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Faculty of Health Sciences
Department of Psychology

Academic performance and student dropout

Results from two studies in upper secondary and higher education in Northern Norway

Rannveig Grøm Sæle

A dissertation for the degree of Philosophiae Doctor – April 2016



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Rannveig Grøm Sæle

Abstract

Education is important for the individual and for society. Higher education is associated with a range of positive factors for work life and social and personal well-being, as well as for the economy of a society. Lower levels of education, and especially dropout from education, come with both personal and public costs, and are associated with unemployment, lower salaries, more crime and more use of welfare benefits. One of the most important and stable predictors of educational dropout is academic performance, typically measured by grades.

This thesis aims to investigate factors related to academic performance and student dropout. It comprises two projects. The first project, *Young Will (Ung vilje)*, is based on a sample of adolescents entering upper secondary school in the autumn of 2010. The second project, *Learning in Higher Education*, studies a sample of students entering university in the autumn of 2013.

Academic performance: Several predictors were examined in relation to academic performance, measured by grade point average. In the upper secondary sample, the most important predictors for lower grade point averages were male gender, enrolment in the vocational track, lower self-reported task solving abilities, lower educational ambitions, less promotion focus and more literacy problems. In the university sample, the most important predictors for lower grade point averages were less reported use of deep and strategic learning approaches and lower incoming grades. Literacy problems and procrastination were not significant predictors in the university sample.

Dropout: Predictors for student dropout, measured two years after enrolment in a study programme at university, were higher age, less use of surface learning approaches, fewer hours spent on studying, lower grades achieved in the first year and enrolment in study programmes with shorter durations. Deep and strategic learning approaches were not significant predictors. We also included literacy problems, procrastination and burnout, but these constructs did not predict dropout.

The findings indicate that educational institutions should focus not only on *what* students learn, but also on *how* they learn. At upper secondary level this includes supporting students with literacy problems and paying attention to low academic performance. At the higher education level, it seems important to foster productivity and commitment from the beginning of the study programme.

Sammendrag (abstract in Norwegian)

Utdanning er viktig for den enkelte og for samfunnet. Høyere utdanning er assosiert med en rekke positive faktorer for arbeidsliv og for den enkeltes livskvalitet, samt for økonomien i samfunnet. Lavere nivåer av utdanning, og særlig frafall fra utdanning, har både personlige og offentlige omkostninger, og er forbundet med arbeidsledighet, lavere lønn, mer kriminalitet og mer bruk av velferdsgoder. En av de viktigste og mest stabile prediktorer for frafall fra utdanning er akademiske prestasjoner, vanligvis målt ved karakterer.

Denne avhandlingen tar sikte på å undersøke forhold knyttet til faglige prestasjoner og studentfracfall. Den består av to prosjekter. Det første prosjektet, Ung vilje, er basert på et utvalg av ungdom som startet i videregående opplæring høsten 2010. Det andre prosjektet, Læring i høyere utdanning, studerer et utvalg av studentene som startet på universitet høsten 2013.

Akademiske prestasjoner: Flere prediktorer ble undersøkt i forhold til akademiske prestasjoner, målt ved karaktersnitt. I videregående skole-utvalget var de viktigste prediktorene for lavere karaktergjennomsnitt å være mann, å gå på yrkesfag, lavere selvrapporterte evner til selvstendig å løse oppgaver, lavere utdanningsambisjoner, mindre grad av *promotion* fokusert motivasjon og større grad av lese- og skrivevansker. I universitetsutvalget var de viktigste prediktorene for lavere karaktergjennomsnitt mindre rapportert bruk av dyp og strategisk læringstilnærming og lavere karakterer fra videregående. Lese- og skrivevansker og utsettelsesatferd var ikke signifikante prediktorer i universitetsutvalget.

Frafall: Prediktorer for studentfracfall, målt to år etter at studentene var oppmeldt ved universitetet, var høyere alder, mindre bruk av overflatiske læringstilnærminger, færre timer brukt på studiene, lavere karakterer i det første året og oppmelding til studieprogrammer med kortere varighet. Bruk av dyp og strategisk læringstilnærming var ikke signifikante prediktorer. Vi undersøkte også lese- og skrivevansker, utsettelsesatferd og utbrenthet, men disse konstruktene predikerte ikke frafall.

Funnene tyder på at utdanningsinstitusjonene bør fokusere ikke bare på *hva* elevene lærer, men også på *hvordan* de lærer. På videregående nivå innebærer dette å støtte elever med lese- og skriveproblemer og vie oppmerksomhet til lave skoleprestasjoner. I høyere utdanning er det viktig å fremme produktivitet og skoleengasjement fra starten av studiet.

List of papers

- I. Sæle, R. G., Sørлие, T., Nergård-Nilssen, T., Ottosen, K.-O., Goll, C. B., & Friborg, O. (2015). Demographic and psychological predictors of grade point average (GPA) in North-Norway: A particular analysis of cognitive/school-related and literacy problems. *Educational Psychology*, 1-22. doi:10.1080/01443410.2014.998630

- II. Sæle, R. G., Dahl, T. I., Sørлие, T., & Friborg, O. (2016). Relationships between learning approach, procrastination and academic achievement among first year university students. *Higher Education*, resubmitted manuscript

- III. Sæle, R. G., Dahl, T. I., Sørлие, T., & Friborg, O. (2016). Predictors of student dropout two years after enrolment at university. Submitted manuscript

Abbreviations

ASSIST	Approaches and Study Skill Inventory for Students
ASQ	Adolescent Stress Questionnaire
BSCS	Brief Self Control Scale
CFA	Confirmatory factor analysis
ECTS	European Credit Transfer and Accumulation System
EFA	Exploratory factor analysis
GPA	Grade point average
GRFM	General Regulatory Focus Measure
HSCL	Hopkins Symptom Checklist
IPS	Irrational Procrastination Scale
IRT	Item response theory
LP	Literacy problems
MAR	Missing at random
MBI	Maslach Burnout Inventory
MCAR	Missing completely at random
MNAR	Missing not at random
PAQ	Personal Attributes Questionnaire
RSA	Resilience Scale for Adults

Introduction

The impact of education for individuals and for society is massive. First and foremost, education builds competence. It enables individuals to pursue a professional career and provides society with a proficient workforce. But the implications span even more broadly, as the level of education may also impact employment, social engagement and health.

Effects of education

Employment.

Employment status and income are associated with level of education. People who drop out of upper secondary education work less and have lower incomes than people with higher education (Rouse, 2007). For every year of schooling a person completes, earnings rise with approximately 10 percent. More highly educated individuals also receive fewer social insurance benefits than adults with lower education (Belfield & Levin, 2007; K. A. A. De Ridder, Pape, et al., 2012; OECD, 2013; Putnam, 2015; Steingrimsdóttir et al., 2012).

Social consequences.

Holding a higher education degree is associated with more engagement in society and in the local community. People with a higher education also participate more in politics and are more likely to vote than people with only upper secondary education or less, making education important also for the function of democracy (Putnam, 2015; Rumberger, 2011; U.S. Census Bureau, 2015). School dropouts are more likely to be engaged in anti-social and criminal behaviour (Moretti, 2007; Rumberger, 2011). Moreover, these patterns tend to reproduce themselves in the family, making it harder for children of parents with lower educational levels to move upwards in socio-economic status (Putnam, 2015).

Health.

Adults with higher education report higher life satisfaction, have better health and live longer than adults with lower education (Belfield & Levin, 2007; K. A. A. De Ridder, Pape, et al., 2012; OECD, 2013; Putnam, 2015; Steingrimsdóttir et al., 2012). It seems that many of the health benefits of education – leading, for instance, to a longer life expectancy – are actually due to the education itself (Muenning, 2007). The influence of educational attainment on health works through both a cognitive and an occupational pathway. Higher cognitive abilities are associated with healthier behaviours. This may be related to increased acknowledgment of health warnings and recommendations, for example regarding exercise and diet. More highly educated people also tend to have a better comprehension of doctors' instructions, superior understanding of health bureaucracies and a greater capacity for developing good coping strategies against stress. In addition, social networks influence health behaviour (Christakis & Fowler, 2008). Holding a higher education degree may create or strengthen ties to social networks with other people who have higher education and lead more healthy lifestyles, thus additionally increasing the probability of healthier behaviours in the individual.

The occupational pathway includes the impact of type of occupation, type and amount of job benefits and level of income (Muenning, 2007). These may moderate the level of stress experienced and whether or not stressors become vulnerabilities. School dropouts are more likely to perform physically burdensome or hazardous labour than people holding a higher education degree. The effects of higher levels of stress among school dropouts is a higher risk of cardiovascular disease, cancer, infectious disease and diabetes.

The consequences of dropout are prominent for the individual, but they also affect society, as upper secondary school dropouts contribute only 40% of the tax revenues contributed by graduates (Rouse, 2007). In addition, inadequate education increases costs of health care, criminal justice and other public services (Belfield & Levin, 2007).

Given the importance of education for the individual, society and the nation, understanding the barriers to achieving an education is paramount. One important barrier is poor academic results,

which may hinder further educational advancement and opportunities for skilled or professional jobs. However, a more important concern is if the student drops out of education completely. The aim of the present thesis is hence to examine aspects related to academic performance (exam grades) and dropout from education.

The Norwegian educational system

Education in Norway is free and open for all. The first ten years of schooling are mandatory, and after that, all adolescents have the right to continue into upper secondary level. Students achieving the necessary academic requirements may then continue into higher education, without costs.

While our society has good systems for letting people *start* an education, we do not yet have sufficient ways of securing that they *complete* that education. Currently, about 90% of adolescents aged 16-18 enter upper secondary school (Statistics Norway, 2015b), but only 71% of these have completed when their legal study right expires five years later (Statistics Norway, 2015c). The number of students entering higher education is increasing (OECD, 2015; Statistics Norway, 2016). Here, the problem of not attaining an academic degree is much larger as about two out of five students entering higher education have not completed any degree ten years later (Statistics Norway, 2012).

Upper secondary education.

The year 1994 represents a change in the educational system in Norway, when all adolescents between ages 16 and 19 received a right to secondary education through the *Reform 94* policy. One of the aims of the reform was to improve throughput, but it also increased the number of adolescents entering secondary education. The share of 16-year-olds in the first year of secondary education increased from 79% in 1993 to 92% in 1994 (Statistics Norway, 1996; Støren, Skjersli, & Aamodt, 1998). Among students entering upper secondary education in 2009, 71% had completed

schooling five years later (Statistics Norway, 2015c). This is an increase of 2.3 percent points since the 1994 cohort, and most of the increase is achieved among boys in vocational study tracks. Still, more girls than boys complete upper secondary school even today (76 vs. 66%), and the completion rates are higher in the general track than in the vocational track (83 vs. 58%). The three counties in Northern Norway have the lowest rates, with Troms and Nordland at 65% and Finnmark at 54%. However, the strongest discriminator seems to be grade levels. In Norway, grades from lower secondary school are summed up, divided by the number of subjects completed, and multiplied by ten, resulting in school points ranging from 0 to 60 (Statistics Norway, 2015c). The importance of grades from lower secondary school for further education is clearly illustrated as follows: Among students with 55 school points or more, almost all (99%) complete upper secondary education, while among students with less than 25 school points, only 14% do.

Higher education.

Public higher education in Norway is open to all students who have completed upper secondary school either in the general track, or in the vocational track with special supplemental studies. There are no registration fees, except for a common fee to the student union of about €60 per semester. Students may apply for a student loan, which makes economic support from parents less important. A student will receive about €10500 per year, and if the student does not live with her parents, 40% of this sum is transformed to an educational grant every year – if she passes all the exams. The payments typically do not cover all everyday expenses and it is common to have a part-time job while studying. Still, the threshold for entering university is low, and in 2014, one in three persons between 19 and 24 years of age was enrolled in higher education (Statistics Norway, 2015a). Sixty percent of all students enrolled were women. However, ten years after entering a higher educational programme, 41% of the students had not achieved an academic degree (Statistics Norway, 2012).

Academic performance has been established as one of the most central predictors also for dropout at university (Araque, Roldán, & Salguero, 2009; Jia & Maloney, 2015; Paura & Arhipova, 2014). Moreover, poor academic performance has been found to be a mediator of other important predictors, such as socio-economic status and demographics, deviant behaviour, socialization in school and in the family (Battin-Pearson et al., 2000) and mental disorders (Esch et al., 2014).

Academic performance

Academic performance is normally measured by the teachers' assessment of student learning. Teacher judgment may be biased due to its subjective aspects. Unclear expectations and poor understanding of the learning outcomes among teachers and examiners may lead to unreliable evaluations (Dahl, 2006). A review by Hoge and Coladarci (1989) found that correlations between teacher judgments and objective, standardised tests ranged from .28 to .92. However, the median correlation was .66, indicating adequate validity of teacher assessment as a measure of performance.

Assessment may take different forms, such as written or oral exams, or observation of behaviour and acquired skills (Schunk, 2014). The evaluation may be expressed as a number (e.g. 78 out of 100) or a percentage (78%). However, most grades are given as either pass/fail or a letter. In Norway, the letters A-B-C-D-E-F are used, where A reflects an outstanding performance (Norwegian Ministry of Education and Research, 2008). An E reflects passing with only the minimum requirements fulfilled and an F is a fail.

Dropout

The definitions of dropout from higher education are diverse. Some studies investigate dropout after the end of a certain study programme, while others examine dropout rates during the study period (Grau-Valldosera & Minguillón, 2014). Studies investigating dropout during the study period may include students who have withdrawn from a study programme; students who were registered, but who did not turn up; students who did not complete course work and students who

did not renew their enrolment for the next year. Some studies also set a cut-off point for consecutive semesters without registration, because students may take breaks from studying and return later. Grau-Valldosera and Minguillón (2014) found that in online courses, with a five percent error threshold, students not registered for 3-5 consecutive semesters are likely to be real dropouts.

Forty years ago, Tinto (1975) proposed a theory of school dropout, emphasising the role of integration, and separating academic integration from social integration. Background factors in the model include family background, individual attributes such as age and gender and previous schooling. *Previous schooling* includes past educational experiences, in terms of achievement, i.e., grades, but also in terms of other experiences related to school. *Family background* is important because parental education, work status and attitudes towards education influence the students' choices and opportunities. People with higher education have higher incomes, a larger formal and informal network from which their children may benefit and more time and resources to support their children in education and career planning (Putnam, 2015). This involvement may also strengthen the integration of their children at school and in society, as adolescents growing up with more highly educated parents tend to be better informed in their meetings with school systems and bureaucracy.

Tinto's model then proceeds into two systems, an academic and a social one. Both systems concern commitment and how this influences the dropout decision. The decision to quit school is often based on a long process, and educational commitment and participation are key factors in this process (Frostdad, Pijl, & Mjaavatn, 2014; Reegård & Rogstad, 2016; Rumberger & Lim, 2008). It is not uncommon among university students to doubt the education chosen and to consider quitting (Xuereb, 2014). Reasons given by the students themselves for having doubts include too high workload or pressure, failed exams, unmet expectations, managing competing priorities, family and work, and financial stress. Reasons for staying despite the doubt are commitment and a wish for goal fulfilment. Several researchers have proposed categories of dropout students based on different

types of risk factors. Heublein (2014) identified three types of students which mirror the most important reasons found by Xuereb (2014), with different elements characterising the process for each type. The first type drops out due to performance-related issues. The process starts with poor grades from upper secondary school and poor knowledge about studying, and continues with inadequate study support, tough demands and exam failures. The second type drops out because of motivational causes. Their process starts with unmet expectations or with not studying their favourite subject, and continues with a lack of motivation and perceived relevance of the education, which leads to decreased interest and willingness to perform. The third type drops out because of financial causes. In this thesis, primarily reasons that characterize the first student group are examined.

Academic performance is one of the most important and stable predictors for dropout (Bowers, 2010; Casillas, Robbins, Allen, & Kuo, 2012). An array of factors also explain variance in both academic performance and dropout, as described in the next section. Finally, the two constructs tend to predict similar individual outcomes later in life, such as employment status, job performance and salary (Belfield & Levin, 2007; French, Homer, Popovici, & Robins, 2014; Kuncel, Hezlett, & Ones, 2004). Hence, academic performance and dropout are related phenomena, and both should be addressed in the pursuit of identifying underlying tentative causes (i.e., predictor variables).

In this thesis, grade point averages (GPA) were used as the outcome measure in Papers I and II. In Paper III, student dropout two years after enrolment was used as the outcome variable. We included predictor variables covering two main domains in order to examine their importance for academic performance and dropout. *Academic factors* were GPA and study behaviour (representing academic commitment in Tinto's model), literacy problems, learning approaches and other factors thought to influence the learning process. *Psychological factors* were motivation and educational aspirations, stress and burnout, personality-related factors and mental health. In addition, some demographic factors were included.

Predictors for academic performance and dropout

Demographics.

Gender is a stable predictor of dropout, as more males than females quit their studies (Alexander, Entwistle, & Horsey, 1997; Battin-Pearson et al., 2000; Casillas et al., 2012). Female students also achieve higher grades than males (Freudenthaler, Spinath, & Neubauer, 2008; Pomerantz, Altermatt, & Saxon, 2002). In addition, socio-economic status, parents' level of education and their engagement with and attitudes towards their children's education add to the picture, regarding both performance and dropout (Alexander et al., 1997; Casillas et al., 2012; De Witte & Rogge, 2013; Lundetræ, 2011; Sirin, 2005; Strom & Boster, 2007). Among Norwegian students whose parents hold a higher education degree equivalent to a Master's Degree, 87% complete upper secondary school, compared to 46% of students whose parents have only completed compulsory schooling (Statistics Norway, 2015c).

Academic factors.

Academic factors represent concepts likely to be related to the learning process. These are learning approaches, procrastination and difficulties with reading and writing.

Learning approaches.

Learning results in change, most notably in terms of changes in knowledge (Mayer, 2011), but also in terms of learning new skills or applying new behaviours (Schunk, 2014). Both types of changes are the results of practice or experience and last over time. How do these changes occur? Behaviourism offers several explanations of change in behaviour, but the change in knowledge is more difficult to examine and explain.

In the 1970s, a number of researchers in Sweden (Marton & Säljö, 1976), Australia (Biggs, 1979) and the UK (Entwistle, Hanley, & Hounsell, 1979) interviewed, tested and surveyed students in order to examine the process of learning. They discovered that students have different approaches

to learning tasks. The initially identified – and still most well-known – approaches were called deep and surface (Marton & Säljö, 1976). As the terms indicate, students using the first approach go deep into the material to be learned, while students using the second only scratch the surface. The deep learner searches for meaning and understanding. For the surface learner, on the other hand, it is not that important to understand and achieve a true change in knowledge. The emphasis is on rote learning and on remembering enough to pass exams and avoid failing. The deep learner tends to be intrinsically motivated – the surface learner extrinsically.

A few additional approaches and labels have been proposed, for instance the strategic learning approach (Entwistle et al., 1979). The strategic learner may use both the deep and the surface approach depending on the learning task. The goal of the strategic learner is to achieve success. She is organised and manages time and resources effectively to reach this goal.

Deep and strategic learning approaches seem to be associated with higher performance (Duff, Boyle, Dunleavy, & Ferguson, 2004; W. A. Reid, Duvall, & Evans, 2007), but one study found that the association is weaker among male students (M. Byrne, Flood, & Willis, 2002). A surface approach is negatively associated with performance (Diseth, 2007; Duff et al., 2004; W. A. Reid et al., 2007), but this relationship may be curvilinear (Diseth, 2002). Other studies have failed to find any association (Campbell & Cabrera, 2014; Gijbels, Van de Watering, Dochy, & Van den Bossche, 2005). One explanation may be poor validity of the deep learning measure used in the studies. Another explanation may be that the performance assessment did not rely on deep conceptual knowledge. The mixed results in the learning approaches literature make the connections between learning approaches and learning outcome worth closer examination.

Procrastination.

To procrastinate is to “voluntarily delay an intended course of action despite expecting to be worse off for the delay” (Steel, 2007, p. 66). Procrastination is also called a self-regulatory failure (Ferrari, 2001). The behaviour is irrational, because the procrastinating person knows that it is unwise to procrastinate and that it will probably lead to an unwanted or at least poorer result. Still, procrastination is prevalent (Harriott & Ferrari, 1996), especially in the student population (Goda et al., 2015). It has been associated with a range of behaviours and emotions. The most relevant correlations for the topic of this thesis are lower self-reported scores on conscientiousness, organisation, achievement motivation and self-control (Steel, 2007). In addition, the positive correlations with self-handicapping, boredom-proneness, impulsivity and distractibility are important, because these aspects are likely to interfere with the learning process. The associations between procrastination and academic performance are small, but significant. However, the high prevalence of procrastination and the strong associations with other negative behaviour make it relevant and important to further investigate the consequences of procrastination among students.

Literacy problems.

Educational attainment is lower among adolescents with learning difficulties than among their peers (Wagner, Newman, Cameto, Garza, & Levine, 2005). Learning difficulties are associated with poorer educational outcomes (Gerber, 2012) and dropout (Dunn, Chambers, & Rabren, 2004; Goldstein & DeVries, 2011; Wagner et al., 2005). Yet, students with learning difficulties are entering upper secondary and higher education at an increasing rate (Goldstein & DeVries, 2011). The demands for having an education to get a job are increasing in the entire society (Wagner et al., 2005). Higher education institutions must thus be prepared to meet the needs of students with learning difficulties (Gregg, 2007). In this thesis, the focus is on reading and writing difficulties, labelled literacy problems (LP). Such problems are characterised by difficulties with visual, temporal and phonological processing and lower processing speed, in addition to poorer metacognitive

awareness and memory (G. Reid, 2009). These factors are increasingly important in higher levels of education, with more material to read and understand in less time.

Psychological factors.

Motivation.

Regulatory focus theory is based on self-regulated learning and motivation. Two self-regulatory processes proposed by Higgins (1997) are promotion and prevention, based on the hedonic principle to seek pleasure and avoid pain. A desirable end-state is wanted, but the motivation for reaching it differs. A promotion focus stimulates sensitivity to presence or absence of positive outcomes and accomplishments, while the prevention focus is characterised by a sensitivity towards negative outcomes and failure. A student with a promotion focus wishes to reach a goal and is motivated by feelings of fulfilment, while a student with a prevention focus is trying to avoid failure and is preoccupied with safety precautions. The two foci also have dissimilar associations with a range of other measures. For example, job satisfaction correlates positively with promotion and negatively with prevention and only promotion correlates (positively) with job engagement (Lanaj, Chang, & Johnson, 2012). A fit between type of motivation and task characteristics enhances performance (Chalabaev, Major, Sarrazin, & Cury, 2012; Shah, Higgins, & Friedman, 1998).

Stress.

Another element likely to influence study and learning processes are subjective perceptions of stress, in particular school-related stress. Stress is the reaction to a provoking factor, a stressor, and the reaction occurs when demands are exceeding the capacity of the individual (Lazarus & Folkman, 1984). School-related or academic stressors may be fear of failure, i.e., exam anxiety. Reactions to stress likely to influence the study situation, such as lack of concentration, inability to begin work and constant fatigue, have been reported to be experienced weekly by more than 50% of students in high school (Feld & Shusterman, 2015) and are also highly prevalent among university

students (Abouserie, 1994). Stress and stressful life events are linked to poor grades (Pluut, Curşeu, & Iliş, 2015; Struthers, Perry, & Menec, 2000), a decline in grades (Liu & Lu, 2011) and dropout (Hess & Copeland, 2001; Schmeelk-Cone & Zimmerman, 2003). Often, the workload itself is not the problem, but the perceived lack of time (Nonis, Hudson, Logan, & Ford, 1998).

Burnout.

Work stress over time may cause burnout. Burnout comprises three components: Exhaustion, cynicism and inefficacy (Maslach, 1982; Maslach & Leiter, 2007). Exhaustion is a basic dimension, and implies a depletion of resources, both emotionally and physically. Cynicism is an interpersonal dimension, which often includes a loss of idealism, and refers to a negative response to work. Inefficacy is a self-evaluating dimension, which implies a feeling of loss of competency in the job. Burnout among students is called educational or learning burnout (Schaufeli, Martinez, Pinto, Salanova, & Bakker, 2002). Examining burnout with regard to dropout is thus relevant.

Personal attributes.

The gender gap in academic performance is widely recognised (Battin-Pearson et al., 2000; Casillas et al., 2012; Pomerantz et al., 2002). Female students perform better academically than male students do, and they more often complete their studies. Differences in cognitive abilities do not explain this difference, and neither do the Big Five personality traits (Spinath, Eckert, & Steinmayr, 2014). Certain attributes associated with either masculinity or femininity may explain individual differences in achievement motivation (Spence & Helmreich, 1978). Being more independent and competitive corresponds to the stereotypical perceptions of masculinity, while interpersonal skills and cooperation abilities are more typically associated with femininity. However, other typically masculine traits, such as self-efficacy (Choi, 2004), predict achievement (Richardson, Abraham, & Bond, 2012). Examining how masculine and feminine traits relate to performance may increase understanding of the gender differences.

Resilience.

The resilience construct is used to denote a favourable outcome (or positive adaptation) despite exposure to difficult life circumstances (Luthar, 2006). However, the construct also refers to a range of protective factors that may facilitate resilience, such as individual, social, family and community factors (Friborg, Barlaug, Martinussen, Rosenvinge, & Hjemdal, 2005). Adolescents who adapt well despite adversity are adept in actively making use of the resources they have available (Werner, 1993), which has been shown to positively predict academic performance (Werner & Smith, 2001). Assessing the role of the protective factors that an individual may use to cope with psychosocial stressors is relevant.

Self-control.

Self-control is the ability to override a dominant response and to regulate thoughts and behaviours (Bandura & Vandenbos, 1989; D. T. D. de Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012). The importance of self-control for a range of domains has been established for a long time (Baumeister, Heatherton, & Tice, 1994; D. T. D. de Ridder, Lensvelt-Mulders, et al., 2012; Mischel, Shoda, & Peake, 1988). This includes a positive association with cognitive competence and academic performance (Mischel et al., 1988; Tangney, Baumeister, & Boone, 2004). Self-control is important for education by facilitating the ability to finish tedious tasks or assignments and to persist in pursuing an academic goal.

Mental health.

Depression and anxiety are more frequently reported among university students than in the general population, and average prevalence reports are about 30% (Ibrahim, Kelly, Adams, & Glazebrook, 2013). Students tend to report that their mental problems affect their performance in school (Eisenberg, Gollust, Golberstein, & Hefner, 2007; Keyes et al., 2012). However, the predictive value of depression on academic performance varies in the literature. Richardson et al. (2012) found in their meta-analysis that depression was negatively associated with GPA, but this association was

not significant. The role of mental health is also given increased attention in dropout research (Jackson, 2009). A recent systematic review (Esch et al., 2014) confirms that mood and anxiety disorders seem to predict dropout, but this relationship may be mediated by behaviour problems and academic performance. The significance of mental health on academic outcomes is still uncertain (Esch et al., 2014; Richardson et al., 2012) and needs further examination.

Aims and hypotheses

The aim of the thesis is to examine the role of academic and psychological factors for academic performance and dropout in upper secondary school and in higher education.

Paper I. *Aims:* To examine factors predicting GPA in an upper secondary school sample. Additionally, to examine the psychometric properties of a self-report measurement for LP and to validate it against GPA. *Hypotheses:* Having more literacy problems, less educational ambition, more mental health problems, a prevention rather than a promotion regulative motivational focus and fewer masculine personality traits predict lower GPA in a sample of Norwegian adolescents.

Paper II. *Aims:* To examine predictors of GPA in a first-year university student sample and to investigate the relationships between learning approaches, procrastination and GPA. *Hypotheses:* Deep and strategic approaches will positively predict GPA, while surface learning and procrastination will negatively predict GPA. Procrastination will negatively predict deep and strategic learning approaches.

Paper III. *Aims:* To examine factors predicting student status after the first two years of university studies. *Hypotheses:* Higher age, male gender and low parental education will predict dropout, as will procrastination, literacy problems, stress and burnout. Deep and strategic learning approaches will predict staying, along with hours spent studying, ECTS passed and GPA.

Methods

The thesis comprises data from two projects. The upper secondary sample was recruited through the project *Young Will* (Ung vilje) and the university sample was recruited through the project *Learning in Higher Education*. Both studies follow a particular group of students longitudinally, thus representing a prospective cohort design. The information was mainly collected using surveys, but registry data were also included.

Young Will

The Young Will project aims to identify causes and consequences of dropout in upper secondary education in Northern Norway, and to provide suggestions for action which may prevent dropout. The project is funded by the RDA: Regional differensiert arbeidsgiveravgift (regional differentiated employers' national insurance contributions) of Troms County, and the Sparebank 1 Northern Norway foundation. The project is anchored at the Department of Clinical Medicine at the Faculty of Health Sciences at UiT The Arctic University of Norway and is led by prof. Tore Sørli.

The sample consists of 1676 students (69% of the total number of students) entering upper secondary school in Troms County in the fall of 2010, and the students will be followed until 2020. As the registry data on dropout rates after five years were not available when Paper I was prepared, the analyses in this paper are entirely cross-sectional. A description of the participants, the procedures and flow of participants are reported in Paper I. The *Young Will* data material contains a broad range of variables and the project group members use different methodologies (e.g., quantitative and qualitative) and different professional perspectives (e.g., psychological and educational) to address the research questions. The paper in the present thesis includes factors related to the learning processes, while other aspects captured in the qualitative analyses are reported elsewhere (Ottosen, Goll, & Sørli, 2016).

Learning in Higher Education

The aims of the second project correspond to the aims of *Young Will*, but the sample is comprised of 428 university students (which equals approximately ten percent of the new students), drawn from the group of students entering UiT The Arctic University of Norway in the fall of 2013. Descriptions of participants and procedures are given in Papers II and III. Flow of participant recruitment is presented in Figure 1. These students will also be followed for ten years, until 2023, through the use of questionnaires and registry data¹. The project is not externally funded.

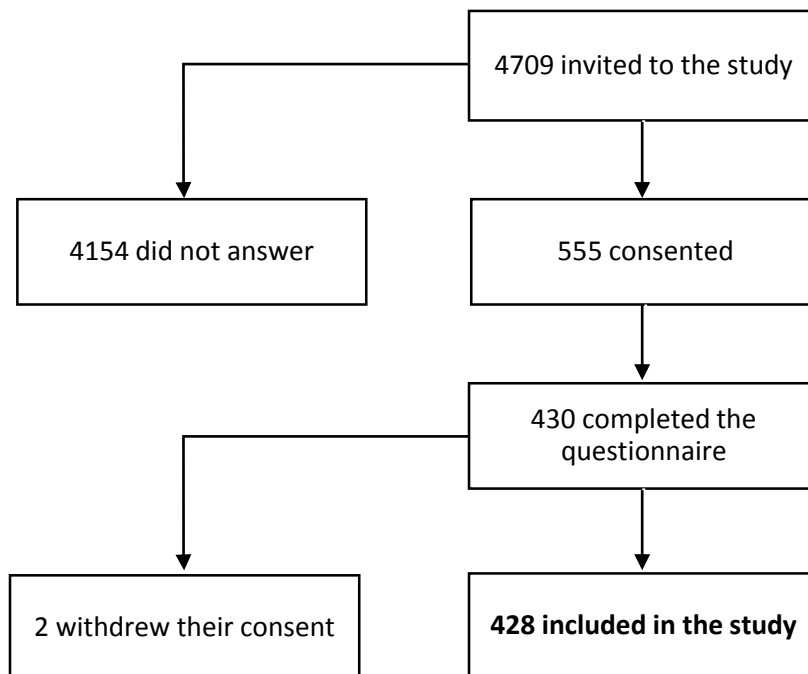


Figure 1. Flow of participants in the *Learning in Higher Education* study

¹ Some of the data used are retrieved from the Database for Statistics on Higher Education (DBH) at the Norwegian Social Science Data Services (NSD). Neither of the institutions delivering data to DBH nor the NSD are responsible for use and analysis of the data nor the interpretations based on the data.

Missing data

Missing data are non-observed – empty – entries in a data matrix, due to for example nonresponse or attrition (Little & Rubin, 2014). As scientists, we try to understand and explain the world through observations and these empty entries may impede our ability to do so (McKnight, McKnight, Sidani, & Figueredo, 2007). Possible consequences are biased estimators, leading to inaccurate and wrong conclusions. Depending on why data are missing, validity and generalizability of the results may be threatened.

Thus, it is important to identify the reasons for why data are missing (D. B. Rubin, 1976). Usually three categories are identified (Allison, 2012; D. B. Rubin, 1976; L. H. Rubin, Witkiewitz, Andre, & Reilly, 2007; Schafer & Graham, 2002). Data missing completely at random (MCAR) are data missing without any pattern or without being dependent on any variable in the dataset, neither the variable where data are missing itself nor others. Missing at random (MAR) implies that data are missing because of a relation the variable has to the other observed variables. If these variables are controlled for in the analysis, the missing data will be MCAR (Manly & Wells, 2015). The third category is missing not at random (MNAR), or non-ignorable missing. Missing data in this category will be dependent on the variable itself, or on unobserved variables. If we label the variable with the missing data Y and the other observed variables X , then the data will be MCAR if the probability of the missingness is related neither to Y nor X , MAR if it is related to X , and MNAR if it is related to Y .

Missing data may be handled in different ways, either by simply excluding cases with missing data, replacing missing data with the mean, estimating missing values by regression or using multiple imputation (MI) or expectation maximization (EM) methods (Tabachnick & Fidell, 2013). If the number of missing data points is low, deleting cases is acceptable. However, it may cause a considerable drop in sample size and power if the number is high (L. H. Rubin et al., 2007). Missing data on the predictor variables in this thesis were imputed using the EM method, conducted in Prellis 8.8 (Jöreskog & Sörbom, 2005). This procedure has two steps, expectation (E) and maximization (M).

In the first step, missing values are predicted through an expectation based on observed data and correlations, and in the second, a maximum likelihood estimation is performed until convergence is reached (Tabachnick & Fidell, 2013).

The participants in the *Young Will* project completed the initial questionnaire on paper. This led to missing data in some cases and variables because participants forgot or did not wish to answer. Little's MCAR test for all variables was non-significant: $\chi^2(17111) = 14708.019, p = 1.000$, indicating that the data were MCAR, as the missingness was not related to the variables themselves. The total proportion of missing data on predictor variables was 7.5%. We imputed values on cases containing less than 40% missing data on the included latent variables and factors. The distribution of missing data and the imputation procedure are further described in Paper I. The outcome variable in Paper I was GPA from lower secondary school, collected from the county's upper secondary school registry. These had missing data from 19.2% of the cases due to enrolment in a Steiner school (where students are not graded), grade exemptions because of different dysfunctions or language difficulties or admittance to upper secondary school on grounds other than lower secondary GPA. These missing data points were partly related to high scores on literacy problems, as Little's MCAR test with GPA and the literacy problem items was significant: $\chi^2(244) = 483.831, p < .000$. We did not impute missing data on this variable.

Participants in the *Learning in Higher Education* project provided all questionnaire data through an online service where all questions were made mandatory to complete in order to proceed. Hence, there were no missing data on these variables. Some participants responded that they did not know their parents' education level. These responses were treated as missing. Student status per semester after enrolment was retrieved from the national database (DBH). Missing data on this variable imply that the student was not registered in any study programme in higher education in Norway; hence, had quit or was on a break, and the student was thus treated as a dropout student. Grades from upper secondary school and on completed exams at university were

initially collected from the university registry. Normally, upper secondary grades are used for admittance to university; however, some students are admitted on other grounds, causing missing data for 30% of the cases. Some students quit before their first exam or received only pass/fail grades, causing missing data on university GPA for 11% of the cases. We did not have enough information to impute missing data on these variables; therefore, we included GPA lastly in the regression models to avoid it biasing the other coefficients until the last step.

Statistical analyses

Correlation and regression analyses were performed using SPSS v.22, as was the exploratory factor analysis (EFA). Confirmatory factor analyses (CFA) and item response theory (IRT) analyses were performed in Mplus (Muthén & Muthén, 1998-2010). Mediation and moderation analyses were performed in SPSS using the Process macro (Hayes, 2013). A more thorough description of the statistical procedures is available in the appropriate subsections of the respective papers.

Item Response Theory and the LP scale.

In Paper I, we used item response theory - or latent trait theory - when we examined the eight items that constitute the LP measure. The method is not as well known as classical test theory; hence, an elaborated justification and explanation of the IRT follows here. The items and the results of the analysis are reported in Table 1, Paper I.

Classical test theory (CTT) does not reveal how well a particular item discriminates between students of different levels of ability (Crocker & Algina, 2006; Embretson & Reise, 2000). The factor loading that CTT provides is used independently of ability levels, whereas the discrimination coefficient in IRT may vary depending on the latent trait variable, i.e., ability. Moreover, IRT estimates these trait levels based on both individual responses and item properties, thus improving the generalizability of the results. The LP items were scored dichotomously; thus a unidimensional, logistic IRT model was appropriate. Up to three item parameters may be estimated: difficulty,

discrimination and guessing. Item difficulty or location (b) refers to how difficult it can be expected to be for students to answer *yes* to the question. If the location parameter is located low on the x-axis, then the question is easy to answer. An interpretation of this is that students may agree to the item even if LP levels are low. Conversely, if the item location is high, the required unobserved trait (i.e., LP problems) needs to be high for students to answer affirmatively. Item discrimination (a) is the slope of the regression line and provides information about how well the item discriminates between students experiencing low and high levels of literacy problems. Steeper slopes indicate better discrimination. The guessing parameter (c) was not estimated since socially desirable responding was considered low and an objectively correct answer does not exist.

Measures

Outcomes.

In the first two papers, academic performance was our primary concern. Grades, being a more stable and robust measure, seem to be more important than scores from single tests or exams (Rumberger & Lim, 2008); hence a composite measure like GPA is appropriate. The GPA is calculated from all the grades a student receives during a given time period. When merging all grades into one, we assume that they all share the properties of a latent construct. In a paper concerning the use of GPA in research studies, Bacon and Bean (2006) found that internal consistency reliability for all courses ranged from .84 at the end of the first year of a study programme to .94 at the end of the fourth year. Earlier GPA is the best predictor for later academic performance, confirming GPA as a valid measure (Salvatori, 2001).

In the first paper, discussing the upper secondary sample, we used GPA from lower secondary school. The GPA variable was comprised of all grades from lower secondary school, which were summed up and divided by the number of school subjects. These grades were decided a few months before the collection of questionnaire data. Hence, the outcome measure was collected prior

to the predictor variables. However, we did not have access to grades achieved during upper secondary school. Nevertheless, grades are found to be relatively stable over time (Casillas et al., 2012) and the retrospective time frame was short; hence we consider the outcome variable valid.

In the second paper, which is concerned with the university sample, grades from the first year were used as the outcome variable. The predictor variables were collected during the early autumn of 2013, while the grades were collected after the final exams in the summer of 2014.

For university level, the duration and form of the education varies more than in upper secondary school. In addition, students may change study orientation or fail to pass subjects, making it essential not only to investigate the end-point, but also to examine what happens during the educational process (Arias Ortiz & Dehon, 2013). In the third paper, student status after 2 years at university was used as outcome.

Predictor variables.

Table 1 presents an overview of the instruments used in the three papers. Further descriptions, validity reports and reliability measures are found in the papers in which they are used.

Procedure.

The predictor variables listed in Table 1 are based on self-reports. Self-reported data are statements people make about themselves (Schunk, 2014). Instruments used in questionnaires relying on self-reports need to be valid and reliable; hence, validity and reliability for the instruments are discussed in the papers where they are used.

In the *Young Will* study, participants completed the questionnaire on paper. They were asked to do this during class, and they spent approximately an hour completing it.

In the *Learning in Higher Education* study, the self-report data were collected via a web-based questionnaire. Some participants responded twice to the same questionnaire. However, they

were identifiable through their ID number, and only the first or the most complete response was saved for analysis.

Table 1.
Overview of instruments used in Papers I, II and III

	Construct	Instrument (reference)	I	II	III
Academic factors	Learning approaches	Approaches and Study Skill Inventory for Students (ASSIST; Entwistle, 1997; Tait & Entwistle, 1996)		X	X
	Procrastination	Irrational Procrastination Scale (IPS; Steel, 2010)		X	X
	Literacy problem	Literacy problem scale, developed by Karl Ottar Ottosen and Trude Nergaard for the first data collection in the Young Will project (Sæle et al., 2015)	X	X	X
Psychological factors	Motivation	General Regulatory Focus Measure (GRFM) (Lockwood, Jordan, & Kunda, 2002)	X		
		Q: What is the highest level of education you are planning to complete?	X		
	Stress	Adolescent Stress Questionnaire (ASQ; D. G. Byrne, Davenport, & Mazanov, 2007)			X
	Burnout	Maslach Burnout Inventory for students (MBI; Schaufeli, Salanova, Gonzalez-Roma, & Bakker, 2002)			X
	Personality traits	Personal Attributes Questionnaire (PAQ; Spence & Helmreich, 1978)	X		
	Resilience	Resilience Scale for Adults (RSA; Friborg, Hjemdal, Martinussen, & Rosenvinge, 2009)	X		
	Self-control	Brief Self-Control Scale (BSCS; Tangney et al., 2004)		X	
	General mental health	Hopkins Symptom Checklist (HSL; Derogatis, Lipman, Rickels, Uhlenhuth, & Covi, 1974)	X		
	Q1: How do you currently evaluate your mental health?				
	Q2: How do you currently evaluate your physical health?			X	

Ethical considerations of the projects

The Young Will project has been approved by the Regional committee for medical and health research ethics – North (REK; 2010/1503-7) and by the county administration of Troms. All participants signed a consent form. Some students were under 16 at the point of the first data collection, and in these cases, their parents also signed the form. The participants are de-identified by replacing names and social security numbers with an ID number. The identifier is kept in a locked safe, separate from any data files and questionnaires. Completed paper questionnaires are kept in a locked cabinet.

For the Learning in Higher Education project, approval from the REK North was not required, but it was approved by the Data Protection Official for Research at the Norwegian Social Science Data Services (NSD; 34867). Participants first completed an electronic consent form. They were then assigned an ID number and received an electronic questionnaire (Software: Questback). The identifier is kept in a password-encrypted file, only accessible to the PhD candidate.

Participation was voluntary in both studies, and participants were informed that they were free to withdraw from the studies at any point, without giving any reason. They also received an information letter about the background and aims of the studies and about protection of privacy.

Summary of papers

Paper I

Demographic and psychological predictors of grade point average (GPA) in North-Norway: a particular analysis of cognitive/school-related and literacy problems

Analyses and results.

The psychometric validation of the LP scale was conducted in two randomly split samples. The first and second samples were used for EFA and CFA purposes, respectively. The EFA extracted one factor, and the full scale had a Cronbach's α of .84. The IRT analysis showed that six out of the eight items discriminated well between the subjects (see Table 1 in Paper I). Although the two final items discriminated less well, factor loadings were satisfactory and the items were retained.

Figure 2 (see Appendix) shows the item characteristics curves of the eight items. The difficulty of the item (the b parameter) is decided from the point where the ability (or latent trait) of a person to respond correctly (or affirmatively) to the item passes a probability of 0.5. The discrimination property of the item (the a parameter) indicates how quickly a person crosses this probability cut-off as ability (or the latent) increases. In Figure 3 (see Appendix), the item information curves show where the items contribute most information in the trait distribution of LP.

We conducted a multiple linear hierarchical regression analysis to identify significant predictors of GPA. Variables were included in the model in four blocks. The first block included demographic variables such as gender, age, self-reported financial status in the family and current educational track (vocational/general). The second block included cognitive/school variables: Task solving ability, conflict with classroom rules and educational aspirations. The third block included psychological/affective variables: Regulatory focus, resilience, personal attributes and a short measure of mental health. Literacy problems were included in the fourth and last block together with an interaction term (literacy \times task solving ability). The most important predictors for higher GPA

were being enrolled in a general track ($\text{std } \beta = .36$), being female ($\beta = -.16$), having good task solving abilities ($\beta = .20$), less literacy problems ($\beta = -.16$), lower social competence ($\beta = -.12$), a promotion focused motivation ($\beta = .10$) and more social resources ($\beta = .09$). The interaction effect between LP and task solving abilities was significant. Total variance explained was 55%.

A particular feature of the regression analysis was the examination of the predictive power of the four blocks of predictors (demographic, school-related, psychological and LP) if entered as sole predictors of GPA. Since the r-squared statistics were considerably more pronounced for the demographic ($R^2=.39$) and the cognitive/school-related ($R^2=.35$) than for the psychological/affective ($R^2=.20$) and LP ($R^2=.18$) predictors, the former two seem to be most important for GPA. However, these can be controlled by the learner to a lesser extent, so the latter remain important when considering what to try to change.

Discussion.

The gender gap in academic achievement is well documented (Pomerantz et al., 2002), and our study confirmed that female students have higher GPA than male students. Possible reasons for the gender differences may be home and school environment, peer culture, differences between the genders in adaptation to the school environment, attitude towards school work and higher self-discipline among girls (Duckworth & Seligman, 2006; Spinath et al., 2014; Warrington, Younger, & Williams, 2000).

A higher degree of self-reported LP was associated with a lower GPA, which was expected since low academic achievement is one of the characteristics of learning difficulties (American Psychiatric Association, 2013). Higher self-perceived ability to solve tasks – an indication of self-efficacy – was associated with higher GPA, and this relationship was moderated by LP. Experiencing more LPs weakened the association. The relationship may also be interpreted the other way around, i.e., to imply that higher self-perceived ability to solve tasks moderated the effect LP had on GPA.

Hence, enhancing self-efficacy and skills to cope with academic tasks may contribute to a reduction in the negative effect LP has on GPA.

Having a promotion focus was associated with higher GPA, in line with existing research on motivational strategies (Richardson et al., 2012). Aiming to achieve a good grade, instead of aiming to avoid a poor grade, is a better strategy.

Lower social competence predicted higher GPA, which was perhaps a counterintuitive finding. However, scoring high on social competence may indicate being more open to new friendships and nursing relationships with others, that is, spending more time with friends and less time on school work.

In summary, the reliability and validity of the LP scale were adequate, and at least six out of the eight items discriminated well between the students. The last two items addressed problems with reading comprehension and articulating thoughts on paper. More than one third of the students responded affirmatively to these, whereas the prevalence of the other items ranged between 12.9% and 25.7%. These two items therefore measure the more general aspects of literacy problems and are potentially more related to comprehension than to decoding and spelling. Moreover, both questions were double-barrelled, trying to capture two closely related aspects in a single item. The first addressed problems with understanding and remembering sentences, while the other addressed problems with articulating and verbalizing thoughts on paper. However, since the psychometric properties of the total score were not compromised by retaining these two items in terms of test score reliability, they were kept until other studies could prove them unnecessary.

Paper II

Relationships between learning approaches, procrastination and academic achievement among first year university students

Analyses and results.

We performed a hierarchical regression analysis with GPA as the dependent variable. Learning approaches were included as predictors in the first step, procrastination in the second and self-control in the third. Relevant covariates likely to affect GPA – among others, literacy problems and self-reported mental and physical health – were included in the fourth step. Finally, upper secondary GPA was included. The analysis showed that upper secondary GPA (std $\beta = .39$) and deep ($\beta = .12$) and strategic ($\beta = .12$) learning approaches predicted GPA, while procrastination and self-control did not. Total variance explained was 23%.

Hierarchical regression analysis with deep approach as the dependent variable showed that procrastination negatively predicted a deep learning approach, but it turned out non-significant after adjusting for strategic and surface learning approaches. Both strategic ($\beta = .27$) and surface ($\beta = -.13$) approaches predicted a deep approach. Among the covariates, age ($\beta = .17$), study techniques learnt at university ($\beta = .20$) and planning to pursue a master ($\beta = .14$) or a PhD degree ($\beta = .28$) contributed significantly positively to a deep approach. Total variance explained was 22%.

The next regression analysis was conducted with strategic approach as the dependent variable. Procrastination ($\beta = -.40$) and self-control ($\beta = .30$) together explained 51% of the variance. In addition, deep approach ($\beta = .13$), study techniques learnt at university ($\beta = .11$), perceived usefulness of the study ($\beta = .14$) and educational aspirations of completing only single subjects ($\beta = .08$) were significant positive predictors. Total variance explained was 58%.

A mediation analysis revealed that a strategic approach mediated the relationship between deep approach and GPA, explaining 21% of the direct effect of deep approach on GPA.

Discussion.

Having a deep learning approach, that is, seeking meaning in and understanding of the material, is valuable for academic achievement as measured by GPA. In addition, a strategic approach, that is, being structured and spending study time thoughtfully, is helpful. Moreover, having a strategic approach mediated the effect of deep learning on GPA. We hypothesized that procrastination would negatively predict GPA, but this was not supported. However, procrastination was negatively associated with strategic approach and self-control, indicating a negative impact on study habits and perhaps the learning *experience*, even if it does not influence the learning *product*.

Implications: Teaching methods promoting active learning and deeper understanding should be investigated further. Students should be taught how to acquire study strategies that promote deep and strategic learning approaches in order to optimize the learning process *and* the study results. However, relatively little variance in GPA was explained.

Paper III

Predictors of student dropout two years after enrolment at university

Analyses and results.

Since student status as a dependent variable was dichotomously coded (stayer vs. dropout), we conducted a logistic regression analysis. In the first block, *demographics*, age, gender and parental education were included. The next block, *study behaviour/experience*, included learning approaches, procrastination, the number of study hours during the first semester, literacy problems and previous study experience. The third block included stress and burnout. The fourth block, *study context*, included the level/duration of the course where the students were enrolled and the number of European Credit Transfer and Accumulation System (ECTS) passed in the first year of studying. In the last block, we included GPA achieved during the first year. Out of the 426 students included in the analysis, 21.4% were not registered in any study programme in Norwegian higher education two years after enrolment. Predictors for dropout included stress (OR = 1.55), higher age (OR = 1.06) and being enrolled in short-term study programmes (OR = 2.74). Predictors for staying included higher grades (OR = .59), spending more time studying (OR = .96) and higher scores on surface learning approach (OR = .60). Procrastination, deep and strategic learning approaches, literacy problems and burnout were not significant predictors.

Discussion.

The dropout rate after two years of study was 23%; hence action to prevent dropout should already be taken during the first semesters. Spending more hours studying - study time - and getting higher grades were particularly important for decreasing the odds of dropping out. Study stress and being enrolled in a short-term study programme increased the odds of dropout. The predictive value of stress was only evident if surface learning was simultaneously tested, thus indicating a suppression effect.

Strengthening the students' feelings of academic integration to prevent dropout is important. This may include teaching students learning skills, giving feedback to students and making demands and expectations clear to them. One way of making demands and expectations clearer may be to align objectives, teaching and assessment in courses. Welfare structures for reducing stressors and preventive interventions for reducing negative stress reactions might additionally be beneficial.

General discussion

In the upper secondary school sample, gender, promotion focus, students' self-reported ability to solve problems on their own and literacy problems were significant predictors for GPA in the final year of lower secondary education. Previous grades and deep and strategic learning approaches were significant predictors for higher GPA at university. Student status after two years at university was predicted by age, surface learning, study time during the first year, type of study programme enrolment and GPA. Deep and strategic learning approaches did not predict student status two years later. Literacy problems and procrastination failed to predict both GPA and dropout in the university sample.

Previous research was confirmed by the predictive value of gender (Alexander et al., 1997; Battin-Pearson et al., 2000; Casillas et al., 2012; Freudenthaler et al., 2008; Legewie & DiPrete, 2012; Pomerantz et al., 2002), current educational choice (Rojewski & Kim, 2003), motivation (Richardson et al., 2012) and LP (Reiff, Hatzes, Bramel, & Gibbon, 2001) for GPA in the upper secondary sample.

Deep and strategic learning approaches have also previously been associated with academic performance (Diseth, 2007; W. A. Reid et al., 2007), as we found in Paper II. The relationships found in the learning approach literature are typically weak to moderate, corresponding to our findings.

The significance of GPA for dropout confirmed previous research (Araque et al., 2009; Jia & Maloney, 2015; Paura & Arhipova, 2014; Xuereb, 2014). In Tinto's (1975) theoretical model of dropout, two integration paths are identified. In the academic path, the commitment is directed towards goals, while in the social path it is directed towards the institution. Institutional commitment is influenced by peer-group and faculty interactions, which lead to social integration. Goal commitment is influenced by intellectual development and grade performance, which lead to academic integration. Both endpoints influence the dropout decisions. The predictors examined in this thesis support the importance of academic integration. Performance and time spent studying decreased the odds of dropping out after two years.

Other findings were unexpected. For example, we anticipated that parental educational level would be a significant predictor for both GPA and dropout (Alexander et al., 1997; Casillas et al., 2012; De Witte & Rogge, 2013; Lundetræ, 2011; Sirin, 2005; Strom & Boster, 2007). The non-existing importance of parental education in our data suggests that the significance of social background on academic outcomes may be weaker in Norway than in countries with greater income gaps and less social equality (Lundetræ, 2011; Wilkinson & Pickett, 2010). This is not surprising given that Norway has a long history of policies and regulations which favour equality at many levels, including education, work and health systems.

Literacy problems have previously been associated with both GPA (Gerber, 2012) and dropout (Dunn et al., 2004; Goldstein & DeVries, 2011; Wagner et al., 2005). We expected LP not only to predict educational outcomes in the upper secondary sample, but also in the university sample. We also anticipated that procrastination would be of significance for both GPA and dropout, as it is associated with a range of aspects likely to influence learning and studying (Steel, 2007).

Furthermore, we hypothesised that learning approaches would predict dropout. There is a positive association between deep and strategic learning approaches and higher GPA (Duff et al., 2004; W. A. Reid et al., 2007), and a negative association between the surface learning approach and GPA (Diseth, 2007; Duff et al., 2004; W. A. Reid et al., 2007). Moreover, GPA predicts dropout. Thus, we anticipated that students scoring high on the deep and strategic approaches would have decreased odds of dropping out, but our findings indicated no such relationship. Regarding the surface learning approach, we expected it to increase the odds of dropping out, but found the opposite. Finally, we expected that reported depression or anxiety symptoms or mental health status would predict GPA (Esch et al., 2014; Jackson, 2009). However, mental health did not contribute to GPA neither in the upper secondary sample nor in the university sample. The association between mental health problems and academic performance has also previously been shown to be low (Richardson et al., 2012).

This thesis thus provides four new insights to the research on learning and educational performance.

1) Reported literacy problems predict lower grades among upper secondary school students, but they do not predict neither GPA nor dropout in the university sample. This may indicate that students with literacy problems perform equally well as their peers at university, but not in lower secondary school. This pattern is unexpected because of the increased demands for reading and writing at a higher level – and often even in another language – at university. One explanation for the lack of association in higher education may be that students with the most serious literacy problems do not enter the university at all, so that the university sample includes fewer students with considerable levels of literacy problems. In the upper secondary sample, we used a response format with yes/no, while we changed this to a Likert scale (1-5) in the university sample, so this hypothesis is unfortunately difficult to test properly. Another explanation may be that students are acquiring more strategies to cope with their problems as they grow and continue their education, either by themselves or with the assistance and support of teachers. A third explanation may be that students in higher education choose their educational path more freely, making it possible to not choose subjects or study programmes with the most challenging curricula and assignments.

2) The predictive value of problem solving abilities on GPA was moderated by LP, as more LP weakened the link between problem solving and GPA. Another and perhaps more useful interpretation is that problem-solving abilities weaken the link between LP and GPA. Problem solving may be related to self-efficacy, which has previously been shown to be lower in adolescents with learning difficulties (Hen & Goroshit, 2014). Strengthening self-efficacy may thus reduce the negative effect LP has on academic performance. Teachers should continue to help students with LPs, but combining this effort with promoting self-efficacy may prove to be advantageous.

3) Having a strategic learning approach mediated the well-established association between deep learning and academic performance. Having a deep approach and a wish for understanding and

true learning perhaps motivates students to manage time and resources well in order to learn more. Previously, Diseth (2002) has found interaction effects between deep and strategic approaches, strengthening the hypothesis that both are important for performance. However, in our study, the effect of deep approach on GPA was not dependent on the level of strategic approach – the strategic approach simply transferred the benefits of the deep approach through a mediation effect

4) Deep and strategic learning approaches predicted higher GPA at first year at the university, but not dropout in the second year. On the other hand, a surface learning approach predicted dropout, but not GPA. This is perhaps a counterintuitive finding. Diseth (2002) found a curvilinear relationship between the surface approach and performance which may contribute to a better understanding of the association between surface approach and GPA. A low to moderate level of surface approach may be beneficial for performance, although this does not explain why higher levels of surface approaches predict staying. However, this curvilinear relationship was not found in our data. It may be that the explanation is more closely connected to the course design and learning objectives. Alignment between the elements in a study program and in the specific courses is important. Biggs (1999) suggests that a lack of alignment may cause the students to adopt more of a surface approach to learning. While we regard a deep approach to learning as the ideal approach for understanding and comprehending a topic, courses where the goals and expectations are unclear and the elements do not correspond may push the students towards the surface approach. They try to cover the entire curriculum and do not know how to separate out the important things to learn. Most study programmes consist of several smaller courses each semester, and to complete a course, a minimum of one exam is needed. A surface approach may thus be beneficial in order to pass exams, even if it has the cost of a weaker understanding of the topics and potentially lower exam grades.

A lack of consistency between elements in a course may also contribute to the students' performance stress, because it increases the perceived workload. The suppression effect that we

fund of surface approach on performance stress supports this interpretation. In addition, a surface approach is characterised by a fear of failure, which is also likely to contribute to performance stress.

Total variance explained by GPA in the university sample was 23% and total accuracy for the prediction of dropout was 74.5% (Nagelkerke $R^2 = .31$). This is similar to other studies in the field. Nevertheless, a lot of variance in both outcomes remains unexplained. We still need to investigate other factors to understand university dropout better. Academic performance is the most important factor for dropout, both in this study and in previous research. However, it may be relevant to separate students who drop out because of low academic performance from students who quit for other reasons, perhaps as a more voluntary action (Tinto, 1975). Recognising these two groups of students may help identify predictors that are concealed when examining all dropout students as one group.

In the upper secondary sample, 55% of the total variance in GPA was explained, while this percentage was only 23% in the university sample. This difference between the two samples may indicate that predicting academic performance is an even more complex issue in higher education than in upper secondary school.

Implications

Predictors of educational performance at different levels are a mix of relatively fixed factors, such as gender and literacy problems, and changeable factors, such as learning approaches, regulatory focus, effort and performance. Several of these factors may function as warning flags which schools and educational institutions should be aware of when considering whether special actions to assist at-risk students should be taken. Knowing about such predictors is beneficial when distributing resources, allowing teachers to focus more closely on students who may be at risk. A student with poor grades, or a student with problems related to reading and writing, should be monitored more closely than other students. However, to be able to act on such flags requires a

close follow-up of students, which is perhaps feasible in upper secondary school, but probably not in higher education. Interventions targeting the whole student population may therefore be more useful in higher education. Promoting active learning and understanding, teaching students study techniques which work and helping them to identify the strategies which do not work very well and to beat procrastination tendencies will be beneficial for most students, and certainly not harmful. Such teaching also need not be time-consuming or resource tapping.

Barr and Tagg (1995) wrote about a paradigm shift twenty years ago. They described the old paradigm as primarily concerned with *instruction*, whereas the new paradigm primarily focuses on *learning*. The main difference is that the former considers instruction – or teaching – as both a method and a goal. Within this paradigm, success is measured by the number of students enrolled and the amount of teaching happening at institutions. The latter, on the other hand, separates concerns about methods from goals. Within this paradigm, teaching is simply one of many methods for realizing goals, and hence success must be measured by what students learn.

Focusing on student learning as the aim and the goal makes the *method* of teaching a more central issue. How should we teach in order to most successfully help students learn? We have showed that deep and strategic learning approaches predicted higher performance for first year students in higher education. One concept promoting the deep learning approach is active learning (Phillips & Graeff, 2014). Active learning represents educational methods where practice is an important aspect. Active learning methods require students to not only listen, but to read, write, discuss and be engaged in problem-solving activities (Bonwell & Eison, 1991). This includes analysing and synthesising material in addition to doing meta-cognitive tasks and evaluating the learning progress. These skills help students think about their own learning process and enable them to change study habits which are not working optimally. A recent meta-analysis by Freeman et al. (2014) examined 225 studies comparing active learning to traditional lecturing in STEM (science, technology, engineering and mathematics) courses. They found that student performance increased

(average examination scores went up by six percent) and fail rates decreased in courses using active learning methods. It seems that the optimal way for a student to learn is to be actively engaged in her own learning process and to seek a deeper understanding of the material when needed.

A range of factors contributes to explaining dropout in the literature, illustrating the complexity of reasons. In a follow-up study of the university sample in this thesis in the autumn of 2014, one year after enrolment, we asked the participants for their reasons for taking a break or quitting. Despite the low response rate in this follow-up, which is an important reason for not analysing these data specifically as part of the current thesis, the qualitative answers illustrate considerable diversity in reasons for quitting. These answers are shown in Table 2 in the Appendix. A future goal of studies examining a variety of dropout factors should therefore be to integrate such retrospective reports to improve the understanding of academic performance among university students.

As teachers, our mission is to help students learn (Barr & Tagg, 1995). In this mission, integrating knowledge of how students learn best should be a natural and logical part of teaching. Teaching students adequate study skills is important to help them master the transition between upper secondary and higher education and to improve the learning process during education. In addition, many occupations require that employees keep professionally updated through continuous self-education. This may be hard to do when they no longer have university teachers and curricula to tell them what to read and learn. Students need to *learn how to learn* to be better prepared for their formal education, but this is also important for their ability to function well in future jobs which are complex and require constant acquisition of new knowledge and skills.

The findings of the present thesis point teachers towards focusing on some specific issues. However, these issues are not necessarily the same at every educational level. In upper secondary school, students with literacy problems and/or low self-efficacy and students who have been in conflict with classroom rules should be monitored more closely. At university, literacy problems

seem to be a smaller problem. Here, teachers should focus on promoting deep and strategic learning for the students and encouraging them to put time and effort into studying from the beginning.

Strengths and limitations

A key strength of this thesis is that it includes registry and survey data on students both in upper secondary school and at university. Strengths and limitations of the two studies are discussed within the three papers. The most important issues are the following:

A major strength of the *Young Will* study is the response rate and the large sample size relative to the population of Tromsø. Among the students entering upper secondary school in the autumn of 2010 in Troms County, 2/3 responded to our questionnaire, which is good given the low response rates that current population studies generally face. The broad selection of variables measured is also a strength compared to previous research within this area. The main limitation is the lack of access to grades from upper secondary school. Yet, we did have access to the registered students' GPA from lower secondary level (although data were missing for about one fifth of the students), which they received two to three months prior to data collection. This implies that we are making a backwards prediction. However, the time frame was short, and GPA is a fairly stable measure which also predicts later GPA (Casillas et al., 2012).

In the *Learning in Higher Education* study, we also had registry data on GPA. In this study, we had access to a national database (DBH), which allowed us to collect grades also from students migrating to other institutions in Norway. The response rate was however poor as only about 10% of the invited students responded. On the other hand, a strength is that we had access to the gender, age and incoming GPA of all invited students, making it possible to compare the participants to non-participants. As these differences were minor, the low response rate does not seem to have considerably biased the results with regard to central demographic variables and previous academic achievements. In addition, even though a low response rate may introduce bias when estimating

means or prevalence estimates, the problem is less pronounced in terms of covariance structures like correlations and regression coefficients (Stormark, Heiervang, Heimann, Lundervold, & Gillberg, 2008). Furthermore, students from all faculties of the university were included in the study, increasing generalizability.

Using self-report measures may represent a limitation because of response bias among participants (Cheung & Rensvold, 2000). Participants may answer in ways that are socially desirable, and we do not know whether the answers correspond to actual behaviour. Another possible bias is acquiescence, i.e. systematically higher or lower responses. However, the influence of acquiescence is normally small (Friborg, Martinussen, & Rosenvinge, 2006) and several of the measures included items that were reversed, minimizing this effect.

The participants in the upper secondary sample were informed that they could withdraw at any stage; however, the classroom setting may have made such a decision difficult to make. The relatively long questionnaire and the potential social cost of withdrawing could have influenced the quality of the answers given.

We used a web-based questionnaire in the university sample. These seem to yield the same results as paper-based questionnaires (Gnambs & Kaspar, 2016; Gosling, Vazire, Srivastava, & John, 2004), and have several advantages. Missing data are easy to sidestep by making questions mandatory to answer in order to proceed. Participants may use their device of choice and complete the questionnaire whenever they have Internet access. When the questionnaire has been completed, the participant need only push the send-button – there is no paper work to post or deliver. Web-based questionnaires are also easier and cheaper to distribute to potential participants and answers are automatically stored and transferred to a database, avoiding scanning and punching mistakes. One possible limitation to web-based questionnaires is a lower rate of completed questionnaires (Heiervang & Goodman, 2011). Other limitations mentioned in the literature include biased samples

and multiple responses (Heiervang & Goodman, 2011; Wright, 2005), but these claims have largely been repudiated (Ekman, Dickman, Klint, Weiderpass, & Litton, 2006; Gosling et al., 2004).

Future research

The LP scale we tested had good psychometric properties. Further validation of the scale would be constructive for future use, especially to test the two items with less favourable properties. The lack of predictive value of LP on learning outcomes at university may be better explained through prevalence studies at the different levels of education and through closer examination of those students scoring high on LP.

Since a large portion of individual differences in academic performance in university students was unexplained in the research conducted in this thesis, other factors which may influence the learning process should be investigated. Data on executive functions, alcohol- and drug use and sleep would perhaps shed more light on the relationships between learning approaches and learning outcomes.

Reasons for quitting vary, and while some students drop out because of low grades or lack of academic integration, others quit voluntarily. In future research, trying to separate these groups will be beneficial for identifying predictors which better fit each group. More information about factors related to teaching methods, study practices and types of exam in specific study programmes may also contribute to a better explanation.

Conclusions

The benefits of a population with adequate education include a better national economy because of higher tax income as well as fewer expenses for welfare, prison, hospitals and so on. The benefits for the individual include a more stable work situation, better income, better health and longer life-span. These benefits have been acknowledged for a long time. Norwegian adolescents

have the right to attend upper secondary school because of these advantages. We also have a low threshold for entering higher education and a principle that education should be free of charge. Equal opportunities for all to start an education are thus good. Still, the dropout rates are high, both in upper secondary and in higher education, even after several years with a broad focus on the problem from academia, the government, teachers and school administrations. Extensive research on different aspects of educational attainment and performance is central in order to identify why education matters so much and how to secure adequate levels of education for the population.

There are some fixed factors which are important for academic performance and student status, and these may serve as flags or signals for teacher response. Literacy problems constitute such a flag at lower levels of education, but not necessarily at the university level.

Interventions for the changeable factors do not need to be offered only to individuals. They can be offered to large groups of students, as well. Helping *all* students learn which strategy works best in any given situation is beneficial for helping all student study effectively. This thesis highlights several strategies and abilities that are beneficial for academic performance. These are a focus on achievement rather than on avoiding failure, work motivated by a wish for a deeper understanding of the material, a feeling of positive self-efficacy related to ability being able to solve learning tasks and the ability to plan, organize and structure the study environment effectively. Educational institutions should help promote these strategies to students, paying more attention to *how* students learn, not only *what* they learn. Students who *learn how to learn* may thrive better in future jobs that require the constant acquisition of more complex knowledge and skills. The future educational system should therefore pay more attention to helping students attain good study habits which both facilitate the quantity (study time) and the quality of the learning process. In these studies we have identified some suggestions on where to start.

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Appendix

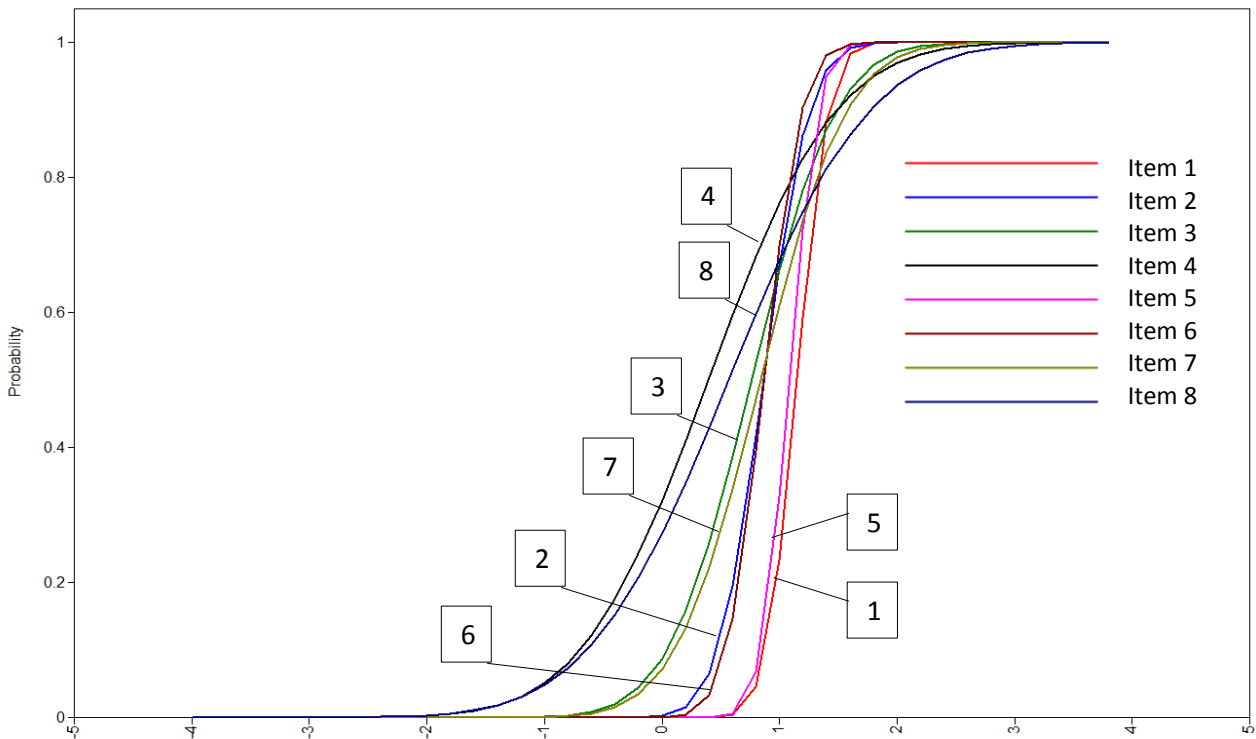


Figure 2. Item characteristics curve for the eight items included in the LP scale.

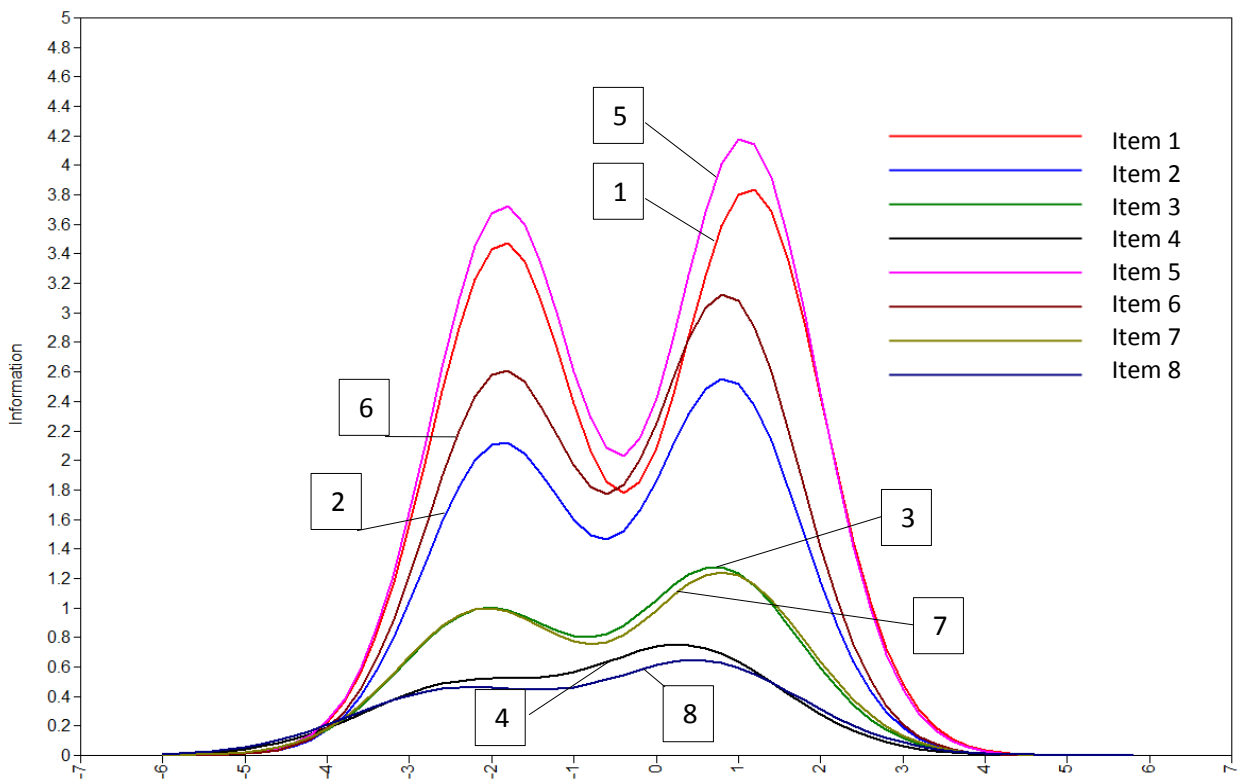


Figure 3. Item information curves for the items included in the LP scale

Table 2.

Reasons given for quitting university studies, N = 44

Reason	N
I have completed the subjects that I wanted to complete	16
I wanted to work instead	11
Economic reasons	6
Health-related reasons	6
I wanted to study something else	4
I don't think studying is for me	4
Family-related reasons (caretaker, illness in family)	4
The subjects were not interesting enough	2
Social reasons	1
Lack of housing near campus	1
Other	9
(for instance: not accepted at the study programme of wish, military service, travel)	