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Fostering the use of pedagogical practices among teachers to support elementary students' motivation to write

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ABSTRACT

Based on self-determination theory, this research aimed at evaluating the effectiveness of the CASIS professional development (PD) program for fostering (1) teachers' use of five recommended pedagogical practices during a writing lesson and (2) students' motivational resources (intrinsic, identified, and controlled regulations) toward writing. Two quasi-experimental studies with two-time points were conducted among preservice (Study 1, $n = 32$) and inservice (Study 2, $n = 111$) elementary teachers and their students (Study 1, $n = 559$; Study 2, sample 1, $n = 1779$; sample 2, $n = 1471$). In both studies, the CASIS PD program appeared to foster the use of two of the five recommended pedagogical practices. For the other three, some effects were observed in one study but were not always reproduced in the other. Although the CASIS PD program fostered greater use of the pedagogical practices, this effect did not always translate directly to the students' motivational resources. However, some significant differences were observed between students of the CASIS and the control groups on identified and controlled regulations, as a function of the socioeconomic background of the schools in which teachers and students were sampled. The results are discussed in light of past research and relevant theories.

1. Introduction

Writing motivation is associated to the development of writing skills (Bruning & Kauffman, 2016; Collie, Martin, & Curwood, 2016; Fayol, 2016; García & de Caso, 2006; Pajares, 2003; Troia, Harbaugh, Shankland, Wolbers, & Lawrence, 2013). Writing motivation could be defined as a function of autonomous and controlled types of motivation (Boscolo & Gelati, 2013). As evidenced by many studies in the field of education, writing autonomous motivation (performing writing activities by pleasure and choice) is expected to develop writing skills, whereas controlled motivation (performing writing activities for external contingencies) is expected to hamper them (Ryan & Deci, 2017). Consequently, it is important that teachers use pedagogical practices that support students' autonomous motivation to write, instead of those that could foster controlled motivation. However, there are few empirically tested professional development (PD) programs for teachers focusing on pedagogical practices that are beneficial for students' autonomous motivation to write. Testing a PD program designed to improve teaching is particularly relevant for practical reasons, but also for theoretical ones. Results showing that a PD program based on a theory increases students' writing quality would provide direct evidence of the ecological validity of the theory concerned. Furthermore, intervening in elementary school is important because delaying interventions in high school years to address writing problems occurring early in children development has not proven successful (Slavin & Madden, 1989). Moreover, programs designed to close the gap between what students know and what they are expected to know have higher rates of return in human capital (e.g., higher skills, knowledge, and experience possessed by an individual or a population) for children than for adolescents (Heckman, 2006).

This article thus presents the theoretical background of a new PD program in writing instruction called CASIS (CASIS stands for: Collaboration, Autonomy-Support, Structure, Involvement, and Significant Activities), but also empirical evidence of its effectiveness for teachers (preservice and inservice) and students. Below, we define more thoroughly the concept of autonomous and controlled motivation in writing, the five pedagogical writing practices behind the PD program, as well as the characteristics of the program.

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1.1. Autonomous and controlled types of motivation

According to self-determination theory (SDT; Ryan & Deci, 2017), motivation is defined as the energy and direction underlying a behavior. SDT makes a distinction between various regulation types, which vary in terms of self-determination (i.e., the extent to which a behavior is concordant with the self). Some of them are classified as autonomous and others as controlled.

Intrinsic regulation refers to involving in an activity for the pleasure and satisfaction it provides (Ryan & Deci, 2000). Extrinsic regulation relates to engaging in an activity for instrumental rather than intrinsic reasons, but extrinsic regulation can vary in terms of self-determination. There are four types of extrinsic regulation varying from low to high self-determination: external regulation, introjected regulation, identified regulation, and integrated regulation (Ryan & Deci, 2000).

Students experience external regulation for an activity when their behavior is motivated by obtaining rewards or avoiding punishments. When the motivation behind a behavior is introjected, students manage internal pressures, such as obligation or guilt. These students endorse to some extent the reasons for doing the activity, but in an internally pressured manner. Like in other studies, we assessed introjected and external regulations in a combined fashion to capture the total amount of controlled motivation (see Shahar, Henrich, Blatt, Ryan, & Little, 2003). This approach was taken to reduce the number of items that children have to fill out (see Guay, Chanal, Ratelle, Marsh, Larose & Boivin, 2010). Students motivated by identified regulation find the reasons for performing an activity important. Identified regulation is self-determined because the behavior originates from the self. Integrated regulation occurs when behaviors are congruent with overarching individuals' values and needs. However, elementary school children generally do not have a clear conception of their various identities and therefore cannot respond to items relating to this construct (Deci, Ryan, & Guay, 2013). Intrinsic, identified, and integrated regulation are classified as autonomous motivation.

Guay et al. (2010) found that the more elementary school students performed written tasks for intrinsic and identified reasons, the more competent they felt in this field. Moreover, in a Flemish sample of 800 fifth- and sixth-grade students, De Smedt, Van Keer, and Merchie (2016) found that students with high autonomous writing motivation wrote better narrative and informational texts, whereas students with controlled writing motivation were less successful in writing narrative texts.

Autonomous motivation for writing may be the key element that enables students to develop various cognitive skills. This type of motivation may drive writers to use the knowledge (procedural, lexical, syntactic) available in their working memory, to use self-regulated strategies to make sure that their text is readable (MacArthur & Graham, 2016), and to thoroughly execute the writing process (planning, translating, reviewing; Fayol, 2016). In contrast, controlled motivation for writing may hinder the development of these cognitive skills. When students are motivated in a controlled manner, they may perform writing activities for reasons such as guilt or to avoid negative consequences. In doing so, their intention may be first to please their teachers and, not necessarily to master the complex cognitive skills required to improve the quality of their writing. However, aiming to please the teacher is not always in opposition to students' intention to master skills. Some students might endorse both autonomous and controlled motives and perform relatively well (see Ratelle, Guay, Vallerand, Larose, & Senécal, 2007). Finally, students may be amotivated toward writing, that is, they do not know why they are performing writing activities. In that case, cognitive skills will not necessarily be mobilized by the students and the consequence could be poor writing quality as suggested by SDT (Ryan & Deci, 2017).

1.2. Pedagogical practices and autonomous and controlled motivation

Empirical studies (Bruning & Horn, 2000; Guthrie et al., 1998; Guthrie, Wigfield, & VonSecker, 2000; Reeve, 2002) indicate that five pedagogical practices are positively associated to students' intrinsic and identified regulations, but negatively related to their controlled regulations. When teachers use *autonomy-support* practices, they consider the students' point of view; they give a rationale for requests; acknowledge students' feelings and perceptions; and they provide them with information and choices while minimizing pressure and control (e.g., performance-based rewards; Ryan & Deci, 2009). With *involvement*, teachers demonstrate a marked interest in students' life, care about student's learning, and set realistic and positive goals (Skinner & Belmont, 1993). With *structure*, teachers set clear expectations, optimal challenges, and effective feedback for students (Reeve, 2002). Teachers who are autonomy-supportive, involved with students and who use appropriate structure may create a classroom climate where intrinsic and identified regulations grow as well as other desirable outcomes (Truax, 2018), although the reverse process could also be true (i.e., motivation/outcomes → pedagogical practices) .

In addition to these three pedagogical practices, we focused on two others—significant activities and collaboration (Guthrie et al., 2000). *Significant activities* refer to meaningful writing activities which have real consequences for a child's life (Duke, Purcell-Gates, Hall, & Tower, 2006; Gambrell, Hughes, Calvert, Malloy, & Igo, 2011; Hiebert, 1994) and capture attention, raise questions, and promote active learning (Belet Boyaci, & Güner, 2018; Boscolo & Gelati, 2013). With *collaboration*, students share their knowledge and ideas with their peers. Collaboration is associated with less competition and social comparison among students (Guthrie et al., 2000) and to more positive attitudes toward writing (Li, Chu, & Ki, 2014).

All of these pedagogical practices are in line not only with recent advances in motivation research, but also with evidence-based writing practices. More specifically, Graham, Harris, and Chambers (2016) provided six recommendations for writing instruction: (1) write; (2) create a supportive writing environment; (3) teach writing skills, strategies, knowledge, and motivation; (4) provide feedback; (5) use 21st-century writing tools; and (6) use writing as a tool to support learning. The five pedagogical practices outlined above are in line with four of these six recommendations. More specifically, they aim to create a supportive environment by focusing on collaboration, involvement, and autonomy support (second recommendation). Teachers are also encouraged to provide feedback via the structure dimension (fourth recommendation) and to use writing as a tool to support learning by setting up significant writing activities (sixth recommendation). Within these five pedagogical practices, there is the implicit notion that teachers ask students to write often and for a variety of purposes (first recommendation). Moreover, most of the five pedagogical practices in CASIS have been found to have strong effect sizes for writing quality (Graham et al., 2016). However, the fifth recommendation is not covered in the CASIS PD program because it does not focus on the use of any electronic support such as computer or tablet. The third recommendation is not filled since the CASIS PD program do not focus per se on writing skills, strategies and knowledge, but only on motivation.

1.3. The CASIS professional development framework

The workshop is made of four units taught to groups of 8–12 teachers during regular school hours, but during a period where they are nor responsible of their students (i.e., pedagogical day). Each unit is delivered by an experienced elementary school teacher who has been trained by our research team. For Unit 1, we offered to participants a detailed explanation of students' motivation types and why they are relevant for children's learning and achievement. Within Units 2 and 3, we described the five pedagogical practices. Written case studies and illustrated examples with a series of videos were provided. Additionally, we asked

teachers to observe their own practices (video-recorded). Studies have demonstrated the usefulness of classroom self-observation to support learning (Visnovska & Cobb, 2013) and to make behavioral changes. Unit 4 focused on teachers' skills in relation to the five pedagogical practices.

Each unit was designed to include the main characteristics of effective PD programs for teachers (see Desimone, 2009). These characteristics are (a) content focus (i.e., all examples are in line with the writing content); (b) active learning (i.e., teachers observe videos of other teachers, share their teaching practices and those they have adopted in light of CASIS); (c) coherence (i.e., the material taught is consistent with the Quebec Education Program in writing); (d) duration (i.e., in line with recommendations in the field, CASIS is a 16-hour training workshop taking place over a semester); and (e) collective participation (i.e., when possible, more than one teacher from a same school participated in CASIS to provide potential interactions facilitating the learning of the five pedagogical practices).

To foster enactment of the pedagogical practices among teachers, we focused on what Kennedy (2016) calls "strategies." PD programs within the "strategies" category have a specific goal that teachers should try to attain and provide examples that would help teachers reach that goal. Kennedy (2016) outlines that PD programs fostering enactment via strategies are associated with the largest effect sizes. In this regard, the goal of CASIS is to have teachers use the five pedagogical practices as much as possible during writing lessons. Illustrative examples are offered to teachers to help them meet this general goal. A rationale is provided for each pedagogical practice so that teachers can see the benefit of their implementation in the classroom context. In CASIS, there is no prescription per se regarding which practices teachers should use, nor is there any mandatory assignment (i.e., you should use collaboration and significant activities for your next writing lesson). In other words, teachers have the freedom to apply or not the five pedagogical practices. Pedagogical practices targeted in the CASIS PD program are aligned with those assessed in this study. Specifically, the CASIS PD program is based on 23 key teaching behaviors (e.g., see Table 1). We taught the basic competencies underlying these behaviors through various tools including videos, exercise, and reading material. Teachers were in turn evaluated on these 23 specific behaviors.

CASIS is also in line with other existing motivational programs such as CORI and TARGET. For example, Concept-Oriented Reading Instruction (CORI) has been successful in enhancing different-aged students' motivation for reading and comprehension of information texts (Guthrie, Wigfield, & Klauda, 2012; Guthrie, Klauda, & Ho, 2013). CORI focuses on the following motivational practices: (a) using content goals in the conceptual theme for reading instruction, (b) providing hands-on experiences, (c) affording students' choice and decision-making, (d) using interesting texts and (e) providing activities in which students collaborate with each other. Likewise, but not specific to a particular school subject, TARGET focuses on 6 motivational strategies at the school level that should increase students' motivation such as intrinsic value of learning, participation in decision making and recognition (Cecchini, Méndez-Giménez, & Sánchez-Martínez, 2020; Morgan, 2019; Vedder-Weiss & Fortus, 2018). CASIS, although not targeting all components embedded in these two programs, shares many features with them.

Table 1
Observational Measure Used in Study 1 and Study 2.

Indicator		Items	Indicator		Items
1	C	The teacher proposes a task in which students must necessarily cooperate to succeed.	13	AI	The teacher reprimands the students when they do not reach the desired level of performance or when they do not complete the task.
2	C	The teacher proposes an activity in which students interact little or not at all with each other.	14	AI	The teacher is warm with the students.
3	C	The teacher assigns a specific role to each student in a co-operative task (e.g., secretary, proofreader).	15	AI	The teacher is irritated by the students' demands.
4	C	The teacher explains a cooperation skill to work on (e.g., to make a consensus, to respect the turn of speech, to explain to others).	16	AI	The teacher is patient and understanding when a student has trouble during an activity.
5	SA	The teacher proposes an activity related to the students' interests or experiences.	17	AI	The teacher has a positive attitude toward the learning abilities of his/her students (he/she believes in everyone's success).
6	SA	The teacher proposes an activity in which the students' reactions suggest that they are enthusiastic about it.	18	SG	The teacher clearly verbalizes the purpose of the task.
7	SA	The teacher ensures that the proposed writing activity has a genuine purpose other than being a learning or writing assessment.	19	SG	The teacher proposes an activity whose course is clear.
8	SA	The teacher proposes a writing activity in which the principal recipient is someone other than him/her (e.g., parents, uncle, aunt).	20	SG	The teacher clearly verbalizes his/her expectations of the task (e.g., criteria for success, behaviors to adopt).
9	AI	The teacher lets students express their feelings, whether positive or negative.	21	SF	The teacher proposes tasks adapted to the pupils' competence level.
10	AI	The teacher questions the students so that they can freely express their opinions or explain the strategies they have used.	22	SF	The teacher offers support tailored to each student.
11	AI	The teacher uses a directive language with the students.	23	SF	The teacher provides feedback to tell the student how to continue the task and achieve the goals.
12	AI	There is mutual exchange between the teacher and the students.			

Note. C = Collaboration; SA = Significant activities; AI = Autonomy/Involvement; SG = Structure-Goal; SF = Structure-Feedback.

1.4. Contributions

In a previous study, Guay, Valois, Falardeau, and Lessard (2016) tested the effectiveness of the CASIS PD program on a small sample of teachers ($n = 18$) and students ($n = 277$) within the confines of a two-time points design. Their study supported the effectiveness of CASIS by showing that teachers within the experimental group used the pedagogical practices to a greater extent at the end of the study compared to teachers of the control group (while controlling for the initial scores at the beginning of the study). This study also showed that students of the experimental group experienced an increase in their intrinsic motivation for writing while students of the control group experienced a decrease in this type of writing motivation. However, these results needed to be replicated on a larger sample of teachers and students from different backgrounds. For this reason, this research encompasses two quasi-experimental studies with a pretest–posttest design, conducted among preservice and inservice teachers. This research contributes to knowledge in three ways. First, we examined the impact of CASIS on teachers' pedagogical practices (via observational data) and on students' motivational resources (via self-report data) at the same time. Second, we tested the impact of CASIS by using a quasi-

experimental design involving pretest–posttest measures over two months (Study 1) and over two school years (Study 2). Indeed, long-term evaluation of a PD program effectiveness is important to determine if teachers still use the new pedagogical practices once the program is over. Third, CASIS is based on SDT, a theory with a lot of empirical support (see Ryan & Deci, 2017). Hypotheses within each study were tested while taking into account pretest levels for both teachers and students.

In both studies, we checked if CASIS produced results that were more positive for teachers and students attending schools in disadvantaged neighborhoods because these students may have trouble mobilizing their motivation to write. Indeed, they may have experienced learning problems, restricted learning opportunities for learning, family difficulties, or peer pressure, which may have hindered their motivation for school tasks (Schoon, 2008). Evaluating the effectiveness of an intervention program for students living in disadvantaged neighborhoods could lead to a better understanding of the key ingredients that work best for this population (Battistich, Solomon, Kim, Watson, & Schaps, 1995). Based on this rational, we posit that CASIS will have benefits for children attending schools in advantaged and disadvantaged neighborhoods, but we leave open the possibility that one group of students may benefit more from the five pedagogical practices compared to the other.

2. Study 1: Preservice teachers

2.1. Rationale and hypotheses

The reasons preservice teachers give to justify their career choices are their desire to help others, their enjoyment of working with children and adolescents, and their willingness to contribute to the development of society (Richardson & Watt, 2010). Although these motivations seem well rooted at the beginning of the bachelor's program in teaching education, they seem to change rapidly when teachers enter the labor market. According to Day, Kington, Stobart, and Sammons (2006), one of the factors most likely to demotivate teachers toward their work in the early years of their career is students' lack of motivation to learn. Therefore, it seems relevant to teach preservice teachers some pedagogical practices that are associated with their students' motivation (Richardson & Watt, 2010).

The design of Study 1 is depicted in Fig. 1. The first hypothesis posited that when pedagogical practices were controlled for at pretest (see E1 and C1 in Fig. 1), preservice teachers exposed to CASIS would use more autonomy support, involvement, structure, significant activities, and collaboration at posttest (E2) compared to preservice teachers of the control group (C2). The second hypothesis proposed that a similar pattern of differences would be found in children's motivational resources at posttest (children nested in E2 and C2). While controlling for the initial value of the dependent variable at pretest, we anticipated that children whose preservice teachers were exposed to CASIS would show higher intrinsic and identified regulation and lower controlled regulation than children in the control group. We also verified if these effects were moderated by the fact that the school attended by the participating students was located in a disadvantaged neighborhood based on an index provided by the Quebec Ministry of Education and Higher Education.

3. Method

3.1. Participants and procedure

This project received the approval of the research ethics committee. Preservice teachers were enrolled in a bachelor's program in teaching education in a large French-language university located in the province of Quebec (Canada). We collected our data over two consecutive years (Cohort 1 and Cohort 2, respectively). We used two cohorts to facilitate the recruitment of participants. The recruitment of participants for Cohort 1 started with a meeting in the spring with preservice teachers. This meeting was organized by the bachelor's program administrators and aimed at informing these preservice teachers about their final teaching internship. All preservice teachers doing their internship during the following fall (n = 146) were invited to participate in our research project. Of the 146 students, 44 showed interest in participating in the study. However, seven of them had to be excluded because they were assigned to a school in a remote area, where it was impossible to carry out the research. Thus, the remaining 37 bachelor students were randomly assigned to the CASIS group (n = 18) or the control group (n = 19). After the assignation procedure, several preservice teachers, notably in the control group, choose to withdraw from the study. As a result, 20 bachelor students (15 in the CASIS group and five in the control group) continued the research protocol, although two eventually dropped out toward the end of the PD program.

For Cohort 2, the principal investigator of this study invited preservice teachers (N = 131) to participate in the research during a meeting about their teaching internship. Of the 131 preservice teachers, 40 showed interest in participating and 37 of these students (three eventually withdrawn) were randomly assigned to the CASIS (n = 18) or control group (n = 19). Just before data collection began, other dropouts followed. Thus, 15 preservice teachers (10 in the CASIS group and five in the control group) completed the research protocol. As in Cohort 1, most dropouts were in the control group.

Therefore, we had a total of 25 preservice teachers in the CASIS group and 10 in the control group for this study. However, 23 preservice teachers from the CASIS group and 9 from the control group were selected for the final analyses because three participants provided incomplete answers (see descriptive statistics in Table 2). These 32 teachers taught to 737 elementary school students attending a public school. At pretest, there were 559 students with parental consent (76%), of whom 385 were in the CASIS group and 174 in the control group (see descriptive statistics in Table 3). Of these students, 481 provided scores at the posttest for an attrition rate of 14%. The pretest and the posttest for preservice teachers and their students occurred respectively in September and two months later, namely in December. Pre-service teachers from the control group were told that they would receive the training at the end of the study (delayed control group).

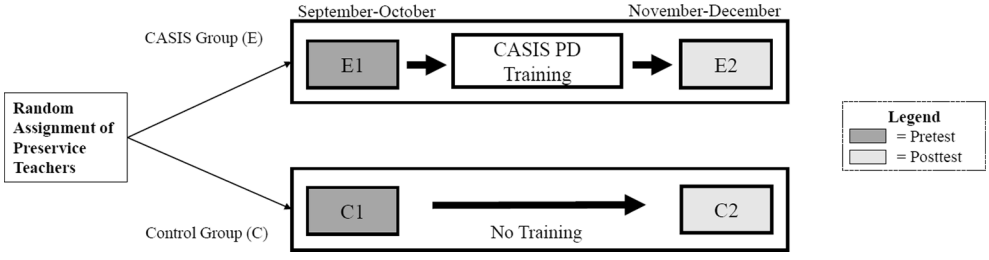

Fig. 1. Design of Study 1.

Table 2
Study 1: Preservice Teachers' Characteristics.

Variables	CASIS group			Control group		
Gender	*n*	%		*n*	%	
Female	22	95.7		7	77.8	
Male	1	4.4		2	22.2	
Total	23	100		9	100	
Grades	*n*	%		*n*	%	
1	4	17.4		2	22.2	
2	3	13.0		2	22.2	
3	5	21.7		2	22.2	
4	3	13.0		2	22.2	
5	3	13.0		1	11.1	
6	2	8.7				
Multi-Grade	3	13.0				
	n	Mean	*SD*	*n*	Mean	*SD*
Age	23	24.22	2.91	9	23.89	2.80
GPA	17	3.27	0.39	6	3.04	0.52

Note. GPA could range between 0 and 4.33. A mean of 3.27 corresponds to a B + whereas a mean of 3.04 corresponds to a B.

Table 3
Study 1: Students' Characteristics.

Variables	CASIS group		Control group	
Gender	*n*	%	*n*	%
Male	199	51.8	91	52.3
Female	185	48.2	83	48.7
Missing	1	–	–	–
Total	385	100	174	100
Grades	*n*	%	*n*	%
1	84	21.8	42	24.1
2	65	16.9	38	21.8
3	68	17.7	28	16.1
4	70	18.2	26	14.9
5	42	10.9	40	23.0
6	56	14.6	0	0.0
Total	385	100	174	100
Mothers' education level	*n*	%	*n*	%
High school incomplete	13	6.3	5	5.2
High school completed	26	12.5	12	12.5
College completed	57	27.4	29	30.2
Undergraduate studies	76	36.5	40	41.7
Master or Ph.D	36	17.3	10	10.4
Missing	177	–	78	–
Total	385	100	174	100
Family income	*n*	%	*n*	%
Less than C$40,000	27	11.8	12	10.7
C$40,000–69,999	43	18.8	23	20.5
C$70,000 or more	159	69.4	77	68.8
Missing	156	–	62	–
Total	385	100	174	100
Language used at home	*n*	%	*n*	%
French	211	95.1	105	97.2
Other	11	5.0	3	2.8
Missing	163	–	66	–
Total	385	100	174	100
Lives with both parents	*n*	%	*n*	%
Yes	183	80.3	91	82.0
No	45	19.7	20	18.0
Missing	157	–	63	–
Total	385	100	174	100

3.2. Students' measures

3.2.1. Regulation types in writing

We used the Elementary School Motivation Scale (ESMS; Guay et al., 2010) to measure motivation in writing. The ESMS contains 27 items that assess regulation types in three school subjects: reading, writing, and math. In this study, the children only completed the nine items about writing (three items per regulation type). The children were asked to indicate how well each item corresponded to their perceptions on a four-point scale ranging from 1 (*never*) to 4 (*always*). Sample items are "I like writing" (intrinsic regulation), "I find it important to write" (identified regulation), and "I write to please my parents or my teacher" (controlled regulation). Cronbach alpha values were acceptable at Times 1 and 2, ranging between 0.69 and 0.85 (see Table 5). We also analyzed scores on the three subscales with a CFA. This analysis provided support for the construct validity of children's scores (see Table S1 and Table S2). More specifically, all loadings are high on their respective construct and correlations among motivation scores are in line with theoretical expectations: intrinsic scores correlate more with identified regulation scores than with external regulation ones. These results are similar to those obtained in past research conducted on young elementary school children (see Guay et al., 2010).

3.3. Preservice Teachers' measures

3.3.1. Pedagogical practices

Each preservice teacher was videotaped in his/her classroom giving a writing lesson on two occasions over a two-week period. Their use of the five pedagogical practices was assessed at the beginning (Time 1) and end of the semester (Time 2). Each lesson lasted approximately 45 min (Time 1: mean of 46.40 min, $SD = 10.74$; Time 2: mean of 45.47 min, $SD = 9.97$). We videotaped two lessons at each time point to ensure a valid assessment of the five practices used. Two well-trained research assistants were asked to evaluate the pedagogical practices through a Q-sort procedure that was used in a previous study (Guay et al., 2016). They were blind to the group to which the teachers had been assigned.

The Q-sort measure contains 23 items referring to specific behaviors (see Table 1) used to assess the five pedagogical practices. Each judge was asked to watch the video and then to perform the Q-sort using this scale: (1) does not characterize the teacher at all, (2) does not really characterize the teacher, (3) characterizes the teacher somewhat, (4) characterizes the teacher adequately, and (5) characterizes the teacher well.

Each evaluator rated all the teachers on all 23 items on two occasions, that is, at the beginning and end of the school year. The average interrater reliability coefficient was calculated with intra-class correlation and was 0.81 at Time 1 and 0.80 at Time 2. The evaluators' ratings on the cards were averaged to produce a composite rating score for each pedagogical practice at Time 1 and at Time 2. For more details on the Q-sort see the online supplementary material. Preliminary analyses (Guay, Valois, Falardeau, & Lessard, 2013) have demonstrated that some pedagogical practices were highly correlated and that some could be distinguished. For this reason, we used the following five factors: (1) collaboration, (2) significant activities, (3) autonomy support and involvement, (4) structure goals, and (5) structure feedback. Interestingly, the essence of the five pedagogical components was kept according to this structure: all components were included but grouped differently.

3.4. Measures not related to students or inservice teachers

3.4.1. Low income cutoff index (LICI)

This index is provided by the Quebec Ministry of Education and Higher Education. The LICI reflects the proportion of families in which there are children and whose income is near or below the low-income cutoff. The low-income cutoff is defined as the level of income where families are estimated to spend 20% more of their family income than the average population on food, shelter, and clothing. It provides information that is used to estimate the proportion of families whose income can be considered low while taking into account the size of the family and the place of residence (rural area, small urban area, large agglomeration, etc.). For example, if a family of four spent 63% of its entire income (after taxes) over a two-week period on food, shelter, and

clothing, whereas the average of the population of families of four spent 43%, this family would be considered to have a low income. For the year 2011, the after-tax LICI for a family of four living in a community with a population between 30,000 and 99,999 was $30,487, expressed in current Canadian dollars. In the present study, the score used was not a percentage but rather a decile rank, where a score of 1 reflects low poverty and a score of 10, high poverty, within the neighborhood where the school is located. In other words, a score of 10 indicates that 37% of the families in a given school spend 20% more than the average family on food, shelter, and clothing. Alternatively, a score of 1 indicates that only 4% of the families in a given school spend 20% more than the average family on food, shelter, and clothing. To group students in low, moderate, and high categories on this measure, we used the following criterion: low corresponds to deciles 1–3, moderate to deciles 4–7 and high to deciles 8–10.

4. Results

For the statistical analyses, we combined Cohort 1 and Cohort 2. There were no significant differences between the two cohorts in the preservice teachers' scores for the use of the five pedagogical practices, although the differences between cohorts for collaboration is of medium size (see Table S3 of the online supplementary material). More specifically, according to Cohen (1992), a d of 0.2 corresponds to a weak effect, 0.5 to a medium effect, and 0.8 to a strong effect. However, there were significant differences between cohorts on the students' motivation scores at Time 1 (see Table S4 of the online supplementary material) with some medium effects according to Cohen's d values. Moreover, at Time 1, there were no significant differences between preservice teachers from the CASIS and control group regarding the use of the five pedagogical practices, although some observed effects are of a medium size (see Table S5). We observed some differences at Time 1 between the CASIS and control group in terms of the students' motivation scores, but these differences were small (see Table S6). We compare the LICI of preservice teachers as a function of cohorts and groups and no significant differences were observed, but some effects were medium according to Cohen's d (see Table S7).

We depicted the pattern of missing values for the students' sample in Table S8. Students who responded at Time 1 only had higher scores on all motivation variables comparatively to students who have provided data at both times. In addition, the Little test for MCAR was significant (Little's MCAR = 67.22 df = 6 $p < .001$). Data are thus not MCAR. Consequently, missing values are replaced by multiple imputations with 20 estimated samples generated (Pedersen et al., 2017). Analyses were performed 20 times for each of the 20 samples generated. Once these analyses were performed, the MIANALYSE function in SAS version 9.4 synthesized the results obtained 20 times into a single result. This procedure makes it possible to calculate statistical parameters such as adjusted means with the 95% CIs as well as the regression coefficient with its p value. All correlations connecting scores at Time 1 to scores at Time 2 as a function of groups are presented in Table S9.

We controlled for differences at Time 1 by using the scores at Time-1 in the analyses. To test our two hypotheses, we performed analyses of covariance (ANCOVAs) on the samples of preservice teachers and students with PROC MIXED in SAS version 9.4. For the preservice teachers' sample, we controlled for the scores at pretest regarding their use of the five pedagogical practices as rated by the two evaluators. Moreover, we controlled for grade because the curriculum changes from grade to grade and could thus be a confounding factor. However, teachers were not clustered into schools because the number of schools included in the study is not sufficient (i.e., 24). For the students' sample, we controlled for the pretest scores of motivation as well as for the grade and the use of the five pedagogical practices by the teachers at Time 1. When ANCOVAs were performed on the students' sample, the multilevel structure of the data was taken into account (students are nested in their classroom). Moreover, to run multiple imputation adequately, scores were transformed in z scores for the student's sample (mean = 0, $SD = 1$). In all analyses, we used the LICI continuous score to compute main effects as well as interaction effects. However, if an interaction effect was uncovered, we used the three categories of LICI presented above to interpret the interaction.

For the first hypothesis, once all of those variables were controlled for (see Table S10 for all statistical parameters (β) for covariates), the results showed that preservice teachers in the CASIS group used collaboration to a greater extent than those of the control group at posttest (see Table 4). Although this effect was nonsignificant, its size was medium ($d = 0.73$). This means that if a preservice teacher from the CASIS group is randomly selected, he or she will have a 69% chance of having a higher score on collaboration than a randomly selected control group member. This is called probability of superiority, hereinafter referred to as ps. Thus, ps gives the probability that a person picked at random from the treatment group has a higher score than a person picked at random from the control group (Ruscio, 2008).

On the basis of Cohen's d, significant activities ($d = 0.43$, ps = 61%), autonomy support-involvement ($d = 0.47$, ps = 63%), and structure in relation to goals ($d = 0.37$, ps = 61%) had effects at posttest that were also substantial, although nonsignificant, and always in favor of preservice teachers who had attended the CASIS PD program. For structure in relation to feedback ($d = 0.15$, ps = 55%), the size of the effect was too small to consider that CASIS had an effect. No significant main effects of LICI on pedagogical practices used by teachers were observed, except for the autonomy support/involvement practice ($p < .07$). Indeed, teachers in schools located in a socioeconomically disadvantaged neighborhood used this practice less often. No interactions were found between the group and the LICI index.

For the second hypothesis, students were nested in each preservice teachers' classroom (see Table S11 for the effects of all covariates). The proportion of variance in students' motivation scores explained by teacher was very low, ranging between 0.00 and 0.03. The LICI index had no significant main effect on motivational scores. The results pointed to no significant differences between students in the CASIS group and those in the control group (see Table 5). However, interactions at $p < .10$ were found between the groups and the LICI index on identified regulation and controlled regulation. Specifically, it appears that students attending a school located in a highly disadvantaged neighborhood in the CASIS group had higher scores on identified regulation than those of the control group. Moreover, students of the CASIS group attending a school located in a moderate disadvantaged neighborhood had lower scores on controlled regulation comparatively to those of the control group.

5. Brief discussion

This study provides preliminary support for the effectiveness of the CASIS PD program for preservice teachers, although no effects were significant at $p < .05$. More specifically, when pretest scores for each of these practices were controlled for, preservice teachers used collaboration, autonomy support/involvement, structure-goals (clear and consistent), and significant activity more frequently at posttest. The effect size was much smaller for structure-feedback. The effects found for students' motivation depend on the socioeconomic status of their neighborhood. CASIS seems more effective for identified regulation and controlled regulation when students attend a school in a highly or moderately disadvantaged neighborhood.

The main limitation of this study was the small size of the teacher' and student' samples. Moreover, because not all preservice teachers that we have contacted participated to this study, this methodological shortcoming might have led to self-selection effects which may have affected the findings (i.e. only the most motivated preservice teachers might have participated to the study). Furthermore, the reason why motivational resources were not so much impacted may stem from the fact that the students know that their preservice teacher is not their

Table 4
Study 1: Adjusted Means, Confidence Intervals, p Values, and Cohen's d for Group Differences (CASIS vs. Control) Among Preservice Teachers at Time 2.

	n	β	Adjusted means	Standard error	95% CI	*p*	Cohen's*d*
Collaboration							
CASIS	23	−0.39	1.84	0.11	[1.61, 2.07]	0.09	0.73
Control	9		1.45	0.18	[1.07, 1.83]		
LICI		0.029				0.37	
Group * LICI		0.023				0.80	
Significant activity							
CASIS	23	−0.33	3.17	0.16	[2.85, 3.49]	0.28	0.43
Control	9		2.84	0.25	[2.32, 3.36]		
LICI		−0.00				0.93	
Group * LICI		0.13				0.27	
Autonomy/involvement							
CASIS	23	−0.15	4.05	0.06	[3.93, 4.18]	0.23	0.47
Control	9		3.91	0.10	[3.70, 4.12]		
LICI		−0.03				0.07	
Group * LICI		−0.03				0.54	
Structure goals							
CASIS	23	−0.14	4.14	0.08	[3.99, 4.30]	0.36	0.37
Control	9		4.00	0.12	[3.75, 4.26]		
LICI		0.01				0.78	
Group * LICI		−0.08				0.19	
Structure feedback							
CASIS	23	0.06	3.43	0.08	[3.26, 3.61]	0.74	0.15
Control	9		3.49	0.14	[3.21, 3.78]		
LICI		0.00				0.95	
Group * LICI		−0.07				0.28	

Note. CI = Confidence interval. Potential ranges for all variables is 1 to 5. Covariates = grade level and dependent variables measured at Time 1.

"real" teacher. Moreover, the high attrition rate observed should also be considered a limitation. In the two cohorts, a high rate of preservice teachers' dropout was observed in the control group comparatively to the CASIS group. This high dropout rate could be explained by two factors. First, teachers from the control group did not receive any training during the first part of the study, but they were offered to receive the CASIS PD program at the end of the study (delayed control group). Secondly, teachers had to be videotaped during writing lessons which may have been perceived as a confronting task. Thus, participation costs (e.g. videotaping of a classroom) might have outweighed participation benefits (e.g. receiving the training later) for some of the preservice teachers. We recognize that this attrition rate should be taken into account when interpreting the findings. Moreover, if the CASIS training program had been longer, it could have led to more significant differences.

Although the PD program had important effects on the teachers' pedagogical practices, these findings need to be replicated on a larger population of teachers who are not in an internship but rather who have completed their socio-professional transition. Indeed, inservice teachers face different challenges, such as dealing with multiple and conflicting messages about what the priorities are in their classroom (Kennedy, 2016). These differences could promote their motivation to follow the recommendations from a PD program but it could also decrease it. Indeed, although the PD program could be perceived as scientifically sound by teachers, it could also be perceived as useless by them because it does not meet the school administrators' or parents' requirements. Finally, with a larger sample of students, interesting significant effects on motivation scores might be observed, especially if the students are followed over a longer period of time during which teachers have more opportunities to use the pedagogical practices they have been taught.

6. Study 2: Inservice teachers

6.1. Rationale and hypotheses

The goal of Study 2 was to overcome the limitations of Study 1 by using a larger sample of teachers and students as well as by following the teachers over two consecutive years and the students over a full year. The design of Study 2 is depicted in Fig. 2. At the beginning of the study, teachers were assigned to the CASIS group (E) or the control group (C). Both groups of teachers were evaluated twice during the first year (Time 1 & 3, see E1, E3, C1, and C3 in Fig. 2) and twice during the second year (Time 4 & 6, see E4, E6, C4, and C6 in Fig. 2). The control group received the CASIS PD program immediately after Time 4 (see C4 in Fig. 2). Based on this design, we predicted the following pattern of results for teachers. While controlling for the teachers' use of the five pedagogical practices at pretest (E1 and C1), it was expected that the teachers of the CASIS group would use the five pedagogical practices more often at Time 3 (E3) and at Time 4 (E4) than the teachers of the control group (C3, C4). However, these differences between groups were expected to disappear at Time 6 (E6, C6) because the control group would have received the CASIS PD program immediately after Time 4 (C4). As in Study 1, we explored the potential moderating effect of school status based on the LICI index. Moreover, we integrated teachers' pretest scores on burnout as a covariate to make sure that this variable did not act as a confounding factor explaining differences between groups. Because burnout symptoms are associated with fatigue and depression (Salvagioni et al., 2017), one may argue that teachers involved in the research who have relatively high levels of burnout symptoms may apply the pedagogical practices of the CASIS PD program less often. This confounding factor might be especially important in a quasi-experimental design where the characteristics of the teachers might differ between the experimental and the control group due to the non-random assignment of participants, although we performed a random assignment of the schools.

The second hypothesis proposed a similar pattern of differences in children's motivational resources at posttest. Indeed, compared with children of the control group, children whose inservice teachers were assigned to CASIS were expected to show higher intrinsic and identified regulation, and lower controlled regulation at Time 2 (E2, C2) and Time 3 (E3, C3) of Year 1 while controlling for students' scores on the ESMS at pretest (E1, C1). For Year 2 at Time 5 (E5, C5) and Time 6 (E6, C6), we expected no differences in children' motivation scores because inservice teachers in the control group will have followed the CASIS PD program at this time. Again, we explored the potential moderating effect of LICI. Moreover, grade level and teachers' use of the five pedagogical practices and their burnout scores at pretest were used as covariates.

Table 5
Study 1: Adjusted Means, Confidence Intervals, p Values, and Cohen's d for Group Differences (CASIS vs. Control) Among Students of Preservice Teachers at Time 2.

	n	β	Adjusted means	Standard error	95% CI	*p*	Cohen's *sd*	Proportion of variance in students' scores explained by teachers
Intrinsic regulation (alpha = 0.85)								
CASIS	385	0.12	−0.01	0.06	[−0.14, 0.12]	0.36	0.10	0.03
Control	174		0.11	0.10	[−0.09, 0.32]			
LICI		−0.04				0.50		
Group * LICI		0.14				0.28		
Identified regulation (alpha = 0.69)								
CASIS	385	−0.12	0.07	0.04	[−0.01, 0.14]	0.15	0.11	0.00
Control	174		−0.05	0.06	[−0.17, 0.07]			
LICI		0.01				0.81		
Group * LICI		0.14				0.08		
Low LICI	167							
CASIS	105	−0.13	0.10	0.08	[−0.05, 0.25]	0.37	0.13	0.00
Control			−0.03	0.10	[−0.24, 0.17]			
Moderate LICI								
CASIS	98	−0.15	0.09	0.10	[−0.10, 0.28]	0.52	0.15	0.00
Control	52		−0.06	0.16	[−0.38, 0.26]			
High LICI								
CASIS	120	−0.99	0.11	0.09	[−0.06, 0.28]	0.04	0.92	0.00
Control	17		−0.87	0.42	[−1.70, −0.04]			
Controlled regulation (alpha = 0.81)								
CASIS	385	0.01	0.07	0.04	[−0.01, 0.15]	0.89	0.05	0.02
Control	174		0.08	0.07	[−0.05, 0.21]			
LICI		0.03				0.41		
Group * LICI		0.15				0.06		
Low LICI	167							
CASIS	105	−0.17	0.20	0.07	[0.06, 0.33]	0.20	0.19	0.00
Control			0.03	0.09	[−0.15, 0.21]			
Moderate LICI								
CASIS	98	0.36	0.04	0.12	[−0.19, 0.28]	0.21	0.28	0.00
Control	52		0.40	0.20	[0.02, 0.78]			
High LICI								
CASIS	120	−0.14	−0.13	0.11	[−0.35, 0.09]	0.82	0.10	0.00
Control	17		−0.27	0.54	[−1.32, 0.79]			

Note. CI = Confidence interval. Scores are standardized in z values (mean of 0 with a *SD* of 1).
Covariates = dependent variables measured at Time 1, grade level and the use of the five pedagogical practices by the preservice teacher at Time 1. Consequently, the PROC MIXED code in SAS includes a class statement to take into account the multilevel structure (teachers in the present case and groups) as well as a model statement (the covariates) with a random intercept. The little test for MCAR was significant. Data are thus not MCAR. Consequently, missing values were replaced by multiple imputations with 20 estimated samples generated and analyses were performed 20 times for each of the 20 samples generated. Once these analyses were performed, the MIANALYSE function synthesized the results obtained 20 times into a single result. This procedure makes it possible to calculate statistical parameters such as adjusted means with the 95% CIs as well as the regression coefficient with its *p* value. Standardized scores were used.

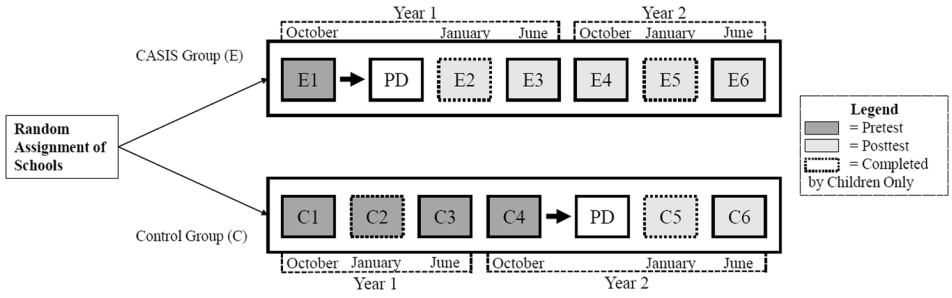

Fig. 2. Design of Study 2.

7. Method

7.1. Participants and procedure

This project received the approval of the research ethics committee. The inservice teachers participating in this study worked in elementary schools in the province of Quebec (Canada). Like in Study 1, we collected our data from two cohorts. Descriptive statistics for the participating teachers from the two cohorts are presented in Table 6. A complete picture of the attrition pattern for each cohort is depicted in Table 7, and Table 8 offers a description of the participating students' characteristics.

For the first cohort, recruitment was initiated in the spring of 2013 in three school boards of the Quebec City area. Sixty-six teachers accepted to participate in the project. Unfortunately, it is impossible to know how many teachers were reached initially. Indeed, school boards sent invitations to participate in the study to school principals, but we do not know if all principals have sent these invitations to school teachers.

Table 6
Study 2: Inservice Teachers' *Characteristics.*

Variables	CASIS group			Control group		
Gender	*n*	%		*n*	%	
Female	61	95.3		45	95.7	
Male	3	4.7		2	4.3	
Total	64	100		47	100	
Grades	*n*	%		*n*	%	
1	17	26.6		9	19.2	
2	16	25.0		15	31.9	
3	11	17.2		9	19.2	
4	6	9.3		4	8.5	
5	10	15.6		5	10.6	
6	4	6.3		5	10.6	
	n	Mean	*SD*	*n*	Mean	*SD*
Age	64	40.41	6.61	47	41.34	8.33

Table 7
Study 2: Attrition Pattern for Inservice Teachers and Their Students.

	Measurement time points					
	Year 1			Year 2		
Teachers/ Students	T1- Fall	T2- Winter	T3- Spring	T4- Fall	T5- Winter	T6- Spring
Cohort 1						
Teachers - Total (*N*)	47	–	47	34	–	32
Teachers - CASIS	29	–	29	18	–	17
Teachers - Control	18	–	18	16	–	15
Students - Total (*N*)	647	628	646	451	503	435
Students - CASIS	411	389	406	251	272	245
Students - Control	236	239	240	200	231	190
Cohort 2						
Teachers - Total (*N*)	66	–	64	58	–	52
Teachers - CASIS	36	–	35	31	–	29
Teachers - Control	30	–	29	27	–	23
Students - Total (*N*)	1085	1080	1012	966	867	815
Students - CASIS	619	611	572	486	431	445
Students - Control	466	469	440	480	436	370

These 66 teachers worked in 50 different schools and each of these schools were randomly assigned to one of two conditions: CASIS or control. No school matching was undertaken. It should be noted that the schools, not the teachers, were randomly assigned to either the CASIS or the control condition. Teachers could not be randomly assigned to conditions because teachers in either group could have been working at the same school. In such a situation, the CASIS teachers could have discussed the pedagogical practices with the control teachers, thereby affecting the internal validity of the study. The random assignment of schools was planned to create a control and experimental group with a relatively equal number of inservice teachers. However, 19 teachers eventually decided to drop out after the random assignment. Thus, the initial sample of the first cohort at Time 1 was composed of 47 teachers: 29 in the CASIS group (14 schools) and 18 in the control one (eight schools). The control group did not follow any alternative PD program during the study but did receive the CASIS PD program after Time 4. It should be noted that inservice teachers (control and CASIS) were evaluated at Time 1 (E1, C1), Time 3 (E2, C3), Time 4 (E4, C4), and Time 6 (E6, C6). All elementary school teachers in Quebec teach all school subjects including writing.

For the second cohort, recruitment was initiated in the spring of 2014, in three school boards of the Quebec City area. A total of 112 teachers were interested in participating in the project. However, only 66 of them committed to the study. The teachers worked for 35 different schools. The 35 schools were randomly assigned to one of two conditions (CASIS or control). Nineteen schools were assigned to the CASIS condition (36 teachers) and 16, to the control one (30 teachers).

For the first cohort, there was 897 elementary school students in all groups. However, we received parental consent for 647 of them (72%) at Time 1, 411 in the CASIS group and 236 in the control group (see descriptive statistics in Table 8). Of these students, 628 were present at Time 2 and 3, for an attrition rate of 2.9%. In Cohort 2, there were 1349 elementary school students in all groups. However, we received parental consent for 1085 of them (80%) at Time 1, 619 in the CASIS group and 466 in the control group (see descriptive statistics in Table 8). Of these students, 1012 were present at Time 2 and 3, for an attrition rate of 6.7%. Because the teachers were followed for two consecutive years, students in Year 2 were different from those in Year 1. In Cohort 1 (cohorts were assigned as a function of teachers, not students), there were 451 students at Time 4. Of these, 435 were present at Time 5 and 6, for an attrition rate of 3.5%. In Cohort 2, there were 966 students at Time 4. Of these, 815 were present at Time 2 and 3, for an attrition rate of 15.6%. For both cohorts, the average number of students per class was 16.75. Teachers teach only to one class per year. Consequently, there was 194 classes of students (79 in Cohort 1 and 115 in Cohort 2).

7.2. Measures

We used the same measures as in Study 1. For the ESMS, Cronbach alphas ranged between 0.69 and 0.80 for the six time points (see Table 10). Results from CFA on both samples of students are presented in Table S12 and S13 and attested for the construct validity of children's scores. For the observational grid, the average interrater reliability coefficients ranged between 0.75 and 0.80 for the four time points. Each videotaped lesson lasted approximately 46 min (mean scores for Time 1 to Time 6 ranged between 46.05 and 47.13 min, $SD = 8.30$ to 9.38). The LICI was also used in this study. However, in contrast with Study 1, we gathered data at Time 1 on the level of burnout experienced by teachers. Burnout was assessed with the French-Canadian version (Dion & Tessier, 1994) of the Maslach Burnout Inventory (MBI; Maslach, Jackson, Leiter, Schaufeli, & Schwab, 1986), which is divided into three subscales. The first one, Emotional Exhaustion (alpha = 0.93), was composed of nine items (e.g., "I feel emotionally drained from my work"). The second subscale, Depersonalization (alpha = 0.69), was assessed with five items (e.g., "I've become more callous toward people since I took this job"). The third subscale, Personal Accomplishment (alpha = 0.80), was measured by eight items (e.g., "I have accomplished many worthwhile things at this job"). Responses to all items were scored on a seven-point scale ranging from 0 (*never*), 1 (*a few times per month*), 2 (*once per month*), 3 (*several times per month*), 4 (*once a week*), 5 (*a few times per week*) to 6 (*daily*).

8. Results

We combined Cohort 1 and Cohort 2 to conduct statistical analyses (see Table S14 and S15 for tests of significant differences between cohorts). Differences between cohorts were rather small in magnitude for the inservice teachers' sample, except for the significant activity ($d = 0.63$) and LICI ($d = 0.42$). However, there were no significant differences at Time 1 between groups (CASIS vs. Control) for the inservice teachers' sample (Table S16), although the Cohen's *d* for structure feedback was 0.22. We compared the LICI of preservice teachers as a function of groups and no significant differences were observed (see Table S16). As for the students' samples, some differences were observed

Table 8
Study 2: Students' Characteristics.

	Year 1				Year 2			
	CASIS group		Control group		CASIS group		Control group	
Variables	*n*	%	*n*	%	*n*	%	*n*	%
Gender								
Male	539	51.0	357	49.4	405	50.6	343	51.2
Female	517	49.0	366	50.6	395	49.4	327	48.8
Missing	–	–	–	–	–	–	1	–
Total	1056	100	723	100	800	100	671	100
Grades								
1	231	21.8	143	19.8	168	21.0	94	14.0
2	283	26.8	252	34.9	142	17.8	149	22.2
3	152	14.4	122	16.9	116	14.5	225	33.5
4	133	12.4	60	8.3	76	9.5	70	10.4
5	156	14.8	72	10.0	214	26.8	83	12.4
6	101	9.6	74	10.2	84	10.5	50	7.5
Total	1056	100	723	100	800	100	671	100
Mothers' education level								
High school incomplete	36	7.6	36	11.3	19	6.9	14	6.0
High school completed	68	14.3	52	16.4	32	11.6	27	11.5
College completed	178	37.3	108	34.0	104	37.7	96	40.9
Undergraduate Studies	124	26.0	77	24.2	75	27.2	64	27.2
Master or Ph.D	71	14.9	45	14.2	46	16.7	34	14.5
Missing	579	–	405	–	524	–	436	–
Total	1056	100	723	100	800	100	671	100
Family Income								
Less than C$40,000	71	13.2	61	17.4	45	14.5	44	16.3
C$40,000–69,999	145	27.0	89	25.4	59	19.0	73	27.0
C$70,000 or more	321	59.8	200	57.1	206	66.5	153	56.7
Missing	519	–	373	–	490	–	401	–
Total	1056	100	723	100	800	100	671	100
Language used at home								
French	532	98.7	332	94.9	303	97.4	256	94.8
Other	7	1.3	18	5.1	8	2.6	14	5.2
Missing	517	–	373	–	489	–	401	–
Total	1056	100	723	100	800	100	671	100
Lives with both biological parents								
Yes	440	81.6	279	79.7	255	82.0	198	73.3
No	99	18.4	71	20.3	56	18.0	72	26.7
Missing	517	–	373	–	489	–	401	–
Total	1056	100	723	100	800	100	671	100

in motivation scores between cohorts (Table S15) and between groups at Time 1 (Table S17). However, these differences were rather small according to Cohen's *d*. To control for these potentially confounding factors, we used pretest motivation scores as covariates. To test our two hypotheses, we performed ANCOVAs on the samples of inservice teachers and students with PROC MIXED in SAS version 9.4. We took the multilevel structure of the data into account by including in the analysis the schools as a level 2 variable for the inservice teachers' sample and the teachers as a level 2 variable for the students' samples. For the inservice teachers' sample, covariates included were the pretest scores on the MBI, the grade level, as well as the pretest scores on each dependent variable entered in the analyses. For the students' samples, the covariates used were teachers' scores on the MBI and their use of the five pedagogical practices at pretest, students' scores on the dependent variables at pretest, and the grade level. A complete picture of the pattern missing values for inservice teachers and their students is presented in Tables S18–S20. All correlations connecting scores at Time 1 to scores at Time 2, and Time 3 as a function of groups are presented in Tables S21 and S22.

The results for the first hypothesis are presented in Table 9 (also see Table S23 for the effects of covariates). First, these results indicate that the proportion of variance in teachers' scores explained by schools range between 0.00 and 0.37 (see Table 9). However, these effects were not consistent across measurement times. For example, schools explained 37% of the variance in significant activity scores at Time 3, but only 10% at Time 4, and 0% at Time 6. These results show that some schools are doing better than others on the five different pedagogical practices, but this effect is not systematic across measurement times; a finding difficult to interpret. Second, the LICI index did not predict significantly the use of the pedagogical practices by teachers.

Third, when teachers' use of the five pedagogical practices at pretest was controlled for with other covariates, the CASIS group' scores at Time 3 were statistically different than those of the control group on collaboration ($d = 1.01$, ps = 78%) and autonomy support/involvement ($d = 0.40$, ps = 61%). There was an interaction effect with the LICI index ($p < .10$) on structure-feedback. Based on Cohen's *d*, when the LICI index is low or moderate, inservice teachers exposed to CASIS use more frequently structure-feedback than teachers of the control group. As expected, the CASIS group's scores at Time 4 were significantly higher than those of the control group for collaboration ($d = 0.99$, ps = 76%), significant activity ($d = 0.47$, ps = 64%), and autonomy support/involvement ($d = 0.57$, ps = 69%). Again, there was an interaction effect with the LICI index ($p < .10$) on structure-feedback. Based on Cohen's *d*, when the LICI index is low or moderate, inservice teachers exposed to CASIS use more frequently structure-feedback than teachers of the control group. However, the reverse pattern was observed when the LICI is high: inservice teachers exposed to CASIS use less frequently structure-feedback compared to the teachers of the control group. At Time 6, differences between both groups disappeared based on the *p* values because the control group had received the CASIS PD program immediately after Time 4. Again, there was an interaction effect with the LICI index ($p < .10$) on structure-feedback at Time 6. Based on Cohen's *d*, when the LICI index is moderate and high, inservice teachers from CASIS use less frequently structure-feedback than teachers of the control group. This could be explained by the fact that inservice teachers from the control group were recently exposed the PD program.

Table 9
Study 2: Adjusted Means, Confidence Intervals, p Values, and Cohen's d for Group Differences (CASIS vs. Control) Among Inservice Teachers.

	n	β	Adjusted means	Standard error	95% CI	*p*	Cohen's *d*	Proportion of variance in teachers' scores explained by schools
Time 3								
Collaboration								
CASIS	64	−0.73	2.23	0.09	[2.04, 2.41]	<0.0001	1.01	0.17
Control	47		1.49	0.11	[1.27, 1.71]			
LICI		−0.01				0.54		
Group * LICI		−0.01				0.90		
Significant activity								
CASIS	64	−0.07	3.08	0.12	[2.84, 3.30]	0.67	0.08	0.37
Control	47		3.00	0.14	[2.72, 3.28]			
LICI		−0.04				0.26		
Group * LICI		−0.01				0.87		
Autonomy/ involvement								
CASIS	64	−0.16	3.97	0.05	[3.87, 4.06]	0.04	0.40	0.05
Control	47		3.81	0.06	[3.69, 3.92]			
LICI		−0.01				0.64		
Group * LICI		0.03				0.24		
Structure-goals								
CASIS	64	−0.07	4.15	0.05	[4.06, 4.24]	0.32	0.19	0.00
Control	47		4.08	0.05	[3.98, 4.19]			
LICI		0.00				0.98		
Group * LICI		−0.01				0.60		
Structure feedback								
CASIS	64	−0.13	3.43	0.06	[3.31, 3.55]	0.16	0.27	0.22
Control	47		3.30	0.07	[3.16, 3.44]			
LICI		0.00				0.84		
Group * LICI		0.05				0.08		
Low LICI								
CASIS	30	−0.19	3.46	0.08	[3.30, 3.62]	0.12	0.41	0.23
Control	23		3.28	0.09	[3.09, 3.46]			
Moderate LICI								
CASIS	23	−0.27	3.38	0.10	[3.15, 3.62]	0.20	0.56	0.25
Control	7		3.11	0.18	[2.71, 3.52]			
High LICI								
CASIS	11	0.00	3.42	0.11	[3.16, 3.67]	0.98	0.03	0.00
Control	17		3.41	0.09	[3.21, 3.61]			
Time 4								
Collaboration								
CASIS	49	−0.69	2.24	0.10	[2.03, 2.44]	<0.0001	0.99	0.00
Control	43		1.54	0.11	[1.32, 1.76]			
LICI		−0.03				0.32		
Group * LICI		0.01				0.92		
Significant activity								
CASIS	49	−0.27	2.91	0.08	[2.74, 3.08]	0.03	0.47	0.10
Control	43		2.64	0.09	[2.46, 2.82]			
LICI		−0.01				0.69		
Group * LICI		0.03				0.54		
Autonomy/ involvement								
CASIS	49	−0.23	4.19	0.06	[4.08, 4.30]	0.01	0.57	0.21
Control	43		3.96	0.06	[3.84, 4.08]			
LICI		−0.01				0.34		
Group * LICI		−0.04				0.17		
Structure-goals								
CASIS	49	−0.02	4.11	0.05	[4.01, 4.21]	0.77	0.06	0.05
Control	43		4.09	0.05	[3.99, 4.19]			
LICI		−0.01				0.67		
Group * LICI		0.00				0.87		
Structure feedback								
CASIS	49	−0.20	3.44	0.05	[3.34, 3.54]	0.01	0.54	0.00
Control	43		3.24	0.06	[3.13, 3.35]			
LICI		0.00				0.98		
Group * LICI		0.05				0.06		
Low LICI								
CASIS	19	−0.32	3.49	0.08	[3.33, 3.65]	0.01	0.97	0.00
Control	20		3.17	0.07	[3.01, 3.33]			
Moderate LICI								
CASIS	23	−0.18	3.41	0.09	[3.21, 3.61]	0.34	0.42	0.11
Control	7		3.23	0.16	[2.88, 3.59]			
High LICI								
CASIS	7	0.15	3.26	0.10	[]3.02, 3.50]	0.26	0.65	0.15
Control	16		3.42	0.06	[3.26, 3.57]			

(*continued on next page*)

Table 9 (*continued*)

	n	β	Adjusted means	Standard error	95% CI	*p*	Cohen's *d*	Proportion of variance in teachers' scores explained by schools
Time 6								
Collaboration								
CASIS	46	−0.03	2.07	0.12	[1.82, 2.31]	0.86	0.04	0.00
Control	38		2.04	0.13	[1.76, 2.31]			
LICI		−0.04				0.19		
Group * LICI		0.02				0.73		
Significant activity								
CASIS	46	−0.03	2.98	0.11	[2.75, 3.20]	0.88	0.04	0.00
Control	38		2.95	0.12	[2.70, 3.20]			
LICI		−0.01				0.81		
Group * LICI		−0.06				0.25		
Autonomy/ involvement								
CASIS	46	0.05	4.03	0.05	[3.93, 4.12]	0.49	0.15	0.00
Control	38		4.08	0.05	[3.97, 4.18]			
LICI		−0.01				0.56		
Group * LICI		−0.02				0.44		
Structure-goals								
CASIS	46	0.08	4.11	0.06	[3.99, 4.22]	0.37	0.18	0.00
Control	38		4.18	0.06	[4.06, 4.31]			
LICI		0.01				0.35		
Group * LICI		−0.01				0.69		
Structure feedback								
CASIS	46	0.14	3.49	0.05	[3.38, 3.60]	0.09	0.40	0.15
Control	38		3.63	0.06	[3.51, 3.75]			
LICI		0.01				0.38		
Group * LICI		0.05				0.06		
Low LICI								
CASIS	18	0.01	3.47	0.06	[3.33, 3.61]	0.91	0.04	0.00
Control	18		3.48	0.06	[3.34, 3.62]			
Moderate LICI								
CASIS	21	0.14	3.60	0.07	[3.44, 3.77]	0.39	0.46	0.00
Control	6		3.75	0.14	[3.43, 4.06]			
High LICI								
CASIS	7	0.39	3.34	0.11	[3.05, 3.64]	0.05	1.45	0.00
Control	14		3.73	0.07	[3.54, 3.93]			

Note. CI = Confidence interval. Potential ranges for all variables is 1 to 5.
Covariates = Dependent variables measured at Time 1; grade level; emotional exhaustion, depersonalization and personal accomplishment. Consequently, the PROC MIXED code in SAS includes a class statement to take into account the multilevel structure (schools in the present case and groups) as well as a model statement (the covariates) with a random intercept.

The results for the second hypothesis are presented in Table 10 (see Table S24 for the effects of the covariates). These results indicate that the proportion of variance in students' motivation scores explained by teachers range between 0.00 and 0.06 (see Table 10). The results pointed to many significant differences: some revealed principal effects for the CASIS PD program (2 effects) and others revealed interaction effects between both groups and the LICI of the schools (6 effects). Principal effects are not interpreted when they are nested under interaction effects. For Year 1, students' scores on identified regulation at Time 3 were higher in the CASIS group than in the control group. For Year 2, intrinsic motivation at Time 6 was higher in the control group than in the CASIS group. Although not in line with our initial hypothesis (no differences were expected), these results could be explained by the fact that the teachers in the control group had followed the CASIS PD program more recently than those of the CASIS group.

For interaction effects, we noted significant ones at Time 2 of Year 1 for intrinsic motivation, identified regulation, and controlled regulation. All scores were standardized in *z* scores (mean 0, *SD* 1). Based on Cohen's *d*, we observed that CASIS is more efficient on intrinsic and identified regulation scores for students attending a school located in a privileged neighborhood (low LICI values), although we noted that CASIS was less effective on this outcome in schools located in a unprivileged neighborhood area. However, for controlled regulation scores, we observed that CASIS was more efficient for schools located in unprivileged neighborhoods, but less effective in moderate unprivileged neighborhoods. For Year 1-Time 3, only one interaction effect was significant for intrinsic regulation. CASIS appears more effective for students attending a school located in a privileged neighborhood. For Year 2-Time 5, only one interaction effect was found on controlled regulation where the control group had lower scores on controlled regulation comparatively to the CASIS group when the LICI index is high (unprivileged neighborhood). For Year 2-Time 6, the same pattern was observed on controlled regulation: the control group had lower scores on controlled regulation comparatively to the CASIS group when the LICI index is moderate or high (unprivileged neighborhood). Again, these results might be explained by the fact that inservice teachers from the control group have recently received the PD program.

9. Brief discussion

The results of this quasi-experimental study corroborated those of Study 1. More specifically, inservice teachers used collaboration and autonomy support/involvement more frequently on various posttest occasions when the pretest scores for each of these two practices were controlled for. Interestingly, these differences disappear at Time 6 as expected, because inservice teachers form the control have received the PD program. An interaction effect worth mentioning is the one between groups and LICI on structure-feedback. This effect shows that this pedagogical practice was used more frequently by teachers exposed to CASIS in schools located in a privileged neighborhood. We also find significant effects of the CASIS PD program on students' autonomous and controlled regulations, especially in interaction with the school socioeconomic status (privileged vs. unprivileged neighborhood). It appears from these findings that CASIS was more effective in promoting

Table 10
Study 2: Adjusted Means, Confidence Intervals, p Values, and Cohen's d for Group Differences (CASIS vs. Control) Among Students of Inservice Teachers.

	n	β	Adjusted means	Standard error	95% CI	*p*	Cohen's *d*	Proportion of variance in students' scores explained by teachers
Year 1 Time 2								
Intrinsic regulation (alpha = 0.78)								
CASIS	1056	−0.02	0.00	0.03	[−0.05, 0.06]	0.69	0.02	0.02
Control	723		−0.01	0.03	[−0.08, 0.05]			
LICI		0.00				0.94		
Group * LICI		0.13				0.00		
Low LICI								
CASIS	517	−0.12	0.07	0.04	[−0.01, 0.14]	0.06	0.13	0.01
Control	374		−0.05	0.05	[−0.14, 0.04]			
Moderate LICI								
CASIS	383	0.00	−0.01	0.05	[−0.11, 0.08]	0.97	0.00	0.01
Control	115		−0.01	0.09	[−0.19, 0.17]			
High LICI								
CASIS	156	0.14	−0.12	0.07	[-0.26, 0.02]	0.16	0.17	0.00
Control	234		0.02	0.05	[−0.09, 0.12]			
Identified regulation (alpha = 0.71)								
CASIS	1056	−0.01	0.00	0.03	[−0.06, 0.06]	0.80	0.01	0.02
Control	723		−0.01	0.04	[−0.08, 0.06]			
LICI		−0.04				0.11		
Group * LICI		0.19				<0.0001		
Low LICI								
CASIS	517	−0.18	0.13	0.04	[0.05, 0.21]	0.00	0.20	0.01
Control	374		−0.05	0.05	[-0.14, 0.04]			
Moderate LICI								
CASIS	383	0.13	−0.08	0.06	[−0.19, 0.04]	0.30	0.12	0.01
Control	115		0.05	0.11	[−0.16, 0.26]			
High LICI								
CASIS	156	0.28	−0.24	0.08	[−0.40, −0.09]	0.01	0.29	0.00
Control	234		0.03	0.06	[−0.09, 0.15]			
Controlled regulation (alpha = 0.76)								
CASIS	1056	−0.01	0.01	0.03	[−0.04, 0.06]	0.73	0.02	0.04
Control	723		0.00	0.03	[−0.06, 0.06]			
LICI		−0.04				0.04		
Group * LICI		0.12				0.002		
Low LICI								
CASIS	517	−0.09	0.17	0.04	[0.10, 0.25]	0.12	0.11	0.04
Control	374		0.08	0.04	[0.00, 0.17]			
Moderate LICI								
CASIS	383	−0.22	−0.10	0.04	[−0.18, −0.03]	0.01	0.30	0.00
Control	115		−0.33	0.07	[-0.47, −0.19]			
High LICI								
CASIS	156	0.27	−0.24	0.06	[−0.36, −0.13]	0.00	0.38	0.00
Control	234		0.03	0.05	[−0.06, 0.12]			
Year 1 Time 3								
Intrinsic regulation (alpha = 0.80)								
CASIS	1056	−0.07	0.04	0.03	[−0.01, 0.10]	0.14	0.07	0.02
Control	723		−0.02	0.03	[−0.09, 0.04]			
LICI		0.01				0.67		

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Table 10 (*continued*)

	n	β	Adjusted means	Standard error	95% CI	*p*	Cohen's *d*	Proportion of variance in students' scores explained by teachers
Group * LICI		0.08				0.08		
Low LICI								
CASIS	517	−0.12	0.08	0.04	[0.00, 0.15]	0.05	0.14	0.01
Control	374		−0.05	0.05	[−0.14, 0.04]			
Moderate LICI								
CASIS	383	−0.07	0.01	0.05	[−0.09, 0.11]	0.52	0.07	0.00
Control	115		−0.06	0.10	[−0.25, 0.12]			
High LICI								
CASIS	156	0.03	0.01	0.08	[−0.14, 0.16]	0.78	0.03	0.00
Control	234		0.04	0.06	[−0.08, 0.16]			
Identified regulation (alpha = 0.73)								
CASIS	1056	−0.14	0.06	0.03	[0.00, 0.12]	0.01	0.14	0.02
Control	723		−0.07	0.04	[−0.15, 0.00]			
LICI		−0.01				0.66		
Group * LICI		0.07				0.13		
Controlled regulation (alpha = 0.76)								
CASIS	1056	−0.05	0.06	0.03	[0.00, 0.11]	0.25	0.06	0.06
Control	723		0.01	0.03	[−0.06, 0.07]			
LICI		−0.03				0.24		
Group * LICI		0.05				0.24		
Year 2 Time 5								
Intrinsic regulation (alpha = 0.78)								
CASIS	800	0.04	−0.02	0.04	[−0.08, 0.05]	0.45	0.04	0.04
Control	671		0.02	0.04	[−0.05, 0.09]			
LICI		0.00				0.95		
Group * LICI		0.00				0.96		
Identified regulation (alpha = 0.69)								
CASIS	800	−0.03	0.02	0.03	[−0.05, 0.08]	0.62	0.03	0.04
Control	671		−0.01	0.04	[−0.08, 0.06]			
LICI		0.01				0.60		
Group * LICI		0.02				0.69		
Controlled regulation (alpha = 0.77)								
CASIS	800	−0.06	0.07	0.03	[0.00, 0.13]	0.21	0.07	0.06
Control	671		0.00	0.04	[−0.07, 0.07]			
LICI		0.00				0.98		
Group * LICI		−0.10				0.06		
Low LICI								
CASIS	340	0.04	0.08	0.06	[−0.03, 0.19]	0.64	0.04	0.04
Control	333		0.12	0.05	[0.01, 0.23]			
Moderate LICI								
CASIS	357	−0.08	−0.01	0.06	[−0.12, 0.10]	0.55	0.07	0.05
Control	93		−0.09	0.11	[−0.31, 0.13]			
High LICI								
CASIS	103	−0.13	0.08	0.08	[−0.08, 0.23]	0.23	0.17	0.00
Control	245		−0.05	0.05	[−0.14, 0.04]			
Year 2 Time 6								
Intrinsic regulation (alpha = 0.80)								
CASIS	800	0.14	−0.04	0.03	[−0.11, 0.03]	0.01	0.14	0.03
Control	671		0.10	0.04	[0.02, 0.17]			
LICI		−0.01				0.86		
Group * LICI		−0.03				0.53		

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Table 10 (*continued*)

	n	β	Adjusted means	Standard error	95% CI	*p*	Cohen's *d*	Proportion of variance in students' scores explained by teachers
Identified regulation (alpha = 0.72)								
CASIS	800	0.04	0.00	0.04	[−0.08, 0.07]	0.54	0.03	0.04
Control	671		0.03	0.04	[−0.05, 0.11]			
LICI		−0.02				0.63		
Group * LICI		−0.05				0.41		
Controlled regulation (alpha = 0.76)								
CASIS	800	−0.05	0.09	0.04	[0.02, 0.16]	0.39	0.05	0.06
Control	671		0.04	0.04	[−0.04, 0.12]			
LICI		−0.02				0.41		
Group * LICI		−0.12				0.03		
Low LICI								
CASIS	340	0.05	0.09	0.06	[−0.01, 0.20]	0.58	0.05	0.02
Control	333		0.14	0.05	[0.03, 0.25]			
Moderate LICI								
CASIS	357	−0.21	0.06	0.05	[−0.04, 0.16]	0.08	0.22	0.04
Control	93		−0.15	0.10	[−0.36, 0.05]			
High LICI								
CASIS	103	−0.16	0.13	0.09	[−0.05, 0.32]	0.19	0.18	0.00
Control	245		−0.03	0.05	[−0.13, 0.08]			

Note. CI = Confidence interval.
Covariates = dependent variables measured at Time 1, grade level and the use of the five pedagogical practices by the preservice teacher at Time 1, emotional exhaustion, depersonalization and personal accomplishment measured for the inservice teachers. Consequently, the PROC MIXED code in SAS includes a class statement to take into account the multilevel structure (teachers in the present case and groups) as well as a model statement (the covariates) with a random intercept. The little test for MCAR was significant. Data are thus not MCAR. Consequently, missing values were replaced by multiple imputations with 20 estimated samples generated and analyses were performed 20 times for each of the 20 samples generated. Once these analyses were performed, the MIANALYSE function synthesized the results obtained 20 times into a single result. This procedure makes it possible to calculate statistical parameters such as adjusted means with the 95% CIs as well as the regression coefficient with its *p* value. Standardized scores were used.

students' intrinsic and identified regulations in schools located in a privileged neighborhood whereas this PD program was more effective in promoting students' controlled regulation in schools located in unprivileged neighborhoods. We acknowledge that this set of findings on children's regulations is not perfectly clear. At best, we can tentatively conclude that CASIS is especially beneficial for the motivation of students whose schools are classified as privileged. For unprivileged students, CASIS does not seem as effective at it should be.

10. General discussion

The goals of these two quasi-experimental studies conducted among preservice and inservice teachers were to evaluate the effectiveness of the CASIS PD program in fostering (1) the use of autonomy support, involvement, structure (structure-feedback and structure-goals), collaboration and significant activity by teachers during writing lessons and (2) students' motivational resources (intrinsic, identified, and controlled regulations) toward writing. The results revealed that the CASIS PD program is effective in increasing the use of some of the recommended five pedagogical practices. More specifically, teachers who have followed CASIS used collaboration and autonomy/involvement more frequently during writing lessons. For significant activity, structure-feedback, and structure-goals, some effects were observed in one study but not reproduced in the other or across measurement times. These peculiar findings will be discussed below. Moreover, we observed one interaction effect between schools socioeconomic status and groups (CASIS vs. control) on structure feedback: teachers in the CASIS group used more this pedagogical practice comparatively to teachers of the control group, especially in schools located in more socioeconomically advantaged neighborhoods. Although the PD program fosters greater use of the pedagogical practices, this effect does not always translate to children' motivational resources although some interesting effects were observed.

10.1. The CASIS PD program and pedagogical practices

In this study, we videotaped teachers twice at each measurement time while they were giving a writing lesson. Such a methodological procedure has rarely been used in the field of education according to the literature. Usually, these pedagogical practices are assessed via self-reported measures filled out by teachers or by their students. In this study, we were able to show that the CASIS PD program increased the use of some of the five recommended pedagogical practices over time as measured by an observational grid completed by two independent raters. More specifically, in Study 1 (conducted among preservice teachers), those who had followed the CASIS PD program used collaboration, significant activity, autonomy/involvement, and structure-goals more frequently than preservice teachers of the control group. In Study 2 (conducted among inservice teachers), those who had followed the CASIS PD program used collaboration and autonomy support/involvement more frequently at Time 3 than teachers from the control group. The results at Time 4 were nearly equivalent to those obtained at Time 3, except for a larger difference in significant activity. These differences among the groups disappeared at Time 6 when all the teachers had followed the CASIS PD program. It is worth mentioning that in both studies, the largest effect sizes were for collaboration. This might be because collaboration is a relatively easy pedagogical practice to use in a classroom environment (Johnson, Johnson, & Stanne, 2000) for both

inservice and preservice teachers. Moreover, the program was relatively effective across the samples in producing higher use of autonomy support/involvement and significant activity as evidenced by medium effect sizes for these two practices. This reproducibility of the results showed that even though inservice and preservice teachers face different challenges, the program was relevant enough to produce interesting changes in their practices.

However, some interesting differences emerged between both studies, especially for inservice teachers. Indeed, the CASIS PD program was more effective in producing differences between the two groups of inservice teachers (Study 2) for structure-feedback compared to preservice teachers (Study 1). This is especially true when schools were located in a neighborhood classified as privileged or moderately privileged. It could thus be easier for inservice teachers to give adequate feedback when students schools are in a privileged area because these students may behave more in line with classroom rules. Because these interaction effects were limited to one pedagogical practice, they should be interpreted with caution.

Despite these differences across the two studies and at some measurement points (Study 2), it should be noted that the average effect sizes across both studies (Cohen's *d*) for the differences between the control group and the CASIS group scores (scores at Time 2 for Study 1; for Study 2, only the scores at Time 3 and Time 4 were averaged because both groups received the intervention by Time 6) were meaningful: collaboration (0.91), autonomy support/involvement (0.48), significant activity (0.33), and structure-goal (0.21). Based on these findings and the interaction effect observed, we can conclude that the CASIS PD program was relatively successful in encouraging the teachers to use four of the five pedagogical practices. More work is however needed to optimize the CASIS PD program on structure-goals and to uncover why structure feedback is more used by "CASIS teachers" when they work in schools located in a privileged neighborhood area.

The success of the CASIS PD program in producing changes in teachers' pedagogical practices provides support for Desimone's (2009) narrative review on the key ingredients that make a PD program more effective. These ingredients are (a) content focus, (b) active learning, (c) coherence, (d) duration, and (e) collective participation. Our results are also in line with Kennedy's (2016) recommendations on features of a PD program that foster enactment of the pedagogical practices taught. More specifically, when we delivered the CASIS PD program, we encouraged teachers to use the five pedagogical practices as much as possible in their day-to-day writing activities, and we provided a rationale for their use in a non-compulsory fashion. In other words, to facilitate teachers' engagement toward the CASIS PD program, we used no prescription per se concerning the use of the pedagogical practices. Instead, we supported their autonomy in using these five practices. Given our results, researchers and practitioners developing PD programs should be aware that incorporating recommendations made by Desimone (2009) and Kennedy (2016) might increase the probability that their PD program will be effective.

10.2. The CASIS PD program and writing motivation

The absence of significant and/or substantial differences (Cohen's *d* over 0.2) between the CASIS group and the control group of Study 1 and 2 for students' motivational resources is peculiar and not in line with our hypotheses. However, some interactions effects between the school socioeconomic background and the groups were uncovered. In Study 1, it appears that CASIS is more effective to foster students' identified regulation for writing when the program is offered in schools that are located in an unprivileged neighborhood. Alternatively, CASIS seems more effective in decreasing students' controlled regulation for writing when the program is offered in schools that are also located in an unprivileged neighborhood (moderate or high levels), although this effect was not always systematic. These findings obtained in Study 1 are interesting because it appears that the PD program is more effective for the most vulnerable students.

If we focus our attention on Cohen's *d* over 0.2, these results were not reproduced in Study 2. Specifically, we found that the CASIS PD program was more effective for the identified regulation of students attending a school located in a privileged neighborhood. Moreover, it should be noted that for children attending a school located in an unprivileged neighborhood, the CASIS PD program seemed to produce lower levels of identified regulation. This result is clearly counterintuitive and difficult to interpret. To explain such peculiar findings, we propose that the PD program might produce higher levels of identified regulation when there is a match between the expectancies of the program and those of the family socioeconomic background. Indeed, it is recognized that parents with lower SES have lower academic expectations for their children (Davis-Kean, 2005). Thus, students whose teachers have received the PD program and who live in a family with high expectations for them, may tend to value more writing activities. In contrast, a mismatch between the PD program and parental expectations might lead to lower writing value. However, such an explanation is highly speculative. Further work on this issue is definitely needed.

To make things more complicated, the levels of controlled regulation were lower for children of the CASIS group attending unprivileged schools. However, it should be noted that these interaction effects were not always replicated with Cohen's *d* over 0.2, and the unexpected finding on identified regulation was only observed in Study 2 for schools located in unprivileged neighborhoods. It should also be noted that at Year 2-Time 6, there was an effect on intrinsic motivation favoring the control group for which teachers had followed the CASIS PD program seven months earlier over the CASIS group (teachers of the CASIS group had followed the program 19 months before teachers from the control group). Overall, we acknowledge that this set of findings is complicated to interpret for the following reasons: (1) results were not corroborated across studies and (2) although some results were in line with our hypotheses, they did not necessarily replicate across measurement times. For this reason, we should be very careful about drawing conclusions on the effectiveness of CASIS for children' motivation.

How can we explain that the changes in the pedagogical practices adopted by teachers did not always translate into the expected effects on children' motivational resources? Such results may challenge self-determination theory postulates (Ryan & Deci, 2017) as well as previous research findings on these pedagogical practices (Guay et al., 2016) or on writing instruction (Graham et al., 2016). One possible explanation is that it could be more difficult to change perceptions among elementary school children in such a short period of time. Moreover, motivational resources are influenced by other factors that we did not measure, including child-rearing practices (Guay, Ratelle, & Chanal, 2008; Guay, Ratelle, Larose, Vallerand, & Vitaro, 2013) and peers' behaviors (Roy, Guay, & Valois, 2015; Urdan & Schoenfelder, 2006). Consequently, the CASIS PD program is in competition with various natural interventions that occur in the life of elementary school children. It is possible that these variables reduce the ability of the CASIS PD program to positively influence students' writing motivation.

10.3. Limitations and future directions

This study has some limitations that need to be considered when interpreting the findings. First, we did not evaluate whether CASIS produced more effects for different subgroups of students (e.g., students with learning difficulties) or teachers (e.g., level of psychological distress, school type, gender). However, it is important to note that children who were lower on regulation in both studies were more prone to participate to all measurement occasions (see Table S20). Second, other outcomes need to be considered, including quality of writing, since such outcomes could have an influence on students' writing motivation. Third, it would be important to test if CASIS has other benefits for the teachers, such as greater motivation toward their work as well as higher levels of teaching self-efficacy. Fourth, there might be some degree of

overlap between the five pedagogical practices included in CASIS because these practices are all designed to support children' motivation. For example, significant activity could be similar to autonomy support on some aspects (Stroet, Opdenakker, & Minnaert, 2013). Because these pedagogical practices stem from different research tradition that are not only based on SDT, we have decided to keep them separately. Fifth, if the CASIS training program had been longer, it could have led to more significant differences, notably on children's motivation. Sixth, a limited number of male preservice and inservice teachers have participated to both studies. This is another factor that could have influenced the obtained results. Lastly, teachers in the CASIS group knew what type of behaviors they were trained to use. Moreover, they knew that a particular lesson would be videotaped at the posttest. Consequently, some teachers may have adopted these practices only for that specific lesson. This might explain why important differences were found on collaboration (the easiest practice to implement), and also why no consistent effects on students' motivation were found. In future research, it would be crucial to find a solution to this potential methodological problem.

Despite these limitations, this research is characterized by some strengths including two quasi-experimental studies with a pretest posttest design, observational measures of the pedagogical practices used by teachers, and relatively large samples of elementary school children covering different grade levels. This research showed that offering a PD workshop on teachers' pedagogical practices could be an effective way to improve teachers' pedagogical practices but that the effect on children's motivational resources for writing seems limited.

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Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.cedpsych.2020.101922.

References

Battistich, V., Solomon, D., Kim, D. I., Watson, M., & Schaps, E. (1995). Schools as communities, poverty levels of student populations, and students' attitudes, motives, and performance: A multilevel analysis. *American Educational Research Journal, 32*(3), 627–658. https://doi.org/10.3102/00028312032003627.

Belet Boyaci, S. D., & Güner, M. (2018). The impact of authentic material use on development of the reading comprehension, writing skills and motivation in language course. *International Journal of Instruction, 11*(2), 351–368. https://doi.org/10.12973/iji.2018.11224a.

Boscolo, P., & Gelati, C. (2013). Best practices in promoting motivation for writing. In S. Graham, C. A. MacArthur, & J. Fitzgerald (Eds.), *Best practices in writing instruction* (2nd ed., pp. 284–308). The Guilford Press.

Bruning, R., & Horn, C. (2000). Developing motivation to write. *Educational Psychologist, 35*(1), 25–37. https://doi.org/10.1207/S15326985EP3501_4.

Bruning, R., & Kauffman, D. F. (2016). Self-efficacy beliefs and motivation in writing development. In C. A. MacArthur, S. Graham, & J. Fitzgerald (Eds.), *Handbook of writing research* (Vol. 2, pp. 160–173). The Guildford Press.

Cecchini, J. A., Méndez-Giménez, A., & Sánchez-Martínez, B. (2020). Effect of a TARGET-Based Intervention on Students' Motivational Change: A Study Throughout an Academic Year in Physical Education. *Journal of Teaching in Physical Education, 39*(2), 186–195. https://doi.org/10.1123/jtpe.2018-0357.

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*(1), 155–159. https://doi.org/10.1037/0033-2909.112.1.155.

Collie, R. J., Martin, A. J., & Curwood, J. S. (2016). Multidimensional motivation and engagement for writing: Construct validation with a sample of boys. *Educational Psychology, 36*(4), 771–791. https://doi.org/10.1080/01443410.2015.1093607.

Davis-Kean, P. E. (2005). The influence of parent education and family income on child achievement: The indirect role of parental expectations and the home environment. *Journal of Family Psychology, 19*(2), 294–304. https://doi.org/10.1037/0893-3200.19.2.294.

Day, C., Kington, A., Stobart, G., & Sammons, P. (2006). The personal and professional selves of teachers: Stable and unstable identities. *British Educational Research Journal, 32*(4), 601–616. https://doi.org/10.1080/01411920600775316.

De Smedt, F., Van Keer, H., & Merchie, E. (2016). Student, teacher and class-level correlates of Flemish late elementary school children's writing performance. *Reading and Writing, 29*(5), 833–868. https://doi.org/10.1007/s11145-015-9590-z.

Deci, E. L., Ryan, R. M., & Guay, F. (2013). Self-determination theory and actualization of human potential. In D. M. McInerney, H. W. Marsh, R. G. Craven, & F. Guay (Eds.), *Theory driving research: New wave perspectives on self-processes and human development* (pp. 109–133). Information Age Publishing Inc.

Desimone, L. M. (2009). Improving impact studies of teachers' professional development: Toward better conceptualizations and measures. *Educational Researcher, 38*(3), 181–199. https://doi.org/10.3102/0013189X08331140.

Dion, G., & Tessier, R. (1994). Validation de la traduction de l'Inventaire d'épuisement professionnel de Maslach et Jackson. *Canadian Journal of Behavioural Science/Revue Canadienne des Sciences du Comportement, 26*(2), 210–227. https://doi.org/10.1037/0008-400X.26.2.210.

Duke, N. K., Purcell-Gates, V., Hall, L. A., & Tower, C. (2006). Authentic literacy activities for developing comprehension and writing. *The Reading Teacher, 60*(4), 344–355. https://doi.org/10.1598/RT.60.4.4.

Fayol, M. (2016). From language to text: The development and learning of translation. In C. A. MacArthur, S. Graham, & J. Fitzgerald (Eds.), *Handbook of writing research* (Vol. 2, pp. 130–143). The Guildford Press.

Gambrell, L. B., Hughes, E. M., Calvert, L., Malloy, J. A., & Igo, B. (2011). Authentic reading, writing, and discussion: An exploratory study of a pen pal project. *The Elementary School Journal, 112*(2), 234–258. https://doi.org/10.1086/661523.

García, J. N., & de Caso, A. M. (2006). Changes in writing self-efficacy and writing products and processes through specific training in the self-efficacy beliefs of students with learning disabilities. *Learning Disabilities: A Contemporary Journal, 4*(2), 1–27. https://eric.ed.gov/?id=EJ797673.

Graham, S., Harris, K. R., & Chambers, A. B. (2016). Evidence-based practice and writing instruction. In C. A. MacArthur, S. Graham, & J. Fitzgerald (Eds.), *Handbook of writing research* (Vol. 2, pp. 211–226). The Guilford Press.

Guay, F., Chanal, J., Ratelle, C. F., Marsh, H. W., Larose, S., & Boivin, M. (2010). Intrinsic, identified, and controlled types of motivation for school subjects in young elementary school children. *British Journal of Educational Psychology, 80*(4), 711–735. https://doi.org/10.1348/000709910X499084.

Guay, F., Ratelle, C., Larose, S., Vallerand, R. J., & Vitaro, F. (2013). The number of autonomy-supportive relationships: Are more relationships better for motivation, perceived competence, and achievement? *Contemporary Educational Psychology, 38*(4), 375–382. https://doi.org/10.1016/j.cedpsych.2013.07.005.

Guay, F., Ratelle, C. F., & Chanal, J. (2008). Optimal learning in optimal contexts: The role of self-determination in education. *Canadian Psychology/Psychologie Canadienne, 49*(3), 233–240. https://doi.org/10.1037/a0012758.

Guay, F., Valois, P., Falardeau, E., & Lessard, V. (Août, 2013). Elementary Teachers' Pedagogical Practices and Students' Motivation: An Observational Study. In Congrès international de l'American Psychological Association (APA), Honolulu, États-Unis.

Guay, F., Valois, P., Falardeau, É., & Lessard, V. (2016). Examining the effects of a professional development program on teachers' pedagogical practices and students' motivational resources and achievement in written French. *Learning and Individual Differences, 45*, 291–298. https://doi.org/10.1016/j.lindif.2015.11.014.

Guthrie, J. T., Klauda, S. L., & Ho, A. N. (2013). Modeling the relationships among reading instruction, motivation, engagement, and achievement for adolescents. *Reading Research Quarterly, 48*(1), 9–26. https://doi.org/10.1002/rrq.035.

Guthrie, J. T., Van Meter, P., Hancock, G. R., Alao, S., Anderson, E., & McCann, A. (1998). Does concept-oriented reading instruction increase strategy use and conceptual learning from text? *Journal of Educational Psychology, 90*(2), 261–278. https://doi.org/10.1037/0022-0663.90.2.261.

Guthrie, J. T., Wigfield, A., & Klauda, S. L. (2012). Adolescents' Engagement in Academic Literacy. https://booklovefoundation.org/uploads/images/PDFs/Reports/motivation-and-reading.pdf.

Guthrie, J. T., Wigfield, A., & VonSecker, C. (2000). Effects of integrated instruction on motivation and strategy use in reading. *Journal of Educational Psychology, 92*(2), 331–341. https://doi.org/10.1037/0022-0663.92.2.331.

Heckman, J. J. (2006). Skill formation and the economics of investing in disadvantaged children. *Science, 312*(5782), 1900–1902. https://doi.org/10.1126/science.1128898.

Hiebert, E. H. (1994). Reading recovery in the United States: What difference does it make to an age cohort? *Educational Researcher, 23*(9), 15–25. https://doi.org/10.3102/0013189X023009015.

Johnson, D. W., Johnson, R. T., & Stanne, M. B. (2000). Cooperative learning methods: A meta-analysis. https://www.researchgate.net/profile/David_Johnson50/publication/220040324_Cooperative_learning_methods_A_meta-analysis/links/00b4952b39d258145c000000.pdf.

Kennedy, M. M. (2016). How does professional development improve teaching? *Review of Educational Research, 86*(4), 945–980. https://doi.org/10.3102/0034654315626800.

Li, X., Chu, S. K., & Ki, W. W. (2014). The effects of a wiki-based collaborative process writing pedagogy on writing ability and attitudes among upper primary school students in Mainland China. *Computers & Education, 77*, 151–169. https://doi.org/10.1016/j.compedu.2014.04.019.

MacArthur, C. A., & Graham, S. (2016). Writing research from a cognitive perspective. In C. A. MacArthur, S. Graham, & J. Fitzgerald (Eds.), *Handbook of writing research* (Vol. 2, pp. 24–40). The Guildford Press.

Maslach, C., Jackson, S. E., Leiter, M. P., Schaufeli, W. B., & Schwab, R. L. (1986). *Maslach burnout inventory* (Vol. 21,, 3463–3464.

Morgan, K. (2019). Applying the TARGET Pedagogical Principles in Physical Education to Enhance Students' Physical Literacy. *Journal of Physical Education, Recreation & Dance, 90*(1), 9–14. https://doi.org/10.1080/07303084.2018.1535339.

Pajares, F. (2003). Self-efficacy beliefs, motivation, and achievement in writing: A review of the literature. *Reading & Writing Quarterly, 19*(2), 139–158. https://doi.org/10.1080/10573560308222.

Pedersen, A. B., Mikkelsen, E. M., Cronin-Fenton, D., Kristensen, N. R., Pham, T. M., Pedersen, L., & Petersen, I. (2017). Missing data and multiple imputation in clinical epidemiological research. *Clinical Epidemiology, 9*, 157–166. https://doi.org/10.2147/CLEP.S129785.

Ratelle, C. F., Guay, F., Vallerand, R. J., Larose, S., & Senécal, C. (2007). Autonomous, controlled, and amotivated types of academic motivation: A person-oriented analysis. *Journal of Educational Psychology, 99*(4), 734–746. https://doi.org/10.1037/0022-0663.99.4.734.

Reeve, J. (2002). Self-determination theory applied to educational settings. In E. L. Deci, & R. M. Ryan (Eds.), *Handbook of self-determination research* (pp. 183–203). University of Rochester Press.

Richardson, P. W., & Watt, H. M. (2010). Current and future directions in teacher motivation research. In T. C. Urdan, & S. A. Karabenick (Eds.), *The decade ahead: Applications and contexts of motivation and achievement* (pp. 139–173). Emerald Group Publishing Limited.

Roy, A., Guay, F., & Valois, P. (2015). The big-fish–little-pond effect on academic self-concept: The moderating role of differentiated instruction and individual achievement. *Learning and Individual Differences, 42*, 110–116. https://doi.org/10.1016/j.lindif.2015.07.009.

Ruscio, J. (2008). A probability-based measure of effect size: Robustness to base rates and other factors. *Psychological Methods, 13*(1), 19–30. https://doi.org/10.1037/1082-989X.13.1.19.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68.

Ryan, R., & Deci, E. L. (2009). Promoting self-determined school engagement: Motivation, learning, and well-being. In K. R. Wentzel, & A. Wigfield (Eds.), *Handbook of motivation at school* (pp. 171–196). Routledge.

Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. The Guilford Publications.

Salvagioni, D. A. J., Melanda, F. N., Mesas, A. E., González, A. D., Gabani, F. L., & de Andrade, S. M. (2017). Physical, psychological and occupational consequences of job burnout: A systematic review of prospective studies. *PLoS ONE, 12*(10). https://doi.org/10.1371/journal.pone.0185781.

Schoon, I. (2008). A transgenerational model of status attainment: The potential mediating role of school motivation and education. *National Institute Economic Review, 205*(1), 72–82. https://doi.org/10.1177/0027950108096590.

Shahar, G., Henrich, C. C., Blatt, S. J., Ryan, R., & Little, T. D. (2003). Interpersonal relatedness, self-definition, and their motivational orientation during adolescence: A theorical and empirical integration. *Developmental Psychology, 39*(3), 470–483. https://doi.org/10.1037/0012-1649.39.3.470.

Skinner, E. A., & Belmont, M. J. (1993). Motivation in the classroom: Reciprocal effects of teacher behavior and student engagement across the school year. *Journal of Educational Psychology, 85*(4), 571–581. https://doi.org/10.1037/0022-0663.85.4.571.

Slavin, R. E., & Madden, N. A. (1989). What works for students at risk: A research synthesis. Educational Leadership, 46(5), 4–13. https://www.researchgate.net/profile/Robert_Slavin/publication/237410804_What_Works_for_Students_at_Risk_A_Research_Synthesis/links/549812270cf2c5a7e342905d.pdf.

Stroet, K., Opdenakker, M. C., & Minnaert, A. (2013). Effects of need supportive teaching on early adolescents' motivation and engagement: A review of the literature. *Educational Research Review, 9*, 65–87. https://doi.org/10.1016/j.edurev.2012.11.003.

Troia, G. A., Harbaugh, A. G., Shankland, R. K., Wolbers, K. A., & Lawrence, A. M. (2013). Relationships between writing motivation, writing activity, and writing performance: Effects of grade, sex, and ability. *Reading and Writing, 26*(1), 17–44. https://doi.org/10.1007/s11145-012-9379-2.

Truax, M. L. (2018). The impact of teacher language and growth mindset feedback on writing motivation. *Literacy Research and Instruction, 57*(2), 135–157. https://doi.org/10.1080/19388071.2017.1340529.

Urdan, T., & Schoenfelder, E. (2006). Classroom effects on student motivation: Goal structures, social relationships, and competence beliefs. *Journal of School Psychology, 44*(5), 331–349. https://doi.org/10.1016/j.jsp.2006.04.003.

Vedder-Weiss, D., & Fortus, D. (2018). Teachers' mastery goals: Using a self-report survey to study the relations between teaching practices and students' motivation for science learning. *Research in Science Education, 48*(1), 181–206. https://doi.org/10.1007/s11165-016-9565-3.

Visnovska, J., & Cobb, P. (2013). Classroom video in teacher professional development program: Community documentational genesis perspective. *ZDM, 45*(7), 1017–1029. https://doi.org/10.1007/s11858-013-0523-5.