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Eliciting classroom motivation : not a piece of cake

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Eliciting intrinsic motivation in pre-vocational secondary education through motivational why- and how-information³

The motivation and self-regulation models developed by Zimmerman (2000) and Ryan and Deci (2000) provide strategies to optimize motivational orientation in the classroom. In higher education contexts these strategies yielded positive results. This study seeks to extend these findings to secondary education. The strategies investigated aim at influencing task-specific motivational beliefs and perceptions that students hold about the goal and uses of and the approach to a task. In a field experiment we tried to influence students' intrinsic motivation and hence their actual study behaviour by means of five different types of written motivational information, namely intrinsic why-information, extrinsic why-information, how-information, a combination of intrinsic why- and how-information, and a combination of extrinsic why- and how-information. A control condition completed the experimental design. Results showed no effects of the experimental conditions on self-regulatory skills, intrinsic motivation, performance, and persistence. We conclude that eliciting intrinsic motivation in secondary education via motivational information is not that straightforward, and that the possibilities should be investigated further.

Keywords: motivational intervention; intrinsic motivation; self-regulation

Two important personal factors that affect classroom behaviour are motivation (Corno & Mandinach, 1983; Entwistle, 2000) and self-regulation (Boekaerts, 2005; Zimmerman, 2000). Motivation is a prerequisite for behaviour and can be either intrinsic or extrinsic depending on the underlying attitudes and goals that initiate action (Ryan & Deci, 2000). Self-regulation concerns the degree to which learners are metacognitively, motivationally, and behaviourally active participants in their own learning process (Zimmerman, 1986). Indeed, there is a body of research which shows that motivation and self-regulation positively influence study behaviour and study performance (e.g., Boekaerts, 2005; Meece, 1994; Pintrich & Schrauben, 1992; Ryan & Deci, 2000; Schunk, 1991). However, students' motivation and self-regulation are often problematic.

The decline of motivation and lack of self-regulation of the learning process within secondary education has received increasing attention (Peetsma &

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Van der Veen, 2008). Many secondary education teachers find that something has to be done about the decline of classroom motivation. Furthermore, motivation problems in pre-vocational secondary education are considerably higher than in other educational contexts (e.g., Dijsselbloem, 2008; Van der Veen & Peetsma, 2009). However, it is difficult for teachers to do something about this. Often, due to strict and full schedules and the demands of teaching, selecting theoretical insights and implementing these into practice is not easy. Therefore, in this study we investigated strategies to influence classroom motivation in pre-vocational secondary education that are easy to apply in the classroom and that have already been successful in other contexts. Those strategies have been derived from Ryan and Deci's self-determination theory (SDT) and Zimmerman's social-cognitive theory of self-regulation and motivation. These theories emphasize the importance of providing specific information about the learning goals (the *why* of learning) and learning strategies (the *how* of learning).

4.1.1. Optimizing motivational orientation from the perspective of self-determination theory

Research within the SDT framework emphasizes the importance of creating a favourable learning environment that elicits intrinsic motivation. Intrinsic motivation is the tendency to engage in activities for the inherent joy an activity gives and is considered to be superior to extrinsic motivation, where behaviour relies on external rewards (Deci & Ryan, 1985; Ryan & Deci, 2000). Increased intrinsic motivation coincides with more autonomous and self-determined behaviour, which results in higher well-being caused by the satisfaction of the underlying psychological needs (i.e., autonomy, competence, and relatedness). Many studies have confirmed that intrinsic motivation elicits constructive behaviour such as persistence, preference for understanding, and curiosity, which in turn results in better study performance (Ryan & Deci, 2000). It is also associated with well-being. Vansteenkiste, Simons, Lens, Sheldon, and Deci (2004) have summarized this as follows: 'pursuing goals with strongly salient extrinsic content (e.g., wealth, image, and fame) tends to be associated with poorer mental health than does pursuing goals with strongly salient intrinsic content (e.g., relationships, growth, community, and health). Specifically, SDT proposes that intrinsic goal pursuits have positive effects on well-being [...]' (p. 246).

Providing students with a meaningful rationale as to why a task is important or relevant promotes students' self-determination (Reeve, 2002). An approach that is more and more used within SDT is to establish an intrinsic orientation, aiming at influencing students' motivational beliefs and perceptions about the intrinsic value of a specific task. Emphasizing that students will enjoy a task because of the usefulness in everyday life of the skills trained promotes intrinsic motivation. We refer to this kind of information as *intrinsic motivational why-information*. Likewise, an extrinsic orientation can be established by providing *extrinsic motivational why-information*. For example, extrinsic motivational why-

information emphasizes that a task is instrumental to demonstrate one's ability to peers and teachers.

Positive effects of the strategy to influence motivational orientation by inducing motivational beliefs and perceptions have already been reported for students in higher education (most of these found during language classes), and for students in 10th-11th grade who voluntarily participated in physical education classes (see Martens, De Brabander, Rozendaal, Boekaerts, & Van der Leeden, 2010; Schaffner & Schiefele, 2007; Simons, Dewitte, & Lens, 2003; Vansteenkiste, Lens, & Deci, 2006; Vansteenkiste et al., 2004; Vansteenkiste, Simons, Lens, & Soenens, 2004; Vansteenkiste, Simons, Lens, Soenens, Matos, & Lacante, 2004; and Vansteenkiste, Timmermans, Lens, Soenens, & Van den Broeck, 2008). In these studies students were provided with written motivational information, either intrinsic or extrinsic, before they started a specific classroom assignment. Students provided with information on the fun and short-term usefulness of the task at hand (i.e., intrinsic motivational information) showed higher self-report scores on intrinsic motivation, tangible persistence scores, as well as a better test score performance. Extrinsic goal framing resulted in lower scores on intrinsic motivation, conceptual learning, and persistence. For example, three studies reported by Vansteenkiste et al. (2004) showed that information appealing to intrinsic goals (i.e., personal growth, health, or community contribution) resulted in better learning and better academic performance than when extrinsic goals were emphasized (i.e., money or an attractive image). They concluded that when teachers use intrinsic goals to frame learning activities students become more dedicated and more genuinely engaged in these activities. Likewise, Simons et al. (2003) reported that intrinsic motivational information (i.e., emphasizing the usefulness of the task for obtaining personally relevant goals) elicits qualitatively better motivational and behavioural responses, as shown by higher intrinsic motivation and persistence, than extrinsic motivational information (i.e., emphasizing the possibility of future external rewards).

4.1.2. Optimizing motivational orientation from the perspective of self-regulation theory

The importance and impact of self-regulation on the learning process has been extensively described by Boekaerts (2005) and Zimmerman (2000). Self-regulation theory is concerned with *how* individuals regulate their own learning processes in order to attain their goals by activating and sustaining motivation, cognition, behaviours, and affects (Zimmerman, 1986). Information on how to approach an assignment helps students to improve their ability to complete the assignment successfully (Eccles & Wigfield, 2002). Moreover, providing this information avoids self-doubt and low confidence, leading to impediment of effort and interest (Boekaerts, 2005).

The capacity to modulate behaviour involves learning strategies (Zimmerman, 2008), which can be divided into cognitive and metacognitive self-regulatory skills (e.g., effort regulation and the use of metacognitive strategies) and

resource management skills (e.g., time management). These self-regulatory skills described in the first phase of Zimmerman's (2000) social cognitive theory of self-regulation and motivation involve task analysis (for instance including goal setting and strategy planning) and activation of motivational beliefs (such as self-efficacy and outcome expectations), which set the stage for action and precede commitment. The second phase covers the effort that underlies attention and action, and involves self-control (for instance concentration and persistence) and self-observation processes (such as self-recording). The third phase involves the response to an experience, including self-judgment (such as self-evaluation and causal attribution) and self-reaction (for instance self-satisfaction, affect, and adaptive defence). Importantly, the outcome of the third phase should affect the first phase to complete the cycle.

In this paper we will refer to providing motivational information on how to use self-regulatory strategies with the term *motivational how-information*. The focus is on boosting strategic planning, self-efficacy, concentration, and persistence. For example, motivational how-information emphasizes that it is important to concentrate during the assignment and to think of a strategy beforehand. The difference with why-information is that how-information is not related to the reason why the assignment is relevant but to the way in which the assignment may be successfully completed.

Nuckles, Hubner, Dumer, and Renkl (2010) showed that the quality of short-term learning outcomes indeed increase when students are prompted with how-information. When self-regulatory skills improve, levels of course performance and academic grades increase simultaneously (Zimmerman & Martinez-Pons, 1986; 1988). Furthermore, research evidence shows that intrinsically motivated learners make more use of learning strategies and invest more effort in learning than do extrinsically motivated learners (Deci & Ryan, 1985; Deci, Vallerand, Pelletier, & Ryan, 1991; Pintrich & Schunk, 2002).

4.1.3. Replicating findings in a secondary education context

An important advantage of the method of providing motivational information to students is that it is relatively simple to implement. Because in secondary education motivational problems are very persistent, we have tried in our study to replicate the promising findings recapitulated in sections 1.1. and 1.2. in pre-vocational secondary education. In total, there were six conditions (see Table 1). In line with former research, we expect students who are provided with intrinsic motivational why-information to show higher intrinsic motivation, more persistence, and better performance than students who have not been given this information. When students learn about the fun aspect of a task (i.e., intrinsic motivational information), they will enjoy the task (i.e., have a higher intrinsic motivation), and in turn persist and improve performance (i.e., they will be more curious to perform similar tasks in order to improve their performance). Further, we expect that when students read about the importance of using their self-regulatory skills (motivational how-information), they will actually use their self-regulatory skills

(metacognitive skills and effort regulation). When they are consciously using strategies to accomplish the task and regulate their effort students will be able to enjoy the task more (i.e., have a higher intrinsic motivation), and in turn also persist and perform better (i.e., be more curious to perform the task again and obtain a higher test score on the specific task).

Our first hypothesis is that students provided with intrinsic motivational why-information have higher scores on intrinsic motivation, performance, and persistence than students who do not receive this information. Likewise, we hypothesize that students provided with motivational how-information use their self-regulatory skills better in the service of the task and have higher scores on intrinsic motivation, performance, and persistence, than students not provided with this information. We expect the positive effects of the how and intrinsic why information to add up. Hence, our third hypothesis is that students provided with a combination of intrinsic motivational why-information and how-information respond best in regard to the use of their self-regulatory skills, their intrinsic motivation, performance, and persistence, as compared to students in any other of our experimental conditions.

4.2. Method

4.2.1. Sample

Six schools with a pre-vocational secondary education track volunteered to participate within the present study. In the Netherlands pre-vocational secondary education is the lowest level of secondary education and is attended for four years by students between 12 and 16 years of age as a preparation to vocational training. Preceding the experiment, 618 students (57% boys, $M_{age} = 14.6$ $SD = 1.0$) were randomly assigned to one of the six conditions (see Appendix for full instructional texts). The composition of the experimental and control groups with respect to gender was fairly equal (see Table 1).

Table 1.
Experimental conditions

	Emphasis in manipulation text on...	<i>n</i>	M_{age}	boys
1. Intrinsic why-information	fun, enjoy, useful, handy	115	14.5	59%
2. Extrinsic why-information	grade, check, test	111	15.6	54%
3. How-information	strategy planning, self-efficacy, concentration, persistence	91	14.5	61%
4. How- and intrinsic why-information	combination of 1 and 3	95	14.5	55%
5. How- and extrinsic why-information	combination of 2 and 3	96	14.4	59%
6. Control condition	neutral information	110	14.6	55%

Note. For practical reasons cell sizes are unequal.

4.2.2. Manipulations: Motivational information

The experimental instructions for the why-information were based on research reported by Simons et al. (2003) and Vansteenkiste et al. (2004), and the how-

information was based on the crucial constructs from phases one and two of Zimmerman's social cognitive theory of self-regulation and motivation (2000) (see Appendix for full manipulation texts). After reading the instruction for the language assignment (see section 2.3.2.), students given intrinsic why-information read about the short-term usefulness of the task and the joy they would experience while doing it. Students in the extrinsic why-information condition read about the importance of grades and showing a good performance. Within the how-information condition students received information with regard to strategy planning, self-efficacy, concentration and persistence. Finally, students in the control condition read a neutral text that lacked motivational information. In total, there were six conditions, with conditions one and three and conditions two and three combined into two separate conditions (see Table 1).

4.2.3. Instruments

4.2.3.1. Manipulation check.

We used three subscales with three seven-point Likert items each ('is very unlike me' versus 'is very like me') to check the effectiveness of the manipulations. The intrinsic manipulation subscale consisted of items such as: 'I believe this task will be useful when I work on other school assignments and when reading leisure texts'. A sample item of the extrinsic manipulation subscale is: 'I believe this assignment will help me to get better grades in other classes'. The subscale of the how-manipulation check consisted of items such as: 'If I first think about my strategy for this assignment, I will manage to complete it'. Three separate principal component analyses showed good fits for one-component solutions (intrinsic manipulation check: $\alpha = .81$; $R^2 = 63.56$; $r = .70/.85$; extrinsic manipulation check: $\alpha = .75$; $R^2 = 57.90$; $r = .61/.88$; how manipulation check: $\alpha = .60$; $R^2 = 61.72$; $r = .70/.77$). The assumption of normality for all subscales was satisfied. Using planned contrasts within a one-way ANOVA, we checked whether students in the intrinsic conditions (1 and 4, see Table 1) scored significantly higher on the intrinsic manipulation subscale than students in the other conditions. No significant differences between the conditions were found. For the extrinsic subscale, planned contrasts within a one-way ANOVA showed that students in the extrinsic conditions (2 and 5, see Table 1) scored significantly higher than students in the other conditions ($p < .01$). Students in the extrinsic condition ($M = 3.97$) and extrinsic-how condition ($M = 3.89$) scored significantly higher than students in the intrinsic ($M = 3.50$), control ($M = 3.64$), intrinsic-how ($M = 3.62$), and how conditions ($M = 3.50$). The one-way ANOVA on the how manipulation subscale showed no significant differences between the conditions.

Thus, it was only for the extrinsic motivational information that a significantly higher score for the extrinsic groups on the manipulation check was retrieved. No significantly higher scores for the intrinsic and how-information conditions were found on the respective manipulation checks, implying that those manipulations were not perceived as we intended.

4.2.3.2. Performance.

Together with experienced secondary school teachers we developed language tasks for each grade. These tasks measured revision skills and were based on the writing revision problem tasks developed by Zimmerman and Kitsantas (1999). Students had to rewrite two or three short sentences into a single, inclusive, but non-redundant sentence (see Figure 1). The sentences were scored on technical writing aspects (e.g., spelling; grammar) and content (i.e., primary and secondary main words) according to a correction procedure designed for Dutch-speaking students by Boekaerts, Cascallar, Costigan, and Rozendaal (2008). The performance score was the sum of the scores on technical and content aspects. The scores on the different tasks were only comparable within the same grade, and for this reason the performance scores were z-standardized within every grade group before analysing the data. We made sure that the assignment was in line with the curriculum and comparable to other tasks used in the participating schools.

<p>They tried to examine parts of their bodies which they normally cannot see. The elephants moved their trunks to look into their mouths. (23 words)</p> <p style="text-align: center;"><u>Revision:</u></p> <p>The elephants used their trunks to examine the inside of their mouths. (12 words)</p>
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Figure 1. Example of the revision task.

To measure the reliability of the scoring system, a second coder also scored 10 assignments of each task at each grade level. Agreement was assessed by computing coherence (r) between the two coders. The average coherence in the sample was 88%. Disagreements were solved through discussion, which resulted in minor revisions of the scoring system. All normality assumptions of the revision tasks were satisfied.

4.2.3.3. Persistence.

Information on persistence was collected by means of thirteen 7-point Likert scale items ('is very unlike me' versus 'is very like me') after the task. An example is 'I'd like to find out when I can apply the skills we practised'. Cronbach's alpha for this subscale was .87.

4.2.3.4. Motivation.

Information on intrinsic motivation was collected by means of four items using the same 7-point Likert scale items as the persistence measure. The motivation measure was derived from Ryan and Deci's interest/enjoyment subscale of the Intrinsic Motivation Inventory. A sample item is 'This assignment will be fun', with Cronbach's alpha .81.

4.2.3.5. Self-regulatory skills.

Students' use of their self-regulatory skills (i.e., metacognition, time management and effort regulation) was measured retrospectively by a Dutch-validated version (Blom, Severiens, Broekkamp, & Hoek, 2004) of the Motivated Strategies for

Learning Questionnaire (MSLQ: Pintrich, Smith, Garcia, & McKeachie, 1991). We changed the wording of the items into task-specific items. Participants could again use the same 7-point Likert scale for all items (10 items; e.g., 'Before I actually started with the assignment, I took some time to think through my strategy'). Assumption of normality was satisfied and internal consistency was good ($\alpha = .81$).

4.2.4. Procedure

All participants were presented with the language assignment in their everyday classroom environment. Data collection took place during one session (maximum 45 minutes) of a native language class with both the teacher and researcher present. The task was introduced by the teacher as part of the normal curriculum. Students had to revise two or three short Dutch sentences into a single inclusive, but non-redundant sentence. After the teacher read out the standardized instruction, participants read the instruction for the sentence revision tasks for themselves (including the experimental manipulation). The questionnaires were administered before (intrinsic motivation) and after (self-regulatory skills and persistence) working on the sentence revision tasks. All students had the informed consent of their parents and had been randomly assigned to one of the six conditions. Students were unaware of the different conditions, and neither were the teachers. In a debriefing session students and teachers were informed about the experimental conditions and the reason for not telling them upfront.

4.3. Results

4.3.1. Intercorrelations

Table 2 shows the intercorrelations between the outcome variables for the data within all conditions simultaneously. As predicted by SDT we retrieved a positive relation between intrinsic motivation and persistence ($r = .50$; $p < .001$). We did not retrieve a positive relation between intrinsic motivation and performance, and between persistence and performance. Further, we retrieved a positive relation between self-regulatory skills and respectively intrinsic motivation ($r = .46$; $p < .001$), persistence ($r = .36$; $p < .001$), and performance ($r = .09$; $p < .05$). This indicates that higher perceived self-regulatory skills coincide with higher intrinsic motivation and persistence, and with better performance.

Table 2
Intercorrelations between the outcome variables

	Intrinsic motivation	Persistence	Performance	Self-regulatory skills
Intrinsic motivation	-			
Persistence	.50**	-		
Performance	.05	-.00	-	
Self-regulatory skills	.46**	.36**	.09*	-

* $p < .05$ ** $p < .001$ (2-tailed)

Although our manipulation checks found a significant effect only for the extrinsic manipulation text, we here also present the intercorrelations between the outcome variables within the extrinsic group. We used the control condition as the reference group. Table 3 shows intercorrelations that are similar to the general results presented in Table 2. However, when tested by means of the Fisher r -to- z -transformation, the association between intrinsic motivation and persistence significantly increases ($p < .01$) to a strong association within the extrinsic group ($r = .60$, $p < .001$), compared to the medium association in the control group ($r = .26$, $p < .001$). Furthermore, the association between intrinsic motivation and self-regulatory skills also significantly increases ($p < .05$) from a medium (i.e., control group $r = .30$, $p < .001$) into a strong (i.e., extrinsic group $r = .54$, $p < .001$) association. This indicates that intrinsically motivated students in the extrinsic motivational information group show stronger persistence and self-regulatory skills than students in the control group.

Table 3

Intercorrelations between the outcome variables for the extrinsic and control (reference) groups

	Intrinsic motivation	Persistence	Performance	Self-regulatory skills
Intrinsic motivation	-			
Persistence	.26**/.60**	-		
Performance	-.05 / .01	-.06 / -.03	-	
Self-regulatory skills	.30**/.54**	.65**/ .64**	-.07 / -.09	-

* $p < .05$ ** $p < .001$ (2-tailed)

Next, effects of motivational information on self-regulatory skills, intrinsic motivation, performance, and persistence were tested by means of planned contrasts within four ANOVA analyses. The planned contrasts are shown in Table 4.

Table 4

Overview of planned contrasts

Contrast	intrinsic	extrinsic	how	intrinsic & how	extrinsic & how	control
1. intrinsic vs. other	2	-1	-1	2	-1	-1
2. how vs. other	-1	-1	1	1	1	-1
3. intrinsic and how vs. other	-1	-1	-1	5	-1	-1

First, we contrasted the students within an experimental condition with an intrinsic component (intrinsic why-information and the combination of how- and intrinsic why-information) with the four other conditions (contrast 1). Second, we contrasted the students within an experimental condition with a how component (how-information, how- and intrinsic why-information, and how- and extrinsic why-information) with the three other conditions (contrast 2). Finally, we tested whether students who received the combination of intrinsic why-information and how information scored highest on the dependent variables (contrast 3).

Results from the ANOVA analyses showed no statistically significant differences between the groups on the outcome variables; see Table 5 for the mean values based on observed scores (i.e., intrinsic motivation, persistence, self-regulatory skills) and standardized scores (i.e., performance).

Table 5

Mean values of dependent variables within the different experimental conditions

	Intrinsic motivation	Persistence	Performance	Self- regulatory skills
Intrinsic why-information	2.90 (1.25)	3.23 (.86)	.02 (1.05)	3.74 (.92)
Extrinsic why-information	3.09 (1.42)	3.41 (1.10)	.09 (1.07)	4.07 (1.11)
How-information	2.76 (1.32)	3.26 (1.00)	-.16 (.98)	3.86 (1.10)
How- and intrinsic why-information	2.85 (1.29)	3.27 (.92)	-.08 (1.06)	3.90 (.87)
How- and extrinsic why-information	3.07 (1.31)	3.42 (.96)	.01 (1.03)	4.12 (.96)
Control condition	3.09 (1.42)	3.42 (1.03)	-.10 (1.05)	4.00 (1.02)

Note. SD between parentheses and performance scores were standardized before analysis

4.4. Discussion

4.4.1. Explaining our findings

In this study we tried to test the generalizability of the positive effect found in higher education of intrinsic motivational information and how-information on intrinsic motivation, persistence, performance, and self-regulatory skills. However, in our secondary education research design we did not retrieve the same positive effects. Influencing pre-vocational secondary education students' classroom motivation and positive classroom behaviour seems not that straightforward compared to other school types. For instance, Martens et al. (2010) reported positive effects of intrinsic why information in higher education. Vansteenkiste et al. (2004; 2006; 2008) reported positive effects of intrinsic why information during language tasks in higher education and with respect to voluntary participation in gymnastics in secondary education.

Several explanations may be given. First, students worked on the assignment as part of their normal curriculum. In line with daily practice, the teacher instructed the students to work on the assignment. Second, our participants were in the adolescent age group. They participated in a compulsory language class as part of the normal curriculum. These students might respond differently to the experimental manipulations than, for example, the students involved in the Vansteenkiste et al. studies. The results with regard to our manipulation checks also question whether the motivational information was perceived as we intended. Only for the extrinsic motivational information was a significantly higher score found for the extrinsic group on the manipulation check. No significantly higher scores for the intrinsic and how-information were retrieved on the manipulation checks, which implies that those manipulations were not perceived as intended, or at least not on a conscious level. The motivational information might therefore have been interpreted differently by the students than we intended, and was maybe

not powerful enough to make any difference. Third, secondary education students are generally more extrinsically oriented and not used to intrinsic and how-information. As such, our students may have doubted the intrinsic information and neglected the how-information as beside the point. Thus, a challenge for motivation researchers is to design their interventions in such a way that students perceive the interventions the way they are intended. In other words, influencing students' motivational orientation in this context turned out to be a hard nut to crack. The mean intrinsic motivation of this large group of students proved to be below the scale average. This raises the question whether it is even possible to influence classroom intrinsic motivation in a pre-vocational secondary education context. It is feasible that the low intrinsic motivation that we found in these schools may result in a lower well-being in the long-term (Vansteenkiste et al., 2004).

We would also like to draw attention to the intercorrelations between the outcome variables. These are not as straightforward as we expected from both SDT theory and self-regulation theory. More concretely, we failed to observe a positive association between intrinsic motivation and performance, and between persistence and performance. This suggests that students in pre-vocational secondary education react differently to information provided before embarking on a learning task than students in higher education or secondary school students participating voluntarily. Furthermore, intrinsically motivated students in the extrinsic motivational information group showed stronger persistence and better perceived self-regulatory skills than students in the control group. These different associations in the extrinsic group and the reference group (i.e., control condition) between the outcome variables, indicate that research should be more refined. Aggregated results might not provide a mesh fine enough to detect expected relations and effects. For example, research could distinguish effects between and within different subgroups, both within and across time.

4.4.2. Practical implications

We conclude that the influence of motivational information as found by other researchers can not be generalized to the present context. Now that we know that the strategies investigated in this study do not have the desired and expected effects in pre-vocational secondary education, researchers and practitioners should focus on other possibilities. Disappointingly, we cannot provide clear guidelines that are easy to incorporate in the classroom on how to apply strategies to elicit motivation. Nevertheless, we hope that our study provides a modest contribution to the understanding of motivation in educational practice. We think that it is too early to conclude that motivational why and how motivation does not work in pre-vocational education. We would advice researchers to improve the wording of the informational statements used in the different experimental conditions in order to make sure that the students really understand the why and how information provided. In addition, we would advice researchers to try and influence the students' perception of autonomy in the learning situation. SDT predicts that

increasing students' perception of autonomy may increase intrinsic motivation. It may therefore be more profitable to change students' perception of the learning situation than *explaining* to them why a task is relevant or motivating. Drawing students' attention to the teacher's autonomy supportive actions may be more beneficial in the long run. Of course this is a much more radical manipulation, not easily implemented in secondary vocational education.

4.4.3. Theoretical implications

From a theoretical perspective our results imply that optimising motivation and performance in an educational context is not as straightforward as other studies have suggested. Investigating the possibilities of eliciting intrinsic motivation and positive classroom behaviour (i.e., self-regulatory skills, persistence and performance) has shed light on the generalizability of strategies derived from self-determination theory and self-regulation theory. The positive influence of motivational why information as shown by other researchers for the college level and for adolescents who participated voluntarily cannot simply be generalised to other contexts. Motivational why- and how-information did not influence the motivation, performance, and self-regulatory skills of pre-vocational secondary education students as expected. Our results indicate that there is much left to explore. Moreover, considering the relations assumed by SDT that we did not retrieve (i.e., between intrinsic motivation and performance and between persistence and performance), our results seem to question the applicability of this theory for this specific group of students. Further research should show whether pre-vocational secondary education students indeed behave according to the principles assumed by SDT. With regard to self-regulation theory, the expected positive associations were found between self-regulatory skills and respectively intrinsic motivation, persistence, and performance. These results are promising and further research into the field of influencing motivation and performance in pre-vocational secondary education is invited to confirm and extend these findings.

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Appendix: Motivational Information

Experimental condition	Written instruction
Intrinsic why-information	This assignment will help you to understand how sentences are constructed. This will be fun to do and your understanding of the Dutch language will improve. Practicing these skills will improve your language skills and you will enjoy performing those tasks. The acquired skill will be useful when you work on other school assignments and when you read leisure texts. Practicing these skills and doing this assignment is handy because you can frequently use these skills in school, in daily life, and soon also in your job or further education.
Extrinsic why-information	This assignment will not only help you to get a good grade for your Dutch class, it will also improve your grades in other classes. You need to perform this assignment seriously, because it will test your skills. The test will check whether you have learned something. After the test you will get a grade, which will be sent to your teacher. With the grade on the test you will be able to show the teacher how well you have mastered this skill. Practicing these skills and doing this assignment is necessary to perform well on the test.
How-information	This assignment will help you to understand how sentences are constructed. It is a challenging assignment, but when you try to follow the instructions step by step you will see that you'll manage to complete the task. If other students distract you, try to remain concentrated and continue with the task. Do not try to finish the task as quickly as possible, but use all the time you need until you are satisfied with your results. When you find the task difficult, do not give up immediately, but continue working until completely satisfied.
How and intrinsic why-information	This assignment will help you to understand how sentences are constructed and will be fun to do. It is a challenging assignment, but when you try to follow the instructions step by step you will see that you'll manage to complete the task. When other students distract you, try to remain concentrated and continue with the task. Do not try to finish the task as quickly as possible, but use all the time you need until you are satisfied. When you find the task difficult, do not give up immediately, but continue working until completely satisfied. This assignment is useful for other school assignments and when you read leisure texts.
How and extrinsic why-information	This assignment will help you to understand how sentences are constructed and will help you to improve your grades. It is a challenging assignment, but when you try to follow the instructions step by step you will see that you'll manage to complete the task. If other students distract you, try to remain concentrated and continue with the

	task. Do not try to finish the task as quickly as possible, but use all the time you need until you are satisfied with your results. When you find the task difficult, do not give up immediately, but continue working until completely satisfied. With this assignment you will be able to show the teacher how well you have mastered this skill.
Control condition text	This assignment was developed by researchers working at the University. Other teachers in other classes also use assignments developed by researchers. For example math and geography. Sometimes computers are used during those assignments. Teachers often like the assignments developed by others, because they can use them in their lessons. Often, teachers use assignments, books and learning materials developed by special publishers who are specialized in education and the development of learning materials. Practicing these language skills is also done at other schools.
