Fostering self-efficacy and self-regulation in higher education : a matter of autonomy support or academic motivation?

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Abstract

By implementing student-centred learning environments, higher education institutions aim to foster student self-efficacy and self-regulation. Previous research that focuses on how students perceive these learning environments usually does not take the differential impact of students' study motivation into account. However, the type of motivation might influence how students perceive their learning environment. To this end, this study investigates the relationship between students' perceived autonomy support in student-centred learning environments and self-regulation and self-efficacy by taking study motivation into account. The results indicate that autonomy-supportive teacher behaviour enhances self-efficacy for students who are autonomously motivated. Amotivated students might need other than autonomy-supportive teacher behaviour to develop self-efficacy. Self-regulation seems to play a less distinct role. Overall, when examining the effects of autonomy-supportive teaching in higher education, the quality and quantity of students' motivation has a role to play, an aspect which is important to consider in future research and practice.

Keywords

Higher education – motivation – autonomy support – self-efficacy – self-regulation

Self-efficacy and self-regulation are considered important generic competences that have been shown to be substantively related to academic performance and persistence in higher education (McKenzie, Gow, & Schweitzer, 2004; Panadero, 2017; Richardson, Abraham, & Bond, 2012; van Dinther, Dochy, & Segers, 2011; Vogel & Human-Vogel, 2016). They enable students to evaluate their learning experiences, which will influence their beliefs in their ability to perform well with regard to certain tasks (Bandura, 1997) and enable students to plan, monitor and regulate their learning (Boekaerts & Corno, 2005; Pintrich, 1999; Zimmerman & Schunk, 2011). These generic skills have increased in importance because they allow students to cope with change in their educational and future careers, and to inherently engage in continuous learning (Tynjälä, 2008). Fostering these generic skills more explicitly – alongside the promotion of discipline-specific knowledge, skills and attitudes – challenges higher education institutions (Tynjälä, 2008).

Over the last decade, learning environment research in higher education has illuminated important insights into which conditions stimulate student learning and its outcomes (Entwistle, McCune, & Hounsell, 2003). As a result, higher education institutions have, inter alia, been promoting active learning techniques which are student-centred, and specifically enhance the quality of students' learning outcomes (e.g., Darnon, Buchs, & Desbar, 2012; Entwistle et al., 2003). Additionally, it appears that not only the instruction technique itself but also the way students perceive their specific learning environments determines how and what they learn (Biggs & Tang, 1999; Könings, Brand-Gruwel, & van Merriënboer, 2005; Kyndt, Dochy, Struyven, & Cascallar, 2011; Prosser & Trigwell, 1999; Struyven, Dochy, Janssens, & Gielen, 2008). More specifically, aiming to increase self-efficacy and self-regulatory skills, research repeatedly points to their positive relationship with teacher autonomy-supportive behaviour as perceived by students (e.g., allowing students to experience the freedom to make their own

choices) (Alivernini & Lucidi, 2011; Sierens, Vansteenkiste, Goossens, Soenens, & Dochy, 2009; Wang, Ng, Liu, & Ryan, 2016).

We argue that, in addition to the commonly included student characteristics of age, gender, prior knowledge, personality, or learning patterns (e.g., Richardson et al., 2012; Vermunt & Donche, 2017), other student characteristics are important when it comes to understanding the mediating effects of how students perceive student-centred learning environments in terms of fostering self-efficacy and self-regulation. Self-determination theory is a well-substantiated motivational theory which describes how the drive to learn varies between students (Deci & Ryan, 2000). Taking various types of motivation into account, students with a lack of motivation (amotivation; Deci & Ryan, 2000) might perceive the impact of a student-centred learning environment quite differently than students who are more intrinsically motivated with regard to their field of study, as amotivated students have motivational deficits (e.g., Kyndt et al., 2011). Consequently, variations in motivation might lead to different perceptions of the same learning environment, and lead to different learning outcomes. Following the need for a better understanding of which aspects influence students' perceptions of the learning environment, this study examines its role as a mediator between the motivational drive for learning as a student characteristic, and self-efficacy and self-regulation as important learning outcomes. Before we further explore the suggested relationships, we briefly explain the central concepts below.

Self-regulation and Self-efficacy

Self-regulatory activities are particularly important because they engage students in such a way as to achieve learning and performance goals (Boekaerts & Corno, 2005; Zimmerman & Schunk, 2011). Self-regulatory skills such as setting goals and planning (Zimmerman & Schunk, 2011) are promoted by goal-oriented activities. These skills can be divided into processing information,

rehearsing and relating new learning to prior knowledge, and establishing productive social and work environments (Zimmerman, 2000). When students have developed their self-regulatory skills, they are active, constructive participants in their own learning process (van den Hurk, 2006). They are then capable of setting goals for their learning, and of monitoring and managing their own cognition, motivation and behaviour in relation to their learning environment (Pintrich, 2000; Schunk & Zimmerman, 2003).

Related to self-regulation is the concept of self-efficacy. This can be defined as the individuals' beliefs that one is capable of learning and performing actions on designated levels (Bandura, 1997). High self-efficacy promotes further skill development as it helps students to engage in tasks, to work harder, and to persist longer, especially when encountering difficulties (Bandura, 1997; Zepke, Leach, & Butler, 2010; Zimmerman & Cleary, 2009). More specifically, students with high self-efficacy engage more in self-regulation by setting their own goals, monitoring their learning, and evaluating their own progress. Research shows that students' sense of self-efficacy is critical for self-regulation in order to learn and perform well (Schunk & Usher, 2011). Overall, self-regulation and self-efficacy skills enable students (and workers later in life) to identify their own needs and develop themselves accordingly.

Student-centred Learning and Autonomy Support

Many higher education institutions are currently introducing student-centred learning environments, which emphasise the role of self-efficacy and the development of the quality of learning. This shift towards a more student-centred learning approach requires more active learning environments to enhance students' involvement, and to encourage students to take up a participatory role in their learning (Snyder, 2003). Active learning refers to the instructional methods that engage students in their learning process (Bonwell & Eison, 1991) and includes

activities such as quizzes, role-playing and games (Bonwell & Eison, 1991), and more elaborate instructional methods such as case-based learning (e.g., Baeten, Dochy, & Struyven, 2013), problem-based learning (e.g., Gijbels, Dochy, Van den Bossche, & Segers, 2014) or project-based learning (e.g., Stefanou, Stolk, Prince, Chen, & Lord, 2013). Teachers' use of strategies such as discussion and using questioning techniques, also promotes students' active exploration of their subject matter (Bonwell & Eison, 1991).

Enabling student activity involves less teacher controlling behaviour and more autonomy-supportive behaviour. This is required in a student-centred learning environment to promote student engagement (Zepke & Leach, 2010). Teacher's autonomy-supportive behaviour includes guiding students' learning processes, and helping them to achieve their personal goals and interests (Reeve, Deci, & Ryan, 2004). It allows students to determine their own behaviour and to experience the freedom to make their own choices, which enables their feelings of autonomy (Deci & Ryan, 2000; Jang, Reeve, & Deci, 2010; Vansteenkiste, Lens, & Deci, 2006). Teacher's autonomy-supportive behaviour is an important feature of active learning as it activates students to make them think, answer, collaborate, and reflect on their subject.

Studies that explore the influence of autonomy-supportive teacher behaviour on student learning in higher education, such as those dealing with self-efficacy beliefs and self-regulatory skills, are scarce. However, research in secondary education shows that students' perceived autonomy support significantly promotes self-efficacy (Alivernini & Lucidi, 2011; Wang et al., 2016) and self-regulation (Sierens et al., 2009; Wang et al., 2016). Within the context of higher education, Stefanou et al. (2013) found that students participating in active learning environments, in this case using project-based learning, reported higher perceived autonomy support, which supported outcomes related to self-regulated learning such as critical thinking.

Academic Motivation

Students' need for autonomy has its roots in Self-Determination Theory (SDT; Deci & Ryan, 2000) which states that motivation differs according to the extent to which three innate psychological needs, including autonomy, are being fulfilled (Deci & Ryan, 2000). SDT considers motivation to be multidimensional (Deci & Ryan, 2000; Vansteenkiste, Sierens, Soenens, Luyckx, & Lens, 2009) and distinguishes the quantity, amount, or intensity of motivation from the quality or type of motivation (Vansteenkiste et al., 2009). This multidimensional approach results in a distinction between autonomous motivation, controlled motivation, and amotivation (Deci & Ryan, 2000). Autonomous motivation is characterised by a sense of choice and psychological freedom (Deci & Ryan, 2000) and is clearly positively influenced when students perceive more autonomy support (Black & Deci, 2000; Hall & Webb, 2014). Controlled motivation features no freedom of choice, and the experience of being pressured or coerced (Vansteenkiste et al., 2006). Finally, amotivated students lack any intention to learn (Ryan & Deci, 2000).

Previous research shows that the quality of motivation is related to the development of self-efficacy beliefs and self-regulatory skills. Of all three types of motivation, autonomous motivation is positively associated with self-efficacy and the development of adequate regulative learning outcomes (Donche, De Maeyer, Coertjens, Van Daal, & Van Petegem, 2013; Schunk & DiBenedetto, 2016). As students have different types of motivation, it is possible they perceive the same teacher behaviour differently according to their own quality of motivation. For example, college students who are reported as being more autonomously motivated experience the highest levels of need-supportive teaching, which includes autonomy-supportive teacher behaviour (Vansteenkiste et al., 2009). However, a recent study by De Meyer et al. (2016) in the context of

physical education, shows that students prefer autonomy-supportive teacher behaviour, regardless of their type of motivation. As this study uses video-based vignettes to evaluate teacher behaviour, generalisation of the results is limited. However, it raises the issue of academic motivation as an important student characteristic for enhancing our understanding of the effect of the learning environment. Regardless of the type of learning environment, should we not consider such student characteristics more often when studying the effect of learning environments on student learning outcomes?

Aims and Hypotheses of the Present Study

By introducing student-centred learning environments, higher education institutions aim to foster student self-efficacy and self-regulation. Previous research that focuses on how students perceive these learning environments usually does not take the differential impact of students' study motivation into account. However, the type of motivation might influence how students perceive their learning environment. Therefore, trying to foster students' self-efficacy and self-regulation using the student-centred learning environment may benefit from a more differentiated approach (e.g., Tomlinson, 2014) that takes students' study motivation into account. To this end, this study investigates the relationship between students' perceived autonomy support in student-centred learning environments on self-regulation and self-efficacy by taking study motivation into account (Figure 1). In this study we define student-centred learning environments as characterised by a clear focus on student-activating learning such as cases, group discussions, quizzes, and other active learning techniques.

Two research questions (RQ) are central to this study. RQ 1: How is students' academic motivation related to self-efficacy and self-regulation? RQ 2: How does students' perceived

autonomy support contribute to self-efficacy and self-regulation when taking students' academic motivation into account?

* Figure 1 to be inserted here*

Based on previous findings, we expect autonomous motivation to be positively associated with self-efficacy (*hypothesis 1a*) and self-regulation (*hypothesis 1b*) (Donche et al., 2013; Schunk & DiBenedetto, 2016). The relationship between controlled motivation/amotivation, self-efficacy and self-regulation, and perceived autonomy support will be explored. Based on theory, we expect that autonomous motivation will be positively associated with perceived autonomy support (*hypothesis 2a*) (Vansteenkiste et al., 2009). We also expect perceived autonomy support to relate positively to learning outcomes in terms of both self-efficacy (*hypothesis 2b*) (Alivernini & Lucidi, 2011; Wang et al., 2016) and self-regulation (*hypothesis 2c*) (Sierens et al., 2009; Stefanou et al., 2013; Wang et al., 2016). We also explore if and how autonomy support mediates the relationship between academic motivation as a student characteristic, and self-efficacy and self-regulation.

Method

Sample and Procedure

For this study, we collected data with regard to first-year full-time Bachelor degree students of a Dutch university of applied sciences (*N*=230; *M* age = 19.38 years, *SD* = 1.89). Two hundred and twelve students were female (92.17%). This is representative of the student population taking the pedagogical seminars, which aimed for students to apply their knowledge and understanding about educating and bringing up children.

Questionnaires were distributed to students during an extra class, and they were all invited to participate voluntarily. The participants were also assured of confidentiality and anonymity. The questionnaire was issued during the eighth week of the academic year, a week before the first examinations took place, which allowed enough time for the students to get to know their teacher, and so that the outcomes would not be biased by previous test results. The overall response rate was 59.59%.

Measures

For this study, validated questionnaires were used, tapping how students perceived one teacher in terms of delivering pedagogy seminars. Each seminar group consisted of approximately thirty students and involved active learning. All items were assessed at the situational level (with respect to the course of pedagogy) and not at the domain level, because students' course-specific motivation is likely to be more affected by the perceived teaching style, in this case the perceived degree of autonomy support (Vallerand, 1997; Vansteenkiste et al., 2009).

Students' *academic motivation* was measured using the Dutch version of the Academic Self-Regulation Questionnaire (SRQ-A; Ryan & Connell, 1989; Vanthournout, Gijbels, Coertjens, Donche, & Van Petegem, 2012). All three motivation-scales were rated on a five-point Likert scale (1 = "completely not important"; 5 = "very important").

The relevant scales of the previously validated Short Inventory of Learning Patterns (ILS-SV; Donche, Coertjens, Vanthournout, & Van Petegem, 2012) were added to measure *self-efficacy* and *self-regulation*. For self-efficacy all items were scored using a five-point Likert scale ranging from 1 ("totally disagree") to 5 ("totally agree"). Similarly for self-regulation, responses were made on a five-point Likert scale, ranging from 1 ("I never or hardly ever do this") to 5 ("I (almost) always do this").

Part of the Teacher As Social Context Questionnaire (TASCQ; Belmont, Skinner, Wellborn, & Connell, 1988) was used to measure *perceived autonomy support*, and items had to be answered on a five-point Likert scale (1 = "completely disagree"; 5 = "completely agree"). This scale had not been previously validated in the context of higher education. Therefore, a confirmatory factor analysis (CFA) was conducted. Considering the results of the CFA, three items from the original eight items were deleted for further analysis. This resulted in a final model with good fit (χ^2 = 5.43; df = 4, p = .25; CFI = .99; $RMSEA$ = .04) and adequate factor loadings (|.423| - |.719|). All items were answered using a five-point Likert scale (1 = "not true at all"; 5 = "absolutely true").

For all scales, internal consistency, number of items, and example items, are presented in Table 1. A cut-off at .60 was considered adequate because only a small number of items, a maximum of six per scale, were used (Cortina, 1993; Palant, 2007). For all scales, the results showed good reliability.

* Table 1 to be inserted here *

Data-analysis

Prior to substantive analysis, construct validity, reliability, and descriptive statistics were analysed. Research questions were answered by conducting structural equation modelling (SEM), using the lavaan package in Rstudio (Rosseel, 2012). To answer RQ 1 ('How does students' academic motivation influence self-efficacy and self-regulation?') a SEM-model was conducted separately for each type of motivation. For RQ 2 ('How does students' perceived autonomy support contribute to self-efficacy and self-regulation, when taking students' academic motivation into account?') several SEM-models were conducted, using an iterative process. First, for each type of motivation three different SEM-models were conducted using perceived

autonomy support as an outcome variable. Secondly, the relationship of students' perceived autonomy support with self-efficacy and self-regulation was explored. Finally, the results of an integrated model, including all relevant variables from previous analyses, were examined. As the χ^2 model-fit criterion is sensitive to sample size (generally above 200; Schumacker & Lomax, 2010), the model fit was evaluated using two other goodness-of-fit indices: the comparative fit index (CFI) and root mean square error approximation (RMSEA) (Hu & Bentler, 1999; Schumacker & Lomax, 2010). All models showed a sufficient to good fit with a comparative fit index (CFI) greater than .90, and a root mean square error of approximation (RMSEA) less than .08 (Hu & Bentler, 1999; Table 2).

* Table 2 to be inserted here *

Results

Descriptive statistics and correlations between the key variables in this study can be found in Table 3. Standard deviations show the largest spread with regard to self-regulation, which means that students vary the most in their way of being active, constructive participants of their learning process. As expected, most of the variables show a small to moderate significant correlation. All motivational variables, except controlled motivation, correlate with self-efficacy. Only autonomous motivation and self-efficacy show a significant correlation with self-regulation. Autonomous motivation and amotivation correlate positively and negatively respectively with perceived autonomy support.

* Table 3 to be inserted here *

Relation of Academic Motivation with Self-efficacy and Self-regulation

SEM-models were conducted for each motivation type, and self-efficacy and self-regulation (RQ1). The results showed a significant positive relationship between autonomous motivation and as well self-efficacy ($\beta = .560$; $p < .001$) as self-regulation ($\beta = .272$; $p < .01$). These results confirm *hypotheses 1a* and *1b*, which positively relate autonomous motivation to self-efficacy and self-regulation (Donche et al., 2013; Schunk & DiBenedetto, 2016). Results for controlled motivation were not significant. For amotivation, a significant negative relationship with self-efficacy ($\beta = -.403$; $p < .001$) was found. This suggests that a lack of motivation for a subject co-exists with a lack of belief in being able to perform in the subject. Initial findings are consistent with previous research and confirm the importance of nurturing autonomous motivation when trying to promote both self-efficacy and self-regulation. However, to what extent are these relations mediated by students' perceived autonomy support?

Perceived Autonomy Support as Mediator between Academic Motivation, and Self-efficacy and Self-regulation

To explore these relationships (RQ 2), several SEM-models were conducted, using an iterative process. First, the relationship between the type of motivation and perceived autonomy support was investigated. There was a significant relationship for both autonomous motivation and amotivation to the way students perceived their learning environment in terms of teacher autonomy support. Autonomous motivation related positively ($\beta = .223$, $p < .05$) whereas amotivation related negatively ($\beta = -.265$, $p < .05$). No significant relations were found for controlled motivation. Our findings confirm *hypothesis 2a*, which suggested a significant positive relationship between autonomous motivation and perceived autonomy support (Vansteenkiste et al., 2009). In contrast with previous research, in which all types of motivated students preferred

autonomy-supportive teacher behaviour (De Meyer et al., 2016), our study shows a significant negative correlation between amotivated students and perceived autonomy support. This means that amotivated students reported less perceived autonomy-supportive behaviour, and might imply different perceptions of the same teacher behaviour, depending on the type of academic motivation.

Furthermore, the relationship between autonomy support, and self-efficacy and self-regulation was investigated. Perceived autonomy support only showed to be positively significantly related to self-efficacy ($\beta = .369$, $p < .001$), as suggested in *hypothesis 2b* (Alivernini & Lucidi, 2011; Wang et al., 2016). This gives rise to the assumption that active learning techniques such as quizzes, cases, and group discussions lead to a greater range of learning experiences, which in turn relate positively to the degree of self-efficacy (e.g., Niemivirta & Tapola, 2007). Our findings do not confirm *hypothesis 2c*, which suggested a positive relationship between perceived autonomy support and self-regulation (Sierens et al., 2009; Stefanou et al., 2013; Wang et al., 2016).

Finally, to obtain a more refined model, non-significant paths within the initial models were omitted. The results show how perceived autonomy support acts as a mediator between autonomous motivation and self-efficacy (Figure 2). We found no mediation effect for perceived autonomy support between academic motivation and self-regulation. Autonomous motivation has a direct relationship with self-efficacy and self-regulation. In this last model, the effects for amotivation found earlier were no longer significant.

* Figure 2 to be inserted about here *

Discussion

It is important for higher education institutions to foster outcomes of self-efficacy and self-regulation because research has shown these are positively associated with academic achievement and persistence in higher education (e.g., Panadero, 2017; van Dinther et al., 2011). As generic skills self-efficacy and self-regulation allow for continuous learning and are beneficial for students when coping with change, not only during their educational, but also during their professional careers (Tynjälä, 2008). This study builds on the importance of students' quality of motivation and of how students perceive their learning environment for the development of self-efficacy and self-regulation (e.g., Schunk & DiBenedetto, 2016; Sierens et al., 2009). Arguing that other than more commonly-used student characteristics such as gender and age should be taken into account, this study investigated the extent to which the effect of academic motivation on self-efficacy and self-regulation is mediated by the way students perceive their learning environments, whether that be more or less autonomy-supportive. This study contributes by tentatively suggesting that it is students' own academic motivation that most likely shapes their perceptions, and which we should consider when rising to the challenge of creating the most favourable learning environments.

Considering the importance of promoting self-efficacy and self-regulatory skills, what type of learning environment should be provided and which (supportive) teacher behaviour is the most valuable for what type of student? An amotivated student who spends his or her time in class with no motivational drive for learning differs substantially from an autonomously motivated student, who will already benefit from higher levels of self-efficacy. Consequently, the instructional (active) learning environment, teachers' behaviour, students' perceptions of the learning environment and their motivations are all intricately linked. Teachers are challenged to

take students' motivations into account when differentiating instructions in classrooms of various sizes (e.g., Tomlinson, 2014).

Previous research shows that students benefit most from autonomy-supportive learning environments (Alivernini & Lucidi, 2011; Sierens et al., 2009; Wang et al., 2016). More specifically, several studies have investigated teachers' autonomy-supportive behaviour as opposed to controlled behaviour (e.g., Reeve, 2009). Sierens et al. (2009) suggested that structure might matter when provided in an autonomy-supportive way. Within an active learning environment, teachers should support students' autonomy by guiding their learning processes and by helping them to achieve their personal goals and interests (Reeve et al., 2004). They should create a learning environment where students are able to determine their own behaviour and experience the freedom to make their own choices (Deci & Ryan, 2000; Jang et al., 2010; Vansteenkiste et al., 2006). Additionally, students might benefit from a structured environment with non-controlling communication, where teachers share clear expectations with their students, offer help for task engagement, provide students with a rationale when introducing limits, and give them competence-relevant feedback etc. (Reeve et al., 2004; Sierens et al., 2009).

In the context of physical education, De Meyer et al. (2016) pointed to the incongruence between how teachers perceived which supportive behaviour would be beneficial for what students, and which needs students actually expressed. Where teachers thought that controlled motivated and amotivated students would benefit the most from controlled teacher behaviour, the authors concluded that students preferred the autonomy-supportive approach in all cases. However, the current study suggests that other behaviour as well as, or rather than, autonomy-supportive teacher behaviour might be required to positively influence amotivated students' self-efficacy. In particular, because amotivated students perceive the same teacher behaviour differently and not as autonomy-supportive as their autonomously motivated peers. Other sources

of amotivation, such as personal matters, feeling less adjusted to the academic environment, or study choice, should not be overlooked when attempting to understand which aspects contribute to the quality of students' motivation, and hence influence their perceptions of the learning environment and their learning outcomes (Baker, 2004; Germeijs & Verschueren, 2007).

When investigating the effects of perceived autonomy support, self-regulation seems to play a less distinct role. In this study, autonomy-supportive teacher behaviour perceived during class time shows no significant relationship with self-regulatory skills that also need to be applied outside of class; e.g., during studying. Research has previously highlighted that teachers and students should be aware of the importance of developing learner autonomy (Boekaerts & Cascallar, 2006; Clifford, 1999). During the first-year of higher education, next to student-activating lessons, self-regulation strategies might need to be trained more explicitly, e.g., how to monitor for comprehension and how to assess one's progress (Boekaerts & Cascallar, 2006).

Limitations and suggestions for future research

This study is innovative as it presents students' academic motivation as a characteristic that most certainly influences their perceptions of the learning environment. However, taking the previous practical advice into account, more research is needed to enhance our understanding of this relationship. Some limitations of our study need to be acknowledged.

First, the cross-sectional nature of this study prohibits us from drawing any causal conclusions. The mediating relationship is explored and the results shed some light on the role that students' academic motivation might play when evaluating their perceptions of the learning environment. Ideally, future research should use a longitudinal design which would allow causality to be appropriately measured. For example, as our sample consists of first-year Bachelor degree students, some students could still be experiencing difficulties in adjusting their

attitudes and behaviours towards more self-regulated learning (Christie, Tett, Vree, Hounsell, & McCune, 2008). This could be due to the timing of the research in week eight of the first academic year, which might have been too soon for us to find, in some students, the expected relationship between perceived autonomy support and self-regulation (e.g., Sierens et al., 2009). In particular, learning contexts of placements and internships might be of interest to longitudinally follow up on how students' self-efficacy and self-regulatory skills develop because such contexts bridge the gap between education and workplace learning (Tynjälä, 2008).

Second, this research was conducted using a specific sample, measures and variables. More research is required in various higher education learning contexts to generalise the findings, preferably using larger samples with more equally divided male-female student samples, and comparing how teacher behaviour is perceived differently across teachers (e.g., male/female teachers). Furthermore, considering the scarce use of the perceived autonomy support scale within higher education contexts to date, future research should focus on improving current measures regarding validity and reliability. Also, this study only includes academic motivation as a student characteristic, so combining this with other individual characteristics in future research would enhance our understanding of any possible interplay.

Third, as in other research literature, this study's contribution to handling controlled motivated or amotivated students is limited. Although research findings have already proven the importance of autonomous motivation for several learning outcomes, education practice could benefit from insights in how to cope with controlled motivated and amotivated students. Unravelling this issue requires not only quantitative but also qualitative, more in-depth research designs.

Overall, the current study confirms that students' academic motivation matters when fostering self-efficacy and self-regulation. In the case of self-efficacy, the relationship with

autonomous motivation seems to be mediated by the amount of perceived autonomy-supportive teacher behaviour. As such, nurturing self-efficacy probably is not a matter of either students' motivation or teachers' autonomy support. It appears that both aspects contribute to its development. Consequently, activating students seems to be insufficient, as we should take the quality and quantity of students' motivation into account when promoting their self-efficacy and self-regulation.

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Table 1. Scales, internal consistency (Cronbach alpha), number of items and example items.

Scales[*]	Alpha	*N*	Example items[**]
Academic motivation			
Autonomous motivation	.78	6	I am motivated to study for the pedagogy course because I want to learn new things about pedagogy.
Controlled motivation	.63	6	I am motivated to study for the pedagogy course because I would feel guilty if I wouldn't study for it.
Amotivation	.67	3	I don't see why I'm studying pedagogy and, frankly, I couldn't care less.
Self-efficacy	.77	4	Compared to some other students, I think I'm considerably good in studying pedagogy.
Self-regulation	.71	4	When studying for the pedagogy course, I do more than is strictly necessary.
Perceived autonomy support	.68	5	My teacher of pedagogy gives me a lot of choices about how to do my schoolwork.

[*] Course and teacher specific application (adapted from Belmont, Skinner, Wellborn, & Connell, 1988; Donche, Coertjens, Vanthournout, & Van Petegem, 2012; Ryan & Connell, 1989; Vanthournout, Gijbels, Coertjens, Donche, & Van Petegem, 2012); [**] Translated from Dutch

Table 2. Fit indices for all SEM-models ($N_{total} = 230$).

Model	$\chi2$	df	p	CFI	RMSEA
RQ1					
Autonomous motivation – Self-efficacy (SE) – Self-regulation (SR)	88.80	74	.116	.98	.03
Controlled motivation – SE – SR	117.17	72	.001	.94	.05
Amotivation – SE – SR	70.90	40	.002	.95	.06
RQ2					
Autonomous motivation – Perceived autonomy support	61.49	41	.021	.96	.05
Controlled motivation – Perceived autonomy support	58.95	40	.027	.96	.05
Amotivation - Perceived autonomy support	20.07	18	.329	.99	.02
Perceived autonomy support – SE – SR	96.00	61	.003	.94	.05
Final model (Figure 2)	306.17	201	.000	.92	.05

Table 3. Descriptive statistics and Pearson's correlations between study variables.

		Mean	*SD*	1	2	3	4	5	6
1	Autonomous Motivation	4.24	.52	1					
2	Controlled Motivation	1.64	.56	-.10	1				
3	Amotivation	1.24	.45	-.37***	.36***	1			
4	Autonomy Support	4.05	.54	.26***	-.07	-.17**	1		
5	Self-efficacy	3.66	.54	.42***	-.05	-.32***	.25***	1	
6	Self-regulation	2.65	.76	.23**	.05	-.01	.08	.19**	1

*** $p < .001$; ** $p < .01$; * $p < .05$

Figures

Figure 1. Model in which perceived autonomy support mediates between academic motivation and learning outcomes in terms of self-efficacy and self-regulation.

Figure 2. Perceived autonomy support as mediator between academic motivation and learning outcomes in terms of self-efficacy and self-regulation.