

Relationships among motivation, commitment, cognitive capacities, and achievement in secondary education

Hanke Korpershoek

University of Groningen, the Netherlands

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Abstract

The aims of the present study were (1) to identify to what extent school motivation and school commitment contributed to the explanation of students' academic achievement in addition to the effect of students' cognitive capacities, (2) to find out whether school commitment mediated the relation between school motivation and academic achievement, and (3) to find out whether school motivation mediated the relation between school commitment and academic achievement. New in the field is that perspectives from two different research traditions were adopted, resulting in a selection of variables introduced by identity development theory and by motivational theories on achievement goals. The overall goal was to provide insight in the underlying structure of the relationships among these variables by providing new empirical evidence derived from a large student sample. A sample of more than 6,000 secondary school students from the Netherlands was therefore used in the study. Path models (structural equation models) were used to analyse the data. Fit indices of the final model were satisfactory. This model included students' cognitive capacities, three motivation factors (performance, social, and extrinsic motivation; mastery was excluded) and one commitment component (in-depth exploration; the 'commitment' and 'reconsideration of commitment' components were excluded). The results showed small effects of performance (+), social (+), and extrinsic (-) motivation on academic achievement in addition to students' cognitive capacities. A very small negative effect was found for in-depth exploration. In-depth exploration mediated the motivation – achievement relationships to a limited extent. Suggestions for further research are discussed.

Keywords: school motivation; school commitment; cognitive capacities; academic achievement; identity development theory; achievement goal theory

¹ *Corresponding author:* Hanke Korpershoek, University of Groningen, Grote Rozenstraat 3, 9712 TG Groningen, the Netherlands. E-mail: h.korpershoek@rug.nl DOI: <http://dx.doi.org/10.14786/flr.v4i3.182>



1. Introduction

The purpose of the present study was to better understand the underlying structure of the relationships among school motivation, school commitment, and academic achievement of students in secondary education. School motivation is derived from the achievement goal framework. The school commitment construct follows from identity development theory, referring to students' feelings of being committed to school.

The relation between motivation and achievement has received ample attention in the literature (for recent meta-analyses using achievement goal theory see Huang, 2012; Hulleman, Schrager, Bodmann, & Harackiewicz, 2010). However, within the widely used achievement goal framework, the focus is usually on a limited set of achievement goals (i.e. mastery and performance goals). Maehr (1984) suggested that also social solidarity goals and extrinsic goals should be considered when studying achievement goals in educational settings, because students largely vary in their orientations toward learning. Therefore, all four suggested achievement goals are investigated in this paper as indicators of students' school motivation.

The relation between school commitment and academic achievement has received far less attention in the literature. Building and maintaining relationships with significant others in one's environment is part of the identity development process (see e.g. Klimstra, Hale, Raaijmakers, Branje, & Meeus, 2010; Kroger, Martinussen, & Marcia, 2010; Meeus, 2011). The school context is one of the most important life domains within which identity formation processes take place. Students enter into various commitments by establishing meaningful relationships with peers and teachers. Although it is plausible that the extent to which students feel committed influences students' overall functioning at school, the literature on this topic is scarce.

Particularly the commitment construct as defined by identity development theory is not commonly used in educational studies. However, a wide variety of similar constructs (from various theoretical frameworks) have been used to explain student outcomes. That is, school commitment is conceptually related to school engagement (Fredricks, Blumenfeld, & Paris, 2004), school membership (Hagborg, 1998; Wehlage, Rutter, Smith, Lesko, & Fernandez, 1989), school belonging (Goodenow & Grady, 1993), school relatedness (Deci & Ryan, 2002), and school connectedness (Resnick et al., 1997; Shochet, Dadds, Ham, & Montague, 2006). The conceptually closest construct is 'sense of school belonging', which is explained further in the theoretical framework. Prior studies have shown that students' sense of school belonging is positively associated with school motivation (E. M. Anderman, 2002; L. H. Anderman & E. M. Anderman, 1999; Goodenow & Grady, 1993; Roeser, Midgley, & Urdan, 1996; Ryan & Powelson, 1991) and cognitive outcomes (Anderman, 2003; Goodenow, 1993; Ma, 2003; Osterman, 2000; Roeser et al., 1996; Pittman & Richmond, 2007). Based on these findings, it is expected that similar results can be found for the relationship between school commitment and academic achievement.

All in all, the present study aims (1) to identify to what extent school motivation and school commitment contributed to the explanation of students' academic achievement in addition to the effect of students' cognitive capacities, (2) to find out whether school commitment mediated the relation between school motivation and academic achievement, and (3) to find out whether school motivation mediated the relation between school commitment and academic achievement.

Both school motivation and school commitment are, at least theoretically, malleable to some extent, thus insight into the (relative) contributions of these variables to students' academic achievement is a relevant topic for educational practice. Moreover, the multiple goal perspective that is adopted in this paper enables us to identify which achievement goals are related to more general academic achievement measures. This focus on general academic achievement is, in our view, important for educational practice, in addition to the more context- or domain-specific studies on student achievement. It is widely known that mastery goals are generally associated with favourable student achievement in class, but it is not clear whether this is also the case for students' general academic achievement. In this paper, curriculum independent test scores on mathematics and reading comprehension are used as indicators of students' general academic



achievement in the 9th grade of secondary education. These tests give an indication of students' general academic functioning in secondary education. When relevant relationships are found between multiple achievement goals and students' general academic achievement, these insights stress the importance of endorsing and stimulating various achievement goals in school. Performance motivation, for example, may not be beneficial for students' school grades in particular school subjects, but it may relate to students' general academic achievement. The same line of reasoning applies to the impact of school commitment on student achievement. Generally, positive effects are expected, but it is unclear whether these effects are context- or domain-specific or more general in nature. This paper addresses these issues by focusing on the effects of school motivation and school commitment on general academic achievement measures. Some factors (e.g. performance motivation) might be weakly related to students' grades in class, but show stronger relationships with general academic achievement in secondary education. As such, these factors can be seen as appropriate targets for intervention, because they are associated with students' more general academic functioning.

In paragraph 2, the school commitment and school motivation constructs are discussed in more detail before further explaining the present study. Insights from various relevant theoretical frameworks are presented in order to clearly explain how the constructs were defined.

2. Theoretical framework

2.1 The school commitment construct

A fast-growing body of research now recognizes the significance of fulfilling basic psychological needs of students in education. Self-determination theory (SDT) distinguishes the need for autonomy, competence, and relatedness which, when all three are supported, are associated with favourable outcomes. These needs specify 'innate psychological nutrients that are essential for ongoing psychological growth, integrity, and well-being' (Deci & Ryan, 2000, p. 229). The need for relatedness is suggested to facilitate the process of internalization, which means that people tend to internalize values and practices from contexts (and people within that context) in which they experience a sense of belonging (Niemic & Ryan, 2009). The social context is therefore of major importance in facilitating growth processes such as growth in intrinsic motivation and integration of extrinsic motivation among students (Deci & Ryan, 2000). Moreover, it is said that the need to belong precedes the desire for knowledge (e.g. Deci & Ryan, 2002). The need for relatedness is therefore seen as a basic and innate psychological need of people.

Closely linked to these statements about the need for relatedness is the so-called belongingness hypothesis, which states that human beings have a pervasive drive to form and maintain at least a minimum quantity of lasting, positive, and significant interpersonal relationships (Baumeister & Leary, 1995, p. 497). Within the school context, this would imply that students generally have a pervasive drive (or in SDT an innate need) to form and maintain significant interpersonal relationships (e.g. with their teachers and peers). Similarly, a sense of school belonging is conceptualized as 'the extent to which students feel personally accepted, respected, included, and supported by others in the school social environment' (Goodenow & Grady, 1993, p. 60-61). Here we can already see that the need for relatedness, the pervasive drive to form and maintain interpersonal relationships, and the need to belong are closely related and, more importantly, are closely linked to identity development processes in the school context.

Faircloth (2012) stated that 'identity can be seen as a type of ongoing negotiation of participation, shaped by – and shaping in response – the context(s) in which it occurs.' (p. 186). The school context is therefore an important factor in shaping adolescents' identity (Eccles & Roeser, 2011; Lannegrand-Willems, & Bosma, 2006; Rich & Schachter, 2012). Strongly grounded in the work of Erikson (1950) and Marcia



(1966, 1980, 1994), Crocetti, Rubini, and Meeus (2008) developed a three-dimensional model of identity formation that can be used to assess adolescents' identity formation processes in various life domains (e.g. the school). The model comprises three dimensions. The first dimension, commitment, is conceptualized as a choice made in an identity-relevant area and as the extent to which one identifies with that choice (Crocetti et al., 2008, p. 218). It indicates whether a person feels committed to a certain relationship, for example, to friends or to school in general. Meeus (1996) formerly defined commitment as the extent to which young people feel committed to, and derive self-confidence from, a positive self-image and confidence in the future from relationships (p. 585; see also Bosma, 1985; Meeus & Dekovic, 1995; Meeus, Iedema, & Maassen, 2002). Recall that these definitions show remarkable overlap with the definition of school belonging. Both refer to a malleable emotional state and both stress the importance of interpersonal relationships with significant others in obtaining a sense of school belonging or the feeling of school commitment. The second dimension, in-depth exploration, refers to the way in which adolescents deal with existing commitments and how much young people are actively engaged in investigating relationships. The third dimension, reconsideration of commitment, refers to the comparison between current commitments and other possible alternatives and also includes young peoples' efforts to change present commitments because they are no longer satisfactory (Crocetti et al., 2008, p. 209). Together, the three dimensions can be used to characterize students' (feelings of) commitment to the school in general.

In the present study, Crocetti et al.'s (2008) framework is used to measure students' commitment to school. It has a strong theoretical basis and fits our idea that having a sense of commitment (or belonging) is an ongoing process of making and reconsidering commitments, thus interpersonal relationships with significant others such as teachers and peers (i.e. the school community).

2.2 The school motivation construct

A broad range of motivational theories has attempted to unravel student motivation in educational settings, among others, Achievement Goal Theory (AGT; Elliot & McGregor, 2001) and Personal Investment Theory (PI theory; Maehr, 1984). Motivational theories vary largely in how they define the concept of motivation and how motivation is operationalized. An oversimplified yet clear definition that can be drawn from AGT and PI theory is that motivation refers to students' general orientation towards learning. This general orientation involves cognitive aspects (e.g. adopting achievement goals) as well as non-cognitive aspects (e.g. emotional reactions). For this paper, we focused on the adoption of achievement goals as indicators of students' school motivation, because this approach takes a multiple goal perspective. It captures many different motivational dimensions (e.g. multiple achievement goals), which gives the opportunity to link students' school commitment to various dimensions of students' school motivation.

AGT emphasizes that students pursue different achievement goals in learning situations, such as mastery goals (focused on gaining knowledge and improving skills) and performance goals (focused on demonstrating their ability) (Elliot & McGregor, 2001). Mastery-oriented students – those adopting (or striving towards) mastery goals – attempt to understand the topic at hand, gain knowledge, to improve their skills (e.g. Tapola & Niemivirta, 2008), which generally has a positive effect on students' learning outcomes (Huang, 2012). Central to this orientation is the belief that effort leads to success (Elliot & McGregor, 2001). Performance-oriented students – those adopting performance goals – are more focused on demonstrating their ability (e.g. Tapola & Niemivirta, 2008). One's own ability is referenced against the performance of others (Elliot & McGregor, 2001). The effect of adopting performance goals is less straightforward; both positive and negative effects have been reported (e.g. Huang, 2012).

Maehr (1984) suggested that also social solidarity goals and extrinsic goals should be considered when studying achievement goals in educational settings. Maehr's PI theory includes task goals (mastery), ego goals (performance), social solidarity goals, and extrinsic goals (see also King, Ganotice, & Watkins, 2014; King, McInerney, & Watkins, 2013; Urdan & Maehr, 1995). Social goals can be referred to as social-grounded reasons for studying, resulting from social concern and social affiliation (King & McInerney,



2012). Social-oriented students – those adopting social goals – are more focused on group learning, for example, studying for the sake of the group (Covington, 2000). The relationship with academic achievement has not been studied frequently, though one can expect that the effect on academic achievement is at least positive. Deci and Ryan (2000) emphasize the importance of studying social goals that can affect achievement, in addition to examining more frequently addressed mastery and performance goals. Extrinsic goals refer to the desire for external rewards such as praises and tokens. Extrinsic-oriented students – those adopting extrinsic goals – attempt to gain external rewards in learning situations. External rewards then function as an incentive to continue one's work or task (Ryan & Deci, 2000). Some studies found negative effects of extrinsic motivation on cognitive outcomes (e.g. Wolters, Yu, & Pintrich, 1996). However, as is the case with social goals, the relationship with academic achievement remains largely unclear.

Building on the theoretical frameworks of AGT and PI theory, the Inventory of School Motivation was developed (ISM; McInerney, & Sinclair, 1991; 1992; McInerney & Ali, 2006), in order to capture the four motivation dimensions, including mastery, performance, social, and extrinsic goals. These four motivation dimensions are used in the present paper.

2.3 Relationships between the two constructs

In a previous publication using the same dataset, latent cluster analysis was used to define student groups with different motivational profiles (Korpershoek, Kuyper, & Van der Werf, 2015). It was found that the student group with high scores on all motivation dimensions (i.e. adoption of mastery, performance, social, and extrinsic goals) also had high scores on school commitment. Moreover, correlations between the four motivation dimensions and school commitment were all positive and small to medium in size (mastery .40; performance .17; social .32; extrinsic .23). There are also theoretical explanations why the associations are rather small. According to SDT, people tend to pursue goals, domains, and relationships that support their need satisfaction (Deci & Ryan, 2000). These authors state that relatedness plays a more distal role in the maintenance of intrinsic motivation than autonomy and competence, which more directly influence intrinsic motivation. It is not necessarily a prerequisite for intrinsic motivation, but a 'needed backdrop' that makes expression of the innate growth tendency of intrinsic motivation more likely (Deci & Ryan, 2000, p. 235).

Prior research also suggests that the two constructs are related to students' academic achievement. School motivation is found to be a prominent predictor of school grades (e.g. Brophy, 2004), but its relation with more objective academic achievement measures (e.g. curriculum independent achievement tests) is less straightforward. Based on a meta-analysis of 84 studies, Huang (2012) found correlations of .13 between mastery motivation and academic achievement and correlations of -.00 between performance motivation and academic achievement. Correlations varying from -.02 to .09 were reported in Korpershoek et al. (2015). Korpershoek et al. (2015) also reported small and positive correlations between school commitment (as an overall construct) and academic achievement (.11 for reading comprehension and .13 for mathematics). Having a sense of commitment (or belonging) is part of students' basic psychological need satisfaction. It is therefore suggested to be an essential prerequisite for learning (and thus for academic achievement).

2.4 The present study

An important question that follows from the theoretical framework is to what extent school commitment and school motivation are related, and to what extent they are related to students' academic achievement. The goal of the path analyses conducted in this paper was to better understand the underlying structure of the relationships among these variables. Three conceptual models were tested to identify to what extent school motivation and school commitment contributed to the explanation of students' academic achievement in addition to the effect of students' cognitive capacities. A measure of students' cognitive capacities was included, because this is generally the strongest predictor of students' academic achievement.



Motivation and commitment were expected to show additive effects on academic achievement. The first model (Model A) includes only direct effects on academic achievement, two other models also include indirect effects. The first mediation model (Model B) includes mediation effects of school commitment on the relation between school motivation and academic achievement. Theoretically, this model is the most plausible of the two because of the definition of school commitment used in this study. Osterman (2000), for example, explains that in contexts in which students' basic psychological needs (such as the need to belong) are met, students will function better (e.g. be more motivated) than in contexts in which their needs are not satisfied. The second mediation model (Model C) includes mediation effects of school motivation on the relation between school commitment and academic achievement. There is no strong empirical support for the latter model, however, we sought to unravel the underlying structure of the relationships among motivation, commitment, and academic achievement. Therefore, both mediation models were empirically tested.

3. Method

3.1 Participants

The data used were collected as part of a large-scale study in secondary education in the Netherlands, the so-called COOL⁵⁻¹⁸ project (Zijsling, Keuning, Kuiper, Van Batenburg, & Hemker, 2009). The students included in the present paper were selected from a response group of 8,884 9th grade students (from 80 secondary schools throughout the Netherlands) who had participated in the overall data collection. The students were on average 16 years old. In the Netherlands, all students are expected to enter secondary education and obtain a secondary school diploma (track A or B, see below) or a secondary school diploma (track C) plus an addition diploma in senior secondary vocational education. Students start 7th grade (year one of secondary education) in different educational tracks. The track placement is based on the primary school teachers' recommendation. The lowest track is the preparatory secondary vocational education programme (track C, duration 4 years), which prepares students for senior secondary vocational education. This track is further divided into three sublevels. The senior general secondary education track (track B, duration 5 years) prepares students for higher professional education. The highest track, pre-university education (track A, duration 6 years) prepares students for university. Thus, both tracks A and B prepare for higher education. The students in our sample pursued preparatory vocational secondary education (48%), senior general secondary education (27%), or pre-university education (25%). The sample included similar numbers of boys and girls (each 50%).

3.2 Instruments

3.2.1 School commitment

The school commitment scale was part of a paper-and-pencil questionnaire administered at the participating schools. We used an adapted version of the U-GIDS (Utrecht-Groningen Identity Development Scale; Crocetti et al., 2008). This instrument comprises three subscales: *commitment* (5 items), *in-depth exploration* (5 items), and *reconsideration of commitment* (3 items). Sample items are: "My school gives me certainty in life" (commitment), "I think a lot about my school" (in-depth exploration), and "I often think it would be better to try to find a different school" (reconsideration of commitment; reversed scale), with answer categories ranging from 1 (strongly disagree) to 5 (strongly agree). The factor structure was confirmed in a factor analysis. The reliabilities of the subscales were: commitment ($\alpha = .86$), in-depth exploration ($\alpha = .79$), and reconsideration of commitment ($\alpha = .87$).



3.2.2 School motivation

A Dutch version of the Inventory of School Motivation (ISM) of McInerney and Ali (2006) was used. The questionnaire used here consisted of 32 items (see Ali & McInerney, 2004 for this subset of items) on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The items were included in the same questionnaire as the items of the school commitment scale. Factor analysis has confirmed the four factor structure suggested by the literature (McInerney, Dowson, & Yeung, 2005; McInerney, Marsh, & Yeung, 2003, see also Korpershoek, Xu, Mok, McInerney, & Van der Werf, 2015) and resulted in four reliable scales: mastery motivation (9 items, $\alpha = .77$), performance motivation (7 items, $\alpha = .84$), social motivation (7 items, $\alpha = .74$), and extrinsic motivation (9 items, $\alpha = .86$) in our sample. Each of these four dimensions is based on two first order factors. Mastery motivation is based on *task* (e.g. “I like to see that I am improving in my schoolwork”) and *effort* (e.g. “When I am improving in my schoolwork I try even harder”), performance motivation on *competition* (e.g. “I work harder if I’m trying to be better than others”) and *social power* (e.g. “I often try to be the leader of a group”), social motivation on *social concern* (e.g. “It is very important for students to help each other at school”) and *affiliation* (e.g. “I prefer to work with other people at school rather than alone”), and extrinsic motivation on *praise* (e.g. “At school I work best when I am praised”) and *token* (e.g. “I work hard in class for rewards from the teacher”).

3.2.3 Cognitive capacities

Students’ score on an intelligence test was used as indicator of students’ cognitive capacities. Students’ intelligence was estimated based on their performance on the so-called NSCCT intelligence test (“Non-Scholastic Cognitive Capacities Test”; Van Batenburg & Van der Werf, 2004) which was adapted to the level of 9th grade students (see also Zijssling et al., 2009). The test consists of 76 items including five topics: constructing figures, exclusion, series of numbers, categories, and analogies. The reliability of the test in the overall student sample was .91.

3.2.4 Academic achievement

Two standardized achievement tests were used to assess the students’ achievements in mathematics and reading comprehension. The achievement tests were paper-and-pencil tests that were administered at the participating schools. The mathematics test was based on an item bank of 50 multiple choice questions, resulting in three different versions (with 11 anchored items) for students in different educational tracks. The reading comprehension text consisted of several short texts about which multiple choice questions were formulated. An item bank of 46 questions was used (with 11 anchored items). Thus, different versions of the mathematics and reading comprehension tests with both anchored and unique items were used for students in the lower and higher educational tracks (for details see Zijssling et al., 2009). For COOL⁵⁻¹⁸ three versions of the test have been developed, two for track C students (one for the lowest two levels and one for the highest level within this track) and one for track A and B students. Using a one-parameter logistic model (OPLM; an item response model), the students’ scores were placed on one performance scale, indicating the percentage of items within the overall item test bank which a student was expected to answer correctly (between 0-100%), regardless of the track they were in and regardless of the test version. The advantage of using this procedure is that the students’ scores can easily be compared across different test versions (e.g. when comparing the results of Track A and Track B students, which had taken the same test version). The reliability for the mathematics test was .94 and for the reading comprehension test it was .92. Since we attempted to explain students’ academic achievement in general, a latent factor based on both test scores was included in the path models.

3.3 Analyses

Structural equation modelling was applied to the data. Models were estimated with Mplus software (version 7) using maximum likelihood (ML) estimation. Model fit indices reported are the Chi-square and



degrees of freedom values, the Root Mean Square Error of Approximation (RMSEA), the Standardized Root Mean Square Residual (SRMR), the Comparative Fit Index (CFI) and the Tucker-Lewis Index (TLI). Adequate fit is found when the RMSEA values are .06 or lower, SRMR values are .08 or lower, and CFI/TLI values are .95 or higher (Hu & Bentler, 1999). First, Model A is presented, including only direct effects of the school motivation factors (i.e. four latent variables) and school commitment factors (i.e. three observed variables) on academic achievement. Then, Models B and C (the mediation models) are presented. Insignificant paths ($p > .01$) will be deleted step-by-step to improve model fit.

4. Results

Table 1 shows the correlations among all variables.

Table 1

Correlations among all variables

	1	2	3	4	5	6	7	8	9
1. Cognitive capacities	-								
2. Mastery motivation	.04	-							
3. Performance motivation	.05	.36	-						
4. Social motivation	.09	.47	.14	-					
5. Extrinsic motivation	-.02	.51	.56	.36	-				
6. Commitment	.11	.35	.14	.27	.17	-			
7. In-depth exploration	-.05	.35	.24	.26	.31	.30	-		
8. Reconsid. of commitment	-.20	-.07	.08	-.10	.07	-.32	.09	-	
9. Reading comprehension	.49	.07	.01	.08	-.03	.10	-.02	-.17	-
10. Mathematics	.70	.05	.10	.09	-.01	.13	-.04	-.21	.52

Students' cognitive capacities correlated highly with their scores on the mathematics test ($r = .70$) and moderately with their scores on the reading comprehension test ($r = .49$). All other correlations varied from $-.01$ to $.56$, with the highest correlations between performance and social motivation ($r = .47$), between mastery and extrinsic motivation ($r = .51$), between performance and extrinsic motivation ($r = .56$), and between the reading comprehension and mathematics scores ($r = .52$). Finally, the correlations between the school motivation and school commitment components on the one hand and the achievement measures on the other hand were low (the highest correlation was $-.21$).

All variables were initially included in the path models. The first path model (Model A1) included direct effects of students' cognitive capacities, school motivation (4 latent factors: mastery, performance, social, and extrinsic motivation), and school commitment (commitment, in-depth exploration, reconsideration of commitment) on students' academic achievement. The model did not show adequate fit with regard to the RMSEA (.084) and SRMR (.091) values and the CFI (.881) and TLI (.834) values. Deleting the insignificant path from reconsideration of commitment to achievement ($p = .167$) in Model A2 did not improve model fit: RMSEA (.091), SRMR (.098), CFI (.881), TLI (.829). Subsequently, the other insignificant path, that is, from mastery motivation to achievement ($p = .026$) was deleted in Model A3. This model, now only including significant paths, also did not improve model fit (see Table 2).



Table 2

Model fit results of Models A3, B2, and C

	Model A3	Model B2	Model C
RMSEA	.090 [.087-.094]	.057 [.053-.060]	.126 [.122-.129]
SRMR	.087	.034	.099
CFI	.896	.967	.816
TLI	.846	.944	.702
AIC	191957.338	215718.962	193420.437
BIC	192181.762	215974.196	193665.437
χ^2 (df)	1938.108 (35)	636.237 (26)	3395.381 (32)
R ²	.681	.677	.679
N	6639	7319	6639

Note. Full Information Maximum Likelihood was used, therefore, the number of students included in the analysis varies per model. Missing data are generally missing scores on the intelligence test, because not all schools administered this test. Moreover, some individual students did not take the achievement tests or filled out the questionnaire (or had too many missing items to construct scale scores).

Subsequently, Model B was constructed, including the direct effects from Model A3 (3 out of 4 school motivation factors: performance, social, and extrinsic motivation; 2 out of 3 school commitment variables: commitment and in-depth exploration) and mediation effects of the school commitment variables on the motivation – achievement relationships. Model B1 shows adequate fit: RMSEA (.059), SRMR (.037), CFI (.959), except for the TLI value (.929). However, the one direct path was not significant, that is, from commitment to achievement ($p = .215$). Model B2 therefore shows the results without this variable in the model (see Table 2), which significantly improved model fit. The RMSEA and SRMR values are well below the cut-off values. The CFI value is above the cut-off value of .95 (Hu & Bentler, 1999), the TLI value almost reaches the cut-off value (.944). Model C, the model that included mediation effects of the school motivation factors on the school commitment – achievement relationships, did not fit the data (see Table 2). Model B2 appeared the best fitting model. Figure 1 shows the corresponding path model.

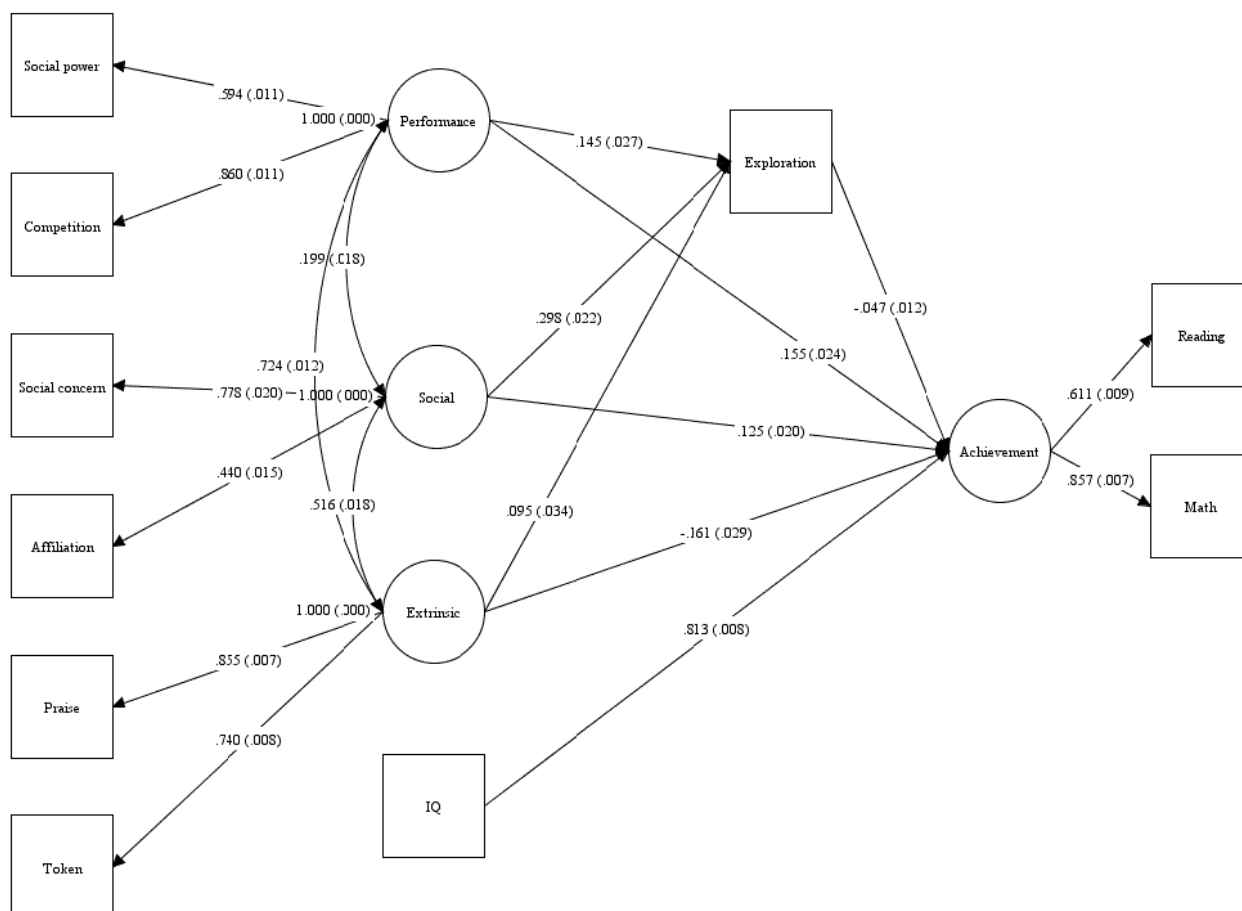


Figure 1 Path model of Model B2 (standardized estimates, standard errors between brackets)

Note. All paths are statistically significant at $p < .001$. The path from extrinsic motivation to in-depth exploration is significant at $p < .01$.

The strongest predictor of academic achievement was students' score on the intelligence test (an indicator of students' cognitive capacities; .813). Additionally, performance motivation (.155) and social motivation (.125) showed positive effects on students' academic achievement. The desire to outperform others (performance motivation) and to learn together with others (social motivation) seems to progress students' achievement. Extrinsic motivation (e.g. learning for praise and tokens) was, however, associated with lower levels of academic achievement (-.161). The final model included one of the three subscales of school commitment, namely, in-depth exploration. Referring to the extent to which students are actively engaged in investigating relationships and the way in which they deal with existing commitments, this variable was negatively related to academic achievement. The size of the effect was quite small (-.047), which indicates that this result needs to be interpreted with some caution. We will return to this issue in the discussion. Stronger effects were found for the relationships between the motivational factors and in-depth exploration. Higher levels of motivation (performance, social, and extrinsic) were associated with higher levels of in-depth exploration. That is, the higher one's motivation, the more one thinks about and explores relationships at school. This was particularly the case for social motivation.

The final model revealed small significant mediation effects of in-depth exploration on the motivation – achievement relationships, although we would like to stress that the relationship between in-depth exploration and achievement was quite small to begin with. We tested the indirect effects of performance, social, and extrinsic motivation on achievement via in-depth exploration. These indirect effects



were negligible: performance motivation $-.007$ ($SE = .002$; $p < .01$), social motivation $-.014$ ($SE = .004$, $p < .001$), and extrinsic motivation $-.004$ ($SE = .002$, $p < .05$).

5. Discussion

This study integrated insights from identity development theory and motivational theories on achievement goals in an educational context, using a large student sample. Although the constructs that were used in this study have very different theoretical origins, the empirical findings underscore that school motivation (following motivational theories on achievement goals) and school commitment (following identity development theory) are related constructs among secondary school students. Various school motivation factors (i.e. performance, social, and extrinsic motivation) and one school commitment component (i.e. in-depth exploration) each had unique effects on academic achievement in addition to the effect of students' cognitive capacities. Moreover, the school motivation factors were positively related to students' in-depth exploration. Educational studies attempting to explain students' academic achievement should, therefore, integrate insights from these different theoretical perspectives in their explanatory models to further understand the direct and unique contributions of each of these variables.

A positive direct effect was found for social motivation on students' academic achievement (as suggested by Covington, 2000 and Deci & Ryan, 2000) and a negative direct effect was found for extrinsic motivation (in line with findings presented by Wolters et al., 1996), which suggests that it is relevant to study other achievement goals in addition to the more commonly addressed mastery and performance goals (see Maehr, 1984). Furthermore, a positive effect was found for performance motivation. Performance-oriented students, thus those that, for example, responded that they worked harder when they tried to be better than others, had higher scores on the achievement tests than students with different orientations towards learning. For students' general academic achievement, it seems beneficial to be (to some extent) oriented towards outperforming others. This finding is in contrast with the results of the meta-analysis of Huang (2012), who did not find a significant relationship between performance motivation and achievement. A notable finding was that mastery motivation was the first factor that needed to be deleted from the model (see result section for details). The findings for mastery and performance motivation are in contrast with the results of the meta-analysis of Huang (2012), who found positive relationships between mastery motivation and achievement but not between performance motivation and achievement. Presumably, the study design is important here for the interpretation. When outperforming others is students' general orientation toward learning, performance on a low stakes academic achievement test (which was used in this study) provides students with almost the same opportunities as performance on a high stakes test, namely outperforming others. When mastery is students' general orientation toward learning, performance on a low stakes test does not imply that actual learning takes place. That is to say, the context does not ask for any learning activities such as trying to master the content. There were no consequences attached to the outcomes of the tests. A more methodological explanation is that the several motivation components were moderately correlated (which was allowed in the path model). Particularly the correlations of social motivation with mastery and extrinsic motivation were moderately high, which may have resulted in smaller effects for each of these components. Students are not mastery *or* performance-oriented, they often adopt various achievement goals in learning situations (see also Korpershoek et al., 2015).

Only one of the three school commitment components was included in the final model. The higher students' score on the in-depth exploration scale, the lower their general academic achievement. This would imply that thinking a lot about school and exploring one's commitment to school is unfavourable for students' general academic outcomes, which is not in line with theoretical notions discussed earlier in this paper. As already mentioned in the results section, the size of the effect was rather small ($-.047$), which is why this result should be interpreted with some caution. Replication of the study is needed to validate these findings. The other two school commitment components (commitment and reconsideration of commitment)



were not included in the final model, indicating that those components were not related to students' general academic achievement. As stated in the introduction, these factors may still be relevant for day-to-day functioning of students in class and presumably also for their school grades in more context- or domain-specific situations. The impact on general academic achievement could, however, not be confirmed.

Finally, although in-depth exploration mediated the motivation – achievement relationships, the indirect effects of performance, social, and extrinsic motivation on academic achievement via in-depth exploration were negligible. The final model that included these effects showed adequate model fit, but our data did not support the idea that one's school commitment substantially mediated the motivation – achievement relationships. Replication of the study is needed to validate these findings. Notwithstanding these critical remarks, Model B (including mediation effects of school commitment on the motivation – achievement relation) fitted the data much better than the theoretically less plausible Model C (including mediation effects of school motivation on the school commitment – achievement relation).

The study contributes to further theory development, particularly by highlighting that some motivational processes (such as adopting mastery goals) and some identity development processes (such as making commitments to people in one's environment) are presumably more important for situation-specific school contexts than for general school contexts. That is, in our models, mastery motivation did not show a meaningful relationship with our general academic achievement measures ($r < .10$), but the correlations between mastery motivation and two school commitment components (commitment and in-depth exploration) were meaningful (both $r = .35$). These latter findings are more in line with theory (e.g. Deci & Ryan, 2000; Osterman, 2000), because these relationships suggest that motivational processes and students' identity development processes go, to some extent, hand in hand. Model B (including mediation effects of school commitment on the motivation – achievement relation) fitted these theoretical notions, although the relationship between in-depth exploration and achievement we found was quite unexpected. However, in our study, we used curriculum-independent test scores to measure students' academic achievement rather than situation-specific achievement measures (e.g. student achievement on a domain-specific test in a specific course in secondary education), which might explain this finding. Based on our results, one could argue that the theories that we studied to explain differences in student achievement appear less applicable to this more general school context. An important suggestion for further theory development with regard to AGT (Elliot & McGregor, 2001) and PI theory (Maehr, 1984) is, therefore, to see how and to what extent these motivational theories on achievement goals can capture more general motivational patterns among adolescents in addition to more situation-specific contexts such as classroom learning. Additionally, it might be worthwhile to examine different ways to operationalize school motivation (i.e. more situation-specific versus more in general) when studying students' general academic achievement.






With regard to educational practice, the finding that social motivation is positively associated with students' general academic achievement, suggests that social motivation is a suitable target for intervention. Although the contribution of this variable to the explanation of students' general academic achievement is relatively small compared to the effect of students' cognitive capacities, it showed a meaningful relationship. Stimulating students' social concern, for example, by emphasizing that it is important to help each other at school, may create an atmosphere in which students stimulate each other's learning processes. In a similar vein, the findings show that students' often prefer to work in groups rather than alone (social affiliation). The positive association between social motivation and academic achievement suggests that group work may stimulate student learning.

In addition to validating the findings and confirming the final model in future studies, we suggest investigating differential effects on students' academic achievement. That is, for particular student groups (e.g. for underperforming students) some relationships may be stronger than for other student groups, but more research is needed to investigate this (e.g. by using multigroup analysis). Additionally, the addition of other variables in the model, for example, school engagement (see Osterman, 2000) and self-efficacy (see Hejazi, Shahraray, Farsinejad, & Asgary, 2009) is a relevant topic for future research. Various studies propose that the effect of sense of school belonging (conceptually related to school commitment) does not directly influence student achievement, but influences student engagement and self-efficacy beliefs, which in



turn affects achievement. An important limitation of this paper is that cross-sectional data were used, therefore eliminating the opportunity to examine cause-effect relationships. That is, the findings confirmed various significant associations, but it is likely that the relationships work both ways. For example, high academic achievement may have a positive impact on students' motivation as well. Further research is therefore needed to understand how these relationships develop over time (e.g. using cross-lagged models). Notwithstanding this limitation, the main contribution of this paper lies in the empirically-funded argument that the integration of insights from identity development theory and motivational theories enhances our general understanding of student learning and student achievement in secondary school.

Keypoints

-  This paper adopted insights from two different theories, namely identity development theory and achievement goal theory
-  Various motivation and school commitment components were significantly related to students' academic achievement
-  Cognitive capacity was the strongest predictor of academic achievement among 9th grade secondary school students
-  The final model included small effects of performance (+), social (+), and extrinsic (-) motivation on students' academic achievement
-  In-depth exploration mediated the motivation – achievement relationships to a limited extent

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