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Bridging contextual and individual factors of academic achievement: a multi-level analysis of diversity in the transition to higher education

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Abstract

The transition to higher education has been extensively documented in the literature. In this line, many individual variables were identified as strong predictors of academic achievement. Yet, this literature suffers from one main limitation; contextual factors have often been left out of the investigation. The majority of studies have tested the impact of individual characteristics assuming that the effects are the same in different programs. However, differences between institutions or programs could result in specific learning contexts leading to different adjustment processes. As an attempt to overcome this limitation, the current study has investigated the impact of both individual and contextual factors on academic achievement through a multifactorial multilevel analysis. The analyses were carried out on 1,173 freshmen from 21 study programs. Results highlighted that 15% of variation in students' achievement was found between programs. Aspects of curriculum organization that contributed to academic achievement were gender ratio, opportunities given for practice and class size. Besides, seven individual factors were also predictive of academic achievement in the multifactorial approach: past performance, socioeconomic status, self-efficacy beliefs, value, mastery goal structure, study time and paid job. Finally, significant random effects were identified for peer support, course value, attendance and external engagement (i.e. commitment in extra-academic activities). The implications and limitations of this study are discussed. By connecting individual and contextual predictors of academic achievement this study intends to endorse a frontline approach regarding the transition to higher education.

Keywords: academic achievement, learning environment, teaching practices, contextual factors

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1. Introduction

In the light of political imperatives for study success and higher education expansion, the transition to Higher Education (HE) and more precisely student's first-year experience has received increased attention (Gale & Parker, 2014). The challenge is to understand the process which can lead students to the academic achievement, and factors embedded in it. The effects of many variables have been investigated on academic achievement: socioeconomic status (Sirin, 2005), past performance (Elias & MacDonald, 2007), attendance (Credé, Roch & Kieszczynka, 2010), self-efficacy (Bandura, 1997), peer support (Dennis, Phinney & Chuateco, 2005), informed choice (Husman and Lens 1999) and perception of teaching practices (Lizzio, Wilson & Hadaway, 2007).

Despite a vast body of research, most studies addressed individual predictors of academic achievement without considering organizational diversity among institutional contexts. As achievement process is mainly considered as universal, environmental characteristics are overlooked. Yet, as suggested by some authors (Pascarella and Terenzini, 2005; Kuh, Kinzie, Schuh & Whitt, 2011), distinctiveness of countries, institutions or programs in admission procedures, student body, requirements and assessment could result in specific learning environments leading to specific achievement process. For example, we can postulate that the learning context of a student registered in medicine in the United Kingdom will largely differ from those of a student enrolled in a sociology program in France.

Moreover, achievement among the first year at the university is a complex process involving a series of interrelated factors. For instance, De Clercq, Galand and Frenay (2017) found that the impact of self-efficacy beliefs on achievement depends on students' past performance and their socioeconomic status. The negative effect of low confidence in his or her ability to succeed could be offset by high past performance and privileged social background. Therefore, it is important to understand the relative importance of these factors when they are considered together. Current research widely acknowledges the need to endorse multifactorial approaches of academic achievement (Coertjens, Brahm, Trautwein, & Lindblom-Ylänne, 2017; De Clercq, Galand, Dupont, & Frenay, 2013a; Richardson, Abraham, & Bond, 2012; Van Petegem, Coertjens, Donche, & Noyens, 2017).

This paper can be understood as a frontline step forward in the consideration of the transition to HE through a multifactorial and multi-level analysis of students' achievement process. As achievement can be conceived as an index of a successful transition, the investigation of the process leading to achievement during the first year at the university can be considered as an interesting perspective on student's transition. More precisely, performing a multi-level analysis, the present study aimed at investigating the main effects of the factors embedded in students' achievement processes, considering both individual and program characteristics. This study investigated the predictors of a successful transition by connecting individual and contextual levels of investigation of students' achievement processes.

1.1 Toward a Conceptual Framing of the Achievement Process

Based on literature about first-year experience at the university, three categories of achievement predictors can be distinguished: background factors, experience of the learning environment and psychosocial factors (De Clercq et al., 2013a, De Clercq, Galand & Frenay, 2020; Richardson et al., 2012; Schneider, & Preckel, 2017). More precisely, a conceptual framing of the achievement process can be proposed from the integration of previous works and theories on the first-year experience. Recent work embedded in an adapted approach of Tinto's model of student departure also suggested that both individual backgrounds, psychological attributes, and perceived institutional factors should be considered together when addressing the first year in HE (Schaeper, 2019). Another recent research grounded in the self-system model of motivational development (Skinner, Wellborn, & Connell, 1990) and social cognitive theory of career and educational choice (Lent & Brown, 2019) posited that student achievement will be directly influenced by psychological factors (engagement and motivation) which

are, in turn, impacted by the experience of the learning environment (De Clercq et al., 2020). This study also considered backgrounds factors as important distal predictors of academic achievement. This conceptual framing is also consistent with Price's 4P model of student's learning outcomes in HE (Price, 2014). This model, focused on approach to learning, arguing that a student's characteristics (Presage) will determine his or her perceptions of the learning context (Perceptions) which will in turn influence the student's approach of the learning task (Process) which will finally predict his or her outcomes (Product).

Based on these studies and the above-mentioned theoretical frameworks, we suggested that achievement would be a three-stage process including backgrounds factors, experience of the learning environment and psychological factors. More precisely, psychological factors are expected to have the most proximal impact on academic achievement. The experience of the learning environment is supposed to have a distal impact, and the background factors are expected to be the most distal category of variables. The categories of predictors are described in figure 1 hereunder.

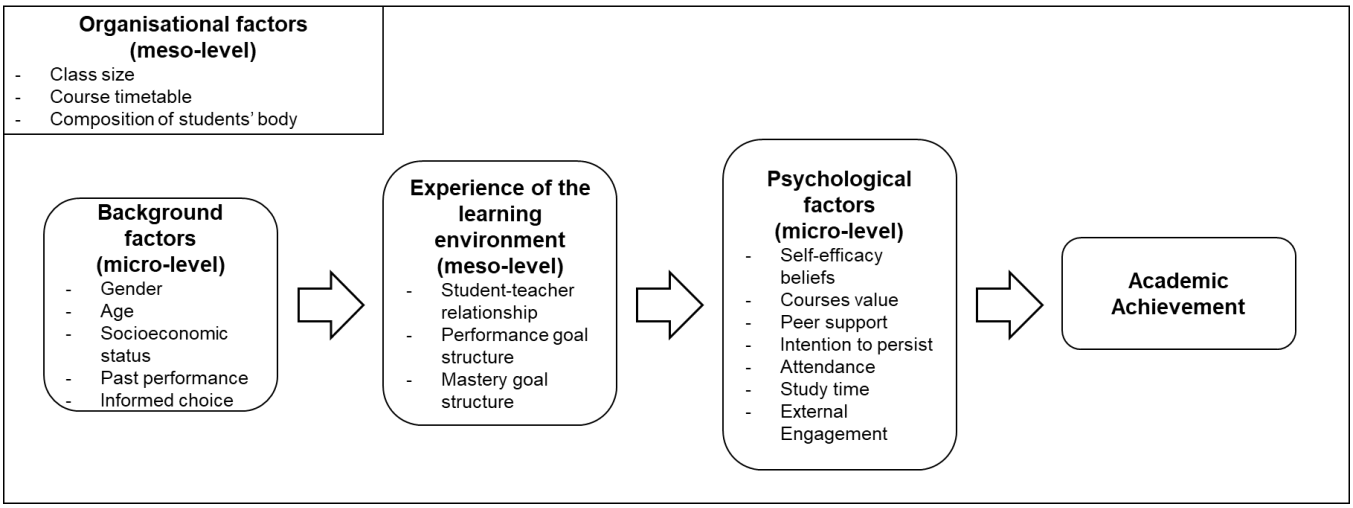

Figure 1. Conceptual modelling of the achievement process

Moreover, beyond these three categories of variables, the objective characteristics of the context were added to the model. Based on the I-E-O model (Astin, 2012), a recent study highlighted the necessity to consider both student perceptions and institutional characteristics when investigating college experience (Georgianna et al., 2020). This argument can be related to broader theories such as the ecological systems theory (Bronfenbrenner, 1992; 2005). This theory postulates that (1) individual development arises through transactions with the environment and that (2) different environmental nested levels can be considered. Ecological systems theory can also be related to studies using a three-level framework of HE (Enders, 2004; Munge, et al., 2018; Nuñez, & Kim, 2012; Perna, & Thomas, 2008; Taylor & Ali, 2017) which argued that the microsystem (students' individual characteristics) will be affected by the meso- (institutional context) and the macrosystem (educational policy).

Among the first year at the university, the institutional context (mesosystem) can be influential in several ways. Schaeper (2019) proposed that it could impact student experience as an objective reality and as a subjective shared perception of the learning environment. The proposed framework therefore encompassed both objective and subjective dimensions of the context: the above-mentioned experience of the learning environment and the organizational characteristics of the institutional context such as course timetable, class size or composition of student body. This additional category considers for organizational aspects of the context (Georgianna et al., 2020; Pascarella and Terenzini, 2005; Kuh et al., 2011).

1.2 The Organizational Aspects of the Institutional Context

Van Der Hulst and Jansen (2002) were the first to investigate the question of academic achievement using multi-level analysis. Focusing on 1,578 engineering students from twelve different cohorts of students in three engineering disciplines, they showed that three percent of the variation in student's achievement was due to the curriculum. They also found a significant impact of the spread of study activities over the year and instruction characteristics. Van den Berg and Hofman (2005) also used multi-level analysis to estimate the variation in study progress from one course to another among 1,800 freshmen from 60 different courses. They showed that five percent of variation was due to factors related to courses, such as course timetable or course evaluation. This study also highlighted the importance of study load and opportunity for practice (problem-based learning) for achievement. Yet, the results did not highlight any effect of examination characteristics. Jansen (2004) also questioned the influence of curriculum characteristics on academic success in six different departments. She demonstrated the significant effect of curriculum organization characteristics such as study load and tutorial hours on academic success. These studies provided interesting first findings about the effects of organizational aspects on academic achievement. Yet, they are still too scarce to provide a clear picture of this impact.

Beyond organizational aspects of institutional context, some authors also found that individual predictors of achievement varied from one study program to another (De Clercq et al., 2013a; Lizzio, Wilson, & Simons 2002, Millet, 2003; 2012). For instance, Lizzio and colleagues (2002) found that the impact of prior achievement was only significant in one of three faculties (Science) investigated. De Clercq and colleagues (2013a) found that peer support, intention to persist and time spent to study were only significant predictors for science program whereas, extrinsic motivation was only a negative predictor of achievement in a physical education program. These results suggest furthering investigations on educational environment.

1.3 The Role of Background Factors

Student background factors (such as gender, age, parental educational level, socioeconomic status, and past academic performance or standardized achievement test score) have been extensively studied in the literature about the first year at the university (Van Rooij, Brouwer, Fokkens-Bruinsma, Jansen, Donche, & Noyens, 2018). From a theoretical point of view, several models supported the importance of background characteristics in the first year at the university. For example, they are conceived as pre-entry attributes of Tinto's theory of departure (Tinto, 1997) and as pre-college traits of Pascarella and Terenzinni's model of change (2005).

Many studies have indicated that women performed better than men in HE (Lekholm & Cliffordson, 2008), and that age is negatively related to academic performance (Farsides & Woodfield, 2007). Yet, the meta-analysis of Richardson and colleagues (2012) on first-year students estimated very low corrected correlations of these factors with academic achievement (between .03 and .04).

Another line of research tackled students' educational or socioeconomic background. Students from lower socioeconomic backgrounds were found to have lower achievement (Rodríguez-Hernández, Cascallar, E., & Kyndt, 2020; Sirin, 2005). Several studies based on Social Capital Theory (Bourdieu, 1986) identified social capital as an explanation of how socioeconomic status is related to academic achievement. Yet, this idea was recently questioned and criticized (Rodríguez-Hernández et al., 2020). The meta-analysis of Richardson and colleagues (2012) estimated a corrected correlation of .15 with academic achievement. However, some studies failed to replicate this result, claiming that socioeconomic status has no direct effect on achievement at university when the impact of past performance is controlled (Sackett, Kuncel, Arneson, Cooper, & Waters, 2009). In this idea, a mediating mechanism can be postulated: socioeconomic status would determine prior school background (high school grade, school specialization, educational track…) which would subsequently be predictive of academic achievement.

Past academic performance (i.e. secondary-school diploma or standardized achievement test scores) has also been an extensive topic of investigation. Four meta-analyses (Poropat, 2009; Richardson et al., 2012; Robbins et al., 2004; Sackett et al., 2009) corroborated the stable and important link between past performance and academic achievement (corrected correlation between .20 and .35). This factor is mainly identified as the most powerful predictor – sometimes the only significant one – of achievement in college or at university (Díaz, Glass, Arnkoff, & Tanofsky-Kraff, 2001; Perry, Hladkyj, Pekrun, & Pelletier, 2001; Vandamme, Superby, & Meskens, 2005).

Beyond traditional background factors, another line of research recently emerged from the literature, focusing on student's study choice process. Several studies and theories, such as future time perspective theory (Husman & Lens, 1999) and educational choice implementation (Germeis & Verschueren, 2007; Germeijs, Luyckx, Notelaers, Goossens & Verschueren, 2012), have highlighted the importance of the information process. First findings concluded that students who made an informed and thoughtful study choice attain higher academic achievement, were more satisfied with their courses, and applied more adaptive study strategies (Biémar, Philippe, & Romainville, 2003; Lens, Simons, & Dewitte, 2002). However, this field of research remains underdeveloped and needs more investigation to support these first findings.

Despite a vast body of research on background factors, this category of predictors is far from explaining all the variance in achievement, suggesting that other variables could also play a role. Indeed, Robbins et al. (2004) showed in a meta-analysis that background factors account approximately for 22 percent of the variance in academic achievement. These authors also confirmed that other kinds of factors, namely psycho-social factors, make a significant incremental contribution in predicting college achievement. Such results were corroborated by Dollinger, Matyja and Huber (2008) who insisted on the added value of considering background factors together with psychosocial ones. Allen and colleagues (2010) found that some psychosocial factors could have some effect sizes comparable to those of background factors. Moreover, recent research insisted on the added value to move beyond backgrounds variables and to consider the experience of the learning environment in the investigation of the first year in HE (Schaeper, 2019). This experience could have a strong impact on academic achievement (Schneider, & Preckel, 2017).

1.4 The Role of the Experience of the Learning Environment

Grounded in a first contextual consideration of academic achievement, some studies put forward the necessity to consider students' experience of the university (Lizzio et al., 2007). The experience of university, defined as the way the student connects to the specific university context, could have an impact on engagement and achievement (Rayle, Kurpius, & Arredondo, 2006).

Several studies found a relationship between perceptions of the learning environment and academic achievement (Lee & Burkam, 2003; Lizzio, et al., 2002; Lizzio, et al., 2007). In HE literature, a large amount of energy was devoted to the understanding of perceived teaching practices considered as a paramount component of students' experience of the university (Schneider, & Preckel, 2017). The Australian authors Lizzio and colleagues (2002, 2007) specifically focused on the importance of the perceptions and the relationships with the teachers. Their studies indicated that the perception of good teaching was positively associated with academic grades whereas the perception of a heavy workload and inappropriate assessment were negatively associated. Such results were questioned by Patrick, Ryan and Kaplan (2007) who found an indirect link between student/teacher relationship and achievement. Teacher support would rather have a direct impact on students' self-efficacy beliefs and motivation.

Some authors supported that, beyond the quality of the relationship with the teacher, what was important for student success is the teaching climate (Anderman & Patrick, 2012). According to the goal theory (Ames, 1992), students' subjective perceptions of the values and messages conveyed by the learning environment would play a significant role in their engagement and achievement (Anderman & Patrick, 2012). More precisely, two constructs can be distinguished: mastery goal structure and

performance goal structure. According to Anderman & Patrick (2012), mastery goal structure encompasses with students' perception that "learning and understanding are valued and that success is indicated by personal improvement" (p.181). Conversely, performance goal structure taps the student's perception that "achievement and success entail outperforming others or surpassing normative standards" (Anderman & Patrick, 2012; p.181). Several authors found a positive association of mastery goal structure and academic achievement in high school context (Bong, 2005; Greene, Miller, Crowson, Duke & Akey, 2004; Meece, Anderman & Anderman, 2006; Roeser, Midgley & Urdan, 1996). Studies also investigated these variables in HE and showed a positive link between mastery goal, task value and achievement (Church, Elliot & Gable, 2001; De Clercq, et al., 2020; Karabenick, 2004, Zusho, Karabenick, Bonney & Sims, 2007). However, empirical findings about the relation between these constructs and academic achievement in HE are still scarce and deserve further consideration (De Clercq et al., 2020).

Although this literature attempted to address the contextual nature of the first-year experience, it only focuses on individual perceptions of the learning environment. The studies mentioned above did not use multi-level analyses which also impede the interpretation of their findings and conclusions regarding the experience of the program. According to Marsh and colleagues (2012), the aggregation of the individual perceptions of the students is needed to overcome idiosyncratic bias and obtain an accurate estimation of shared learning environment. Such methodology was employed by some researchers in order to investigate the impact of the actual curriculum characteristics on academic success (Jansen, 2004; Van den Berg & Hofman, 2005; Van Der Hulst & Jansen, 2002). Our work aimed to apply this approach to the investigation of the impact of learning environment experience on academic achievement.

1.5 The Role of Psychosocial Factors

Based on contemporary educational (e.g. Tinto, 1997) and motivational theories (e.g; Eccles and Wigfield, 2002), Robbins and colleagues (2004) delimited psychosocial factors as the motivational, behavioural and social variables at work during the academic year. Several factors were mentioned such as academic self-efficacy beliefs, task value, intention to persist, social support and commitment.

Social cognitive theory (Bandura, 1997) claimed that confidence in one's ability and chance of success are important in the prediction of achievement. This assumption has been substantiated by related works such as expectancy-value theory (Eccles and Wigfield, 2002). From an empirical lens, numerous studies supported the claim that academic self-efficacy is a key construct in student achievement in HE (Bruinsma, 2004; Chemers, Hu, & Garcia, 2001; Elias & MacDonald, 2007). Beyond its link with academic achievement, several authors (Bong and Skaalvik, 2003; Torres and Solberg, 2001) showed that self-efficacy beliefs foster social integration, intention to persist and engagement, while reducing the perceived stress of college students. The meta-analysis of Richardson and colleagues (2012) identified self-efficacy beliefs as one of the most important predictors of academic achievement (corrected correlation between .28 and .67 depending to the measure used).

Grounded in Expectancy-value Theory (Eccles & Wigfield, 2002), task value is also identified as an important motivational construct in the achievement process. Task value can be defined as students' perception of the importance, the utility, the cost and the interest of a task (Pintrich & De Groot, 1990; Eccles, 2005). Empirical investigations in HE mainly highlighted that task value had positive effects on study time, effort, and academic achievement (Bong, 2005; Bruinsma, 2004, Neuville, Frenay & Bourgeois, 2007, Pintrich & De groot, 1990, Pintrich 1999, Pintrich 2003). The meta-analysis of Robbins and colleagues (2004) found a moderate link between task-value and academic achievement (corrected correlation of .25).

Another line of research focused on the intention to persist (Cabrera, Nora, & Castaneda, 1993; Hausmann, Ye, Schofield, & Woods, 2009). This variable is at the core of Tinto's attrition theory (1997) as one of the most direct predictors of students' persistence. Moreover, intention to persist has been empirically found to be related to academic persistence (Hausmann et al., 2009; Vallerand, Fortier & Guay, 1997;). Several authors also pointed to a positive association between the intention to persist and academic achievement (DaDeppo, 2009; Neuville et al., 2007; van Rooij, Jansen, & van de Grift, 2018). More precisely, De Clercq and colleagues (2013a) highlighted in hierarchical regressions that intention to persist significantly determined academic achievement while controlling for the impact of backgrounds factors, experience of the learning environment and other psychological factors. Neuville and colleagues (2007) also demonstrated through structural equation modeling that intention to persist was a significant predictor of academic achievement. Yet, the causal relationship between these two constructs is still unclear and it could also be assumed that intention to persist is a consequence of achievement.

Another body of research focused on the social layer of the transition to HE. Freshmen are separated from their previous social networks and need to create new ones. This is one of the first difficulties that these students have to cope with (Schmitz et al., 2010). Self-determination theory (Ryan & Deci, 2017) supported that an individual needs to feel socially accepted and recognized in order to actively engage in a specific task. The same goes for the student entering at the university who needs to feel personally supported by his peers in order to achieve academically. In this line, peer support also emerged as an individual predictor of academic achievement in some studies (Dennis et al., 2005; Hackett, Betz, Casas, & Rocha-Singh, 1992; Larose, Robertson, Roy, & Legault, 1998). Two meta-analyses (Richardson et al., 2012; Robbins et al., 2004) assessed a weak effect size of peer support on academic achievement (corrected correlation between .09 and .11). For some authors, the impact of peer support on academic achievement may be indirect. For example, Torres and Solberg (2001) showed that peer support had a direct impact on self-efficacy beliefs, study time and anxiety but no direct effect on achievement.

Finally, some scholars stated that behavioural commitment is the most proximal predictors of academic performance (Credé et al., 2010). In this line, Dollinger and colleagues (2008) concluded that class attendance accounts for 6 to 10 percent of achievement variance among undergraduate students. Similar conclusions were drawn by Pirot and De Ketele (2000) among first-year university students. Moreover, a meta-analysis from Credé and colleagues (2010) revealed a strong relationship between class attendance and academic marks ($r = .41$), leading the authors to claim that class attendance is the single best predictor of achievement. Study time, another indicator of commitment, was found to be moderately correlated with final grades in the first year at university (Vandamme et al., 2005; Van den Berg and Hofman, 2005). The meta-analysis of Robbins et al. (2004) found a direct weak link between study time and academic marks (corrected correlation of .12). Finally, some studies (Torenbeek, Jansen & Hofman, 2010; Van den Berg & Hofman, 2005) investigated the external engagement (commitment in extra-academic activities such as paid work). These studies found a negative association with academic achievement.

1.6 Aims of the Study

As an attempt to overcome limitations of the literature on academic achievement at the first year at the university, this study endorsed a multifactorial and contextual approach regarding the achievement process. Students' achievement process is considered as a proxy to assess a successful transition to HE. This procedure can therefore be conceived as a frontline approach of transition to HE by bridging subjective and objective aspects of the institutional context to background and psychosocial individual factors. Moreover, the study also aimed at analyzing the contextual differences among several study program. This consideration made an innovative investigation of the meso-level of diversity during the first year in HE possible. More precisely, the aims were fourfold.

First, the study aimed at identifying the main predictors of academic achievement when their impacts are considered together. Regarding the above-mentioned literature, past performance (Díaz et al., 2001), self-efficacy beliefs (Richardson et al., 2012) and behavioural engagement (Credé et al., 2010) are supposed to remain important predictors of academic achievement in multifactorial analyses. From a theoretical point of view, behavioral engagement is supposed to be the most proximal predictor of achievement in our theoretical framework. Conversely, the effect of gender, age (Richardson et al., 2012), socio-economic status (Sackett et al., 2009), peer support (Torres and Solberg, 2001) and performance goal structure (Anderman & Patrick, 2012) on academic achievement are supposed to become non-significant predictors in such a multifactorial approach. These factors are also theoretically supposed to be distal and non-direct predictors of achievement in our theoretical framework.

Second, in order to highlight the importance of considering the contextual diversity in the transition to HE, the study aimed to estimate the magnitude of the variations of academic achievement across different study programs. Van Der Hulst & Jansen (2002) namely found three percent of variation across study program in Engineering. Van den Berg & Hoffman (2005) found five percent of variation across the course regarding study progress. We expected higher variation across study programs because the contextual differences in the programs investigated in the current study (different disciplines, number of students, teaching practices, academic demands…) are much bigger than in research cited above.

Third, the aim of the study was also to understand which characteristics of the programs could explain variation in achievement. To do so, organizational characteristics of the study programs (class size, composition of the student body, course timetable) and aggregated measures of perceived learning environment (teacher-student relationship, goal structure) were considered at the program level.

Third, we assumed that the impact of several achievement predictors on academic achievement would significantly vary from one program to another. Considering the work of Lizzio and colleagues (2002) and De Clercq and colleagues (2013a), different effects of past performance, intention to persist, motivation, peer support and behavioural engagement on achievement are expected.

2. Methodology

2.1 Sample

1,173 freshmen participated in the study. They came from 21 different study programs at the Université catholique de Louvain in Belgium, namely medicine, dentistry, veterinary, psychology, philosophy, economics, management, law, engineering, biology, geology, physics, chemistry, agronomy, political science, communication, computer science, architecture, physical education and history. The sample was composed of 53% of female. The median age was 18 years old and scattered as follows: 16% of 17 years old freshmen, 52% of 18 year old, 20% of 19 year old, 7 % of 20 year old and 5% older than 20 year old.

2.2 Administration and Measures

First several study program characteristics were retrieved from institutional records. The following information was obtained: gender ratio, proportion of tutorials[1] in the program (hours of lecture/tutorials ratio), average class size and mean age.

[1] In our educational system, tutorials encompass small group learning activities such as practical exercises and workshops.

Then, two self-report questionnaires were administered during regular lectures at the beginning and during the academic year. Students were informed that they were free to participate in the study and that gathered information will be kept confidential. Moreover, the study was approved by the Ethics Commission of the University.

The first questionnaire administered in September assessed variables that characterized students at the entrance of the university. Students reported their gender (0= male; 1= female), their age (1= 17; 2=18; 3=19; 4=20; 5= older than 20) and their high school grade (1= 60-70%; 2= 70-80%; 3= 80-90%; 4= More than 90%). Their socioeconomic status was also measured, through cultural and material resources as used in PISA studies (OECD, 2012). Exploratory factor analysis demonstrated one single factor (eigenvalue higher than 1) which explains more than forty percent of the variance. According to Tabachnick and Fidell (2007), factor loadings ranged from good to excellent (.57 to .72). Factor score was extracted to create an overall SES indicator. Finally, informed choice was estimated by the number of sources consulted by the students to choose their study (6 different sources; e.g. teachers, former students, counsellor).

The second questionnaire administered in November encompassed variables that characterized students during the academic year (self-efficacy beliefs, task value, attendance, peer support, intention to persist) and perceived teaching practices. All scales were adapted from Galand & Frenay (2005). Students answered on a five-point scale from 1 = totally disagree to 5 = totally agree. Self-efficacy beliefs were measured through seven items (e.g., 'As long as I do my work, I'm sure I can succeed this year'; α = .72). Task value was assessed through 12 items (e.g., 'I am really interested in the courses' α =.83). Intention to persist was assessed using/by means of 5 items (e.g., 'I will continue my study no matter if I pass or not the year"; α =.87). Peer support was measured through 7 items (e.g., 'I know I can rely on some other students to help me'; α =.80). Two items tapped student's time spent studying (e.g., 'how many hours per week do you usually spent on academic work?'; α =.66), two items assessed attendance (e.g., 'how often do you attend the lecture?'; α =.74) and two dichotomous items tapped external engagement (e.g., 'do you need to have a paid job to finance your study"). Teaching practices were measured through three different scales adapted from Galand & Frenay (2005). Students answered on a five-point scale from 1 = totally disagree to 5 = totally agree. The quality of teacher/student relationship was estimated by four items (e.g., 'teachers listen to our needs'; α =.71). Students' perceived mastery structure was assessed through seven items (e.g., 'teachers first emphasized and focused on student's understanding'; α =.67). Finally, students' perceived performance structure was measured through six items (e.g., 'teachers mainly help high achieving students'; α =.69). In order to obtain accurate indices of shared learning environment, students' perceptions of teaching practices were aggregated to the study program level. Therefore, we also assessed the ICC(1) (i.e., proportion of variance occurring at the classroom level) and the ICC(2) (i.e., the level of inter-rater agreement between students' rating within classrooms) (Lüdtke et al., 2009). Whereas ICC(1) values greater than .10 (10% of variance occurring at the program level) suggest the presence of enough program-level variability to support multilevel analyses, ICC(2) values can be interpreted as traditional estimate of reliability (Marsh et al., 2012). The results revealed sufficient variability at the program level, and adequate levels of reliability (Quality of teacher/students relationship: ICC(1) = .161; ICC(2) = .914; Perceived mastery structure: ICC(1) = .105; ICC(2) = .867; Perceived performance structure: ICC(1) = .182; ICC(2) = .925).

Finally, academic achievement was measured at the end of the year (August) using students' GPA (final overall percentage). In the French speaking Belgian tertiary educational system, achievement is measured through the average percentage for all courses at the end of the academic year. This final score was collected from department records and used as an overall indicator of achievement. An overall final percentage of sixty is required to succeed.

2.2 Analytical Procedure

Multilevel analyses were performed using the HLM7 software using a step-by-step procedure. The significance test of deviance reduction was conducted at the 5% level. Apart from gender, all variables introduced in the analyses were grand mean-centred. First, an empty model was run to estimate the proportion of between programs variance. Next, in the Model 1, study program characteristics were entered at level 2. In Model 2, background characteristics were added at the individual level. In order to estimate the impact of the learning environments, students' perception of teaching practices were introduced at level 2 (Model 3) but not at the individual level. Such procedure is supported by Marsh and colleagues (2012) who highlighted that the most appropriate measure of learning climate consists in the aggregated students' perceptions introduce at program level. In Model 4, psychosocial factors were added to the model at the individual level. Finally, in order to estimate the variation of the effects of level 1 predictors on achievement across the programs, slope variations were introduced in Model 5. Reduction of the residual variance between programs and within programs is presented in the tables of the Results section. Effect sizes for level 1 factors were calculated using Reyes, Brackett, Rivers, White and Salovey (2012, p. 706) formula ($\delta = \gamma/(\sqrt{(r00+\sigma^2)})$; "where γ is the association between the predictor and outcome variables, and the denominator is the standard deviation of the outcome variable, where $\tau 00$ and $\sigma 2$ are the between- and within-groups variances") and directly integrated in the results section.

3. Results

Table 1 presented descriptive statistics for the level 1 variables and their correlations with academic achievement. Age, high school grade and socioeconomic status were the most related to academic achievement.

Table 1
Descriptive statistics for variables included in the analyses and correlation with academic achievement.

	Range	M	SD	$r_{achievement}$
1. Gender	0-1	/	/	-.10**
2. Age	1-5	2.33	0.99	-.16**
3. High school grade	1-4	1.77	0.75	.33***
4. Socioeconomic status	Factor score	/	/	.17**
5. Informed choice	0-6	4.54	1.34	.10**
6. Self-efficacy beliefs	1-5	3.53	0.56	.09**
7. Value	1-5	3.75	0.41	.08*
8. Intention to persist	1-5	4.31	0.79	.07*
9. Peer support	1-5	4.27	0.58	.01
10. Attendance	1-5	4.59	0.76	.06*
11. Study time	1-5	3.53	0.83	.13**
12. External engagement	0-1	0.1	0.24	-.14**
13. Teacher/student relationship	1-5	3.02	0.63	.01
14. Mastery structure	1-5	3.02	0.54	.02
15. Performance structure	1-5	2.12	0.59	-.11**
16. Academic achievement	0-100	52.09	22.70	/

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

Most relationships were weak. The correlation matrixes among the independent variables at the individual and the program level were respectively provided in table 2 and 3.

Table 2

Correlations among independent variables at the individual level.

		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1.	Gender	1.00											
2.	Age	.12***	1.00										
3.	Past Performance	-.10**	-.15***	1.00									
4.	Socioeconomic Status	-.05*	-.11**	.14***	1.00								
5.	Informed choice	-.11**	.04	.07*	16***	1.00							
6.	Self-efficacy beliefs	.18***	.01	.13**	.12**	.01	1.00						
7.	Value	-.18***	.07*	.05	.04	.14***	.19***	1.00					
8.	Intention to persist	.03	.02	-.07*	.06*	.01	.21***	.41***	1.00				
9.	Peer support	.03	-.07*	-.03	.11**	.04	.19**	.29***	.29***	1.00			
10.	Attendance	-.13**	.03	.08**	.12**	.08*	-.03	.12**	-.00	.05	1.00		
11.	Study time	-.21***	-.01	.14***	.02	.16***	-.02	.24***	.08*	-.02	.15***	1.00	
12.	External engagement	.01	.17***	-.03	-.08*	.01	.02	.04	-.01	-.03	.05	.03	1.00

The table 3 highlighted that perceived performance goal structure was positively related program with age and proportion of girls among the program. It was also negatively related to students' perceived quality of the relationship with the teachers.

Table 3

		1.	2.	3.	4.	5.	6.	7.
1.	Gender ratio	1.00						
2.	Mean age	.29	1.00					
3.	Lecture/tutorial hours ratio	.27	-.37	1.00				
4.	Class Size	-.14	.11	-.25	1.00			
5.	Student/teacher relationship	-.02	-.13	.02	-.05	1.00		
6.	Performance structure	.55**	.43*	.02	.11	-.46*	1.00	
7.	Mastery structure	.25	.07	-.16	.15	.33	-.24	1.00

Null model (Model 0) indicated that 15% of the variance (Intra-class coefficient = 0.15) in academic achievement laid between the study programs. This significant between-program variance highlighted that achievement rates differed depending on the study program.

Model 1 enclosed study program characteristics and reported 9.3% of between-program variance explanation. More precisely, study program's average "class" size was a significant negative predictor of academic achievement.

Model 2 included individual variables. Introduction of these variables explained 18% of within-classroom variance and 25% of between-classroom variance. Past performance was a significant predictor of academic achievement (δ=0.37). Students with more privileged socioeconomic background (δ=0.06) and more thoughtful study choice process (δ=0.02) were also found to achieve slightly better. Detailed information about Model 2 can be found in Table 2. Another intuitive way of interpreting the results could be adopted by referring directly to the coefficient. For instance, the coefficient of 7.64 means that an increase of one point out of the past-performance Likert scale will induce an increase of 7.64% on final average percentage.

Table 4
Results of multilevel analyses for models 1, 2 and 3.

	Model 1		Model 2		Model 3	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
Intercept	61.19	1.09***	62.95	1.99***	62.63	1.86***
Program level						
1. Program characteristics						
Gender ratio	-5.81	4.43	1.19	3.11	1.63	3.24
Mean age	2.13	3.20	3.40	2.45	3.15	2.44
Lecture/tutorial hours ratio	-4.43	11.89	-11.39	9.66	-14.54	9.84
Class size	**-0.02**	**0.01***	**-0.02**	**0.01***	**-0.02**	**0.01***
3. Experience of the learning environment						
Student/teachers relationship					-0.25	5.51
Performance structure					-8.08	5.62
Mastery structure					**17.97**	**5.58****
Student level						
2. Background factors						
Gender			-2.17	1.40	-1.44	1.44
Age			-0.73	0.61	-0.86	0.58
Past performance			**7.64**	**0.69*****	**7.22**	**0.56*****
Socioeconomic status			**1.17**	**0.28****	**1.06**	**0.33****
Informed choice			**0.40**	**0.15****	0.24	0.16
Δ within-classroom variance	0%		18.9%		0%	
Total of within-classroom variance explained	0%		18.9%		18.9%	
Δ between-classroom variance	9.3%		25%		15.6%	
Total of between-classroom variance explained	9.3%		34.3%		49.9%	
Deviance	9449		9193		9154	

Note. $N_{students}$=1173; $N_{programs}$=21
*p<.05;**p<.01;***p<.001.

The perceptions of teaching practices aggregated at the program level were added in the third model (**Model 3**) and their main effects on achievement were tested. The results can be found in Table 3. This model improved the between-program variance explanation by 15.6%. The results showed better academic achievement in study programs in which teaching practices were perceived as putting an emphasis on the mastery of the content and self-enhancement (δ=0.20).

In **Model 4**, psychosocial factors were added to the analysis at level 1. Such variables provided incremental within-classroom variance explanation of 7.4%. Four variables were found to have a significant impact on academic achievement. Self-efficacy beliefs were related to better achievement at the end of the year (δ=0.15). The more students attributed value to the courses, the better they performed at the end of the year (δ=0.10). Students who spent more time studying also reached higher performance (δ=0.08). Finally, students involved in a paid job experienced more difficulties to perform (δ=0.22). Detailed information about the model can be found in Table 5.

Table 5
Results of multilevel analyses for model 4 & 5.

	Model 4		Model 5	
	Coefficient	SE	Coefficient	SE
Intercept	62.81***	2.07	62.26***	1.74
Program level				
1. Program characteristics				
Gender ratio	9.43	4.79	8.47	3.40
Mean age	0.50	1.48	-1.67	1.46
Lecture/tutorial hours ratio	-17.01	9.18	**-21.85**	**6.23****
Class size	**-0.02**	**0.01***	**-0.02**	**0.01***
4. Learning environment				
Student/teachers relationship	-3.25	4.12	-1.47	4.14
Performance structure	-7.42	3.22	-4.04	3.49
Mastery structure	**18.94**	**5.48****	**9.78**	**3.38****
Student level				
2. Background factors				
Gender	-1.39	1.42	-1.22	1.29
Age	-0.87	0.57	0.84	0.59
Past performance	**7.22**	**0.56*****	**7.18**	**0.52*****
Socioeconomic status	**1.03**	**0.32****	**1.08**	**0.34****
Informed choice	0.22	0.16	0.25	0.16
3. Psychosocial factors				
Self-efficacy beliefs	**2.10**	**0.70****	**2.27**	**0.69****
Value	**1.69**	**0.77***	**1.97**	**0.87***
Intention to persist	0.20	0.65	0.23	0.63
Peer support	-0.97	0.78	-1.00	0.70
Attendance	0.37	0.79	0.69	0.56
Study time	**1.46**	**0.36*****	**1.31**	**0.32*****
External engagement	**-3.60**	**1.96***	**-4.98**	**1.82***
5. Random effects				
			Chi^2	SD
Past performance slope			19.32	1.20
Value slope			**39.89****	**1.94**
Intention to persist slope			**34.47***	**1.19**
Peer support slope			**35.52***	**1.62**
Attendance slope			**34.62***	**1.37**
Study time slope			22.16	0.46
External engagement slope			29.10	5.51
Δ within-classroom variance	7.4%		4.6%	
Total of within-classroom variance explained	25.4%		30%	
Δ between-classroom variance	0%		0%	
Total of between-classroom variance explained	49.9%		49.9%	
Deviance	9127		9101	

Note. $N_{students}$=1173; $N_{program}$=21
*p<.05;**p<.01;***p<.001.

In order to estimate the variation of the impact of past performance, intention to persist, value, peer support, attendance, study time and external engagement, slope variations were released in **Model**

5. This last model provided 4.6% of additional within-program variance explanation. The final model explained 30% of the within-program variance and 49.9% of the between-program variance. Significant slope differences were found regarding intention to persist, value, peer support and attendance, disclosing that the relationship between these variables and achievement fluctuates between programs. It is also worth noting that lecture/tutorial hours ratio appeared as a significant negative predictor of achievement in this final model.

4. Discussion

The transition to HE is a complex experience partially determined by the characteristics of the new environment. However, multifactorial and contextualized approaches have received relatively little empirical consideration to date impeding our understanding of the contextual diversity into HE. This study went a step further by looking at this phenomenon through the specific lens of students' achievement process. By using multilevel analysis, the current study estimated the magnitude of achievement variation across study programs and depicted the impact of background, psychosocial and environmental factors while considered together.

4.1 A Multifactorial Consideration of Achievement Process

The results first corroborate that both psychosocial and background variables need to be considered (Dollinger et al., 2008; Robbins et al., 2004). Psychosocial factors provide around nine percent of additional explained variance regarding achievement which is in line with the meta-analysis of Robbins and colleagues (2004). This finding supports the necessity to consider these categories of variables together. Backgrounds factors emerge as the most predictive category of predictors which highlighted the crucial importance of students' preparation for HE as assumed by Nicholson's (1990) model of transition cycles. A large part of achievement can therefore already be explained before entering the university.

Out of the results, the most important predictors are past performance, self-efficacy beliefs and behavioural engagement. The more the student is confident in his abilities to succeed and spends time studying, the better he or she will achieve academically. This is in line with the literature which highlighted the unequivocal links of these variables with academic achievement (Credé et al., 2010, Díaz et al., 2001;Richardson et al., 2012). Course value also proves to remain a significant predictor of achievement in this multifactorial analysis. This result is in line with the meta-analysis of Robbins and colleagues (2004) that found a moderate effect on achievement. More surprisingly, socioeconomic status also remains a significant predictor of achievement whereas empirical and theoretical literature mainly identified this factor as having a distal and non-direct impact on achievement. This remaining effect could be explained by the specific nature of the Belgian educational system. The Belgian educational system is characterized as a highly unequal educational system where socioeconomic status has a strong impact on educational pathway since the very beginning of primary education (Cattonar & Mangez, 2014; Maroy & Dupriez, 2000). Students from privileged background go to the best schools and develop the most advanced scholastic competences. At the same time, access to tertiary education (including HE) is widely unconstrained and costs very low tuition fees. This specific configuration increases the importance of first-year students' socioeconomic status. Students from underprivileged background are free to enter at the university. However, they are very poorly prepared to face the requirement of the program due to their disadvantageous educational pathway.

4.2 Combining Micro and Meso-Levels of Investigation

As little is known about the contextual grounding of academic achievement, a first step was to assess the magnitude of achievement's variation from one program to another. As expected, the variation of 15% is quite large and higher than previous estimates of Van Der Hulst and Jansen (2002) regarding engineering students or Van den Berg and Hoffman (2005) on study progress variation across courses. Consistently with previous studies (Chickering & Reisser, 1993), we can suggest with some confidence that study programs largely differ in learning environment which could explain achievement variations. Therefore, the diversity of the environment would deserve more attention in future research.

Looking at the explanation of between program variance, three categories of variable are spotted as sources of explanation: curriculum characteristics, background variables and teaching environment.

First, class size and lecture/tutorial hours' ratio are both negative predictors of academic achievement in the final model. If a student is in a program with a large number of students and a lot of tutorials, he or she is going to achieve less compared to students in smaller programs and fewer tutorials. The result concerning the tutorials contradicts the results of Van den Berg and Hofman (2005) who found a positive association between progress and opportunity for practice. This unexpected result can be explained by the level of investigation of the study. Van den Berg and Hofman (2005) worked at the course level whereas this study analyzed the program level. Thus, we assume that study programs that are very challenging and selective during the first year (i.e. medicine, engineering, physics) also offer more tutorials, and that thus, the composition of the program is relevant.

Second, background factors are identified as significant explanation of between-program variations in achievement. Such finding could be interpreted as follows: the different programs do not deal with the same patterns of students. From one program to another, student background characteristics significantly vary which could explain between-program variations and highlight that contextual diversity is accompanied by individual diversity. According to our results, significant background variation can be found in past performance, socioeconomic status and informed choice. This assumption is in line with studies emphasizing the heterogeneity of the student body among first-year students (Fenollar et al., 2007; Heikkilä, Niemivirta, Nieminen & Lonka, 2011). Recent studies of De Clercq and colleagues (2017; 2020) identified different student's entrance profiles endorsing specific achievement processes. These results pointed to the importance of considering diversity in the student body when addressing academic achievement issue. They also lend credence to this individual heterogeneity and show its connection with contextual diversity.

Third, consistently with previous research (Anderman & Patrick, 2012; Lizzio et al., 2007), the overall perception that teachers valued learning and understanding in a program (i.e. mastery goal structure) explains a significant part of achievement variation between programs. The more teachers are perceived as supporting in-depth learning and self-improvement, the higher the students will achieve. This result highlights that students perceived academic environment has a real impact on the outcomes they are able to achieve. It also suggests that the consideration of teaching practices is paramount to provide a comprehensive depiction of contextual diversity among first-year students in universities. Yet, it is worth noting that only mastery goal structure appears to be significant in contrast to performance goal structure and the quality of the relationship with the teacher. These variables are also moderately correlated. A teaching environment characterized by high mastery goal structure also tends to be defined by rather low performance goal structure and good teacher relationship. So, we can postulate that these other aspects of teaching practices are indirectly related on achievement. While mastery goal structure is the most important when investigating academic achievement, it couldn't be the same with other outcomes variables such as retention or wellbeing. This underdeveloped field of investigation would deserve more attention in the literature.

By emphasizing the specificity of the environment, the findings question the generalizability of the results found in one context to other ones. As suggested by Millet (2012), several achievement predictors would be context-specific and their effects cannot be directly transferred to another

environment. This assumption is supported by significant slope variations found in our analyses, notably about attendance, intention to persist, value and peer support. The differential effect of attendance could be explained by the nature of the assessment procedures. A student registered in a study program which mainly assessed students through evaluations mapping on knowledge (e.g. Law program) would not require much behavioural and cognitive participation to perform. It is not the case for a student registered in another study program which employs more complex assessment tasks directly depending on students' active participation during the lesson (problem-based evaluation task, for example; Engineering program). Such reasoning was partially corroborated by De Clercq, Galand and Frenay (2013b) who proved that the impact of deep processing strategies differed according to the way the student was assessed.

The nature of the courses in the program could explain the differential effect of the value of the course and the students' intention to persist. Students enrolled in programs mainly composed of very general courses (e.g. psychology program) might require a more thorough motivation to succeed than students in very applied and specific courses (e.g. dentistry, veterinary). Finally, the differential effect of peer support could be partially explained by the difficulty of the interactions with the students in the program. A study program mainly characterized by lectures held in large auditoriums (e.g. economics) could result in more difficulty for the students to develop social connections than programmes with smaller class sizes (e.g. architecture, history programmes). Perceived peer support could, therefore, become crucial for students in these big, rather anonymous learning conditions.

4.3 A Widened Theoretical Perspective on the Diversity in the Transition to HE

Our findings do support the theoretical assumption of the three-level framework of HE (Enders, 2004; Munge, Thomas, & Heck, 2018; Taylor & Ali, 2017) that micro-level characteristics of the transition cannot be fully understood without considering meso-level features of HE. This assumption also meets Bronfenbrenner's (1992, 2005) ecological systems model which describes individual development as shaped by multiple, nested layers of context. Transferred to the HE system, the results emphasize the importance of considering both immediate and more distal environmental settings and how they interact with individual characteristics in order to better understand student transition to HE (Taylor & Ali, 2017; McLinden 2017).

Moreover, the relevance of the four categories of variables investigated was highlighted, each of them being composed of significant predictors of achievement. This finding lends credence to the proposed conceptual framework. It also supports several other theoretical models - such as Price's 4P model of student's learning (2014) or De Clercq and colleagues' (2020) model of the achievement process - which both highlighted the necessity to consider background factors, psychological variables and perception of the context together. More precisely, the combination of individual and contextual variables allows for an explanation of 30 percent of individual achievement variance and almost 50 percent of program variance. The selection of variables can therefore be considered as relevant. In sum, our approach can be considered as a valid modelling of achievement process.

Yet, our analytical procedure does not allow to fully validate our conceptual framework. The multi-level analysis only focuses on the direct predictors of achievement and did not consider for indirect effects. The temporal unfolding of the achievement process was therefore left out of the scope of the study. There is, thus, room for improvement in the validation and the modelling of the proposed theoretical framework. Following this idea, the investigation of diversity should be expanded beyond the micro and meso-level. Future research should integrate differences at (1) the micro-level of the individual student experience, (2) the meso-level of the institutional context and (3) the macro-level of the wider education system.

4.4 Limitations and Further Considerations

This study's limitations are threefold. First, a limitation of this study lies in the choice of the variables investigated and the measures employed. The aim was to focus on the contextual nature of academic achievement. To do so, the multilevel analyses allowed us to estimate the magnitude of achievement variation across programs and the explanative power of the perceived learning environment. However, this approach was constrained and did not provide much information about the structural and administrative characteristics of the context. Only four curriculum characteristics were investigated whereas a lot of other indicators (e.g., difference in admission procedures, requirements, assessment, workload, administrative functioning,…) could have improved our understanding of the contexts. According to Kuh and colleagues (2011), the detailed investigation of these objective characteristics would go a step further in this consideration. To do so, such an approach could be inspired by the above-mentioned Dutch studies which specifically addressed this question (Jansen, 2004; Van Der Hulst & Jansen, 2002). Moreover, the subjective experience of the environment was only measured by perceived teaching practices. This could be further investigated by adding the social layer of the environment (Schaeper, 2019) and the nature of the learning tasks composing the program (assessment, perceived workload). Finally, despite the multifactorial approach of academic achievement, complementary variables could have been considered at the individual level. For instance, learning strategies would have been an interesting variable to include in the scope of the analysis. According to the meta-analysis of Richardson and colleagues (2012), adding cognitive factors would be incrementally predictive of achievement. Moreover, Millet (2003, 2012) found significant variations of the effect of cognitive variables across the program. Following this idea, the results of this study should be replicated including cognitive factors in the modelling.

Second, a question remains concerning the level of investigation adopted. The analyses were carried out at the study program level. Conversely, Van den Berg & Hoffman (2005) realized analyses at the course level. Such scopes of investigation refer to different questions and realities. Further studies could broaden the scope to the university level and provide complementary results on the variations observed. Another possibility would be to include different levels of investigation directly in the same analysis. A multilevel analysis endorsing student, course, program and university levels could be of major interest regarding the contextual question of academic achievement. The macro-level of diversity could also have been considered in order to provide a comprehensive investigation. However, such analysis would require a massive international data collection and important collaborative work that lacks in our approach.

Third, the specific perspective of the paper can be questioned. We postulate that achievement can be conceived as a proxy of a successful transition. Therefore, the investigation of the process leading to achievement among the first year at the university was considered as an interesting perspective on student's transition. Yet, this perspective is very specific and leaves several aspects of the transition out of the picture. Several authors argued that the transition is a dynamic process involving several outcomes such as achievement, adjustment, retention, learning and personal fulfilment (Crider, Calder, Bunting, & Forwell, 2015; Dangoisse, De Clercq, Van Meenen, Chartier, & Nils, 2019; Kovač, 2015). Therefore, the transition to HE cannot be fully understood through the achievement process and through cross-sectional designs (Coertjens et al., 2017). An interesting future perspective would be to complement the current approach with a multilevel design addressing other layers of the transition (retention, learning) and considering the longitudinal nature of the first-year experience. In this idea, a study of De Clercq and colleagues (2018) proposed several important moments to consider in order to capture the dynamic nature of the first year at the university, such as the very first week of the transition that constitutes a crucial moment of adjustment for the students.

In conclusion, the paper highlighted the strong potential of an approach that bridges the micro and meso-level of the diversity to the transition to HE. More investigation is needed to unveil the potential of such an approach and move toward an even more fine-tuned understanding of the first-year experience. From a practical point of view, the study highlighted the necessity to consider both

individual and contextual heterogeneity when supporting the students in their transition to HE. The findings sustained a more program-specific promotion of academic achievement accounting for different patterns of students.

Keypoints

- Contextual diversity explains 15 percent of academic achievement among the first year at the university.
- Individual predictors of academic achievement significantly varied across study programs.
- Both curriculum characteristics and perceived teaching practices are significant predictors of academic achievement.
- Study programs varied in student body which highlights that micro-level diversity is partially determined by meso-level diversity.

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