

Examining the Effects of a Professional Development Program on Teachers' Pedagogical Practices and Students' Motivational Resources and Achievement in Written French

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Abstract

We tested the effects of a professional development program (CASIS) on teachers' pedagogical practices and students' motivation and achievement in written French. CASIS involved a two-day workshop in which we taught teachers to use collaboration, autonomy support, authentic tasks, involvement, and structure. We conducted a quasi-experimental longitudinal study among 18 elementary school teachers and 277 of their students. The results showed large group effect sizes for four of the five pedagogical practices and increased intrinsic motivation for students whose teachers attended CASIS. The discussion centers on the implications of these findings for research and practice.

1. Introduction

In Quebec, a Canadian province where the official language is French, approximately 20% of sixth-grade students (11-year-olds) fail the final French exam prescribed by Quebec's ministry of education (MELS, 2012). Concerns about writing quality are neither recent nor specific to Quebec (Harris, Graham, & Mason, 2006). However, they are nonetheless relevant, because the minimum literacy level required to function in society has risen substantially in recent decades (Cartier, 2006; Torgesen, 2002).

The purpose of this study was to evaluate a teachers' professional development (PD) program called CASIS, which was designed to improve teachers' pedagogical practices, to foster elementary students' motivational resources and writing achievement. Indeed, waiting until later grades to address writing problems that originate in the elementary grades has not proven successful (Slavin, Madden, & Karweit, 1989). We held a two-day workshop based in part on self-determination theory (SDT; Deci & Ryan, 2002), where we taught teachers to use the five following pedagogical practices: collaboration, authentic activities, structure, involvement, and support for autonomy, or CASIS. We investigated three main questions: 1) Is CASIS effective in encouraging teachers to increase their use of the five pedagogical practices? 2) Does CASIS help children increase their motivational resources? and 3) Does CASIS improve their writing performance?

2. Motivational resources from a self-determination theory perspective

We focused on three motivational resources that were expected to be important for children's functioning at school: regulation types, perceived competence, and perceived relatedness to teachers (Ryan & Deci, 2009).

2.1. Regulation types in writing

According to SDT (Ryan & Deci, 2000), motivation is defined as the reasons that underlie behavior (hereafter referred to as “regulation”). SDT makes a distinction between different regulation types, which vary in terms of self-determination (i.e., the extent to which behavior originates from the self). Intrinsic regulation refers to engaging in a writing activity for its own sake, for the pleasure and satisfaction derived from it (Ryan & Deci, 2000). Most students are intrinsically regulated to write early in school, but unfortunately, the pleasure and satisfaction decrease with age (Boscolo & Gelati, 2013). This decline may be attributable to the increasing complexity of writing, leading to a switch from intrinsic to extrinsic regulation. The latter refers to engaging in a writing activity for instrumental rather than intrinsic reasons. According to SDT, there are different types of extrinsic regulation, which vary along a self-determination continuum. From low to high self-determination, these are external regulation, introjected regulation, identified regulation, and integrated regulation (Ryan & Deci, 2000).

External regulation occurs when behavior is motivated by the desire to obtain a reward or avoid punishment. Introjected regulation refers to behaviors in response to internal pressures, such as obligation or guilt: students somewhat endorse the reasons for doing writing activities, but in a controlled manner. In this study, we assess introjected and external regulations jointly under the construct of controlled regulation (see Shahar, Henrich, Blatt, Ryan, & Little, 2003). Identified regulation occurs when students identify with the reasons for performing a writing activity, or when they personally find it important. This is a self-determined form of extrinsic motivation, because the behavior originates from the self in a non-contingent manner. Integrated regulation occurs when the identified regulation is congruent with other values and needs. However, this type of regulation requires individuals to have formed a clear conception of their various identities (Deci, Ryan, & Guay, 2013), which is not the case with elementary school children. Therefore, we did not assess integrated regulation in this study.

Similar to students who are intrinsically motivated, those who adopt identified regulation are more persistent and cognitively involved in their tasks, experience more positive emotions, and earn better grades, whereas students who are motivated in a controlled fashion are less persistent, more distracted, experience more negative emotions, and obtain lower grades (Guay, Ratelle and Chanal, 2008). Very few studies have investigated these regulation types in writing. In one study, however, 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.

2.2. Perceived competence in writing

Perceived competence means that students see themselves as being effective in their interactions with the school environment (Marsh, 1990). Specifically, students who perceive themselves as highly competent in a given school activity will perform it better (Guay, Marsh, & Boivin, 2003) and persist longer (Guay, Larose, & Boivin, 2004). Research in this area has shown that perceptions of competence are not unitary, but are instead specific to school subjects (see Marsh, 2007). Although perceived verbal competence and verbal self-concept have been widely investigated in the motivation literature, perceived writing competence has been less studied. However, findings from the self-efficacy literature show that students' confidence in their writing capabilities influences various writing outcomes (Pajares, 2003).

2.3. *Perceived relatedness to teachers*

According to Ryan and Deci (2002), perceived relatedness refers to students' feeling connected to others. Students' representations of relatedness are of interest because previous research shows that these representations are important organizers of psychosocial development (Guay, Marsh, Sénécal & Dowson, 2008). This is especially important when students are not very intrinsically motivated to write, but must nonetheless endorse this school value. Students are more likely to internalize external demands when they feel connected to significant others (Deci & Ryan, 1991). Numerous studies have shown that when students feel connected to their teachers, they perform better in various school subjects (see Martin & Dowson, 2009).

2.4. *The five pedagogical practices*

According to some researchers (Boscolo & Gelati, 2013; Guthrie, Wigfield, & VonSecker, 2000; Guthrie et al., 1998; Reeve, 2002), five pedagogical practices may help students feel more competent, develop a sense of relatedness to their teachers, and regulate their school behaviors in an intrinsic and identified, rather than a controlled, manner.

Autonomy-supportive practices mean that the teacher considers the students' perspective; provides a rationale for his/her requests; acknowledges students' feelings and perceptions; provides them with information and choices; and minimizes the use of pressure and control, such as task deadlines, performance-based rewards, imposed goals for a given activity, and competition (Ryan & Deci, 2009). *Involvement* means that the teacher is aware of the students' personal knowledge and interests, cares about each student's learning, and sets realistic, positive goals for students' efforts and learning (Skinner & Belmont, 1993). *Structure* means giving students clear expectations, optimal challenges, and effective feedback (Reeve, 2002). The research to date shows that teachers who are autonomy-supportive and involved and who use appropriate structures foster intrinsic and identified regulations, perceived competence, academic achievement, conceptual learning, and greater creativity (Skinner & Belmont, 1993). These three pedagogical practices may also be linked to the concept of person-centered teaching (Cornelius-White, 2007), whereby teachers who listen, are caring, and have positive regard for others produce higher achievement outcomes (Hattie, 2009).

In addition to these pedagogical practices, we focused on two others that are not linked to interpersonal dimensions per se, but which could affect the above-mentioned motivational resources (Guthrie et al., 2000), namely authentic tasks and collaboration. *Authentic tasks* refer to meaningful writing activities. Such tasks have real consequences for a child's life (Duke, Purcell-Gates, Hall, & Tower, 2006; Hibert, 1994). Past research suggests that these types of activities capture attention, raise questions, and promote active learning, because they call on autonomous regulation and develop perceived competence in the educational task (Boscolo & Gelati, 2013). *Collaboration* requires students to share their knowledge and ideas with their peers while receiving feedback on their work. Research has shown that collaboration helps reduce competition and social comparison among students (Guthrie et al., 2000) and may thus foster autonomous regulation, perceived competence, and perceived relatedness, and reduce controlled regulation.

3. The CASIS professional development framework

CASIS was developed based on knowledge about teachers' professional development (PD; Desimone, 2009). The CASIS workshop included four learning units. In Unit 1, we provided a detailed explanation of motivational resources and why they are important for children's learning and achievement. In units 2 and 3, we thoroughly defined the five pedagogical practices. Written case studies were provided to ensure that all participants had a good understanding of the concepts. We also illustrated each pedagogical strategy with a series of videos featuring teachers and their students. Additionally, we asked teachers to observe their own practices (videotaped) in light of the five proposed pedagogical practices. Several studies have demonstrated the usefulness of classroom videos to support teacher learning (Visnovska & Cobb, 2013). This way, teachers can gauge their progress on goal achievement. Self-observation, combined with discussions with the PD facilitator, can thus motivate teachers to make behavioral changes. Unit 4 focused on the teachers' own competencies in applying the pedagogical practices.

We designed each unit to include core characteristics of PD programs that have been demonstrated to be effective in improving teachers' instructional practices (see Desimone, 2009), namely a) content focus (i.e., all examples are in line with the writing content to be covered in second grade), b) active learning (i.e., teachers observe videos of other teachers, share their “usual” teaching practices and those they have adopted in light of CASIS, and do some in-session collaborative work), c) coherence (i.e., the material taught is consistent with the Québec Education Program), d) duration (i.e., CASIS is a 16-h training workshop spread over one semester, a duration in line with most recommendations in the field; Desimone, 2009), and e) collective participation (i.e., when possible, more than one teacher from the same school participated in CASIS, to provide potential interactions that could facilitate learning of the five pedagogical practices).

4. Contribution to existing knowledge and hypotheses

This study contributes to the existing knowledge in four ways. First, to our knowledge, it was one of the first to integrate, into a PD program, not only autonomy support (see Su & Reeve, 2011), but also other pedagogical practices intended to foster motivational resources and achievement. Second, it did not examine the impact of CASIS solely on teachers' pedagogical practices, but also on students' motivational resources and writing achievement (Desimone, 2009). Third, we tested the effectiveness of CASIS using observational data, standardized dictation, and a quasi-experimental design involving pretest–post-test measures. Fourth, the PD program was based on a solid theoretical framework with substantial empirical support (see Ryan & Deci, 2009).

For a better understanding of the hypotheses, please consult Fig. 1 showing the timeline of the study. *The first hypothesis* posited that while controlling for pedagogical practices at pretest, second-grade teachers exposed to CASIS would use more autonomy support, involvement, structure, authentic activities, and collaboration at post-test compared to the control group. *The second hypothesis* proposed similar changes (from September 11 to June 12) in children's motivational resources, such that children whose teachers were exposed to CASIS were expected to show higher intrinsic and identified regulation, higher perceived competence, higher perceived relatedness to their teacher, and lower controlled regulation than children in the control group. *The third hypothesis* posited that students whose teachers were exposed to CASIS would have better

grades on post-test dictation. This third hypothesis would be tested while considering teachers' assessments of their students' writing achievement at pretest.

5. Method

5.1. Participants and procedure

The participants were 18 second-grade teachers and 277 of their students. The teachers worked in 12 different elementary schools located in the larger Quebec City area, in diverse socioeconomic neighborhoods. More specifically, according to official documents from Quebec's ministry of education (MELS, 2012), five schools were located in a very socioeconomically disadvantaged neighborhood, two in a socioeconomically disadvantaged neighborhood, four in a socioeconomically advantaged neighborhood, and one in a very socioeconomically advantaged neighborhood. The teachers were all women, and their mean age was 42.11 years (range: 33–54). Seventeen teachers worked full-time and one, part-time (i.e., four days a week instead of five). They had an average of 16.47 (SD = 5.90) years' experience as elementary school teachers and 8.28 years' experience (SD = 3.968) teaching second grade. The students' mean age was 7.23 years (SD = .504) at the beginning of the school year, with a slight majority of girls (51%; 3.6% of the data on gender were missing).

The 12 schools were randomly assigned to one of two conditions: CASIS or control. Note that the schools, not the teachers, were randomly assigned to either the CASIS or control condition. The control group did not receive any alternative professional training during the study's duration. If the teachers had been randomly assigned to either condition, teachers in either group could have been working at the same school. Therefore, CASIS teachers could have discussed the pedagogical practices with control teachers, which could have had dramatic effects on the internal validity of the study. The random assignment was planned so as to create a control and experimental group with an equal number of participants. Seven schools were assigned to the CASIS condition (nine teachers) and five, to the control one (nine teachers). Table 1 summarizes the teachers' and students' characteristics for CASIS ($n = 135$) and controls ($n = 142$). Class sizes ranged between 10 and 21 students. Table 1 shows class sizes for the control and experimental groups. No significant between-group differences were observed in these characteristics using a chi-square test and several t-tests ($ps < .05$). Children's self-report measures were collected on three occasions, after a writing lesson (October 2011, February 2012, and June 2012). Teachers' self-report and observational measures were collected on two occasions (October 2011 and June 2012). Fig. 1 presents the data collection time frame. Time-1 measures were all collected before the workshop sessions to document training effects. No compensation was offered to teachers or students. At the end of the study, teachers in the control group received the CASIS workshop. To recruit the 18 teachers, we sent pamphlets explaining the study procedure and goals to school boards in the Quebec City area (Quebec, Canada). Teachers who were interested contacted us directly. Unfortunately, we do not know the number of teachers who received our pamphlet.

5.2. Children's measures

5.2.1. Regulation types in writing

We used the Elementary School Motivation Scale (ESMS; Guay et al., 2010) to measure regulation types in writing. The original version of the ESMS contains 27 items assessing regulation types in three school subjects: reading, writing, and math. In this study, children completed only the nine items addressing writing (three items per regulation type). Children were asked to indicate the extent to which each item corresponded to their perceptions. 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), rated on the following scale: (1) “never,” (2) “sometimes,” (3) “frequently,” and (4) “always.” Table 2 presents the Cronbach's alphas for the scores on each regulation type across the three measurement times. Internal consistency values are acceptable, except for some values below the .70 cut-off value at Time 1 and 2. However, these results are consistent with past research on young elementary school children (see Guay et al., 2010).

5.2.2. Perceived competence in writing

Four items were adapted from the Academic Self-Description Questionnaire (Marsh, 1990) to assess perceived academic competence in writing (e.g., “Writing is easy for me”). Children were asked to rate each item on the same scale used for regulation types. These items were used in a previous study, with reliable and valid scores (Guay et al., 2010). Table 2 presents the Cronbach's alphas for the scores across the three measurement times.

5.2.3. Relatedness to teachers

Three items were taken from the Interpersonal Relationships Quality Scale (IRQS) developed by Sénécal, Vallerand, and Vallières (1992) to assess perceived relatedness to teachers (“When I am with my teacher, I feel important”). Children were asked to rate each item on the same scale used for regulation types. Table 2 presents the Cronbach's alphas across the three measurement times. Internal consistency values are acceptable, except for Time 1, when it was lower than the .70 cut-off value.

5.2.4. Post-test dictation

We developed a dictation that was administered at the end of the school year. We thus asked the students to write a text that was read aloud to them by a research assistant who did not know in which group the teachers were assigned (experimental or control). Such a task evaluates spelling skills and phonological processing. The dictation contained 82 vocabulary words commonly used in second grade. Dictations were corrected by a research assistant (blind to the experimental condition) for grammatical and vocabulary mistakes. Dictation scores could vary from 0 to 106, but the final score for the analysis was calculated out of 100 to facilitate the interpretation. We chose a dictation over a written production for three reasons. First, it is a relatively efficient way to evaluate if students master vocabulary words and grammar rules. Second, the correction costs are lower than if we had asked some judges to rate a writing production on other aspects of writing (e.g., relevance of ideas, quality of wording). Third, since this test is exactly the same for all students, the results could be compared.

5.3. Teachers' measures

5.3.1. Students' writing achievement

At Time 1 (pretest), teachers were asked to assess their students' writing achievement by rating the following six skills: relevance of ideas, quality of wording, spelling, text organization, penmanship, and strategy. They used the following scale: 1) student's achievement does not at all meet expectations for Grade 2 (using three grades: E -, E, or E +); 2) student's achievement does not meet expectations for Grade 2 (D -, D, or D +); 3) student's achievement minimally meets expectations for Grade 2 (C -, C, or C +); 4) student's achievement meets expectations for Grade 2 (B -, B, or B +); and 5) student's achievement surpasses expectations for Grade 2 (A -, A, or A +). All letters were converted into numbers (1 to 15; 1 = - E, 2 = E ... 15 = A +). The scores on the six skills were thus combined to form a single score.

The validity of teachers' ratings has been established in past studies. For example, Frentz, Greshman, and Elliot (1991) reported correlations ranging from .43 to .72 between teachers' ratings of achievement and the Peabody Individual Achievement Test and the Wechsler Intelligence Test for Children—Revised, thereby providing good support for the validity of teachers' ratings of achievement.

5.3.2. Pedagogical practices

Each teacher was videotaped in her classroom giving a writing lesson on three occasions over a two-week period. Practices were assessed at the beginning (pretest) and end of the school year (post-test). Each lesson lasted approximately 45 min. We videotaped three lessons to ensure a valid assessment of the five practices used. Two well-trained research assistants were asked to evaluate the pedagogical practices with a Q-sort procedure. They were blind to the group to which the teachers had been assigned.

The Q-sort measure contains a pool of 45 specific behaviors on cards used to assess the five pedagogical practices and the degree of control that the teachers used. Each evaluator was asked to watch the 45-minute video and then to perform the Q-sort using a two-step procedure. First, the evaluator had to sort the specific behaviors into three different piles: 1) does not correspond to the teacher during the lesson; 2) corresponds somewhat to the teacher during the lesson, and 3) corresponds well to the teacher during the lesson. After the initial sorting, the evaluators divided the three piles into the following five piles: 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. The number of cards to be assigned to each pile was not fixed.

Each evaluator rated all the teachers on all 45 cards on three occasions at the beginning and end of the school year. The average inter-rater reliability coefficient was .76 at Time 1 and .70 at Time 2. Internal consistency was somewhat low for the card scores on each pedagogical practice and for the control dimensions. We therefore removed a total of 10 cards from the initial version. Table 3 presents the internal consistency values for this short version, and all are acceptable (>.70). The evaluators' ratings on the selected cards were averaged to produce a composite rating score for each pedagogical practice at Time 1 and Time 2.

6. Results

6.1. Teachers' pedagogical practices

We performed six ANCOVAs to determine whether the post-test pedagogical practices differed between groups (CASIS vs. control). The pretest score was used as covariate for each pedagogical practice. Table 4 presents the F-tests and means. A Bonferroni adjustment was made because we had performed six ANCOVAs ($.05/6 = .008$). None of the results were significant at $p < .008$. However, these non-significant effects may be due to a lack of statistical power. With small samples, it could be risky to focus solely on p-values. Estimates of the effect size could be more informative. We therefore computed Cohen's d for all tests, and most could be qualified as medium or large according to the benchmarks proposed by Cohen (1992), whereby 0.2 equates to a small effect, 0.5 equates to a medium effect, and values greater than 0.8 equate to large effects. The only small effect found was for providing structure ($d = .12$).

6.2. Regulation types, perceived competence, relatedness to teachers, and dictation

We performed six hierarchical linear model (HLM) analyses, one for each regulation type, and one each for perceived competence, perceived relatedness to teachers, and the post-test dictation. A Bonferroni adjustment was made because we had performed six analyses ($.05/6 = .008$) on students' outcomes. The fixed factors were: 1) group (CASIS vs. control); 2) students' Time 1 (pretest) writing achievement (assessed by teachers); 3) global score for Time 1 pedagogical practices, including autonomy support (i.e., the total autonomy support score was calculated by subtracting teachers' scores on the control dimension from their score on the autonomy support dimension), involvement, structure, and authentic tasks; 4) collaboration; and 5) four interaction effects (all fixed factors over time). Because the collaboration scores correlated less with the four other pedagogical practices, they were entered separately in six models. Random effects in the models were intercept and time. The crucial estimate in these regression models (except for Model 6) is the group \times time interaction, which should be significant to provide support for the effect of CASIS on students' outcomes.

Table 5 presents all fixed effects. The group \times time interaction effect is significant only at $p < .008$ for intrinsic motivation ($p = .001$). Fig. 2 shows the trajectories of the control and CASIS groups. The CASIS group shows a significant increase for intrinsic motivation ($b = .20$, $p = .001$), whereas the control group shows a decrease as indicated by a Cohen's d of .31 (small effect size). No significant effects ($p < .008$) of group \times time were observed on perceived competence, identified regulation, controlled regulation or perceived relatedness to teachers. Results for the post-test dictation show a significant group effect ($p = .039$) at $p < .05$ but not when the p value is corrected at the .008 level. It appears that the CASIS group scored higher than the control group on the post-test dictation, even when controlling for students' prior writing achievement. However, we have to be careful because this effect was non-significant at .008.

7. Discussion

The goal of this study was to determine whether the CASIS professional development (PD) program can increase effectively teachers' use of five pedagogical practices and foster second-grade students' motivational resources in written French. For teachers, results based on effect size calculations reveal substantial mean differences between CASIS and control teachers in their use of five of the six pedagogical practices, although formal statistical tests indicate that these differences were non-significant. For students, the HLM analysis results indicate significant differences between the CASIS and control groups in intrinsic regulation. More specifically, the CASIS group shows increased intrinsic motivation, whereas the control group shows a decrease. Moreover, CASIS students outperformed controls on the post-test dictation, but not significantly ($p > .008$).

7.1. Implications for research

Self-determination theory has guided many empirical studies in education in the past decade (Ryan & Deci, 2009). However, few studies have investigated writing using a PD framework. In this study, we posited that teachers exposed to CASIS would use more autonomy support, involvement, structure, authentic activities, and collaboration compared to teachers in a control group. To our knowledge, this was one of the first intervention studies to examine, in addition to autonomy support (Su & Reeve, 2011), other pedagogical practices that have been positively associated with students' motivation (Boscolo & Gelati, 2013). The results show that CASIS is relatively effective in increasing teachers' use of four of the five pedagogical practices and in decreasing their level of control. These promising results could be attributable to the fact that we followed Desimone's (2009) recommendations on effective features to include in a PD program as well as the use of classroom videos (Visnovska & Cobb, 2013). However, further work is needed to understand why CASIS was less effective in changing how teachers provided structure. Was it because this practice is considered more difficult to implement in the classroom? Indeed, providing accurate feedback to children and offering differentiated instruction for less able children could be perceived by teachers as daunting tasks. Overall, these results provide good support for our first hypothesis when interpreted in terms of effect size. However, no definitive conclusion could be reached based on formal statistical tests. Therefore, these results need to be replicated in a larger sample of teachers.

Research on teachers' PD usually focuses on evaluating changes in teachers' pedagogical practices, with only limited attempts to assess the effects on children's outcomes (Desimone, 2009). In this study, following Desimone's (2009) recommendation, we assessed children's motivational resources and achievement. The results provide some support for the second hypothesis, notably for intrinsic regulation. This finding is in line with past research showing that these pedagogical practices can foster intrinsic motivation (e.g., Boscolo & Gelati, 2013; Ryan & Deci, 2009). It is noteworthy that students in the control group (i.e., whose teachers were assigned to the control group) showed lower intrinsic regulation through time. These results might be explained by the increasing complexity of writing exercises over the school year, leading to decreased intrinsic regulation (Boscolo & Gelati, 2013). Comparing the developmental trajectories for the two groups on this outcome, we may conclude that CASIS not only prevents this natural drop, but also acts to enhance this resource.

Note that we found no significant effects for identified or controlled regulation. The non-significant result for identified regulation is surprising because some students do not much enjoy writing. In fact, children could be expected to increase their identified regulation more easily than their intrinsic motivation. It could be that in Grade 2, children are too young to identify with a task. Significant effects on identified regulation would be more likely to be observed in older students. The reliabilities, which improved over the three measurement times, provide some support for this explanation. The absence of significant between-group differences in controlled regulation is also worrisome. If the teachers used most of the pedagogical practices taught but were less controlling, we should have observed a corresponding decrease in students' controlled regulation. Future studies are needed to understand this unexpected finding. Furthermore, the lack of between-group differences in students' perceived relatedness to teachers and perceived competence in writing was unexpected. Because we focused on three pedagogical practices in CASIS that are in line with the person-centered teaching approach (Cornelius-White, 2007), we should have observed a difference in this respect. However, because the students in this study were quite young, they may have been reluctant to acknowledge that they did not like their teacher or that they felt incompetent in writing. The fact that CASIS students did not significantly ($p > .008$) outperform controls on the post-test dictation is also disappointing. However, the direction of the effect (CASIS students obtained higher scores than controls did) is in line with past research showing that emotional support by teachers predicts students' performance on standardized early literacy tests in preschool and first grade (Baker et al., 2006).

7.2. Implications for research in teachers' professional development

According to Desimone (2009), research has identified teachers' PD as an important element in improving the quality of schooling. In Quebec, a similar avenue has been taken in the past five years, with numerous PD projects funded by Quebec's ministry of education. Desimone (2009) concludes that a consensus has been reached in the field of teachers' PD that five core features play a determinant role in the effectiveness of a teachers' PD program, namely content focus, active learning, coherence, duration, and collective participation. In this study, we have shown that integrating these core features in CASIS enabled us to change how teachers use pedagogical practices. However, some of these core features may play a greater role than others in the effectiveness of a PD program, and future studies could attempt to identify these features.

7.3. Limitations and future directions

Although this study used a quasi-experimental design and objective measures of pedagogical practices and achievement, some limitations need to be considered when interpreting the findings. First, the teachers' sample size was relatively small which could have somewhat inflated the effect size reported (Kühberger, Fritz, & Scherndl, 2014). Second, we did not determine whether CASIS was more effective for different subgroups of students (e.g., students with learning difficulties; family background variables, such as education level, family income, gender) or teachers (e.g., level of psychological distress, school type, gender). Further studies are needed to determine whether CASIS is generally effective for students and teachers. Third, other outcomes need to be considered, such as children's peer acceptance, children's level of externalizing and internalizing behaviors, students' school engagement, and cognitive self-control. Finally, it would be useful to investigate whether CASIS has some benefits for the teachers themselves, such as greater motivation, higher teaching self-efficacy, and lower self-reported burnout symptoms. In sum, this

study found that offering a PD workshop on teachers' pedagogical practices could be an effective way to improve teachers' pedagogical practices as well as students' intrinsic motivation.

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Table 1*Teachers' and students' characteristics: CASIS and control groups*

Groups and Characteristics	CASIS	Control
Teachers		
1. Total years' teaching experience	18.78	13.88
2. Years' experience teaching second grade	10.00	6.56
3. Age	43.11	41.11
4. Class size	15.00 (range 10–20 students)	15.78 (range 14–21 students)
Students		
1. Age	7.25	7.21
2. Gender	49% girls	57% girls

Table 2

Reliabilities, means, and standard deviations for perceived competence, regulation types, and relatedness to teachers as function of groups

Variables	α T1	α T2	α T3	<u>Mean T1 (SD)</u>		<u>Mean T2 (SD)</u>		<u>Mean T3 (SD)</u>	
				CASIS	Control	CASIS	Control	CASIS	Control
Intrinsic regulation	.74	.74	.76	3.15 (.87)	3.18 (.81)	3.20 (.87)	2.96 (.87)	3.32 (.74)	2.95 (.93)
Identified regulation	.63	.69	.79	3.61 (.63)	3.64 (.58)	3.68 (.58)	3.55 (.69)	3.55 (.75)	3.48 (.76)
Control regulation	.57	.68	.73	2.95 (.87)	3.24 (.73)	2.73 (.98)	2.79 (.90)	2.67 (1.01)	2.76 (.93)
Perceived competence	.75	.74	.74	3.02 (.74)	3.23 (.62)	3.14 (.67)	3.17 (.70)	3.20 (.67)	3.14 (.65)
Relatedness to teachers	.62	.73	.80	3.55 (.64)	3.56 (.64)	3.45 (.79)	3.41 (.79)	3.48 (.78)	3.34 (.84)
Dictation								73.64 (14.85)	75.30 (11.01)

Scores on each variable could vary from 1 to 4.

Table 3

Reliabilities, means, and standard deviations for the five observed pedagogical practices as a function of groups

Variables	Number of items	α T1	α T2	<u>Mean T1 (SD)</u>		<u>Mean T2 (SD)</u>	
				CASIS	Control	CASIS	Control
1. Involvement	9	.79	.68	4.10 (.52)	3.86 (.28)	4.23 (.32)	3.91 (.39)
2. Collaboration	4	.77	.83	1.55 (.63)	1.40 (.34)	1.73 (.76)	1.42 (.28)
3. Structure	9	.82	.76	3.68 (.36)	3.08 (.48)	3.72 (.31)	3.28 (.48)
4. Real-world interactions	5	.83	.69	3.51 (.75)	2.75 (.31)	3.53 (.74)	2.89 (.34)
5. Autonomy support	5	.72	.67	3.84 (.53)	3.61 (.32)	4.07 (.29)	3.64 (.47)
6. Control	3	.85	.85	1.51 (.73)	1.49 (.46)	1.64 (.59)	1.97 (.80)
Total number of items	35						

Scores on each variable could vary from 1 to 5.

Table 4*Results of the ANCOVA: Group effects on post-test pedagogical practices*

Variables	F-Test	<i>p</i>	Cohen's <i>d</i>	Estimate d adjusted means – CASIS	Estimate d adjusted means – Control	95% CI – CASIS	95% CI – Control
1. Involvement	F (1,15) = 1.91	.187	.77	4.18	3.96	[3.95,4.42]	[3.73,4.19]
2. Collaboration	F (1,15) = 1.07	.316	.54	1.72	1.43	[1.30,2.14]	[1.01,1.85]
3. Structure	F (1,15) = 0.07	.798	.20	3.53	3.48	[3.28,3.77]	[3.24,3.73]
4. Meaningful/Authentic	F (1,15) = 2.98	.105	.90	3.50	2.92	[3.03,3.97]	[2.45,3.39]
5. Autonomy support	F (1,15) = 3.51	.081	.96	4.04	3.68	[3.75,4.32]	[3.39,3.96]
6. Control	F (1,15) = 1.88	.191	.70	1.63	1.98	[1.25,2.02]	[1.60,2.36]

Scores on each variable could vary from 1 to 5.

Table 5

Results of the linear mixed models on regulation types, perceived competence, and relatedness to teachers across the three measurement times.

Variables	Model 1 Perceived competence			Model 2 Intrinsic motivation			Model 3 Identified regulation		
	Estimate	SE	p	Estimate	SE	p	Estimate	SE	Sig.
Intercept	1.67	.36	.000	2.71	.49	.000	3.17	.35	.000
Time	0.19	.42	.683	-0.25	.51	.619	-0.09	.50	.849
Group	-0.08	.04	.081	-0.04	.06	.548	-0.01	.04	.747
Time*group	0.09	.05	.075	0.20	.06	.001	0.04	.06	.472
Pedagogical practices T1 (PPT1)	0.21	.09	.011	0.09	.12	.440	0.10	.09	.219
Collaboration T1 (CT1)	-0.16	.08	.050	-0.05	.11	.663	-0.03	.08	.701
Writing performance T1 (WPT1)	0.10	.02	.000	0.02	.02	.331	0.02	.02	.309
Time * PPT1	-0.08	.10	.442	0.04	.12	.734	0.01	.12	.965
Time * CT1	0.27	.09	.005	0.07	.11	.556	0.13	.11	.236
Time * WPPT1	-0.03	.02	.119	-0.01	.02	.905	-0.02	.02	.383
	Model 4 Controlled regulation			Model 5 Relatedness to teachers			Model 6 Post-test dictation		
	Estimate	SE	Sig.	Estimate	SE	Sig.	Estimate	SE	Sig.
Intercept	3.19	.46	.000	3.07	.40	.000	34.29	6.47	.000
Time	-0.17	.58	.767	-0.40	.49	.409	--	--	--
Group	-0.14	.06	.017	-0.03	.05	.584	1.85	0,83	.039
Time*group	0.05	.07	.448	0.04	.06	.543	--	--	--
Pedagogical practices T1 (PPT1)	-0.02	.11	.861	0.08	.09	.401	-1.53	1.60	.354
Collaboration T1 (CT1)	-0.04	.10	.720	0.11	.09	.222	-0.62	0.27	.680
Writing performance T1 (WPT1)	0.01	.02	.704	0.01	.01	.862	4.30	1.47	.000
Time * PPT1	0.07	.14	.604	0.08	.12	.486			
Time * CT1	-0.07	.13	.601	-0.02	.11	.858	--	--	--
Time * WPPT1	-0.03	.03	.229	0.01	.02	.813	--	--	--

Figure 1. Study time frame

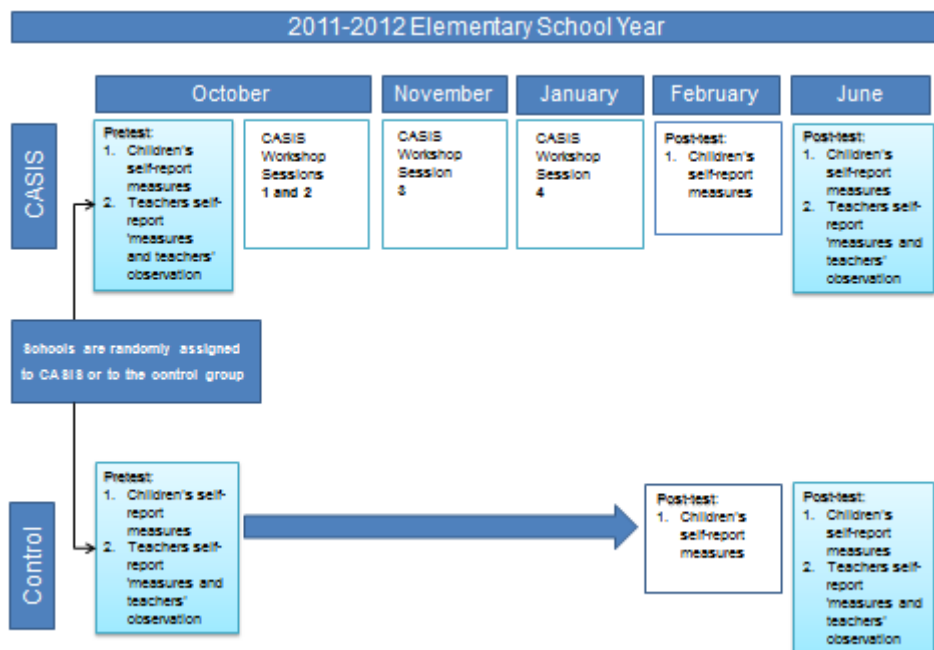


Figure 2. Results for intrinsic motivation

