom: a perspective on assessment and intervention. *Appl. Psychol.* 54, 199–231. doi:10.1111/j.1464-0597.2005.00205.x
- Boruchovitch, E. (2015). “O sucesso no contexto educativo: Contribuições da perspectiva da aprendizagem autorregulada,” in *XII Congresso Nacional de Psicologia Escolar e 37th International School Psychology – ISPA, 2015* (São Paulo, SP).
- Boruchovitch, E., and Ganda, D. R. (2010). *Escala de Autoeficácia para a aprendizagem*. São Paulo, SP: Universidade Estadual de Campinas.
- Boruchovitch, E., and Ganda, D. R. (2013). Fostering self-regulated skills in an educational psychology course for Brazilian preservice teachers. *J. Cog. Educ. Psychol.* 12, 157–177. doi:10.1891/1945-8959.12.2.157
- Brunstein, J. C., and Glaser, C. (2011). Testing a path-analytic mediation model of how self-regulated writing strategies improve fourth graders’ composition skills: a randomized controlled trial. *J. Educ. Psychol.* 103, 922–938. doi:10.1037/a0024622

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- Cartier, S. C., Butler, D. L., and Bouchard, N. (2010). Teachers working together to foster self-regulated learning through reading by students in an elementary school located in a disadvantaged area. *Psychol. Test Assess. Model.* 52, 382–418.
- Cleary, T. J. (2011). Professional development needs and practices among educators and school psychologists. *New Direc. Teach. Learn.* 126, 77–87. doi:10.1002/tl.446
- Costa, E. R., and Boruchovitch, E. (2009). As estratégias de aprendizagem e a produção de textos narrativos. *Psicologia, Reflexão e Crítica* 22, 173–180. doi:10.1590/S0102-79722009000200002
- Dembo, M. H. (2001). Learning to teach is not enough: future teachers also need to learn to learn. *Teach. Educ. Q.* 28, 23–35.
- Dembo, M. H., and Seli, H. P. (2004). Students’ resistance to change in learning strategies courses. *J. Dev. Educ.* 27, 2–9.
- Dweck, C. S. (2006). *Mindset: The New Psychology of Success*. New York: Random House.
- Edwards, A. L. (1990). Construct validity and social desirability. *Am. Psychol.* 45, 287–289. doi:10.1037/0003-066X.45.2.287
- Efklikes, A. (2011). Interactions of metacognition with motivation and affect in selfregulated learning: the MASRL model. *Educ. Psychol.* 46, 6–25. doi:10.1080/00461520.2011.538645
- Fabriz, S., Ewijk, A. D., Poarch, G., and Buttner, G. (2013). Fostering self-monitoring of university students by means of a standardized learning journal—a longitudinal study with process analyses. *Eur. J. Psychol. Educ.* 29, 239–255. doi:10.1007/s10212-013-0196-z
- Fantinel, P. C., Angelo, N. P., Lima, J. V., and Maraschin, C. (2013). *Autorregulação da aprendizagem: Uma competência fundamental na formação do licenciado em matemática à distância*. Belém, PA: Anais do X Congresso Brasileiro de Ensino Superior à Distância.
- Frison, L. M. B., and Moraes, M. A. C. (2010). As práticas de monitoria como possibilitadoras dos processos de autorregulação das aprendizagens discentes. *Poiésis Pedagógica* 8, 144–158.
- Frison, L. M. B., and Veiga Simão, A. M. (2011). Abordagem autobiográfica – Narrativas de formação e de autorregulação da aprendizagem reveladas em portfólios reflexivos. *Educação* 34, 198–206.
- Ganda, D. R. (2016). *A autorregulação da aprendizagem de alunos em curso de formação de professores: Um programa de intervenção*. Doctoral thesis, Educational Psychology Department, School of Education, State University of Campinas, Campinas, Brazil.
- Gomes, M. A. M., and Boruchovitch, E. (2011). Aprendizagem autorregulada da leitura: Resultados positivos de uma intervenção psicopedagógica. *Psicologia* 27, 291–299. doi:10.1590/S0102-37722011000300004
- Hadwin, A. F., Järvelä, S., and Miller, M. (2011). “Self-regulated, co-regulated, and socially shared regulation of learning,” in *Handbook of Self-Regulation of Learning and Performance*, eds B. J. Zimmerman and D. H. Schunk (New York, NY: Routledge), 65–84.
- Isaac, S., and Michael, W. B. (1982). *Handbook in Research and Evaluation*, 2nd Edn. San Diego, California: EdITS publishers.
- Klassen, R. M., and Kuzucu, L. (2009). Academic procrastination and motivation of adolescents in Turkey. *Educ. Psychol.* 29, 69–81. doi:10.1080/01443410802478622
- Lee, H. W., Lim, K. Y., and Grabowski, B. L. (2010). Improving self-regulation, learning strategy use, and achievement with metacognitive feedback. *Educ. Technol. Res. Dev.* 58, 629–648. doi:10.1007/s11423-0109153-6
- Machado, A. C., and Boruchovitch, E. (2015). As práticas autorreflexivas em cursos de formação inicial e continuada de professores. *Psicologia, Ensino e Formação* 6, 54–67.

- Magno, C. (2016). The effect size of self-regulation and prior knowledge on students performance in an open high school program. *Int. J. Res. Rev.* 11, 39–48.
- Marini, J., and Boruchovitch, E. (2014). Estratégias de Aprendizagem de Alunos Brasileiros do Ensino Superior: Considerações sobre adaptação, sucesso acadêmico e aprendizagem autorregulada. *Rev. E Psi* 1, 102–126.
- McKeachie, W. J., Lin, Y. G., and Middleton, M. J. (2004). Two types of low test-anxious (low-worry) students. *Coun. Clin. Psychol. J.* 1, 141–152.
- McKeachie, W. J., and Svinicki, M. (2006). *Teaching Tips: Strategies, Research, and Theory for College and University Teachers*, 12th Edn. Boston, MA: Houghton Mifflin College.
- Middleton, M., Abrams, E., and Seaman, J. (2011). Resistance and disidentification in reflective practice with preservice teaching interns. *New Direc. Teac. Learn.* 126, 67–75. doi:10.1002/tl.445
- Moos, D., and Ringdal, A. (2012). Self-regulated learning in classroom: a literature review on the teacher's role. *Educ. Res. Int.* 423284, 1–12. doi:10.1155/2012/423284
- Panadero, E. (2017). A review of self-regulated learning: six models and four directions for research. *Front. Psychol.* 8:1–28. doi:10.3389/fpsyg.2017.00422
- Panadero, E., Klug, J., and Järvelä, S. (2016). Third wave of measurement in the self-regulated learning field: when measurement and intervention come hand in hand. *Scan. J. Educ. Res.* 60, 723–735. doi:10.1080/00313831.2015.1066436
- Panadero, E., and Romero, M. (2014). To rubric or not to rubric? The effects of self-assessment on self-regulation, performance and self-efficacy. *Assess. Educ. Prin. Policy Prac.* 21, 133–148. doi:10.1080/0969594X.2013.877872
- Pintrich, P. (2004). A conceptual framework for assessing motivation and self-regulated learning in college students. *Educ. Psychol. Rev.* 16, 385–407. doi:10.1007/s10648-004-0006-x
- Randi, J. (2004). Teachers as self-regulated learners. *Teach. Coll. Rec.* 10, 1825–1853.
- Rodgers, C. R. (2002). Seeing student learning: teacher change and the role of reflection. *Harv. Educ. Rev.* 72, 230–253. doi:10.17763/haer.72.2.5631743606m15751
- Rodríguez, S., Regueiro, B., Blas, R., Valle, A., Piñeiro, I., and Cerezo, R. (2014). Teacher self-efficacy and its relationship with students' affective and motivational variables in higher education. *Eur. J. Psychol. Educ.* 7, 107–120. doi:10.1989/ejep.v7i2.183
- Schmitt, S. A., McClelland, M. M., Tominey, S. L., and Acock, A. C. (2015). Strengthening school readiness for Head Start children: evaluation of a self-regulation intervention. *Early Child. Res. Q.* 30, 20–31. doi:10.1016/j.ecresq.2014.08.001
- Schmitz, B., Klug, J., and Schmidt, M. (2011). "Assessing self-regulated learning using diary measures with university students," in *Handbook of Self-Regulation of Learning and Performance*, eds B. Zimmerman and D. Schunk (New York, NY: Routledge, Taylor & Francis Group), 251–266.
- Schunk, D. H. (2001). *Self-Regulation through Goal Setting*. Greensboro, NC: Clearinghouse on Counseling and Student Service, University of North Carolina.
- Schunk, D. H., and Zimmerman, B. J. (2008). *Motivation and Self-Regulated Learning: Theory, Research, and Applications*. New Jersey: Lawrence Erlbaum Associates.
- Simmons, C., and Lehmann, P. (2013). *Tools for Strengths-Based Assessment and Evaluation*. New York: Springer Publishing Company.
- Sitzmann, T., and Ely, K. (2010). Sometimes you need a reminder: the effects of prompting self-regulation on regulatory processes, learning, and attrition. *J. Appl. Psychol.* 95, 132–144. doi:10.1037/a0018080
- Staley, R., and Dubois, N. F. (1996). A self-regulated learning approach to teaching educational psychology. *Paper Presented at the Meeting of the American Educational Research Association*, New York, NY.
- Trindade, A. F. (2009). *O impacto de uma intervenção na motivação na qualidade da aprendizagem: Uma experiência de caso único*. Dissertação de Mestrado, Faculdade de Psicologia, Universidade de Lisboa, Lisboa/Portugal.
- VanderStoep, S., and Pintrich, P. (2003). *Learning to Learn: The Skill and Will of College Success*. Upper Saddle River, NJ: Prentice Hall.
- Weiner, B. (2010). The development of an attribution-based theory of motivation: a history of ideas. *Educ. Psychol.* 45, 28–36. doi:10.1080/00461520903433596
- Weinstein, C. E., Schulte, A. C., and Palmer, D. P. (1987). *Learning and Study Strategies Inventory – LASSI*. Clearwater, FL: H & H Publishing.
- Wentzel, K. R., and Wigfield, A. W. (2007). Motivational intervention that work: themes and remaining issues. *Educ. Psychol.* 42, 261–271. doi:10.1080/00461520701621103
- Winne, P. H., and Hadwin, A. F. (1998). "Studying as self-regulated learning," in *Metacognition in Educational Theory and Practice*, eds D. J. Hacker, J. Dunlosky, and A. C. Graesser (Mahwah, NJ: Lawrence Erlbaum Associates), 277–304.
- Wolters, C. (2010). *Self-Regulated Learning and the 21st Century Competences*. Houston: Department of Educational Psychology, University of Houston, 1–27.
- Zimmerman, B. J. (1998). "Developing self-fulfilling cycles of academic regulation: an analysis of exemplary instructional models," in *Self-Regulated Learning: From Teaching to Self-Reflective Practice*, eds D. H. Schunk and B. J. Zimmerman (New York: The Guilford Press), 1–19.
- Zimmerman, B. J. (2000). "Attaining self-regulation: a social cognitive perspective," in *Handbook of Self-Regulation*, eds M. Boekaerts, P. R. Pintrich, and M. Zeidner (San Diego, CA: Academic Press), 13–39.
- Zimmerman, B. J. (2002). Becoming a self-regulated learner: an overview. *Theory Prac.* 41, 64–70. doi:10.1207/s15430421tip4102_2
- Zimmerman, B. J. (2011). "Motivational sources and outcomes of self-regulated learning and performance," in *Handbook of Self-Regulation of Learning and Performance*, eds B. J. Zimmerman and D. H. Schunk (New York, NY: Routledge, Taylor & Francis Group), 49–64.
- Zimmerman, B. J., and Kitsantas, A. (2005). "The hidden dimension of personal competence: self-regulated learning and practice," in *Handbook of Competence and Motivation*, eds A. J. Elliot and C. S. Dweck (New York: Guilford Press), 204–222.
- Zimmerman, B. J., and Kitsantas, A. (2007). Reliability and validity of self-efficacy for learning form: scores of college students. *J. Psychol.* 215, 157–163. doi:10.1027/0044-3409.215.3.157
- Zimmerman, B. J., and Schunk, D. H. (2008). "Motivation: an essential dimension of self-regulated learning," in *Motivation and Self-Regulated Learning: Theory, Research and Applications*, eds D. H. Schunk and B. J. Zimmerman (England: MPG Books Group), 1–30.

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APPENDIX

TABLE A1 | Overview of course content, classroom activities assessment tools, and the goals targeted in intervention program format—Experimental Group I.^a

Theoretical content	The goals targeted	Classroom activities (assessment tools)	Homework
<i>Class 01</i> – Course proposal overview – Pretest data collection – Learning strategies	– To present the course overview – To collect the pretest data – To present the theoretical theme, to promote self-reflection, and to stimulate the use of learning strategies for reading	01. To answer questions about their own learning strategies 02. To read and to underline a text about self-regulated learning	01. To read, to underline, and to answer questions about the assigned theoretical text. To watch online video about learning strategies and to answer self-reflective questions
<i>Class 02</i> – Motivation to learn	– To present the theoretical theme and to promote self-reflection about their motivation	01. To answer motivation questions and a self-report scale 02. To do a self-reflective motivation exercise	01. To read, to underline, and to use other learning strategies to read the assigned theoretical text. To answer self-reflective questions about motivation to learn
<i>Class 03</i> – Self-handicapping strategies Time management strategies	– To present the theoretical theme and to promote self-reflection about self-handicapping behavior – To help students manage their time	01. To answer questions about their own self-handicapping strategies 02. To do the exercise: weekly planning chart	01. To watch online video about time management and to answer self-reflective questions. To analyze own weekly planning chart
<i>Class 04</i> – Causal attributions – Self-efficacy belief	– To present the theoretical theme and to promote self-awareness about personal beliefs – To observe and record their own study methods	01. To answer questions about their causal attributions for academic situations 02. To answer questions about their own self-efficacy beliefs	01. To read the assigned theoretical text and to answer self-reflective questions as a student and as a future teacher. To do the Homework Log
<i>Class 05</i> – Emotional regulation – Anxiety	– To present the theoretical theme and to promote self-reflection about anxiety and emotional regulation strategies	01. To answer questions about their anxiety regarding academic tasks 02. To do a self-reflective exercise about anxiety	01. To answer self-reflective questions about emotional regulation strategies
<i>Class 06</i> – Implicit Theories of Intelligence – Posttest data collection – Deadline for submission of the learning diary	– To present the theoretical theme and to promote self-reflection and awareness of personal intelligence beliefs. – To collect the posttest data (readministration of initial measures)	01. To answer a self-report scale about Implicit Theories of Intelligence 02. To do an exercise about intelligence beliefs	–
<i>Class 07</i> – Course feedback	– To provide feedback on student course performance	01. Teacher feedback on student course performance	–

^aGoals for the Experimental Group I were all targeted so that participants could observe themselves, become more aware of how they learn, and understand how self-regulated learning can optimize own and future students learning.

TABLE A2 | Overview of course content, classroom activities and the goals targeted in the traditional course format (Experimental Group II).^a

Theoretical content	The goals targeted	Classroom activities (exercises)	Homework
<i>Class 01</i> – Course proposal overview – Pretest data collection – Learning strategies	– To present the course overview – To collect the pretest data – To present the theoretical theme: learning strategies	01. To read and to underline a text about self-regulated learning 02. To answer two theoretical questions about reading and underlining	01. To read, to underline, and to summarize the assigned theoretical text. To do research about other learning strategies
<i>Class 02</i> – Motivation to learn	– To present the theoretical theme: motivation to learn	01. To do theoretical exercises about motivation to learn	01. To create and to answer three theoretical questions about the assigned theoretical text. To do theoretical exercises about motivation to learn
<i>Class 03</i> – Self-handicapping strategies – Time management strategies	– To present the theoretical theme: self-handicapping and time management strategies	01. To answer theoretical self-handicapping strategies questions 02. To write a summary about time management	01. To read the assigned theoretical text and to list the most important concepts. To write a short text about the content read with own words
<i>Class 04</i> – Causal attributions – Self-efficacy belief	– To present the theoretical theme: causal attributions and self-efficacy	01. To answer a theoretical self-efficacy question 02. To define causal attribution	01. To read the assigned theoretical text and to answer three theoretical questions
<i>Class 05</i> – Emotional regulation – Anxiety	– To present the theoretical theme: emotional regulation and anxiety	01. To answer a theoretical question about emotional regulation 02. To do a theoretical exercise about anxiety	01. To create a story about a student with anxiety and to propose a method to help him/her to deal with this problem at school

(Continued)

TABLE A2 | Continued

Theoretical content	The goals targeted	Classroom activities (exercises)	Homework
Class 06 Implicit Theories of Intelligence – Posttest data collection – Deadline for learning diary submission	– To present the theoretical theme: Implicit Theories of Intelligence – To collect the posttest data (readministration of initial measures)	01. To answer a theoretical question about intelligence 02. To do an exercise about intelligence beliefs	–
Class 07 – Course feedback	– To provide feedback on student course performance	01. Teacher feedback on student course performance	–

^aGoals for the Experimental Group II were all targeted so that participants could learn the theoretical content about self-regulated learning.