Learning and Individual Differences 54 (2017) 9–19

Contents lists available at ScienceDirect

Learning and Individual Differences

journal homepage: www.elsevier.com/locate/lindif

Secondary school students' engagement profiles and their relationship with academic adjustment and achievement in university

Els C.M. van Rooij *, Ellen P.W.A. Jansen, Wim J.C.M. van de Grift

Department of Teacher Education, University of Groningen, Grote Kruisstraat 2/1, 9712 TS Groningen, The Netherlands

ARTICLE INFO

Article history:
Received 3 February 2016
Received in revised form 25 November 2016
Accepted 5 January 2017

Keywords:
Student engagement
University preparedness
Academic adjustment
Achievement
Latent profile analysis

ABSTRACT

The ability to distinguish secondary school students according to characteristics that contribute to success in university represents important knowledge in the research areas of university preparedness and student success in higher education. This study identified five secondary school student profiles, derived from three dimensions of student engagement: behavioural engagement, cognitive engagement, and intellectual engagement. Students in different profiles differed in their success in university, measured by grade point average and number of attained credits, and in how well they had transitioned to university, measured by academic adjustment. Intellectually highly disengaged students (7%) and students with low behavioural and cognitive engagement (14%) were least successful in university. Students with the highest behavioural and cognitive engagement scores in secondary school performed best in university. These results point to the importance of both behavioural and cognitive engagement. Raising these factors in secondary school students could contribute to better preparation for university education.

1. Introduction

To lower university dropout rates, secondary school graduates need to be well-prepared for university education. Since most research on achievement in higher education uses samples of university students it is not very clear what attributes that students already possess in secondary education contribute to success in university. Therefore, in this study we examined the relationship between students' attributes, in this case engagement characteristics, in grade 12 of secondary education and their achievement and adjustment one year later in the first semester of university education.

The transition from secondary school to university is critical; many students drop out or switch majors during or after the first year of university. Dropping out has negative financial and emotional consequences, as well as repercussions for labour market positions. Switching educational majors may seem less problematic, but for many students, this shift means it will take them longer to graduate, which could have significant cost implications. Furthermore, the chances of university success appear dependent mainly on the transition from secondary to higher education (Baker, 2004). The better a student is prepared to take this leap, the less likely he or she will stumble over the challenges of a new study and life environment. In the Netherlands, the secondary education system is highly differentiated. The students who showed the most potential in primary school (as measured by a test and judged by the teachers) can attend the highest level of secondary education: pre-university education. Graduating from pre-university education after six years grants students access to university education. In 2014, 80% of pre-university graduates continued their education in university (CBS [Centraal Bureau voor de Statistiek], 2016).

What student characteristics in secondary school may affect their success in university? Academic achievement can be explained by cognitive (i.e. intelligence) and non-cognitive factors. A broad, non-cognitive factor is student engagement. Broadly, student engagement refers to students' involvement in and commitment to school (Landis & Reschly, 2013). Involvement refers to active participation in academic as well as extracurricular activities. Commitment can be interpreted as commitment to educational goals and learning (Christenson, Reschly, & Wylie, 2012). Student engagement has received much attention in research and practice due to its proven connection to dropout. Lately, the concept has been turned around: instead of focusing on low engagement leading to dropout, an increasing number of researchers are emphasizing the importance of high engagement for successful high school completion. As a consequence of this turnaround, engagement research increasingly focused on all students, instead of primarily on the ones that are at risk to dropout. The attractiveness of studying engagement as a useful factor in school improvement lies in the fact that it is an alterable variable, in contrast to (relatively) fixed variables such as socioeconomic status and intelligence (Landis & Reschly, 2013). As Zyngier (2008) pointed out, "While this disengagement

* Corresponding author.
E-mail addresses: e.c.m.van.rooij@rug.nl (E.C.M. van Rooij), e.p.w.a.jansen@rug.nl (E.P.W.A. Jansen), w.j.c.m.van.de.grift@rug.nl (W.J.C.M. van de Grift).

http://dx.doi.org/10.1016/j.lindif.2017.01.004
1041-6080/

might be seen as a problem of the individual student in terms of dropping out or problematic behaviour at school, it can also more appropriately be seen in terms of the school failing to enable the student to achieve their potential" (p. 1767). Originally, student engagement was divided into two elements, following the Participation-Identification (PI) Model introduced by Finn (1989). Participation referred to behavioural engagement and identification involved affective engagement. A decade later, with more researchers entering the field of engagement research, a compartmentalization into three aspects became more popular. The construct was divided into a behavioural, a cognitive, and an affective (sometimes referred to as psychological or emotional) aspect. According to Fredricks, Blumenfeld, and Paris (2004), behavioural engagement consists of indicators such as positive conduct and rule following including attendance, involvement in learning including time on task and asking questions, and wider participation in extracurricular activities. Briefly, behavioural engagement can thus be described as the time and effort students devote to academic work. Cognitive engagement goes deeper than behavioural engagement and can be defined by "the student's psychological investment in and effort directed toward learning, understanding, or mastering the knowledge, skills, or crafts that academic work is intended to promote" (Newmann, Wehlage, & Lamborn, 1992, p. 12). Cognitive engagement thus refers to internal behaviours, such as the quality of processing learning content. Comparing behavioural and cognitive engagement, the former is focused on 'basic' behavioural effort, whereas the latter focuses on mental effort. Examples of variables that are often seen as aspects of cognitive engagement are self-regulation and the use of learning strategies (Fredricks et al., 2004). Affective engagement is constructed from perceived relationships with teachers, perceived support from peers and perceived support from family. Many researchers describe this component as sense of belonging (Landis & Reschly, 2013). Although not part of the three original aspects of engagement, another engagement dimension that can be thought of as relevant for students in the highest levels of education is intellectual engagement. Ackerman, Kanfer, and Goff (1995), p. 276) defined intellectual engagement as "a personality construct that represents an individual's aversion or attraction to tasks that are intellectually taxing and is thus related to acculturative and purposeful development and expression of certain intellectual abilities". Broadly speaking, intellectual engagement thus refers to individual differences in the tendency to engage in intellectual activities. In this study we will focus on behavioural, cognitive, and intellectual engagement.

Previous research consistently showed positive relationships between engagement factors and learning outcomes (Klem & Connell, 2004). Especially in the last decades many studies on student engagement have been performed. Some notable outcomes include that engagement deteriorates over the years (Schlechty, 2002) and that girls are more highly engaged than boys (Goodenow, 1992; Yazzie-Mintz, 2007). Yazzie-Mintz's (2007) large-scale study of data on >80.000 high school students in the United States found that 72% of students indicated that they were engaged in school, leaving many students disengaged. To conclude, Willms (2003) made a crucial note by stating that engagement does not predict academic success for each and every student, since OECD research showed that many disengaged students still perform well academically. However, also disengaged but well-performing students are at risk to experience a difficult transition to higher education: whereas their intelligence may have made it possible for them to obtain sufficient grades during high school, this may not be the case anymore in higher education, where the demands are higher.

A typology of secondary school students, based on dimensions of engagement, might provide a rough view of which groups of students seem more or less prepared for university. Methods such as cluster analysis, or the increasingly popular latent class analysis (for categorical data) or latent profile analysis (for continuous data), provide the tools to make such a typology. These methods are person-centered approaches, and differ from variable-centered approaches, such as correlational analysis. The benefit of a person-centered approach is that it is able to shed more light on combinations of characteristics within the individual (a 'profile') by examining which different profiles can be found based on a number of indicator variables. Consequently, analyses can be performed to investigate how these different profiles are related to other variables. What we were interested in here is to investigate which different engagement profiles could be distinguished in high school students and how these profiles were related to the same students' success later on when they were studying at university. Therefore, we sought to relate the engagement profiles as formed in the last grade of secondary education to academic adjustment and achievement in university.

1.1. Profile indicators in secondary education: three dimensions of student engagement

What causes students to do well in education? Von Stumm, Hell, and Chamorro-Premuzic (2011) identified three pillars of academic performance: intelligence, effort, and intellectual curiosity. Thus, there is a difference between a student's maximum and typical performance, such that the former is indicated by the student's ability, but the latter reflects non-cognitive factors, such as curiosity and effort. If we restrict the range of intelligence, effort and curiosity become more important for explaining academic performance (Chamorro-Premuzic & Furnham, 2003). Students in a differentiated school system - such as pre-university students in Dutch secondary education, to which students are admitted on the basis of their abilities -likely do not differ much in maximum performance, but their typical performance varies greatly, which can be explained by differences in their effort and curiosity. In this study, we used engagement as an overarching concept that encompasses both effort and curiosity aspects. Following the dimensions of engagement as discussed above, effort can be categorised as behavioural engagement when it is conceptualised as 'simple' behavioural effort, such as attending class and completing assignments. Effort in the sense of mental effort, like the use of learning strategies, can be considered cognitive engagement. Last, curiosity can be viewed a form of intellectual engagement. Below we will discuss these three dimensions in more detail and elaborate on the constructs that were used in this study.

1.1.1. Behavioural engagement

Behavioural engagement consists of several indicators, including effort, attendance, time on task, and persistence (Fredricks et al., 2004). Research confirmed that this type of engagement predicts academic achievement (Chase, Hilliard, Geldhof, Warren, & Lerner, 2014; Dotterer & Lowe, 2011).

1.1.2. Cognitive engagement

Whereas behavioural engagement refers more or less to the quantity of students' engagement in school work, cognitive engagement focuses on the quality (Davis, Summers, & Miller, 2012). Learning strategies or approaches describe how students learn; they also provide good indicators of the quality of students' engagement while learning, i.e. how much mental effort a student devotes to learning activities. Greene and Miller (1996) distinguished shallow cognitive engagement, such as surface learning, and meaningful cognitive engagement, such as a deep learning approach and self-regulated learning. Research specifically highlights the importance of meaningful cognitive engagement explaining achievement, specifically in the form of self-regulated strategies and a deep learning approach (Richardson, Abraham, & Bond, 2012). The use of metacognitive and self-regulated learning approaches is important in university education, where less external regulation exists. Metacognition makes a unique contribution to explaining academic achievement (e.g. Veenman, Kok, & Blöte, 2005), and research on time management - an important element of self-regulated learning - revealed its consistent relationship with academic achievement (Britton & Tesser, 1991; Macan, Shahani, Dipboye, & Phillips, 1990). In contrast with studies of these self-regulated learning strategies, research into

the relationship of surface (e.g. rehearsal, memorisation) and deep (e.g. elaboration, critical thinking, integrating) learning approaches with achievement is somewhat equivocal. The use of deep learning approaches contributes to better achievement (Furnham, Monsen, & Ahmetoglu, 2009; Lau, Liem, & Nie, 2008), though some studies (Busato, Prins, Elshout, & Hamaker, 1998; Cassidy & Eachus, 2000) indicated that deep learning does not influence academic achievement, because working hard and conscientiously is sufficient, regardless of the type of learning strategy applied. This ambiguity might arise from differences in learning environments and their demands (e.g. examination requirements), which determine whether a specific learning style is effective. Regardless of environmental circumstances, however, substantial research relates the likelihood that people use certain learning strategies to durable personality differences.

1.1.3. Intellectual engagement

Intellectual engagement is the third engagement dimension we focused upon in this study. It refers to the extent to which a person engages in intellectual activities (Woo, Harms, & Kuncel, 2007). A construct capable of measuring intellectual engagement is need for cognition, which Cacioppo, Petty, and Kao (1984), p. 306) defined as "an individual's tendency to engage in and enjoy effortful cognitive endeavours." In an overview of need for cognition research, Cacioppo, Petty, Feinstein, and Jarvis (1996) showed that this need is modestly correlated with grade point average in high school. Intellectual engagement does not only emphasise engagement, but also interest and values (Woo et al., 2007). Therefore, another useful concept to map intellectual engagement is academic interest. By academic interest, we meant a desire to gain academic knowledge in general, regardless of the field, and conduct research. To pursue a university education, in which students are exposed to academic knowledge, students should be interested in obtaining academic knowledge in their focal field, because interest is a powerful predictor of learning outcomes (Ainley, Hidi, & Berndorff, 2002). Feist (2012) showed that a students' level of academic interest is influenced by need for cognition, such that students with high levels of need for cognition likely were more interested in gaining academic knowledge than were low need for cognition students.

1.1.4. Self-efficacy

Self-efficacy is a strong predictor of study success in higher education and consistently was a main predictor in meta-analyses of study success (Richardson et al., 2012; Robbins et al., 2004). Academic self-efficacy is the confidence a student has that he or she will be able to attain specific academic goals or successfully perform certain academic behaviours. Due to its proven connection to student success in higher education, and since our study focuses on the transition to higher education, we included two measures of self-efficacy in our analyses. One of these was self-efficacy in exerting the necessary effort that is needed to succeed in university-level studies, e.g. being confident that one can manage to study at a regular basis and attend class even when the class is perceived as boring. This type of self-efficacy could be categorised within behavioural engagement. The second one, related to intellectual engagement, was self-efficacy in understanding difficult content, e.g. being confident that one can follow a lecture on a difficult concept and understand difficult passages in a study book.

1.2. Outcomes in university: achievement and academic adjustment

1.2.1. Achievement

In this study we looked at students' grade point average (GPA) and the number of credits they had attained (ECTS) in the first semester of the first year of their university studies. Previous research showed that first-year results are valid predictors of student success throughout higher education. For example, Kahn and Nauta (2001) found that first-semester GPA was the primary predictor of persistence to the sophomore year, Allen and Robbins (2007) found that first-year GPA was a strong predictor of major persistence, and Pascarella and Terenzini's (2005) review emphasised the crucial role of first-year college GPA in predicting educational attainment and persistence.

1.2.2. Academic adjustment

Next to achievement in university, we also investigated how the profiles differed regarding academic adjustment. A student's level of adjustment to the new environment is an effective measure of how well a student has transitioned to university, since adjustment refers to how well a person can cope with the demands of a new situation. Academic adjustment then refers to the ability to cope with the academic demands of the university environment (Baker & Siryk, 1989), which depends on four separate aspects: motivation to learn and having clear academic goals; applying oneself to academic work; exerting effort to meet academic demands; and being satisfied with the academic environment (Baker & Siryk, 1984). Prior literature consistently showed the importance of academic adjustment in predicting performance (Kamphorst, Hofman, Jansen, & Terlouw, 2012; McKenzie & Schweitzer, 2001; Prins, 1997; Rienties, Beausaert, Grohnert, Niemantsverdriet, & Kommers, 2012) and persistence (Kennedy, Sheckley, & Kehrhahn, 2000) in higher education. In this study, we focused only on academic adjustment and not on social or personal-emotional adjustment, because previous research consistently showed that academic adjustment has the most influence on academic achievement (Bailey & Phillips, 2016; Rienties et al., 2012). Moreover, academic adjustment explained variance in achievement beyond high school GPA, traditionally the most important predictor of university achievement (McKenzie & Schweitzer, 2001). This makes academic adjustment an important concept to emphasise when investigating study success, and specifically the transition from secondary to university education.

1.3. Research questions

This study sought to identify meaningful groups of secondary school students who shared the same characteristics on the dimensions of engagement - behavioural, cognitive, and intellectual - and to determine how these groups differed in academic adjustment and achievement in university. Through this profiling, insight is gained into individual differences in engagement and into how the different combinations of the three dimensions of engagement in high school would predict success in university. Our research thus was guided by two main questions:

1) Which student profiles emerge in the last grade of secondary school from the indicators of behavioural, cognitive, and intellectual engagement?
2) How do these groups differ one year later in their academic adjustment and achievement in university?

Fig. 1 provides an overview of the design of the study.

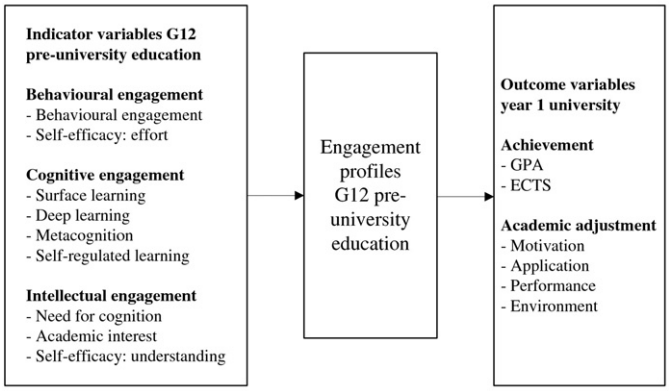

Fig. 1. Design of the study.

2. Method

2.1. Sample

The sample that was used to answer the first research question consisted of 669 grade 12 pre-university students from 11 schools in the Netherlands. They filled out the questionnaires in 2014. Girls were overrepresented (56%), reflecting the trend by which more girls than boys attend the highest levels of secondary education (Coenen, Meng, & Van der Velden, 2011). In the Netherlands, students choose in grade 10 whether they wish to take courses in science or social sciences and humanities, in addition to obligatory subjects such as Dutch, mathematics, and English. The science track was pursued by 57% of the students in our sample, whereas 43% planned to graduate from high school in social sciences and humanities. At the end of the questionnaires students were asked if they were willing to provide their e-mail address, so that they could be contacted one year later for follow-up research. 263 students wrote down their e-mail address and received an e-mail in 2015 that asked them to fill out an online questionnaire on their current activities and, if they indicated they were attending university, on their achievement and academic adjustment. 127 (48%) completed this questionnaire and 90 (71%) of those 127 were studying at a university. The responses of these 90 students were used for the analysis of the second research question, the relationship between the engagement profiles and achievement and adjustment in university. In this second sample, females were overrepresented (69%), as were students who had pursued the science track in high school (67%).

2.2. Measures

2.2.1. Indicator variables

The indicator variables we used to classify the students were factors belonging to the three dimensions of engagement: two behavioural engagement measures (behavioural engagement and self-efficacy in effort), four cognitive engagement measures (surface learning, deep learning, metacognition, and self-regulated learning), and three intellectual engagement measures (need for cognition, academic interest, and self-efficacy in understanding). Table 1 provides an overview of the variables, including their measurement information and sample items.

2.2.1.1. Behavioural engagement. The items that were used to measure behavioural engagement were based on existing instruments that measured engagement, such as the Student Engagement Instrument (Appleton, Christenson, Kim, & Reschly, 2006) and the Student Engagement in Schools Questionnaire (Hart, Stewart, & Jimerson, 2011). To develop a reliable measure, we proceeded through three steps. First, we chose useful items referring to attendance (e.g. 'I skip classes' (reverse-coded)) and 'basic' effort (e.g. 'I pay attention in class') and translated them into Dutch with a back-translation procedure, resulting in an initial version of the scale. Second, we tested this initial version with a small number of students in upper-grade pre-university classes. Third, we conducted analyses to eliminate any redundant items and establish the psychometric qualities of the instrument. Students responded on a five-point Likert-scale (1 = "does not describe me at all"; 5 = "describes me very well"). The final version of the scale consisted of eight items and had a reliability of $\alpha = 0.86$.

2.2.1.2. Cognitive engagement. The four learning strategies were measured with Part B of the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich, Smith, Garcia, & McKeachie, 1991). We made some slight adaptations to the MSLQ: instead of referring to a specific subject, we rephrased the statements to refer to students' general habits of studying, regardless of the subject. The reasoning behind this was that we were interested in students' general strategy use, regardless of how interested they were in a subject, as in university studies they would also encounter classes that may and may not interest them. Following Vrugt and Oort (2008), we used the MSLQ rehearsal subscale to form the surface learning strategy and the elaboration, organization, and critical thinking subscales to form the deep learning strategy. The metacognitive learning strategy consisted of the metacognitive self-regulation subscale from the MSLQ. Self-regulated learning consisted of the time/study environmental management and effort regulation subscales. The internal consistency scores ranged from 0.60 to 0.80.

2.2.1.3. Intellectual engagement. Need for cognition was measured with 18 items from the efficient version of the Need for Cognition scale by Cacioppo et al. (1984). It consists of one factor and has good internal consistency (Sadowski, 1993); we found $\alpha = 0.86$. The extent to which a student has academic interest (regardless of the domain, so not only natural sciences but also social sciences and humanities) was measured by 17 items, based on the Scientific Attitude Inventory II (SAI II; Moore & Foy, 1997). The same three development stages were followed as for the behavioural engagement measure. Students responded on a five-point Likert-scale (1 = "completely disagree"; 5 = "completely agree"). Academic interest was internally consistent ($\alpha = 0.92$).

2.2.1.4. Self-efficacy. To measure self-efficacy, we used items from the College Academic Self-Efficacy Scale (CASES; Owen & Froman, 1988). This questionnaire contains typical behaviours that students need to demonstrate at university. The respondents rated, on a five-point Likert scale, how confident they were that they could perform these behaviours. Three items from the original questionnaire were dropped because they were not appropriate for the current situation at Dutch universities. Previous research has reported good internal consistency (Olani, 2009; Owen & Froman, 1988), and we found $\alpha = 0.88$. In addition to the overall factor, the factor analysis in SPSS distinguished three separate factors of college self-efficacy: confidence in putting in the necessary effort (e.g. attending class even when you find the topic boring,

Table 1
Factors for the indicator variables.

Factor	Sample item	Number of items	Scale range	Cronbach's alpha
Behavioural engagement				
Behavioural engagement	I actively participate in class.	8	1–5	0.86
Self-efficacy: effort	Always attending lectures, even if you think they are boring.	4	1–5	0.73
Cognitive engagement				
Surface learning strategy	I make lists of important items and memorize the lists.	4	1–7	0.60
Deep learning strategy	Whenever I read or hear an assertion in class, I think about possible alternatives.	15	1–7	0.80
Metacognitive learning strategy	If I get confused taking notes in class, I make sure I sort it out afterwards.	12	1–7	0.71
Self-regulated learning	I usually study in a place where I can concentrate on my course work.	12	1–7	0.76
Intellectual engagement				
Need for cognition	I would prefer simple to complex problems (reverse coded).	18	1–5	0.86
Academic interest	I like the idea of gaining academic knowledge in the field of my interest.	17	1–5	0.92
Self-efficacy: understanding	Understanding a lecture on a difficult topic.	8	1–5	0.85

$\alpha = 0.73$), confidence in behaviours associated with understanding difficult content ($\alpha = 0.85$), and confidence in social skills typical of university life (e.g. making new friends, attending social activities, $\alpha = 0.66$). We used the first measure, self-efficacy in effort, as an addition to the behavioural engagement measure, and the second one, self-efficacy in understanding, as an addition to intellectual engagement. We did not use social self-efficacy, because that was outside the scope of this study.

2.2.2. Background variables

We investigated how the profiles related to gender, choosing a science or social sciences/humanities track, high school GPA and whether students planned to attend university after graduation from high school. High school GPA at the moment of research participation was provided by the administrative boards of 9 of the 11 participating schools, such that we had 546 students' GPAs. The Dutch grade point system ranges from 1 to 10, where grades above 5.5 are satisfactory and grades above 8 are good.

2.2.3. Academic adjustment and achievement in university

To answer our second research question about how the latent profiles related to measures of university success, we investigated how latent class membership linked to academic adjustment and achievement of the same students one year later. An overview of these outcomes is available in Table 2.

We measured students' academic adjustment with the academic adjustment subscale of the Student Adaptation to College Questionnaire (SACQ) by Baker and Siryk (1984). This scale consists of 24 questions that involve coping with the academic demands of the university experience. Baker and Siryk (1984) distinguished between four facets of academic adjustment: motivation, which refers to students' attitudes toward academic goals and the academic work they have to do; application, which refers to how well students apply themselves to their academic work; performance, which concerns the effectiveness or sufficiency of students' academic efforts; and environment, which is about how satisfied students are with the academic environment. In line with Baker and Siryk's internal consistency measures for the scale, which ranged from $\alpha = 0.82$ to 0.87, the alpha of our scale was 0.86. Reliability of the four subscales ranged from 0.70 to 0.81.

2.3. Procedure

Secondary school data was gathered in 2014. After obtaining informed consent from the students' parents, the participating students were asked by the researcher or a teacher instructed by the researcher to fill out three questionnaires (need for cognition, engagement, and learning strategies; college self-efficacy and academic interest; and study choice process (not used in this study)). The questionnaires were all paper-and-pencil tests, and students completed them at the beginning of two separate classes, in order to prevent fatigue. Overall, it took the students about an hour to complete all questionnaires. University data was gathered in 2015 through an online questionnaire. Participants gave consent to use their data and to merge their results with the data gathered in high school one year earlier.

2.4. Statistical analyses

To identify the optimal number of latent groups that could be identified in the data from the continuous indicator variables, we conducted a latent profile analysis (LPA) using Mplus 7. Because the scales of the indicator variables had different ranges, we standardised the scores. We fitted models varying from a two- to six-class solution. We used several fit statistics to determine which model fit the data best: Akaike's information criterion (AIC; Akaike, 1987), Bayesian information criterion (BIC; Schwartz, 1978), adjusted BIC (ABIC), Vuong-Lo-Mendell-Rubin likelihood ratio test (VLMRT; Vuong, 1989), and the entropy statistic. For the AIC, BIC, and ABIC, lower values are proof of a better fitting model (Flaherty & Kiff, 2012). The VLMRT compares models for k and $k - 1$ classes. If the ratio test results in a significant p-value, the k class model is a better fit than the $k - 1$ class model (Tofighi & Enders, 2008). Higher entropy indicates less classification error (Collins & Lanza, 2010). As has been discussed widely though (e.g. Marsh, Lüdtke, Trautwein, & Morin, 2009; Pastor, Barron, Miller, & Davis, 2007), fit statistics do not tell the whole story and should not be followed blindly. Therefore, we also determined whether the classes in a k-class solution were interpretable and meaningful, by checking their face validity and determining the percentage of students in the smallest class. We thus could confirm that the classes were large enough to be meaningful and of practical value.

After determining which number of classes fit the data best, we assigned students to the class for which their probability of membership was highest. With analyses of variance (ANOVAs) and post hoc comparisons (Bonferroni), we investigated differences between the latent classes on the indicator variables. To investigate whether the latent classes differed regarding achievement and adjustment in university we performed ANCOVAs, so that we could control for differences due to age, gender, and coursework in secondary school (science vs. social sciences/humanities).

3. Results

3.1. Fit statistics

Table 3 shows the goodness-of-fit measures that we used to determine the number of classes that provided the best fit for our data. Considering the significant p-value of the VLMRT, the entropy value, and the

Table 2
Outcomes.

Factor	Measurement information or sample item	Number of items	Scale range	Cronbach's alpha
Achievement				
GPA	Average self-reported grade attained at courses in the first semester of university.	NA	1–10	NA
ECTS	Self-report number of credits attained in the first semester of university. Since not all degrees had the same number of credits that could be earned, this measure had a scale from 1 (none of the credits that could be attained) to 5 (all of the credits that could be attained so far).	NA	1–5	NA
Academic adjustment				
Overall academic adjustment		24	1–5	0.86
Motivation	I enjoy academic work.	6	1–5	0.71
Application	I keep up-to-date with academic work.	4	1–5	0.70
Performance	I find academic work difficult.	9	1–5	0.73
Environment	I am satisfied with the programme of courses.	5	1–5	0.81

Table 3
Model fit indices.

Model	Number of free parameters	AIC	BIC	Adjusted BIC	VLMRT *p*-value	Entropy	Percentage of students in smallest class
2-Class	28	13,647.87	13,773.65	13,684.75	<0.01	0.77	40
3-Class	38	13,294.68	13,465.39	13,344.73	<0.01	0.79	23
4-Class	48	13,056.31	13,271.93	13,119.53	0.08	0.78	9
5-Class	58	12,850.85	13,111.40	12,927.25	0.02	0.78	7
6-Class	68	12,726.07	13,031.55	12,815.64	0.76	0.79	6

substantial drop in the ABIC from the four- to the five-class solution, we determined that the five-class solution offers the best fit. Across the five groups identified by the LPA, we found that they differed in meaningful ways and were sufficiently large to have practical value (>5%). On the basis of both the interpretability of the classes and the model fit indices, we thus chose a five-class solution.

3.2. Descriptions of the five profiles, based on the engagement dimensions

The names of the profiles reflected their most striking characteristics, e.g. the class with very low intellectual engagement scores was named 'intellectually highly disengaged'. Fig. 2 shows the standardised scores on the indicator variables for each profile. Table 4 offers an overview of some background characteristics of these latent profiles.

The smallest latent profile ($n = 48$; 7.3%), scored relatively very low on all intellectual engagement indicators, even approaching the −2 SD point, which is why we referred to this group as intellectually highly disengaged. Their behavioural and cognitive engagement was well below average. In terms of their background characteristics, the intellectually disengaged learners had a relatively low high school GPA, and female and social sciences and humanities students were overrepresented.

The second smallest class ($n = 93$; 14.2%) consisted of students who scored about 1 SD below average on most behavioural and cognitive engagement factors. In contrast to the first group, however, these students had average intellectual engagement, which is why we called this group behaviourally and cognitively disengaged. This group had a relatively low high school GPA and had the highest percentage of male students (68.8%, while the percentage of male students in the total sample was 43.9). The percentage of science students did not differ from the percentage in the total sample.

The largest latent class ($n = 237$; 36.1%) scored around the average on most factors, hence we referred to them as overall average engaged. Their behavioural and cognitive engagement was higher than their intellectual engagement. Female and social sciences and humanities students were somewhat overrepresented. The average engaged learners had an average high school GPA.

The fourth class ($n = 141$; 21.5%) scored average on most behavioural and cognitive engagement factors and the highest of all groups on intellectual engagement: thus we referred to this group as intellectually engaged. Their scores for behavioural engagement, surface learning and self-regulated learning were a bit below average. Male students and students pursuing the science track were overrepresented in this group. Their high school GPA did not differ much from the overall average GPA.

The last group consisted of one fifth of all grade 12 students ($n = 137$; 20.9%). These students had the highest scores on behavioural and cognitive engagement, and the second highest on intellectual engagement, which is why we called this group overall highly engaged. Female students were overrepresented in this class, but there was no notable difference from the total sample regarding study track. The highly engaged learners had the highest high school GPA of all groups.

Whereas 68.6% of the students in the total sample indicated they were planning to attend university after graduating from pre-university, notably less intellectually highly disengaged learners did so (34.2%)

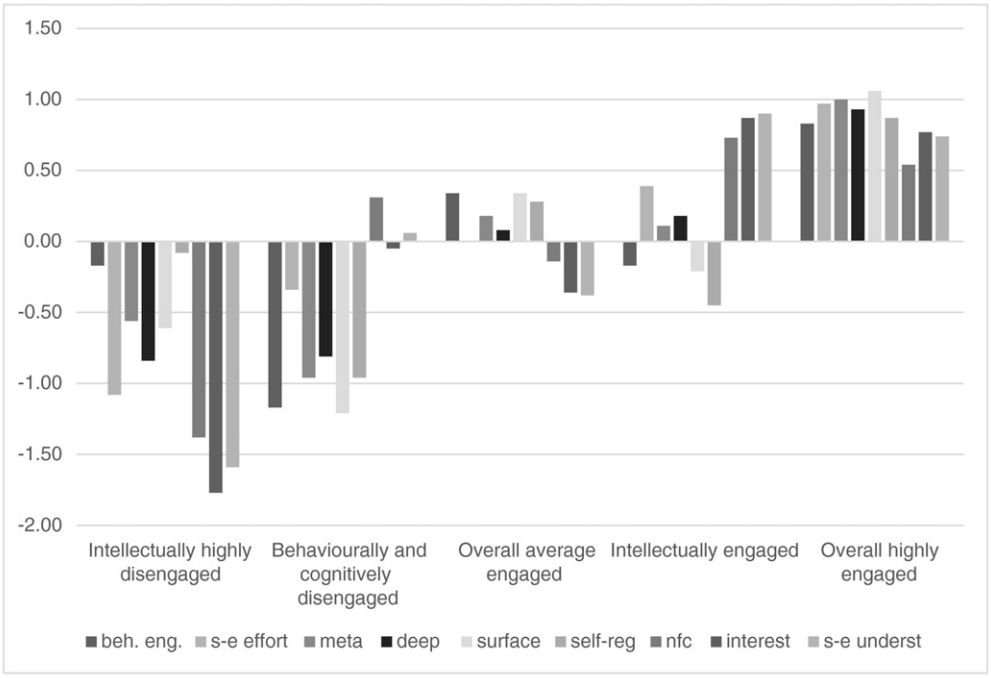

Fig. 2. Standardised scores on the indicator variables per latent profile. Notes: beh eng = behavioural engagement; s-e effort = self-efficacy in effort; meta = metacognition; deep = deep learning; surface = surface learning; self-reg = self-regulated learning; nfc = need for cognition; interest = academic interest; s-e underst = self-efficacy in understanding.

Table 4
Background characteristics of the latent profiles.

Characteristic	Total sample	Intellectually highly disengaged	Behaviourally and cognitively disengaged	Overall average engaged	Intellectually engaged	Overall highly engaged
% of students (number)	100 (656)	7.3 (48)	14.2 (93)	36.1 (237)	21.5 (141)	20.9 (137)
% male (vs. female)	43.9	31.3	68.8	37.1	54.6	32.1
% science (vs. social sciences & humanities)	57.4	40.0	57.4	53.8	67.3	58.3
Average GPA	6.68	6.55	6.53	6.70	6.60	6.89
% of students planning to attend university	68.6	34.2	67.5	60.7	81.9	80.3

and more intellectually engaged, and overall highly engaged learners did so (81.9 and 80.3%).

Bonferroni post hoc comparisons showed that all classes differed significantly ($p < 0.01$) from one another in their surface learning and self-regulated learning (Table 5). On the other variables, varying pairs of classes had comparable scores. As can be derived from the *R*-square values in the last column of Table 5, substantial variance in the indicator variables could be explained by class membership. The largest effects of class membership appeared in the academic interest ($R^2 = 0.60$), surface learning ($R^2 = 0.45$), and metacognition ($R^2 = 0.44$) measures.

3.3. Relationships between latent profiles and university success

To determine whether and how the profiles related to university success, we compared them on grade point average (GPA) and number of attained credits (ECTS) in the first semester of the first year of university and on four measures of academic adjustment (see Table 6, Fig. 3). The results of the ANCOVA – we accounted for the effects of age, gender, and coursework in secondary school (science vs. social sciences/humanities) – showed that the profiles differed significantly in the number of attained credits, $F(4, 67) = 2.83$, $p = 0.03$: intellectually highly disengaged students had earned significantly less credits than intellectually engaged and overall highly engaged students. The profiles also differed in overall academic adjustment, $F(4, 73) = 3.35$, $p = 0.01$: behaviourally and cognitively disengaged learners were significantly less academically adjusted than overall highly engaged learners. Looking into the specific dimensions of academic adjustment, we saw significant differences between the profiles on performance, $F(4, 73) = 5.14$, $p < 0.01$: intellectually highly disengaged learners and behaviourally and cognitively disengaged learners scored significantly lower than overall highly engaged learners, which means that the latter had less problems in exerting academic efforts that were sufficient and efficient than the former two groups. Although the groups' average GPAs varied from 6.40 for the intellectually highly disengaged and

Table 5
Mean scores on indicator variables per latent profile and post hoc comparisons.

Indicator Variable	Total sample mean (SD)	Intellectually highly disengaged	Behaviourally and cognitively disengaged	Overall average engaged	Intellectually engaged	Overall highly engaged	*p*	*F*	R^2
Behavioural engagement									
Behavioural engagement	3.66 (0.73)	3.50a	2.73b	3.85c	3.50a	4.23d	<0.01	101.53	0.41
Self-efficacy: effort	3.73 (0.70)	3.27a	3.29a	3.68b	3.75b	4.24c	<0.01	35.28	0.19
Cognitive engagement									
Surface learning strategy	4.60 (0.97)	4.48a	3.56b	4.85c	4.08d	5.50e	<0.01	117.22	0.45
Deep learning strategy	4.48 (0.72)	3.76a	3.76a	4.48b	4.55b	5.17c	<0.01	104.37	0.42
Metacognitive learning strategy	4.82 (0.68)	4.32a	4.04b	4.87c	4.80c	5.48d	<0.01	114.58	0.44
Self-regulated learning	4.57 (0.76)	4.03a	3.57b	4.80c	4.38d	5.31e	<0.01	171.92	0.40
Intellectual engagement									
Need for cognition	3.55 (0.48)	2.76a	3.33b	3.42b	3.90c	3.80c	<0.01	107.45	0.42
Academic interest	3.56 (0.70)	2.21a	3.46b	3.23c	4.14d	4.03d	<0.01	223.06	0.60
Self-efficacy: understanding	3.82 (0.49)	3.21a	3.69b	3.72b	3.94c	4.15d	<0.01	43.32	0.23

Note: Within-row means with the same letters did not differ significantly from each other ($p > 0.05$).

Table 6
Achievement and academic adjustment in university, per latent profile.

University outcomes	Total sample mean (*SD*)	Intellectually highly disengaged (5.6%)	Behaviourally and cognitively disengaged (7.8%)	Overall average engaged (33.3%)	Intellectually engaged (35.6%)	Overall highly engaged (17.8%)	*p*	*F*	η^2
Achievement									
GPA	7.17 (1.00)	6.40	6.86	7.27	7.10	7.53	0.21	1.51	0.08
ECTS	4.63 (0.79)	3.50	4.67	4.61	4.71	4.85	0.03	2.83	0.14
Academic adjustment									
Overall academic adjustment	3.69 (0.43)	3.40	3.27	3.71	3.69	3.92	0.01	3.35	0.14
Motivation	4.07 (0.51)	4.10	3.79	4.02	4.10	4.21	0.28	1.29	0.07
Application	3.52 (0.85)	3.00	2.86	3.66	3.41	3.90	0.14	1.81	0.09
Performance	3.34 (0.54)	2.80	2.86	3.41	3.32	3.64	<0.01	5.14	0.22
Environment	3.96 (0.54)	3.88	3.66	3.89	4.03	4.11	0.34	1.14	0.06

Note: In the analyses is corrected for the effects of the covariates age, gender, and coursework in secondary school (science vs. social sciences/humanities). Significant differences between latent profiles: ECTS: intellectually highly disengaged < intellectually engaged, overall highly engaged; overall academic adjustment: behaviourally and cognitively disengaged < overall highly engaged; performance: intellectually highly disengaged, behaviourally and cognitively disengaged < overall highly engaged ($p > 0.05$).

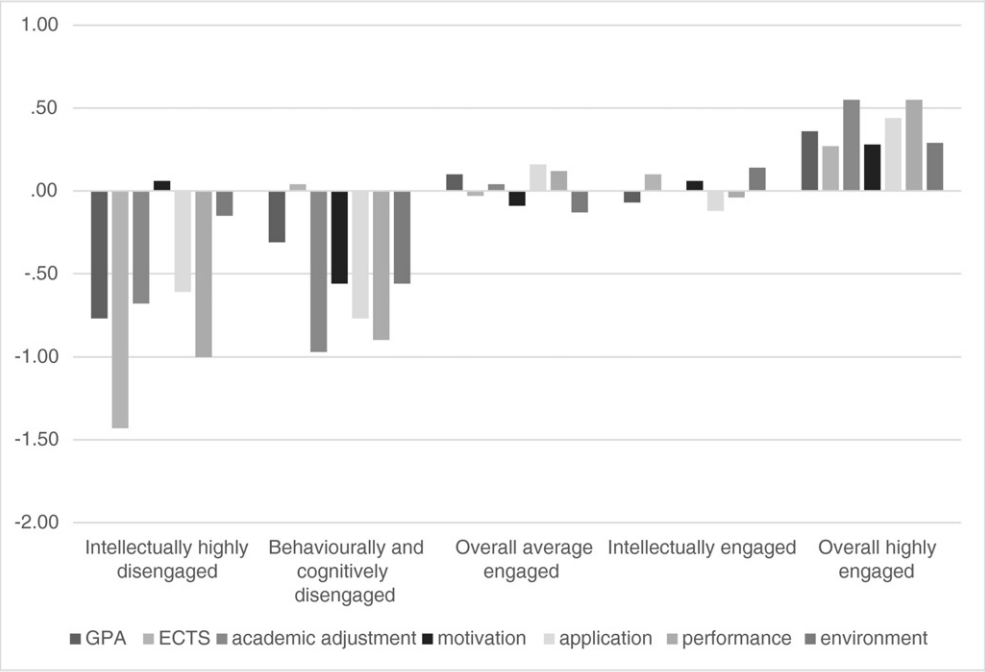

Fig. 3. Students' standardised scores on achievement and academic adjustment in university, per latent profile.

7.53 for the overall highly engaged, this difference was not significant. The adjustment dimensions motivation (i.e. motivation to do academic work), application (i.e. applying yourself to academic work in university), and environment (i.e. satisfaction with the academic environment at university) also did not show significant differences between the profiles. The amount of variance in achievement and academic adjustment explained by profile membership was quite small. The adjustment dimension performance was affected most by class membership ($\eta^2 = 0.22$).

4. Discussion

4.1. Discussion of the main findings

For this study, we were interested in knowing whether students' characteristics in secondary school would affect their success in university. We used LPA to identify five groups of grade 12 pre-university students who shared the same characteristics on three dimensions of engagement: behavioural, cognitive, and intellectual engagement. One year later, we investigated how group membership related to academic adjustment and achievement in the first semester of university.

One group, the overall highly engaged learners (21%), scored high on all measures of engagement in secondary school and had the highest achievement and academic adjustment in university. Being engaged behaviourally, cognitively, and intellectually during high school thus in general seemed to lead to a successful transition to university education.

The largest group, the overall average engaged students (36%), scored average on behavioural and cognitive engagement, but below average on intellectual engagement. In other words, although these students worked hard (behavioural engagement) and were able to use learning strategies (cognitive engagement), their attractiveness to intellectual activities was somewhat low (intellectual engagement). These students' achievement and academic adjustment in university was average.

The intellectually highly disengaged students (7%) were the second group that showed lower intellectual engagement than behavioural and cognitive engagement. Their behavioural and cognitive engagement was below average and their intellectual engagement was very much below average. These students had the lowest GPA and ECTS in university. Their adjustment, most notably regarding application (i.e. applying themselves to their academic work) and performance (i.e. exerting academic efforts that are sufficient and efficient), was below average. Interestingly, this group had the highest percentage of secondary school students who indicated in grade 12 that they did not intend to go to university, so maybe they had a good level of self-knowledge that made them realize university would be an environment that required a certain level of intellectual engagement as well as behavioural and cognitive commitment which did not match their characteristics.

The behaviourally and cognitively disengaged students (14%) and the intellectually engaged students (22%) were perhaps the most interesting. These students earned average respectively high scores on need for cognition and academic interest but this did not translate into a same level of behavioural and mental effort. Likewise, their confidence in being able to put in the necessary amount of effort to succeed at university was substantially lower than their confidence that they could understand university-level content – as opposed to the other three groups who had more faith in their effort than in their intellectual capability. Interestingly, even their scores on deep learning and self-regulated learning fell behind their intellectual engagement scores, while Evans, Kirby, and Fabrigar (2003) showed that these two learning strategies are associated with intellectual engagement, and Von Stumm and Furnham (2012) found a positive relationship between measures of curiosity and deep learning, and a negative one with surface learning. This finding in that the association between meaningful learning strategies and intellectual engagement was not strong for every profile also showed the added value of the person-centered research approach. Nonetheless, the fact that these two groups, as opposed to the other three groups, had higher scores on deep learning than on surface learning was in line with this previously established association in variable-centered research. The question is how this difference between the level of intellectual engagement on the one hand and behavioural and cognitive engagement on the other hand can be explained. One explanation may be that the intellectual engagement indicators can be seen as motivational constructs, whereas the behavioural and cognitive engagement indicators such as effort and actively applying learning strategies emphasise actual behaviour. Being motivated and being behaviourally engaged are not the same. Appleton et al. (2006) also

referred to this distinction by emphasizing that motivation (or in this case need for cognition, academic interest, and being confident in your ability to understand difficult learning content) is a necessary, but not sufficient condition for engagement: "One can be motivated, but not actively engage in a task" (p. 428). Following this line of thought, one cannot assume that students high in intellectual engagement automatically are behaviourally engaged students, even though at first sight they may seem excellent students because they may talk about academic topics that interest them or show that they enjoy cognitive endeavours such as solving difficult problems. Another explanation for the contrast between behavioural and cognitive engagement and intellectual engagement could be that these students are, although motivated for intellectual work, not motivated in school work and hence do not transfer their curiosity and interest to the school context. When looking at the intellectually engaged students, who even outperform the overall highly engaged students on the indicators of intellectual engagement, these may be students who are not being challenged sufficiently in school and consequently have become bored and disengaged in class. An important task for secondary school teachers is to try to ignite these students' curiosity, interest, and self-estimated capability of understanding difficult subject matter in such a way that their actual effort in school work will rise. This is important, because these students may be at risk of underachieving and this study showed that these students may experience a difficult transition to university: the academic adjustment scores of the behaviourally and cognitively disengaged students were lowest of all groups on almost all indicators – even lower than the scores of the intellectually highly disengaged students (the students who were disengaged overall and showed very low intellectual engagement).

When looking at the background characteristics, one interesting finding was that the two groups discussed above consisted of significantly more male students. Having relatively high intellectual engagement but lower behavioural and cognitive engagement thus seemed to be a typical male engagement pattern. This is consistent with research that shows that boys put less effort into schoolwork (Fischer, Schult, & Hell, 2013). Boys' poor effort is a problem that continues to contribute to the growing gender gap in education. To prepare boys better for university and lower their risk of dropping out, strategies that increase their effort to learn should be a central focus. Another interesting background finding was that students pursuing a science track in high school could be found more often in the group of intellectually engaged students, whereas social sciences and humanities students were overrepresented in the intellectually highly disengaged group. As graph 2 showed, these two groups were at the opposite ends of the spectrum of intellectual engagement indicators, so science students seemed to have a higher need for cognition, more academic interest, and more confidence in their capability to understand difficult content than social sciences and humanities students. First of all, this could be self-selection. In grade 10, students chose their track. Those students who were not particularly intrinsically intellectually engaged may have opted for social sciences/humanities because according to a widespread stereotype in the Netherlands this high school track would be less challenging (Groot, 2016). However, it could also be the case that students' intellectual engagement was being aroused more in science subjects than in social sciences/humanities subjects, for example because in the former subjects teachers more often apply enquiry-based learning (Anderson, 2002).

To conclude, among groups of students, it is reasonable to distinguish between intellectual engagement on the one hand and school-related behavioural and cognitive engagement on the other hand. That is, our person-centered analysis clearly showed that the students with high need for cognition and academic interest were not necessarily the same students who also put in the necessary effort in their school work and adopted useful learning strategies, even though variable-centered approaches implied that curiosity related positively to effort (Chamorro-Premuzic, Furnham, & Ackerman, 2006; Goff & Ackerman, 1992). Identifying this distinction clearly is an important result, because research indicates that both being curious and putting in effort are important for academic performance (Von Stumm et al., 2011), a result that our research also showed, since the overall average engaged and overall highly engaged had the highest GPA in university and were most adjusted to their university studies.

4.2. Limitations

An important limitation of this study was that all the measures were self-reported. Self-reports can cause social desirability biases. Students also might not be able to rate their own behaviour and cognitions accurately, such as their use of learning strategies. Moreover, the amount of explained variance in the outcomes in university was rather low. Adding predictors in future research might increase this amount. It would, for example, be interesting to add personality traits, as the meta-analysis of adjustment research by Credé and Niehorster (2012) showed that these influence academic adjustment. Since these traits are relatively stable, they can already be measured in secondary education. Another limitation is that the number of students who filled out the follow-up questionnaire in university was relatively low and that female students were overrepresented in that sample. Moreover, regarding two of the five latent profiles there may have been some response bias in play: the percentage of university students belonging to the group of behaviourally and cognitively disengaged students was substantially smaller than the percentage of grade 12 students belonging to that group (7.8% in university and 14.2% in grade 12), whereas the percentage of university students in the profile of intellectually engaged students was higher than the percentage of grade 12 students belonging to this profile (35.6% in university and 21.5% in grade 12). Since we have no achievement data of students who did not respond to the questionnaire at university, we cannot test whether these students were performing worse than the students who completed the questionnaire. It seems plausible, however, that students who are more engaged in their education are more likely to respond to a questionnaire about how well they are doing in university. As a consequence, it is probable that the achievement and adjustment differences between university students in different profiles would have been more pronounced if our university sample had been more representative. Future longitudinal research should therefore include a larger sample and a better balance of response across the five profiles. A last limitation is that this study took place in the Netherlands, where the secondary education system is highly differentiated and there is a specific secondary school track that aims to prepare students for university. Our findings can, nonetheless, also be relevant for countries with less differentiated systems, because regardless whether a student transitions to university from a comprehensive school or from a more selective type of secondary education (such as in the Netherlands), the issue of having to adjust academically to the new learning environment is present, as well as the fact that students likely differ in their levels of behavioural, cognitive, and intellectual engagement in secondary school. Moreover, a worldwide meta-analysis by Credé and Niehorster (2012) of studies that investigated academic adjustment showed that GPA in higher education was strongly related to academic adjustment. This emphasises the global importance of academic adjustment, and the need to further investigate this construct across countries and education systems. For example, it would be interesting to replicate the findings of our study in a country with a comprehensive secondary education system; to investigate whether the same engagement profiles would be found in secondary education and whether these profiles would also be related to the number of attained credits and academic adjustment in higher education.

4.3. Implications for secondary education

If teachers could get a rough view of students' engagement characteristics during secondary education, appropriate measures can be taken. With the goal of preparing students for a smooth transition to university, it is useful to pay attention specifically to behavioural and

cognitive engagement, since the two groups with relatively lower scores on these factors had the lowest GPA and adjustment scores in university. Considering the profiles with relatively low cognitive engagement, these students clearly need to develop and use learning strategies more effectively to be sufficiently prepared for university. Unlike the relatively high level of external regulation in secondary education, university studies require students to be independent learners and regulate their own learning processes (Jansen & Suhre, 2010). This demand in turn requires metacognitive learning strategies and self-regulated learning strategies, such as planning, monitoring, and regulating the learning process to regulate the use of time, study environment, and effort.

In the group of intellectually highly disengaged students, need for cognition and academic interest were lowest among all latent classes. Overall average engaged learners also scored below average on these intellectual engagement indicators. Teachers thus should pay particular attention to stimulating need for cognition and academic interest in students who do not seem to have this inside flame of curiosity burning. A useful starting activity might be to discuss with students what topics they find interesting; search for appealing, understandable academic knowledge related to these topics; then design an enjoyable, challenging assignment around this.

Looking at the university results of the students in the group of intellectually highly disengaged students, who had the lowest university GPA and almost 1.5 SD below the average number of attained credits, and the behaviourally and cognitively disengaged students, it also seems reasonable for teachers and guidance counsellors to discuss with students who seem to have low engagement whether university is the best path. Our data showed that 34% respectively 67.5% of these students plan to enter university. For these students career guidance and counselling talks might provide space to explain what factors matter for a successful start in university, e.g. the adjustment factors of application and performance, and that due to the students' current low engagement in secondary school the chances are high that he or she might end up struggling with those factors in university. Raising a student's self-awareness then might be a first step to remediation if the student is eager to attend university. After that, measures to help students develop the necessary skills and attitudes might be more effective.

The two profiles with high intellectual engagement scores but lower behavioural and cognitive engagement - the behaviourally and cognitively disengaged students and the intellectually engaged students - need their intellectual engagement to be leveraged to raise their effort and learning strategy use. These students like to be intellectually engaged, so in that sense they are very suitable for undertaking university education, but there may be a mismatch between their interests and the way topics are taught in school, which prevents them from transferring their intellectual engagement to the school setting. Even better than remediation that tries to re-engage these students would be prevention efforts. That is, students often enter secondary education enthusiastically, but their disengagement grows along the way (Kuh, 2007). The crucial question, central to talent development and motivational research, with massive implications for the future of any society that strives to increase the number of well-prepared university students and highly educated employees, thus becomes: How can we prevent talented, curious students from becoming disengaged from high school?

4.4. Conclusion

In this study, we showed that there are five distinct engagement profiles of secondary school students. Once in university, students belonging to different profiles differ from each other regarding academic adjustment and the number of earned credits in the first semester. The characteristics of two of these groups, the intellectually highly disengaged students and the behaviourally and cognitively disengaged students, are such that these students might be at risk of problems in university: their average university GPA was relatively low, as well as their scores on academic adjustment, especially regarding application and performance. Application, the extent to which students apply themselves to their academic work, and performance, the effectiveness or sufficiency of students' academic efforts, relate to behavioural and cognitive engagement aspects, so it may be useful if these students receive extra guidance during high school in developing for example self-regulated learning skills. Moreover, guidance counsellors and teachers could talk to students who are suspected of low behavioural and cognitive engagement about the feasibility and suitability of university education.

The impact of this study lies therein that based on a person-centered approach we showed the value of different dimensions of engagement and showed that a student's specific engagement profile also affects how well he or she performs in university. Secondary school teachers could use this information to address specific shortcomings in engagement if these are clearly visible in their students. If this is not the case, then at least teachers can remind themselves to pay attention to addressing and increasing students' behavioural, cognitive, and intellectual engagement. This could lower the risk of students facing a difficult transition or even dropping out in the first year of university.

References

Ackerman, P. L., Kanfer, R., & Goff, M. (1995). Cognitive and noncognitive determinants and consequences of complex skill acquisition. *Journal of Experimental Psychology: Applied*, *1*, 270–304.

Ainley, M., Hidi, S., & Berndorff, D. (2002). Interest, learning, and the psychological processes that mediate their relationship. *Journal of Educational Psychology*, *94*, 3–13.

Akaike, H. (1987). Factor analysis and AIC. *Psychometrika*, *52*, 317–332.

Allen, J., & Robbins, S. B. (2007). Prediction of college major persistence based on vocational interests, academic preparation, and first-year academic performance. *Research in Higher Education*, *49*(1), 62–79.

Anderson, R. D. (2002). Reforming science teaching: What research says about inquiry. *Journal of Science Teacher Education*, *13*, 1–12.

Appleton, J. J., Christenson, S. L., Kim, D., & Reschly, A. L. (2006). Measuring cognitive and psychological engagement: Validation of the student engagement instrument. *Journal of School Psychology*, *44*, 427–445.

Bailey, T. H., & Phillips, L. J. (2016). The influence of motivation and adaptation on students' subjective well-being, meaning in life and academic performance. *Higher Education Research and Development*, *35*(2), 201–216.

Baker, S. R. (2004). Intrinsic, extrinsic, and amotivational orientations: Their role in university adjustment, stress, well-being, and subsequent academic performance. *Current Psychology*, *23*(3), 189–202.

Baker, R. W., & Siryk, B. (1984). Measuring adjustment to college. *Journal of Counseling Psychology*, *31*(2), 179–189.

Baker, R. W., & Siryk, B. (1989). *SACQ: Student adaptation to college questionnaire manual.* Los Angeles: Western Psychological Services.

Britton, B. K., & Tesser, A. (1991). Effects of time-management practices on college grades. *Journal of Educational Psychology*, *83*(3), 405–410.

Busato, V. V., Prins, F. J., Elshout, J. J., & Hamaker, C. (1998). Learning styles: A cross-sectional and longitudinal study in higher education. *British Journal of Educational Psychology*, *68*, 427–441.

Cacioppo, J. T., Petty, R. E., & Kao, C. F. (1984). The efficient assessment of need for cognition. *Journal of Personality Assessment*, *48*(3), 306–307.

Cacioppo, J. T., Petty, R. E., Feinstein, J. A., & Jarvis, W. B. G. (1996). Dispositional differences in cognitive motivation: The life and times of individuals varying in need for cognition. *Psychological Bulletin*, *119*(2), 197–253.

Cassidy, S., & Eachus, P. (2000). Learning style, academic belief systems, self-report student proficiency and academic achievement in higher education. *Educational Psychology*, *20*(3), 307–322.

CBS [Centraal Bureau voor de Statistiek] (2016). Meer vwo'ers direct naar de universiteit [More pre-university students directly to university]. https://www.cbs.nl/nl-nl/nieuws/2016/02/meer-vwo-ers-direct-naar-de-universiteit

Chamorro-Premuzic, T., & Furnham, A. (2003). Personality traits and academic exam performance. *European Journal of Personality*, *17*, 237–250.

Chamorro-Premuzic, T., Furnham, A., & Ackerman, P. (2006). Incremental validity of typical intellectual engagement as predictor of different academic performance measures. *Journal of Personality Assessment*, *87*, 261–268.

Chase, P. A., Hilliard, L. J., Geldhof, G. J., Warren, D. J. A., & Lerner, R. M. (2014). Academic achievement in the high school years: The changing role of school engagement. *Journal of Youth and Adolescence*, *43*(6), 884–896.

Christenson, S. L., Reschly, A. L., & Wylie, C. (Eds.). (2012). *Handbook of research on student engagement*. New York: Springer.

Coenen, J., Meng, C., & Van der Velden, R. (2011). *Schoolsucces van jongens en meisjes in het havo en vwo: Waarom meisjes het beter doen.* Researchcentrum voor Onderwijs en Arbeidsmarkt: Maastricht University.

Collins, L. M., & Lanza, S. T. (2010). Latent class and latent transition analysis. *With applications in the social, behavioral, and health sciences*. Hoboken, NJ: John Wiley & Sons.

Credé, M., & Niehorster, S. (2012). Adjustment to college as measured by the Student Adaptation to College Questionnaire: A quantitative review of its structure and relationships with correlates and consequences. *Educational Psychology Review*, *24*, 133–165.
Davis, H. A., Summers, J. J., & Miller, L. M. (2012). *An interpersonal approach to classroom management: Strategies for improving student engagement*. Thousand Oaks, CA: Corwin Press.
Dotterer, A. M., & Lowe, K. (2011). Classroom context, school engagement and academic achievement in early adolescence. *Journal of Youth and Adolescence*, *40*(12), 1649–1660.
Evans, C. J., Kirby, J. R., & Fabrigar, L. R. (2003). Approaches to learning, need for cognition, and strategic flexibility among university students. *British Journal of Educational Psychology*, *73*, 507–528.
Feist, G. J. (2012). Predicting interest in and attitudes toward science from personality and need for cognition. *Personality and Individual Differences*, *52*(7), 771–775.
Finn, J. D. (1989). Withdrawing from school. *Review of Educational Research*, *59*, 117–142.
Fischer, F., Schult, J., & Hell, B. (2013). Sex differences in secondary school success: Why female students perform better. *European Journal of Psychology of Education*, *28*(2), 529–543.
Flaherty, B. P., & Kiff, C. J. (2012). Latent class and latent profile models. In H. Cooper, P. M. Camic, D. L. Long, A. T. Panter, D. Rindskopf, & K. J. Sher (Eds.), *APA handbook of research methods in psychology (Vol. 3: Data analysis and research publication)* (pp. 391–404). Washington, DC: American Psychological Association.
Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research*, *74*(1), 59–109.
Furnham, A., Monsen, J., & Ahmetoglu, G. (2009). Typical intellectual engagement, big five personality traits, approaches to learning and cognitive ability predictors of academic performance. *British Journal of Educational Psychology*, *79*, 769–782.
Goff, M., & Ackerman, P. L. (1992). Personality-intelligence relations: Assessment of typical intellectual engagement. *Journal of Educational Psychology*, *84*(4), 537–552.
Goodenow, C. (1992). *School motivation, engagement, and sense of belonging among urban adolescent students. Paper presented at the annual meeting of the American Educational Research Association*. San Francisco: CA.
Greene, B. A., & Miller, R. B. (1996). Influences on achievement: Goals, perceived ability, and cognitive engagement. *Contemporary Educational Psychology*, *21*, 181–192.
Groot, G. (2016, April 7). Bètapakket is prima vooropleiding voor alfa-studies [Science subjects are good preparation for studying humanities]. *Trouw* Retrieved from http://www.trouw.nl
Hart, S. R., Stewart, K., & Jimerson, S. R. (2011). The Student Engagement in Schools Questionnaire (SESQ) and the Teacher Engagement Report Form-New (TERF-N): Examining the preliminary evidence. *Contemporary School Psychology*, *15*(1), 67–79.
Jansen, E. P. W. A., & Suhre, C. J. M. (2010). The effect of secondary school study skills preparation on first year university achievement. *Educational Studies*, *36*(5), 569–580.
Kahn, J. H., & Nauta, M. M. (2001). Social-cognitive predictors of first-year college persistence: The importance of proximal assessment. *Research in Higher Education*, *42*(6), 633–652.
Kamphorst, J. C., Hofman, W. H. A., Jansen, E. P. W. A., & Terlouw, C. (2012). Een algemene benadering werkt niet. Disciplinaire verschillen als verklaring van studievoortgang in het hoger onderwijs [A general approach does not work. Disciplinary differences as an explanation of study progress in higher education]. *Pedagogische Studies*, *89*(1), 20–38.
Kennedy, P. W., Sheckley, B. G., & Kehrhahn, M. T. (2000). *The dynamic nature of student persistence: Influence of interactions between student attachment, academic adaptation, and social adaptation. Paper presented at the annual meeting of the Association for International Research, Cincinnati, OH.* (May 21–24).
Klem, A. M., & Connell, J. P. (2004). Relationships matter: Linking teacher support to student engagement and achievement. *Journal of School Health*, *74*(7), 262–273.
Kuh, G. D. (2007). What student engagement data tell us about college readiness. *Peer Review, Association of American Colleges and Universities, Winter*, *2007*, 4–8.
Landis, R. N., & Reschly, A. L. (2013). Reexamining gifted underachievement and dropout through the lens of student engagement. *Journal for the Education of the Gifted*, *36*(2), 220–249.
Lau, S., Liem, A. D., & Nie, Y. (2008). Task- and self-related pathways to deep learning: The mediating role of achievement goals, classroom attentiveness, and group participation. *British Journal of Educational Psychology*, *78*, 639–662.
Macan, T. H., Shahani, C., Dipboye, R. L., & Phillips, A. P. (1990). College students' time management: Correlations with academic performance and stress. *Journal of Educational Psychology*, *82*(4), 760–768.
Marsh, H. W., Lüdtke, O., Trautwein, U., & Morin, A. J. S. (2009). Classical latent profile analysis of academic self-concept dimensions: Synergy of person- and variable-centered approaches to theoretical models of self-concept. *Structural Equation Modeling: A Multidisciplinary Journal*, *16*(2), 191–225.
McKenzie, K., & Schweitzer, R. (2001). Who succeeds at university? *Factors predicting academic performance in first year Australian university students. Higher Education Research & Development*, *20*(1), 121–133.
Moore, R. W., & Foy, R. L. H. (1997). The scientific attitude inventory: A revision (SAI II). *Journal of Research in Science Teaching*, *34*(4), 327–336.
Newmann, F. M., Wehlage, G. G., & Lamborn, S. D. (1992). The significance and sources of student engagement. In F. Newmann (Ed.), *Student engagement and achievement in American secondary schools* (pp. 11–39). New York: Teachers College Press.
Olani, A. (2009). Predicting first year university students' academic success. *Electronic Journal of Research in Educational Psychology*, *7*(3), 1053–1072.
Owen, S. V., & Froman, R. D. (1988, April). *Development of a college academic self-efficacy scale*. New Orleans, LA: Paper presented at the annual meeting of the National Council on Measurement in Education.
Pascarella, E. T., & Terenzini, P. T. (2005). *How college affects students: Findings and insights from twenty years of research*. San Franciscio: Jossey-Bass.
Pastor, D. A., Barron, K. E., Miller, B. J., & Davis, S. L. (2007). A latent profile analysis of college students' achievement goal orientation. *Contemporary Educational Psychology*, *32*, 8–47.
Pintrich, P. R., Smith, D. A. F., Garcia, T., & McKeachie, W. J. (1991). *A manual for the use of the Motivated Strategies for Learning Questionnaire (MSLQ)*. Ann Arbor, MI: National Center for Research to Improve Postsecondary Teaching.
Prins, J. B. A. (1997). *Studie-uitval in het wetenschappelijk onderwijs. Dissertatie [Drop-out in university education. Dissertation]*. Nijmegen, NL: KUN.
Richardson, M., Abraham, C., & Bond, R. (2012). Psychological correlates of university students' academic performance: A systematic review and meta-analysis. *Psychological Bulletin*, *138*(2), 353–387.
Rienties, B., Beausaert, S., Grohnert, T., Niemantsverdriet, S., & Kommers, P. (2012). Understanding academic performance of international students: The role of ethnicity, academic and social integration. *Higher Education*, *63*(6), 685–700.
Robbins, S. B., Lauver, K., Le, H., Davis, D., Langley, R., & Carlstrom, A. (2004). Do psychosocial and study skill factors predict college outcomes? A meta-analysis. *Psychological Bulletin*, *130*(2), 261–288.
Sadowski, C. J. (1993). An examination of the short need for cognition scale. *Journal of Psychology*, *127*(4), 451–454.
Schlechty, P. C. (2002). *Working on the work: An action plan for teachers, principals, and superintendents. The Jossey-Bass Education Series*San Francisco: Jossey-Bass.
Schwartz, G. (1978). Estimating the dimension of a model. *Annals of Statistics*, *6*, 461–464.
Tofighi, D., & Enders, C. K. (2008). Identifying the correct number of classes in a growth mixture model. In G. R. Hancock (Ed.), *Mixture models in latent variable research* (pp. 317–341). Greenwich, CT: Information Age.
Veenman, M. V. J., Kok, R., & Blöte, A. W. (2005). The relation between intellectual and metacognitive skills in early adolescence. *Instructional Science*, *33*, 193–211.
Von Stumm, S., & Furnham, A. F. (2012). Learning approaches: Associations with typical intellectual engagement, intelligence, and the big five. *Personality and Individual Differences*, *53*(5), 720–723.
Von Stumm, S., Hell, B., & Chamorro-Premuzic, T. (2011). The hungry mind: Intellectual curiosity is the third pillar of academic performance. *Perspectives on Psychological Science*, *6*(6), 574–588.
Vrugt, A., & Oort, F. J. (2008). Metacognition, achievement goals, study strategies and academic achievement: Pathways to achievement. *Metacognition Learning*, *30*, 123–146.
Vuong, Q. (1989). Likelihood ratio tests for model selection and non-nested hypotheses. *Econometrica*, *57*, 307–333.
Willms, J. D. (2003). *Student engagement at school. A sense of belonging and participation*. Paris: Organisation for Economic Co-operation and Development.
Woo, S. E., Harms, P. D., & Kuncel, N. R. (2007). Integrating personality and intelligence: Typical intellectual engagement and need for cognition. *Personality and Individual Differences*, *43*, 1635–1639.
Yazzie-Mintz, E. (2007). *Voices of students on engagement: A report on the 2006 high school survey of student engagement*. Bloomington: Center for Evaluation & Education Policy.
Zyngier, D. (2008). (Re)conceptualizing student engagement: Doing education not doing time. *Teaching and Teacher Education*, *24*, 1765–1776.