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The Impact of a Cooperative Method Embedded in a Writing Strategy Instructional Program on Student Engagement in School^{☆,☆☆}

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ABSTRACT

Cooperative methods are a powerful tool for improving both student engagement in school and writing competence. This study examined the effects of a cooperative method embedded in a writing strategy instructional program on student engagement in school, namely on their cognitive, affective, behavioral, and personal agency dimensions. Using the *Students' Engagement in School: Four-dimensional Scale (SES-4DS)*, 213 ninth grade students (from 14 to 17 years old) were evaluated before and after the intervention. Two conditions were created: an experimental group where a cooperative method associated with a writing strategy instructional program was implemented and a control group where students were instructed with a writing strategy instructional program. Over a six-month period, the experimental students participated in a cooperative experience embedded in a writing strategy instructional program, whereas the control students were instructed with writing strategy method. Results indicated that, when compared with the control, the experimental students increased their levels of behavioral and affective engagement but not their levels of cognitive engagement, personal agency, and total engagement. Implications of these results, limitations and directions for future research are analyzed, and discussed.

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El impacto de un método cooperativo integrado en un programa instruccional de estrategias de escritura en la implicación del alumnado en la escuela

RESUMEN

Los métodos cooperativos son una herramienta poderosa tanto para mejorar la motivación escolar del alumnado como su competencia de escritura. Este estudio examina los efectos de un método cooperativo integrado en un programa de estrategias de enseñanza de la escritura en la motivación académica de los estudiantes (dimensiones cognitiva, afectiva, conductual e implicación personal). Se ha aplicado la escala *Motivación Académica de los Estudiantes (SES-4DS)* a 213 alumnos del 9º grado de escolaridad (de 14 a 17 años), divididos en dos grupos (experimental y control) que han sido evaluados antes y después de la intervención. Durante un período de seis meses el grupo experimental ha sido sometido a un programa de estrategias de enseñanza de la escritura, seguido de un método cooperativo; el grupo de control sólo fue sujeto al programa de estrategias de enseñanza de la escritura. Los resultados indican que el grupo experimental, en comparación con el grupo de control, ha aumentado significativamente su motivación escolar en las dimensiones comportamental y afectiva, pero no en las dimensiones cognitiva e implicación personal, ni en la motivación global. Se analizan y se discuten las implicaciones de estos resultados, así como las limitaciones del estudio y las recomendaciones para investigaciones futuras.

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Introduction

The way in which students are involved in schools – *student engagement in school* – is a crucial factor to their academic and personal success and is seen as a means to address many of the problems which students experience and which affect schools (Appleton, Christenson, & Furlong, 2008; Hagenauer, Hascher, & Volet, 2015).

Because academic learning requires effort, student engagement is essential in that it leads to sustained study and supports activities needed for students to improve their academic work and develop proficiency. Increased proficiency in academic tasks, in turn, leads to greater student engagement because competence is necessary to keep students motivated to engage in school activities (Irvin, Meltzer, & Dukes, 2007). Several studies have shown that the relationship between engagement and academic competence is bidirectional (Miranda-Zapata, Lara, Navarro, Saracostti, & de-Toro, 2018; Wonglorsachon, Wongwanich, & Wiratchai, 2014). This means that the more students are engaged in school, the more they learn, and the more academically competent and successful they are the more worthwhile they feel, which in turn, increases their engagement (Wonglorsachon et al., 2014). Thus, if engagement is an essential condition to academic success, in similar fashion, increasing students' proficiency should develop engagement. Proficiency in writing is deemed particularly important because writing is a core literacy skill (Fidalgo, Harris, & Braaksma, 2017; Gutiérrez-Fresneda, 2018). However, being a difficult task, students often view writing as frustrating and overwhelming (Zumbrunn, Marrs, & Mewborn, 2016). This justifies the pursuit of optimal means that would encourage greater engagement from elementary and middle school students in such an essential academic area. Cooperative methods have been suggested as an appropriate answer to this problem, as research has shown that they represent a powerful tool not only for improving writing competence (Van Steendam, 2016) but also for increasing engagement (Wentzel, 2009) and academic proficiency (Bommarito, 2015).

Student engagement in school

Student engagement in school is concerned with the extent of students involvement in school, and therefore with their motivation to learn (Simon-Morton & Chen, 2009); in addition, it is related to school performance and to an appropriate students behavior, and even with positive and negative teacher emotions (Hagenauer et al., 2015; Wonglorsachon et al., 2014). It is known that behavioral problems and the risk of school dropout are often associated with low levels of student engagement (Appleton et al., 2008; Fredricks, Blumenfeld, & Paris, 2004; Reeve & Tseng, 2011).

The literature points to engagement as having a multidimensional nature, including four dynamically related dimensions: cognitive, affective, behavioral, and personal agency (Reeve & Tseng, 2011). The cognitive dimension covers students' personal investment (Ainley, 1993), learning approaches and self-regulatory strategies (Fredricks et al., 2004). In addition, it is operationalized as the perceptions and the beliefs about the self, about the school, and about the colleagues, and it includes self-efficacy strategies, motivation and academic aspirations (Jimerson, Campos, & Greif, 2003). The affective or psychological dimension (Appleton et al., 2008) refers to the sense of identification with school, to emotions generated by school, colleagues and teachers, and to the sense of belonging to school (Johnson, Crosnoe, & Elder, 2001). The behavioral dimension is related to actions and practices directed toward school, including many positive behaviors, such as doing homework, paying attention during lessons (Johnson et al., 2001), participating in academic tasks and obtaining good grades (Jordan & Nettles, 2000), involvement in extra-curricular activities, and

respecting school norms (Fredricks et al., 2004; Gutiérrez, Tomás, Romero, & Barrica, 2017). Personal agency is defined as students' constructive contribution to the course of the instruction they receive (Reeve & Tseng, 2011).

Student engagement in school is influenced by personal variables, such as self-efficacy, self-reliance, and self-concept, and contextual variables, such as family, peers, and school (Veiga, 2016). Furthermore, findings from the United States, Portugal or Spain consistently revealed that key school attributes such as self-concept (Martínez, Cruise, García, & Murgui, 2017), self-esteem (Rodrigues, Veiga, Fuentes, & García, 2013), self-reliance, psychological adjustment (Fuentes, García, Gracia, & Alarcón, 2015), or bullying victimization (traditional bullying and cyberbullying; Martínez, Murgui, García, & García, 2019) are related with school context but also with parents' and peers' influence. There is evidence that teacher support has an influence on student engagement, academic success, and satisfaction with school (Gutiérrez et al., 2017), and that school engagement has a direct effect on attendance to classes and school performance (Miranda-Zapata et al., 2018).

In this paper we are particularly interested in contextual variables, namely those related to school. Several school-related variables, such as the social climate, and instructional practices have been shown to have an impact on student engagement (Patrick, Ryan, & Kaplan, 2007; Ryan & Patrick, 2001). The beliefs and behaviors of teachers, along with their support of student autonomy help to create a learning climate favorable to the practice of decision making and self-regulating abilities, one in which the students engage in school activities (Roesser, Eccles, & Sameroff, 2000; Ryan & Patrick, 2001). Instructional practices are also strongly related to student engagement, in that sustained engagement depends greatly on the instruction needed to support students in their efforts to learn. Instructional practices that have been proven to be powerful, such as coaching, scaffolding, modeling, and feedback constitute precious support to help students sustain their engagement in tasks (Irvin et al., 2007). Cooperative methods, in particular, are regarded as one of the most important facilitators of engagement in learning activities (cf. Wentzel, 2009).

Cooperative methods

Cooperative learning is based significantly on social interdependence theory (Johnson & Johnson, 1999; Johnson, Johnson, & Smith, 2007). Johnson and Johnson (1999, 2009, 2016) defined cooperative learning as having certain essential characteristics, such as positive interdependence, individual accountability, face-to-face promotive interaction, and appropriate use of social skills. Positive interdependence occurs when the interconnection between each member results in the mutual accomplishment of a common task. According to positive interdependence, individual students should understand that the achievement of group goals is essential for attaining their own objectives. Individual accountability is concerned with the responsibility that each student must assume in order to pursue the group's goals. The learning success of a cooperative group depends on each group member's learning success, and no student is able to perform his/her part if a peer fails to fulfill his/her individual responsibility related to the common task (Donnell, Hmelo-Silver, & Erkens, 2013). Face-to-face promotive interaction signifies that individuals assist each other efficiently and facilitate each other's efforts to perform each part so that the common task can be accomplished. The appropriate use of social skills is an essential condition for working in groups. Since cooperative learning requires group members to learn both the academic subjects and the interpersonal skills ensures the effective operation of groups working cooperatively. Several cooperative methods have been developed, with the jigsaw being one of the most

popular (Aronson, Stephan, Sikes, Blaney, & Snapp, 1978). In the jigsaw method, teachers organize the students into small groups of three or four members (the home group), and assign each member a part of a common task (A, B, C, D). Afterwards, students with the same part meet in the expert groups to study it. In the third step, the students who are experts in their respective part return to their home groups to share information and to work together on the common task. A jigsaw cycle ends with the individual achievement of a task related to the initial common task (Johnson & Johnson, 1999).

As cooperative methods concentrate on positive interdependence, individual accountability, face-to-face promotive interaction, and appropriate use of social skills, they sustain the positive learning climate. Research has shown that cooperative learning in structured groups decreases competitive verbal and non-verbal behaviors (Sharan, 1999), and increases tolerance between students. Furthermore, it increases assistance and positive relationships between students (Gillies, 2017), and prosocial behaviors, namely in the activities of help and cooperation (Carrasco, Alarcón, & Trianes, 2018). Structured cooperative learning experiences promotes help giving behaviors to succeed when students feel a sense of group cohesion (Johnson & Johnson, 2016; Slavin, 2014), increases team potency, that is, confidence in the team (León del Barco et al., 2017), and leads to a greater acceptance of students with special needs (Gillies, 2007; Vedder & Veendrick, 2003). In addition, cooperative methods, and particularly the jigsaw, represent a powerful tool to maintain student engagement in learning activities (cf. Buijs & Admiraal, 2013), resulting in increased academic proficiency (cf. Irvin et al., 2007; Wentzel, 2009). Several studies have demonstrated the advantages of cooperative learning structures over competitive and individualistic ones on academic performance (e.g., Johnson et al., 2007; Roseth, Johnson, & Johnson, 2008).

The intellectual benefits of cooperative learning serves the critical function of demanding the others be heard, but it raises also social skills, and children's curiosity, interest, and confidence (Kuhn, 2015). Cooperative methods require the synchronous combination of the intellectual efforts of each individual in each of the steps that make up the learning task (Todd & Dadlani, 2014). For all these reasons, cooperative methods influence not only the learning climate but also the academic competence, with both of them being essential to promote students engagement.

Writing

Writing literacy plays a crucial role in academic proficiency (e.g., Klein, Boscolo, Kirkpatrick, & Gelati, 2014). Writing is an important mean to demonstrate and to produce knowledge, to gather and recall information, to improve students' ability to learn, and to promote school success (e.g., Klein, Arcon, & Baker, 2016). However, writing is a complex process, because it requires the mastery of skills related to grammar, to punctuation, to spelling, and to sentence construction and involves the processes of planning, translating, and revision. Because of its complexity, many students experience serious difficulties in writing (Graham, Early, & Wilcox, 2014). For this reasons writing instruction has become a priority in research and in education in recent years (cf. Graham & Rijlaarsdam, 2016).

One of the most powerful instructional methods for developing students writing skills from almost all school grade levels is the Self-Regulated Strategy Development (SRSD) model (Harris & Graham, 2016). SRSD has been proven to be an effective writing approach by a number of studies and meta-analyses (Graham, Harris, & Chambers, 2016). Importantly, SRSD has already been tested in Portugal, demonstrating to be an effective writing instructional method in this cultural context (Festas et al., 2015; Limpo &

Alves, 2014). SRSD addresses general writing and specific genre-based strategies, self-regulation strategies, the knowledge needed to apply writing strategies, and motivational aspects such as self-efficacy for writing and attributions to effort.

Adding a cooperative component to a successful writing instruction method will be promising since cooperation is seen as one of the key elements required to enhance effective writing instruction. In effect, in many studies conducted with students from different grade levels in both regular and special classrooms have shown the benefits of cooperative writing settings (cf. Van Steendam, 2016): collaborative writing helps 16 and 17 years old students to emulate from each other's writing and to learn philosophical concepts (Corcelles & Castelló, 2015); adult Second Language students produced more accurate texts when they write in pairs than when they write individually (Storch, 2005); learning disabled 4th-, 5th-, and 6th-grade students working in pairs made more revisions and wrote better texts than control group students writing without peer support (MacArthur, Schwartz, & Graham, 1991).

Being included in a broader writing research (for more details see Prata, de Sousa, Festas, & Oliveira, 2018), the present study is aimed to know whether a cooperative method such as jigsaw, coupled with an instructional writing program such as the SRSD model (Harris & Graham, 2017; Harris, Graham, Mason, & Friedlander, 2008), would influence students' engagement in school. While previous research has demonstrated the role of motivation on writing (MacArthur & Graham, 2016), only few studies have been conducted about the relationship between student engagement and writing (cf. Boscolo & Hidi, 2007). The present study was designed to address this issue. Furthermore, by adding a cooperative method to an instructional writing program, it would be possible to better understand the relationship between writing, student engagement and cooperative methods.

As cooperative methods are a powerful tool for enhancing academic writing proficiency, and given the assumption that engagement should be influenced by such proficiency, we anticipated that students in the experimental group would, at the end of the experiment, be more engaged in school and achieve better results on *Students' Engagement in School: Four dimensional Scale* (SES-4DS). We expected better results in total scores and in each of the dimensions addressed by the questionnaire (cognitive, affective, behavioral and agency). Thus, because experimental students participated in a cooperative setting where they could increase their writing competence to a level necessary to maintain motivation to engage in school activities, we expected to find students more engaged in school.

Method

Participants

This study was carried out in three middle schools randomly chosen between all public middle schools of a Portuguese city. In the continuity of previous research, our study was conducted only on public schools (Festas et al., 2015). Because research teams in Portugal are not allowed to draw students from intact classes, and since the populations of Schools 1 and 2 together were almost as large as the population of School 3, two groups of schools were formed (Schools 1 and 2 formed one group and School 3 another group). These two groups were then randomly assigned to the experimental (Schools 1 and 2) and the control (School 3) groups.

Before the study began, the necessary consent was obtained from the Portuguese Ministry of Education, from the Director of each school, from the students' parents, from the teachers and from the students themselves. Six ninth-grade classes from Schools 1 and 2, with 60 and 82 students, respectively (that formed

the experimental group) and six ninth-grade classes from School 3 with 135 students (which formed the control group) took part in this study. Ninth grade was selected as the target grade level in response to schools' and teachers' request. In fact, the applied writing instruction should help these students to prepare for the national exam that is taken in the ninth grade.

Consent from parents to participate was obtained for all students of the experimental group, but not for eight students in the control group. After excluding those students who receive special education services and those missing the pre-test or the post-test, a total of 213 students were admitted to the study (113 belonging to the experimental group and 100 to the control group). The percentage of mortality was 20.4% in the experimental group and 25.9% in the control group. Although the sample could be larger, it included a number of participants very similar to those of other instructional programs research (e.g., [Cejudo, Salido-López, & Rodrigo-Ruiz, 2017](#); [De La Paz & Graham, 2002](#); [Harris, Graham, & Mason, 2006](#)). All students in the study were Portuguese native speakers.

Concerning the sample distribution by sex, from the 113 experimental group students, 68 were boys (60.2%) and 45 girls (39.8%), and from the 100 control group students, 43 were boys (43%) and 57 girls (57%). The proportion of males was statistically different between the control and the experimental groups ($p = .020$; females: $p = .235$), with a higher percentage of boys in the experimental group. The age of the participants in the experimental group ranged from 14 to 17 years old ($M = 14.71$; $SD = .84$; $n = 113$) and the age of the control students ranged from 14 to 16 years old ($M = 14.39$; $SD = .43$; $n = 100$). The retention of a high number of students explained the difference of ages within the same class. This is particularly true for the experimental group that held 31 of the 35 retentions. An independent t-test revealed a statistically significant difference in age $t_{(211)} = 3.41$, $p = .001$, with experimental students older than control ones.

Comparing the educational level completed by students' parents (ranging from less than compulsory education to a doctoral degree), statistical differences were found for fathers (Mann-Whitney $U = 5.632$, $p < .001$) and for mothers (Mann-Whitney $U = 6.170$, $p < .001$) between the control and the experimental groups. In both cases the control group showed higher levels of parents' educational background. Examining the number of retentions (0, 1 or 2) of students per grade, the two groups did differ statistically (Mann-Whitney $U = -4.635$, $p < .001$), with the experimental group displaying a higher number of student retentions. The evaluation of the structural elements of students' argumentative writing did not reveal any statistical difference between both conditions the experimental and the control $t_{(194,66)} = -1.703$, $p = .090$, $d = -0.11$

Concerning total engagement, the results between the two groups (experimental and control) also revealed no significant difference $t_{(208,69)} = .270$, $p = .787$, $d = 0.003$.

Seven teachers agreed to participate: three in the experimental and four in the control group. All the teachers were female. They all held teaching credentials in education, and all of them had completed an undergraduate degree. All teachers taught language arts classes. The teachers' professional experience ranged from 28 to 38 years in the experimental group ($M = 31.67$; $SD = 5.51$) and from 24 to 34 years in the control group ($M = 29.00$; $SD = 4.40$). No statistically significant differences were found between the two groups (Mann-Whitney $U = 8.0$, $p = .629$).

Instruments

The *Students' Engagement in School: Four Dimensional Scale* (SES-4DS) ([Veiga, 2016b](#)) includes a set of 20 statements aimed to assess student engagement in school through the *cognitive*, *affective*, *behavioral*, and *personal agency* dimensions. Data obtained

from the exploratory and confirmatory factor analysis, in the original study with SES-4DS, suggested that the four dimensions of student engagement in school are relatively independent of one another and that SES-4DS allows a multidimensional measurement of student engagement in school ([Veiga, 2013, 2016b](#)).

The *cognitive* dimension (items 1–5) covers students' personal investment in learning approaches and in self-regulatory strategies. It includes items focusing on the academic areas of writing (e.g., "When I write my academic work, first I make a plan of the text"), reading comprehension (e.g., "When I am reading, I try to understand the author's intention"), and study strategies (e.g., "I regularly revise my notes, even when I do not have exams"). The *affective* dimension (items 6–10) includes items dealing with the sense of belonging to the school (e.g., reversed item, "My school is a place where I feel excluded"), and with emotions generated by school and colleagues (e.g., "My school is a place where I make friends easily"). The *behavioral* dimension items (11–15) relate to actions and practices directed toward school (e.g., reversed item, "I am absent from school without a valid reason"; "I intentionally disturb the class"). The *personal agency* dimension items (16–20) evaluate a student's constructive contribution to the course of the instruction they receive (e.g., "In class, I ask the teachers questions"; "I give suggestions to teachers to enhance classes").

The participants respond to the instrument on a Likert-type 6-point scale, where 1 corresponds to *total disagreement* and 6 to *total agreement*. Total engagement scores ranged from 55 to 114, and internal consistency, measured by Cronbach's α , was .80. The *cognitive* dimension scores ranged from 9 to 27, and internal consistency, measured by Cronbach's α , was .67. The *affective* dimension scores ranged from 12 to 30, and internal consistency, measured by Cronbach's α , was .78. The *behavioral* dimension scores ranged from 10 to 30, and internal consistency, measured by Cronbach's α , was .89. The *agency* dimension scores ranged from 5 to 30, and internal consistency, measured by Cronbach's α , was .87. Other elements related to the instruments used in this study are the following: *cognitive*, $CR = .78$, $AVE = .41$, McDonald's (omega) = .68; *affective*, $CR = .87$, $AVE = .58$, McDonald's = .78; *behavioral*, $CR = .92$, $AVE = .69$, McDonald's = .91; and *agency*, $CR = .87$, $AVE = .58$ and McDonald's = .87. All values found are very similar to those presented by the author of the scale when it was built ([Veiga, 2016b](#)).

Baseline and post-intervention writing probes were used to assess students' argumentative writing skills. As usual in argumentative writing research, in order to evaluate writing compositions, each text was scored for the number of structural elements: introduction to the topic; taking a side; presentation of the arguments that support the opposing position; argumentation for the position taken; and conclusion (e.g., [Festas et al., 2015](#); [Ray, Graham, & Liu, 2018](#)). The evaluation resulted in the total score, which includes the presence or absence of argumentative structural elements. For the introduction to the topic, taking a side and the conclusion, "1" was allocated if the element was present in the text and "0" if the element was absent. The value of "1" was awarded for the inclusion of each argument and each counter-argument. Two graduate students independently evaluated and scored all papers. Inter-rater reliability (weighted Cohen's Kappa) for the two evaluations (pre-test and post-test) regarding structural elements was, respectively, .95 and .98.

Procedure

All students answered the *Students' Engagement in School: Four Dimensional Scale* (SES-4DS), both before and after the training sessions. At the same moments, students also wrote an argumentative composition, in response to two prompts on the theme of adolescent groups (cf. [Prata et al., 2018](#)). The data were collected within

the classroom context, in compliance with all ethical procedures required of this type of research.

Training sessions - Before beginning the classroom instruction all teachers participated in a practice-based professional development sessions, and received guidelines and materials needed to implement the training program in their classrooms (Ball & Cohen, 1999; Festas et al., 2015; Harris et al., 2012; Harris, Graham, & Atkins, 2015; McKeown et al., 2016; cf. also Prata et al., 2018). The training program included ten sessions. The number of sessions respected the usual duration of writing interventions (for example, Festas et al., 2015; De La Paz & Graham, 2002; Lane et al., 2008), as well as the duration of other school intervention programs aimed at improving the adolescents general proficiency (see Rojas-Andrade, Leiva-Bahamondes, Vargas, & Squicciarini-Navarro, 2017).

After the pre-test, teachers delivered to all students (from the control and from the experimental groups) SRSD instruction over a 5-week period (sessions 1–5). During this period students learned self-regulation strategies – goal-setting, self-instruction, self-reinforcement, self-monitoring and self-assessment – and writing strategies aimed to plan and to write argumentation (Prata et al., 2018).

In the experimental group, students were exposed to a collaborative method and they worked in the context of the jigsaw over five weekly classes (sessions 6–10). Therefore, teachers divided students into groups of three or four members each one – the base groups. A common learning task – the development of arguments in favor and against a controversial topic – was divided into equivalent parts, and each group member received one of them. After that, teachers formed the expert groups bringing together those members of the base groups who shared the same part of the common task. Then each group of experts read and explored texts on their part of the common task in order to broaden their knowledge on different points of view for and against the topic under discussion. Finally, students returned to their base groups to share information and to work together, involving themselves in dialogical argumentations, aiming to generate more diverse arguments, until each student was able to individually write an argumentative text (cf. Prata et al., 2018). Over five weekly lessons (sessions 6–10) the students of the control group worked individually with similar support materials to perform the argumentative writing.

Data analyses

For testing the hypotheses under study a mixed-design analysis of variance model (also known as a split-plot ANOVA) was used. This statistical test is recommended to test differences between two or more independent groups whose participants are subjected to repeated measures. In our study this test allows us to verify if the experimental condition made significant gains in school engagement in comparison with the gains of the control group. Furthermore the split-plot ANOVA has the advantage of allowing the researchers to control for differences between the groups characteristics before running any intervention. All descriptive and inferential statistical analyses in this study were performed with IBM SPSS Statistics (version 22.0) and the significance level of 5% ($\alpha = .05$) was considered.

Results

Outcome measures

Answering to our research questions and hypotheses, several mixed between-within subjects analyses of variance were conducted to explore the impact of the intervention program on

Table 1

Performance of students in the Scale of Students' Engagement in School, considering total scores and the scores obtained in each of the four dimensions

	Experimental group (n = 113)		Control group (n = 100)	
	Pre-test M (SD)	Post-test M (SD)	Pre-test M (SD)	Post-test M (SD)
Total	87.81 (12.18)	88.52 (10.08)	87.41 (9.68)	85.26 (10.11)
Cognitive	20.01 (3.71)	19.29 (3.46)	18.30 (3.98)	17.47 (4.17)
Affective	24.25 (4.31)	25.23 (4.61)	25.93 (3.92)	25.16 (4.27)
Behavioral	24.72 (5.79)	27.34 (2.61)	26.79 (2.61)	26.54 (2.58)
Agency	18.83 (5.45)	16.66 (5.09)	16.38 (4.98)	16.09 (4.82)

student engagement in school, measured at Time 1 (prior to the intervention) and Time 2 (after the conclusion of the intervention).

A significant interaction effect was found between *time* and *group* when considering *writing*, evaluated by argumentative structural elements $F(1, 209) = 94.24, p < .001$, and controlled by *age* and *sex*. The effect size of the interaction effect was .311 (η^2). The results revealed that the experimental students made substantial gains in quantitative evaluation, as they included more arguments in favor and against a position about the topic in discussion, and they wrote more elements like introduction to the topic, taking a side and a conclusion (for more details see Prata et al., 2018). The means and standard deviations of students in the *Students' Engagement in School: Four Dimensional Scale (SES-4DS)* (Veiga, 2016b) are presented in Table 1.

Before applying the ANOVA tests, we verify the assumptions of normality (covariance matrices for the dependent variables equal across groups) and of sphericity (equality of the variances of the differences between all possible pairs of within-subject conditions) through Box's *M* test and Mauchly's test, respectively. Both tests found no violation of these assumptions. The results of the main hypothesis under investigation are presented in Table 2. As can be seen, no significant interaction effect was found between *time* and *group* for the *total engagement score (SES)* $F(1, 209) = 2.548, p = .112, \eta^2 = .012$, controlled for *age* and *sex*. That means that the students' engagement as a whole did not differ between experimental and control groups after the intervention. No significant effect was found for *time* $F(1, 209) = .734, p = .392, \eta^2 = .004$, nor a significant main effect was obtained for *group* $F(1, 209) = 3.846, p = .051, \eta^2 = .018$. An identical result was obtained for the *cognitive* dimension: no significant interaction effect between *time* and *group* $F(1, 209) = .008, p = .927, \eta^2 = .000$ and no significant effect found for *time* $F(1, 209) = 1.456, p = .229, \eta^2 = .007$. However, for the *cognitive* dimension a significant main effect was obtained for *group* $F(1, 209) = 16.405, p < .001, \eta^2 = .073$. As for the *affective* dimension, a significant interaction effect was found between *time* and *group* $F(1, 209) = 6.877, p = .009, \eta^2 = .032$. Adolescents improved their scores on *affective* dimension after the intervention. No significant effect was found for *time* $F(1, 209) = .023, p = .879, \eta^2 = .000$, nor a significant main effect was obtained for *group* $F(1, 209) = 1.561, p = .213, \eta^2 = .007$. Regarding the *behavioral* dimension, a significant interaction effect was also found between *time* and *group* $F(1, 209) = 11.623, p = .001, \eta^2 = .053$. After the intervention, the experimental group increased their scores on *behavioral* dimension. No significant effect was found for *time* $F(1, 209) = 2.927, p = .089, \eta^2 = .014$ nor a significant main effect was obtained for *group* $F(1, 209) = .052, p = .820, \eta^2 = .000$. Lastly, in reference to the *agency* dimension, a significant interaction effect was also obtained between *time* and *group* $F(1, 209) = 5.762, p = .017, \eta^2 = .027$. Unexpectedly, post-test analysis indicated lower scores on the experimental group. No significant effect was found for *time* $F(1, 209) = .358, p = .550, \eta^2 = .002$, but a significant main effect was obtained for *group* $F(1, 209) = 4.467, p = .036, \eta^2 = .021$.

Table 2
Results of students' engagement in school using mixed between-within subjects anova

Source	Sum of Squares	df ^a	Mean Square	F	p	Partial η^2
<i>Total</i>						
Between-subjects effects	650.521	1	650.521	3.846	.051	.018
Subjects between (error)	35350.810	209	169.143			
Within-Subjects Effects	38.13	1	38.13	.734	.392	.004
Time*EGCG ^b	132.304	1	132.304	2.548	.112	.012
EGCG x Subjects within time (error)	10851.490	209.000	51.921			
<i>Cognitive</i>						
Between-subjects effects	378.280	1	378.280	16.405	.000	.073
Subjects between (error)	4819.324	209	23.059			
Within-Subjects Effects	9.013	1	9.013	1.456	.229	.007
Time*EGCG	.052	1	.052	.008	.927	.000
EGCG x Subjects within time (error)	1293.391	209	6.188			
<i>Affective</i>						
Between-subjects effects	40.239	1	40.239	1.561	.213	.007
Subjects between (error)	5388.900	209	25.784			
Within-Subjects Effects	.257	1	.257	.023	.879	.000
Time*EGCG	75.910	1	75.910	6.877	.009	.032
EGCG x Subjects within time (error)	2306.948	209	11.038			
<i>Behavioral</i>						
Between-subjects effects	.736	1	.736	.052	.820	.000
Subjects between (error)	2971.396	209	14.217			
Within-Subjects Effects	33.819	1	33.819	2.927	.089	.014
Time*EGCG	134.273	1	134.273	11.623	.001	.053
EGCG x Subjects within time (error)	2414.482	209	11.553			
<i>Agency</i>						
Between-subjects effects	175.754	1	175.754	4.467	.036	.021
Subjects between (error)	8223.043	209	39.345			
Within-Subjects Effects	4.559	1	4.559	.358	.550	.002
Time*EGCG	73.426	1	73.426	5.762	.017	.027
EGCG x Subjects within time (error)	2663.511	209	12.744			

^a df: degree of freedom.

^b EGCG: Experimental Group Control Group.

Discussion

Engagement is influenced by academic proficiency (Miranda-Zapata et al., 2018; Wonglorsaichon et al., 2014), and by collaborative instructional approaches (Wentzel, 2009). Being writing a crucial academic area, it seems reasonable to expect that good collaborative practices aimed to develop writing skills would increase student engagement. As we have hypothesized, along with gains in students' argumentative writing (cf. Prata et al., 2018), students who learned SRSD combined with the jigsaw – the experimental group – showed changes in school engagement, although not in all of its dimensions or in engagement as a whole.

The experimental students in the present study showed a significant increase in engagement results in the affective and behavioral dimensions. The jigsaw, a method based on peer relationships and involving students in dialogical argumentation and discussion in order to produce argumentative texts, had influenced student engagement, through affective and behavior engagement. That means that, concerning the affective dimension, experimental students expressed a greater sense of identification and of belonging to school and showed more positive emotions related to school and colleagues than their colleagues from the control group. The effect size obtained points to a low medium change (Pallant, 2010). Experimental students also improved their results in terms of engagement in the behavioral dimension with the highest effect size of engagement in this study. In effect, when compared with control students, the experimental group showed better results on the SES-4DS' items that aimed to evaluate the behavioral dimension in aspects such as attendance in class, attention during lessons, and absence of disruptive conduct.

Our study showed that improving academic proficiency in areas such as writing through efficient methods such as jigsaw

can influence engagement, a finding already made by others (Irvin et al., 2007; Wentzel, 2009). However, only two dimensions of engagement – affective and behavioral – increased with our instructional design. The cognitive engagement dimension did not suffer any influence from the application of SRSD with the jigsaw, and unexpectedly, the agency dimension even decreased. Total engagement, not showing a significant interaction effect, revealed a low effect size, which means that it was only a little bit affected by the intervention, which combined SRSD with a cooperative method. The absence of a significant increase in total engagement might be attributable to partial results related to the lack of increase in the cognitive and agency dimensions.

In analyzing the data, we observed that there was a significant main effect of group on cognitive and on agency domains, as experimental students had better results than control group students in these two dimensions. This superiority may have had some influence on the absence of results in the cognitive and agency dimensions. In effect, variations across the adolescence were described in different adolescent domains as scholar adjustment (Veiga, García, Reeve, Wentzel, & García, 2015) or personal competence (Riquelme, García, & Serra, 2018). Previous works analyzing multidimensional engagement showed that, in the middle adolescence, the most competent students (those with high self-concept) could lose their cognitive engagement and also their personal agency engagement (Veiga et al., 2015).

In the same manner, control and experimental groups were not similar in certain characteristics such as sex (the experimental group had more boys than the control group), mothers' and fathers' educational levels (the control group showed higher levels of parental educational background), and retentions (the experimental group had a higher number of student retentions). The experimental group's advantage in the cognitive and agency

dimensions and/or the differences between students of the two groups may well have had some influence on the absence of any effect of treatment on cognitive and agency engagement. As Van Steendam (2016) states, it is essential to consider the interaction between collaborative, individual, and contextual variables in order to analyze the effects of cooperative methods. This author expressed the need to consider individual characteristics, such as ability, writing beliefs or others with respect to the outcomes obtained when applying cooperative methods in writing instruction (Van Steendam, 2016). Such individual characteristics, in interaction with contextual ones, may indeed have some type of influence on results. Future research is needed to highlight such interactions, namely how social and academic variables and previous engagement levels would interact with task characteristics, peer relationship and dialogic involvement.

Finally, it is possible that our results can be explained by the lack of effect of cooperative methods on cognitive and agency engagement. Herrman (2013) showed that although cooperative learning could influence some aspects of engagement in terms of actions and behaviors, it did not impact on cognitive engagement activity, or on deep approaches to learning and to schooling. Much more research is needed in order to better understand the impact of cooperative methods on each one of the engagement dimensions. Although these explanations can be plausible, a deeper understanding of the reasons that caused the worst results for experimental students is needed, especially in respect to the decrease of the agency dimension. Analyzing *Students' Engagement in School: Four dimensional Scale (SES-4DS)* (Veiga, 2016b), we can see that almost all items aimed at evaluating the agency dimension are centered on students' actions toward teachers (e.g., "In class, I asked the teachers questions"). In our study we used the jigsaw, a cooperative method centered on peer interaction. Students developed their argumentative writing skills through dialogical argumentation and discussions with their colleagues in the context of the jigsaw (base group) and expert groups. Perhaps such a method, centered on student work and the interaction between students as opposed to the relationship between teacher and students, has a lesser impact on students' actions toward the teacher. In the future, it will be necessary to deepen our knowledge on this topic by continuing research on this question as a way to ascertain how cooperative methods influence the relationship between students and teachers. Similarly, it will be important to evaluate other aspects of the agency dimension, to determine whether the negative effect in the present study remains. In addition to the reasons previously noted for the results obtained, others can exist. A greater sensitivity of the questionnaire items on behavior and affective dimensions may explain the differences found in those dimensions as opposed to the cognitive and agency ones. Similarly, although in the cognitive dimension there were items dealing with writing, the *Students' Engagement in School: Four Dimensional Scale (SES-4DS)* (Veiga, 2016b) is directed toward school engagement and not to writing engagement. In the future it will be of interest to determine whether an intervention that is more centered on the contents related to those included in the questionnaire items might have a greater impact on results, or alternatively, if using a questionnaire directed more specifically to writing engagement will produce results different from those obtained in the present study. The possibility that a longer time intervention could produce stronger effects on the cognitive and agency dimensions should also be examined. In the same manner, in order to deepen our understanding about the impact of cooperative methods on engagement, future research should include a maintenance probe. Even though the students have answered the *Students' Engagement in School: Four Dimensional Scale (SES-4DS)* (Veiga, 2016b), both before and after the training sessions, it would have been important that they also answered at a third moment, one or two months after

the intervention. Because our resources were limited we lacked the funds to apply a follow-up test. Future research on the maintenance of effects of the cooperative writing instructional program on student engagement should include a third assessment moment.

To summarize, we can conclude that using cooperative methods such as jigsaw in areas as important for academic proficiency as writing could influence certain aspects of engagement, more precisely, the fields of behavioral and affective engagement. However, the present study raises many doubts about the effects of this type of method on other aspects of engagement, namely those which relate to the cognitive and agency dimensions. Indeed, although experimental students increased their levels of affective and behavioral engagement after the intervention, they did not increase their cognitive and agency engagement, obtaining even worse results than control students in the latter dimension. As other researchers have defended, it is essential to broaden the present research in order to better understand the interactions between individual, cooperative and contextual variables (Van Steendam, 2016). It is also essential to ascertain the extent to which cooperative learning might affect those aspects of engagement more related to cognitive processing, and to students' constructive contribution to the course of the instruction they receive, i.e., agency engagement (Herrman, 2013). In the same manner, it will be a future interest to plan true experimental designs and interventions, including maintenance probes. These true experimental designs should have contents and measure instruments that are better adjusted to each other, and they should take place over a longer period of time.

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