Effectiveness of higher education
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Chapter 1. Theoretical background and research questions

1.1 Introduction

The prediction and explanation of academic achievement and the prevention of dropout have always been important topics of research in higher education. Studies in higher education, which have focused on questions such as “what affects academic achievement?” and “how can we prevent students from dropping out?”, have identified a set of potential factors, related to the student and the environment, which affect achievement and dropout. This dissertation focuses on a number of these factors to examine the general research problem “which context, input and process factors affect effectiveness in terms of achievement at four departments in the University of Groningen?” Four specific research questions, which include several topics from the field of (higher) education, are examined in the chapters three to six. Though each of these chapters discusses the specific theoretical backgrounds and methodology used, the dissertation also includes a general theoretical background, in this chapter, and a general methodology in chapter two.

The next section, §1.2, starts with an elaboration of the problem of effectiveness in terms of academic achievement. This is followed by a discussion on effectiveness of higher education in §1.3. After that, §1.4 describes four distinct research lines that provide us with a theoretical background on the factors that potentially affect academic achievement. These factors are described in more detail in §1.5. The research questions are discussed in §1.6. Finally, §1.7 presents the structure of this dissertation.

1.2 Problem of Achievement in University Education

Students do not always graduate within the nominal duration of the course; they switch courses or dropout before obtaining their degree. These students, who fail or dropout, induce both financial and psychological costs for themselves, for the educational institutions and for society. The students, themselves, often risk losing their study grants and risk a study debt, which is the result of a study loan to cover the tuition expenses and the living expenses. Furthermore, these students might become demotivated and demotivate their student peers and teachers. Student underperformance or dropout is expensive for institutions as well; the institutions are
financed based on the numbers of first-year students and their numbers of doctoral graduates. Finally, society is affected by lower achievement rates and dropout as the costs of the study grants and the costs of education in general, are not counterbalanced with more qualified students for the labour market.

Over the past decades, numerous studies have focused on the variables that affect achievement in university education and that prevent students from dropout (Bean, 1980; Bean & Metzner, 1985; Beekhoven, 2002; van den Berg, 2002; Bijleveld, 1993; De Jong, Roeleveld, Webbink and Verbeek, 1997; Jansen, 1996; McInnis, Hartley, Polesel & Teese, 2000; Pascarella, 1980; Prins, 1997; Tinto, 1975, 1987; Webb, 1990). These studies have started from various viewpoints, such as combinations of the psychological approach, the organisational approach, the economical approach, the societal approach, the interactional approach and the school effectiveness approach (see, for example, van den Berg, 2002). In general, the variables that affect achievement and dropout can be divided into context variables, input variables and classroom process variables (see for example Huitt, 1994, or the Context Input Process Output or CIPO-model). The input variables concern the characteristics of the students and teachers prior to their starting university education. The student’s characteristics consist of, for example, prior knowledge, gender, age, motivation, study behaviour and learning style. The teacher’s characteristics concern aspects, such as the teacher’s values and beliefs, knowledge, thinking, communication skills, performance skills and personality. The process variables concern the teacher and student behaviour in the course or the manner in which institutes organise their education, i.e. planning, management, instruction and time on task. The context variables include the variables outside of the classroom, which affect the teacher and student characteristics, the classroom processes and the output variable. For example, variables, such as family, community, religion, peer groups and characteristics of the school and school processes, e.g. organisational structure, school size and school climate characteristics, have been mentioned in this respect.

Despite this enormous amount of studies on the factors that affect achievement and dropout, some aspects need to be examined in more detail. Firstly, although most of the models, which examined achievement in higher education, have paid increasingly more attention to both student factors and characteristics related to the way institutions organise their education, these latter factors mainly concern
quantitative aspects, such as “the number of hours spend studying”, while qualitative aspects, such as “the structure and organisation of the course” have received little attention. Secondly, most of these models do not tend to include the relationship between a student’s motivation, deep information processing approach and the quality of the learning environment, nor the relationship between these two variables and achievement. Thirdly, most of the models, which have been examined, concern cross-sectional studies. However, since the study career is a longitudinal process, a longitudinal design is preferred (see Beekhoven, 2002; Goldstein, 1997). Williamson, Appelbaum and Epanchis (1991) indicated that repeated measurements could provide improved estimations, increased precision and a higher reliability.

The present study elaborates on these three aspects and integrates four distinct research lines to determine the context, input and classroom process factors that potentially affect achievement. The first draws on academic achievement in higher education; this literature focuses on the idea that the quality of the interaction between the student and the department determines the student’s decision to dropout from or persist in university (Spady, 1970; Tinto, 1975, 1987). However, these studies have hardly focused on qualitative characteristics of the learning environment, such as the structure and organisation of a course or the quality of assessment. The second research line is based on school effectiveness, and especially on models of educational productivity (Walberg, Fraser & Welch, 1986). These models include, next to quantitative aspects of the learning environment, characteristics related to the quality of the learning environment. The third and the fourth research lines provide information on the learning activities that are essential for the educational process, namely motivation and approaches to study. The third research line focuses on an adaptation of the expectancy-value model of motivation (Pintrich & De Groot, 1990). This model assumes that the relationship between motivation, in terms of expectancy, values and affect, and achievement is mediated by the amount and the quality of information processing. Finally, the fourth research line focuses on the quality of the approaches to study in relation to the quality of the learning environment (Ramsden & Entwistle, 1981). These four research lines provide a selection of context, input, process and output variables that potentially affect effectiveness in terms of academic achievement.
1.3 Effectiveness of Higher Education

Effectiveness, in this dissertation, is defined in terms of achievement in higher education or, in other words, it concerns the product or outcomes of higher education. In general, there are at least three categories of outcomes that need to be considered, namely (1) well organised and flexible accessible domain-specific knowledge and abilities, (2) heuristic strategies for problem analysis, knowledge of and ability in using the appropriate learning strategies, meta-cognitive and self-regulating strategies and, (3) positive beliefs, attitudes and emotions towards the task (De Corte, 2000; Pintrich, 1988).

The domain-specific knowledge and abilities, concern aspects, such as facts, principles and procedures. These form the basis for expertise in a domain (de Jager, 2002; Janssen, 1996; Reigeluth, 1983). These facts, principles and procedures in higher education, can be measured at the individual, or student, level and the group level (Janssen, 1996). For example, at the student level, a student’s learning profits can be examined by the grade point average (GPA) after a certain period in time e.g. a year. In fact, this outcome is one of the most used outcomes in higher education research. An outcome measure that is more commonly used in Dutch higher education is the total number of credits obtained after a period, such as a year or four years. In Dutch university education, one credit equals 40 hours of study. Further, at least 42 credits are needed to pass the first-year or propaedeutic examination, while at least 168 credits are needed to pass the doctoral examination and obtain a degree in the chosen subject (i.e. usually after four years). A final outcome is the study pace, that is, the time, for example in months, a student needs to obtain a first-year degree or a doctoral degree (Jansen, 1996; Need & de Jong, 2001).

Beside these outcomes on the individual level, one distinguishes domain-specific outcomes on the group level, namely the so-called “numerical returns” (Jansen, 1996). The numerical return concerns the percentage of students that succeed for the propaedeutic or doctoral examination, within a year or four years respectively, after the start of the study. Next to the numerical returns, a more commonly used outcome-measure is the dropout rate. This outcome measure is one of the most studied outcomes in the Anglo-Saxon literature on academic achievement.

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1 That is, except for studies such as the Medical Studies, which require six years, and certain departments from the Faculty of Mathematics and Natural Sciences, which require five years of study.
Traditionally, educational outcomes concerned the ones mentioned above. However, measures, such as the total number of credits obtained, grade point averages or the numerical returns might be considered crude measures of effectiveness. For example, Anaya (1999) stated that the GPA is not the best indicator of cognitive ability since it does not take the student’s performance at the beginning of the course (e.g. by a pre-test) into account. Furthermore, the GPA is not standardised, that is, comparisons among disciplines are hard, i.e. a ten or grade A obtained in one discipline is not equal to a ten or a grade A obtained in the other.

Nowadays, educational researchers and institutes have realised the importance of enhancing the appropriate learning strategies, self-regulating skills and positive beliefs and emotions (de Jager, 2002). For example, higher education research studies have included perceptions of the quality of education as indicators of effectiveness (Lawless & Richardson, 2002; Prosser & Trigwell, 1990). Furthermore, studies have examined the variables that affect persistence (Berger & Milem, 1999; Elkins, Braxton & James, 2000). Finally, new manners of assessment, such as portfolio assessment, overall assessment, self-assessment and peer-assessment, have been proposed (Gijbels, Claes & Dochy, 2000; Sluijsmans, 2002). However, the assessment of these strategies, beliefs and values has not been formalised nation-wide or even university-wide. Despite this fact, a combination of outcome measures, which includes domain specific knowledge and abilities, cognitive and meta-cognitive strategies and positive beliefs and emotions towards the task, might be a good indicator of effectiveness of higher education.

1.4 Theoretical Background

This dissertation starts from four research lines (see §1.2) on the problem of achievement in higher education. These research lines form the background for specifying the context, input and classroom process factors that affect achievement. Further, the research lines form the basis for the hypotheses on the relationship between the potential factors and achievement. The next section first discusses a selection of theories and models on the integration between the student and the department, which are prominent in higher education research. However, as mentioned afore, these theories do not tend to focus on the qualitative aspects of
instruction. Therefore, we also discuss school effectiveness research and, more particularly, the educational productivity model, which has been broadly validated in primary and secondary education. As mentioned in the previous section, a student’s approach to study and positive beliefs and emotions are outcomes that need to be considered in higher education. The last two sections therefore discuss the so-called “approaches to study” in relation to the perceived quality of the learning environment an adaptation of the expectancy-value model of motivation.

Models of Academic Achievement in Higher Education

Most of the models that focus on academic achievement are based on the interaction model that was developed by Spady (1970). This interaction model has generated many comparable studies, not only in the US and England, but also in the Netherlands. Spady’s model was, for example, elaborated on by Tinto (1975, 1987), Bean (1980), Pascarella (1980), Bean & Metzner (1985) and Webb (1990). Especially Tinto’s models have been numerous studied. This section discusses a selection of these models of academic achievement. ²

English and American achievement models.

The interaction models developed by Spady and Tinto have been rather influential in higher education; these models have generated an enormous database on factors that affect academic achievement. The first model (Spady, 1970) is based on Durkheim’s suicide theory in which it is argued that suicide is the result of the lack of social integration and normative congruence. Normative congruence, that is, the interaction between complex patterns of ability, aptitude, interests, goals, values and expectations, in combination with grade performance, intellectual development and support by friends, determine the amount of social integration. Further, a high amount of social integration results in satisfaction and institutional commitment. The decision to dropout or to persist is seen as a longitudinal process resulting from a combination of the (lack of) institutional commitment and poor academic achievement (see figure 1.1).

² More of these interaction models are described in the dissertations by Bijleveld (1993), Prins (1997) and the book “How college affects students: Findings and insights from twenty years of research” by Pascarella and Terenzini (1991).
Figure 1.1. Spady’s model (1970).

Tinto (1975, 1987) elaborated on Spady’s model by proposing that both student characteristics and the interactions with the social and the academic environments influence a student’s decision to persist or to withdraw from college. More specifically, student characteristics, such as socio-economic status and knowledge and abilities, influence a student’s intentions and a student’s institutional commitment and goal commitment. Institutional commitment is the degree to which an individual is motivated to graduate from a specific college or university and the goal commitment is the degree to which an individual is committed to earn a college degree in general. Institutional commitment, goal commitment and a student’s intentions influence the degree to which a student integrates academically (i.e. formally in terms of achievement and informally in terms of interaction with faculty members) and socially (i.e. formally in terms of extra-curricular activities and informally in terms of interactions with fellow-students). These last two factors are also influenced by a student’s external commitments (see figure 1.2).
Figure 1.2. Tinto’s model (1987).
Tinto’s model is one of the most tested models of student dropout (see, for example, studies by Berger & Braxton, 1998, Elkins, Braxton & James, 2001, Mannan, 2001, Munro, 1981, Pascarella & Chapman, 1983; Webb, 1990). Based on Spady’s and Tinto’s theories, Pascarella (1980) emphasised the importance of informal contact between the student and the teacher. Bean (1980, 1985) developed a meta-model of dropout, which emphasised the importance of student background variables and environmental variables that directly influence social and academic integration. His student attrition model proposed that students’ intentions were shaped by their beliefs and attitudes related to the institution, friends and faculty. Further, positive social and academic experiences resulted in positive beliefs and attitudes. These positive beliefs resulted in the intention to persist in college. Bean’s model differed from that of Spady and Tinto; his model focused less on social integration and more on environmental variables. Webb (1990) concluded that most of these explanatory dropout models are not very well applicable to non-campus institutions. Based on research at a non-campus institute, he therefore introduced the term perceived student/institution fit instead of the psychological outcomes (e.g. utility, satisfaction, goal commitment, stress) specified by Bean and added the term academic self-confidence to the model.

Dutch achievement models.

The interaction models have been elaborated on in the Netherlands by, for example, Bijleveld (1993), Jansen (1996), Prins (1997), De Jong et al. (1997), van den Berg (2002) and Beekhoven (2002). Bijleveld (1993) specified a model that aimed at explaining differences in dropout between departments. This model focused on the effects of departmental characteristics, such as the amount of problem-based learning, the number of interactive teaching methods, the spread of the study load and the spread of tests. Two central variables in the models were the students’ minimal effort and their minimal intellectual capacities. The minimal effort was seen as the result of motivation, which was influenced by the variables “activation of interest” and “study load”. The minimal intellectual capacities were affected by the difficulty of the course. The effects of the departmental factors were mediated by the student-input characteristics that were determined by demands of the department and by self-selection. This model differed from the integration models mentioned-above in that it focused on (a) departmental characteristics and not on student background and
integration characteristics and on (b) the differences between departments (van den Berg, 2002). However, this model was a conceptual model and was not empirically tested.

Instead of dropout, Jansen (1996) investigated academic achievement of students in six departments in the University of Groningen. In her conceptual model, both student characteristics - such as personality, intelligence, pre-attainment, socio economic status, gender and ability - and curricular characteristics - related to the spread in the curriculum, related to the instruction characteristics and related to formal assessment characteristics - affected the students’ effort, which was determined by time and motivational aspects. Further, both effort and student characteristics determined the amount of academic achievement. However, Jansen (1996) did not empirically test this conceptual model, since (a) student characteristics, such as personality and student characteristics were not collected, (b) the data were limited to information from study guides and (c) the data collection was mainly retrospective. The model which was tested included the student characteristics gender, age and ability and the curricular characteristics as explanatory factors. Numerical returns after one and two years and attainment in terms of total credits obtained in the first year were included as outcome variables. This study showed that female students, younger students and students with a higher ability had a higher achievement. Further, achievement was influenced by measures that affected the student planning behaviour and encouraged a positive attitude to the study. For instance, scheduling fewer subjects simultaneously, scheduling the regular assessments more evenly and scheduling resits less spread over the curriculum resulted in a higher achievement.

Prins (1997), who elaborated on Bijleveld’s model, included some of the variables on academic and social integration from Tinto’s model. Student variables - such as gender, age, support from peers, family background, study career, social integration, academic integration, academic self-confidence, aspiration and motivation-, departmental variables - such as study support, programme characteristics, assessment and “focus on students”- and the interaction between both, were included in the model that examined dropout. Prins concluded that the study counselling, the quality of assessment, the spread of study load, the number of contact hours and the student-centred education affected the dropout or retention rate.

De Jong et al. (1997) performed a nation-wide study on study careers in higher education. In their longitudinal “Amsterdam model of study careers”, they integrated
human capital theory and integration theory to explain academic achievement. The central variables in this model were academic integration, goal and institutional commitment and intentions. The model consisted of 14 blocks of variables that indicated the study career over time. Beekhoven (2002) elaborated on the Amsterdam model of study careers and studied a combination of academic and social integration in one integration concept. Beekhoven (2002, p.163) suggested that ‘educational researchers should reconsider the theories they are used to and open up to other theoretical insights so as to combine and sometimes replace other theories. Tinto’s model and other integration models have been studied often enough.’

Van den Berg (2002) performed a study based on the studies mentioned above in which external factors, which concerned the higher educational policy, where assumed to affect student background variables, economical factors related to the financial situation of the students, social and psychological factors, such as goals and intentions, effort and time spent studying, departmental and institutional factors and the integration in the department.

These interaction models provide a good theoretical framework for examining academic achievement. They include both student input factors and classroom process factors that potentially affect achievement. However, some aspects need to be examined in more detail. Despite the fact these models start to pay more attention to the department or course characteristics, this attention is usually limited to a description of the quantitative aspects of the course or the curriculum, such as the “number of hours” or the “domain of study”. More information is needed on qualitative aspects of the learning environment, such as the structure and organisation of both the delivery method, e.g. books, syllabi, and the instructional methods, e.g. discussion groups, in the course. Furthermore, most of the student variables in these models are limited to background variables, such as age, gender and ability. Studies, which include process variables, such as the student’s approaches to study and motivation, in their models, have been limited. What is needed is more attention to the importance of the classroom and the various learning activities that frame the educational process. The theories on school effectiveness, and more specifically on educational productivity, and the theories on approaches to study and motivation provide a good supplement to the interaction theories of academic achievement.
Models of School Learning

School effectiveness research, which focuses on the added value of schools in primary and secondary education, has been an important field of research in several countries. The main assumption within school effectiveness research is that (Teddlie & Reynolds, 2000 p1.) ‘...schools affect children’s development, that there are observable regularities in the schools that “add value” and that the task of educational policies is to improve all schools in general and the more ineffective schools in particular, by transmission of this knowledge to educational practitioners.’ This section discusses some general developments in models of school learning and discusses a model that includes both student and course/classroom variables in the explanation of achievement.

Developments in models of school learning.

Carroll introduced the first model on school learning in 1963. This model included six constructs, namely aptitude, ability to comprehend instruction, perseverance, clarity of instruction, matching the task to student characteristics and opportunity to learn. The Carroll model formed the starting point for many theories and models on school learning. For example, Bruner (1966), Bloom (1976), Harnischfeger and Wiley (1976), Glaser (1976) and Bennett (1978), Proctor, (1984), Cruickshank, (1985), Gage and Berliner (1992) and Huitt (1994) elaborated on the above-mentioned school learning models (see Haertel, Walberg & Weinstein, 1983; Wang, Haertel and Walberg, 1990).

The first models of school learning emphasised the importance of individual differences between students and the importance of constructs related to classroom instruction. In this beginning stage, from the mid sixties to the early seventies, the studies focused on the initial input-output paradigm. These first studies concluded that school outcomes were especially related to aspects, such as socio-economic status rather than to school-related aspects. However, during this first stage, school outcomes were limited to standardised tests. Furthermore, reviewers stated that these early studies did not incorporate adequate measures of the classroom processes or the socio-psychological climate involved in school learning. These models were soon refined and were elaborated on by extending the range of influences considered (Teddlie & Reynolds, 2000).
During the second stage in school learning research, early to late seventies, process variables and additional outcome variables were introduced in the so-called “effective school studies”. Next to the introduction of the process variables, the measures for the classroom input side were more sensitive, that is, both teacher and school were emphasised, student level output was associated with student level input instead of school level input and social psychological scales to measure school processes were developed. The models were elaborated on by the introduction of adaptive instruction (Wang et al. 1990). These latter models focused on variables associated with instructional delivery systems and program design and implementation.

From the late seventies to the mid eighties more attempts were made to incorporate effective school correlates into schools through the generation of various school improvement programmes (stage 3) (Teddlie & Reynolds, 2000). An example of a model in this stage was the so-called “five factor model” that included strong instructional leadership from the principal, a pervasive and broadly understood instructional focus, a safe and orderly school learning environment or climate, higher expectations for achievement from all students and the use of student achievement test data for evaluating the programme as well as school success.

In stage 4, from the late eighties till present day, more context factors have been included and, especially, more sophisticated methodologies, such as multilevel analysis are foci of attention within the school-learning paradigm.

*Educational productivity model.*

An interesting school learning model, which includes context, input, classroom process and output variables, is the Walberg educational productivity model. Based on an extensive synthesis of the research literature, Walberg (1981) proposed a model of educational productivity which included nine factors that promote student learning, namely (a) variables related to the student-aptitude attributes, such as ability, motivation and the developmental level in terms of age, (b) variables related to the quantity of instruction, that is, variables related to the amount of time students spend learning and to the quality of instruction, that is, variables, such as pacing, structuring and monitoring, (c) variables related to the social-psychological environment, such as the home environment, the peer environment, the classroom environment and exposure to mass media (Benbow, Arjmand & Walberg,

The first educational productivity models were examined using regression analysis in which direct relationships between the productivity factors and achievement were specified. Later on the relationships among the productivity factors were examined in structural equation models. For example, Reynolds and Walberg (1992), who elaborated on the first educational productivity model, considered achievement as a four-phase sequence beginning with the home-environment, followed by the student aptitude-attributes, mediated by the social psychological environment and the quantity and quality of instruction. The home environment was expected to affect the learning process well before secondary education. The student-aptitude attributes motivation and ability were both expected to have direct effects on academic achievement and the social psychological environment. The quantity and quality of instruction were considered as intermediating variables between the home and the student-aptitude variables on the one hand and achievement on the other.

This educational productivity model was the starting point for many research synthesizes, and review studies by Reynolds and Walberg (1991), Wang, Haertel and Walberg (1993) and Young and Reynolds (1996) found that this model is effective in examining the major determinants of the learning process. Even though this model has been tested in primary and secondary education, this model might also be very useful in examining achievement in higher education. However, even though the educational productivity model takes into account the relevant individual and contextual aspects of learning, more information is needed on the learning activities that frame the educational process, namely the student’s motivation and the approaches to study.

Motivation to Study

Student motivation is an essential aspect in the educational process. What motivates students to persist in situations where other students decide to dropout? This question has been an impetus for many studies on the relationship between motivation and achievement (Covington, 2000; Eccles & Wigfield, 2002). Most of the
modern theories on motivation focus on the relationship between beliefs, values and goals and action. Four major sections can be distinguished, namely related to theories that focus on expectancy for success on the task value, related to theories that integrate both expectancy and values and related to theories that integrate motivation and cognition (Eccles & Wigfield, 2002).

An interesting model on motivation concerns an adaptation of a general expectancy-value model of motivation (Jacobs & Newstead, 2000; Pintrich & De Groot, 1990; Wolters & Pintrich, 1998). This model contains elements from the expectancy-value models of motivation and of the theories on self-regulated learning. The first component is the expectancy component, which concerns the student’s beliefs about the ability to perform the task. The basic assumption involves the students believe that they are able to perform the task and that they themselves are responsible for the task. The second component, a value component, concerns the goals for performing a task and the beliefs about the importance of the task. The third component, the affect component, concerns the student’s emotional reactions to the task and is related to the student’s fear of failure or test anxiety.

The basic assumptions concerning the first two components are that the student’s belief in being able to perform the task, being responsible for succeeding in this task and striving for learning goals - which increase one’s competency, understanding and appreciation for what is learned - favour deep-level, strategic processing of information. Students with this deep level of processing are more likely to persist in performing this task (e.g. Eccles & Wigfield, 2002; Pintrich & de Groot, 1990; Tuckman, 1991; Vollmeyer & Rheinberg, 2000; Wolters & Pintrich, 1998).

When examining the third component, we see that studies on the affect-component have shown inconsistent results. On the one hand, positive emotions, such as curiosity, generally enhance motivation and facilitate learning and performance. Negative emotions, on the other hand, can also enhance learning and performance by focusing the learner’s attention to a particular task (Hermans, 1980). However, intense negative emotions, like anxiety, panic, insecurity and related thoughts like feeling incompetent, generally affect motivation, interfere with learning and contribute to a low performance (Sarason, 1986).

Motivation, in terms of expectancy, values and affect, is an important contributor to academic achievement. The relationship between motivation and
achievement is mainly direct, but also indirect through the amount and quality of information processing.

**Information Processing Approach**

Students differ in the ways they acquire, store and use knowledge, i.e. they differ in their information processing approach. These differences have been consistently identified related to various problem solving situations and are seen as a cognitive style. A learning style is seen as part of a cognitive style, which indicates the attitudes, and behaviours that determine a preferred way of learning. The learning style indicates the cognitive, affective and psychological factors that determine how students interact with and how they respond to the learning environment.

Over the past twenty years, the phenomenological perspective has had a great impact on thinking about learning styles. In 1975 Marton suggested that there is hierarchy of learning outcomes that consists of two levels of processing, namely a surface-level of processing and a deep level of processing, and the level of outcome varied with the level of processing. Two approaches to study were distinguished, namely a deep approach to studying, which was described as “striving for improved understanding by applying and comparing ideas”, while a surface approach involves reproductive strategies and the lack of integration of the information.\(^3\) The deep approach to study, which encompasses both cognitive strategies and meta-cognitive strategies, was considered consistent with the goals of higher education (Trigwell & Richardson, 2002).

Many instruments were developed to measure the cognitive learning styles. Based on the distinction between a deep and a surface approach to study, Biggs designed the study process questionnaire (SPQ) in 1985 (Trigwell & Richardson, 2002). This questionnaire contained 42 items divided over six scales measuring three approaches to study, namely a surface approach, a deep approach and an achieving approach to study. Enwistle & Ramsden (1983), developed the approaches to studying inventory (ASI); a questionnaire with 64 items over 16 subscales that measured a meaning orientation, a reproducing orientation, an achieving orientation, a non-academic orientation (Trigwell & Richardson, 2002). Vermunt (1999) developed the Inventory of Learning Styles (ILS) that covers cognitive processing strategies, such as

\(^3\) Later on a “strategic” and “apathic” approach were distinguished.
relating and structuring content. The questionnaire contains questions concerning meta-cognitive regulation strategies, such as self vs. external regulations, mental learning models (learning conceptions) and learning orientations (which refers to motivation).

The approaches to study have been examined in a variety of studies, for example related to conceptions of learning (Fuller, 1999; Säljö, 1979), related to the approaches to teaching and the conceptions of teaching (Murray & MacDonald, 1997; Trigwell, Prosser & Waterhouse, 1999; Trigwell & Prosser, 1996) and related to cognitive development (Zhang, 2001). These studies have shown that the same students show various approaches to studying in various situations and different students show different approaches in the same situations. These differences in approaches were related to gender, age and culture. Furthermore, these differences were related to the conceptions of learning (Säljö, 1979), which consisted of learning as the increase of knowledge, learning as memorising, learning as the acquisition of facts, learning as the abstraction of meaning and learning as an interpretative process and Taylor and Morgan (1986) added “changing as a person” as a conception of learning (Trigwell & Richardson, 2002). Beside that, it was suggested that approaches to studying depended on the content of the task, the context of the task and the demands of the learning task (Trigwell & Richardson, 2002). For example students taking arts courses were more likely to develop a deep approach to study. Further, a deep approach to study was thought to be related to the relevance of the subject matter, to the enthusiasm and support, the opportunity for self-regulation, good teaching and clear goals. The surface approach was thought to be related to assessment, that is, rewarding reproduction, related to fear and to a higher perceived workload (Ramsden & Entwistle, 1981, Trigwell & Prosser, 1996). These individual combinations of approaches, the various influences of the context on these approaches and the various conceptions of learning have also been referred to as study orchestration (Entwistle, Meyer & Tait, 1991).

1.5 Factors that affect Achievement in University Education

These four research lines provide a theoretical background on the context, input and process factors that potentially affect academic achievement. Furthermore, these approaches provide the basis for hypotheses on the relationship between the
variables and achievement. Based on the research lines, the next section discusses the context factors, the input factors and the process factors that affect achievement.

**Context Factors**

Generally, it is expected that a higher parental educational status results in higher academic achievement (Pascarella & Terenzini, 1991; Tinto, 1987). For example, Prins (1997) hypothesised that students with parents with a higher parental educational status would drop out less often. Prins suggested that the relationship between parental educational background and achievement was mediated by motivation and aspiration, that is, a higher parental educational status was related to a higher motivation and aspiration. However, this hypothesis was not confirmed in the analysis. The study by De Jong et al. (1997) did not show an effect of parental educational status either. However, their analyses did show that students with parents with a higher educational status indicated a higher expectancy of success, these students estimated that they needed less time for obtaining a degree, they worked fewer hours and reported a lower effort.

In general, part-time employment or full-time employment is expected to negatively influence achievement; a job interferes with the time spent on studying (time on task). Verbeek and De Jong (1995) showed that students who worked for 12 or more hours per week beside their study had a lower study pace than students who worked less than these 12 hours. Van den Berg (2002) illustrated that part-time employment for more than 8 hours per week negatively affected achievement in terms of total number of credits. Pantages and Creedon (1975) indicated that full-time students who worked more than 15 hours a week were more likely to withdraw. Curtis and Shani (2002), in contrast, indicated that even though there are undesirable effects of part-time or full-time employment, such as missed lectures, benefits of working include the development of skills and an increase in confidence.

The factors that are related to the organisation of the curriculum have mainly been investigated in Dutch higher education research (van den Berg, 2002; Jansen, 1996; Prins, 1997). These studies have investigated aspects related to the spread of the study load, related to assessment and related to the number of active contact hours, passive contact hours and self-study hours. Factors related to the spread of the study load concern the number of college periods and the number of courses that are offered within a college period. The main assumption related to the number of college periods
and the number of courses within a period is that a spread of the study load, in terms of more college periods and less parallel programmed courses within a period, resulted in higher achievement. The study by van den Berg (2002), however, did not support this hypothesis. In her study, more college periods, i.e. spreading the study load more evenly over the year, did not automatically result in higher progress. The study by Jansen (1996) showed a significant effect of the number of parallel programmed courses on achievement. Her study showed that programming courses in parallel, which implied that students had to divide their attention to competing courses, had a negative effect on students’ progress. The study by Prins (1997) showed that less academically or socially integrated students dropped out more often at departments in which more courses were programmed in parallel. Whenever less courses were programmed in parallel, academic or social integration had less effect on dropout or retention.

The number of passive and active contact hours is an important characteristic related to curriculum organisation. Generally, the assumption is that during active contact hours, such as practicals, work groups and skills groups, an active attitude is expected and students will prepare themselves more adequately (van Dijk & van den Berg, 2000; Tsui, 1999). Students will be more motivated to stay focused during lectures and will be stimulated to think critically. The study by van den Berg (2002) showed a negative association between the number of lectures and academic achievement for the first year students. The study did not show a significant association between the number of active hours and achievement. Prins (1997) did not show that the number of contact hours (both passive and active) influenced drop out or retention either. It did influence the time of retention, however. Whenever more contact hours were programmed in the first year the drop out decision was made sooner.

**Student Input Factors**

Most of the studies on academic achievement have included student variables, such as gender, age, ability and motivation in their models. Even though the relationship between gender, age, ability and achievement has usually been investigated in relation to the amount of social and academic integration, there have been studies that examined the direct effects of these three variables on achievement. Generally, the studies of the relationship between gender and academic achievement
have shown that female students perform better than male students (van den Berg, 2002; van der Hulst & Jansen, 2002; de Jong et al. 1997; Shah & Burke, 1999; Jansen, 1996; Need & de Jong, 1998). On the other hand, a study on background characteristics as predictors of academic self-confidence and academic self-efficacy among graduate science and engineering students, did not find gender to be a significant factor in predicting academic self-confidence, academic self-efficacy, or career-related outcome expectations (Santiago & Einarson, 1998). Trueman and Hartley (1996), who investigated the relationship between time-management skills and academic performance of mature and traditional-entry university students, did not show consistent sex differences either. They suggested that the relationship between gender and achievement might be mediated by time-management skills. Their study indicated that female students reported significantly better time-management skills than male students. Next to time-management skills, the relationship between gender and achievement might also be related to the domain under study; male students appear to perform better in technical studies while female students perform better in social studies.

When looking at the relationship between age and achievement, we see that younger student perform better than older students do. They, for example, achieve more credits (van den Berg & Hofman, 2000; van der Hulst & Jansen, 2002; Jansen, 1996; de Jong et al. 1997) and drop out less often (McInnis, et al., 2000; Murtaugh, Burns & Schuster, 1999). Jansen (1996) and de Jong et al. (1997) suggested that the effects of age might be related to repeating years in secondary education or it might be related to a delayed study career. Further, the domain under study might mediate the relationship between age and achievement. In contrast to the above findings, Trueman and Hartley (1996) indicated that older students usually perform as well as or even better than younger students. They indicated that time-management skills might be a mediating factor: older mature students reported significantly better time-management skills than younger students. Further, McInnis, James and McNaught (1995) indicated that mature students who have a clear career orientation and lower integration needs, are more likely to achieve higher results.

Beside gender and age, a student’s ability is another important variable in explaining academic achievement. Generally, it is assumed that ability is positively related to academic achievement (van der Hulst & Jansen, 1996; de Jong et al. 1997; McKenzie & Schweitzer, 2001; Need & de Jong, 1998; Pargetter, McInnis, James,
Evans, Peel & Dobson, 1998; Pike & Saupe, 2002). For example, Van der Hulst & Jansen (2002) found that higher grades on the secondary school subjects “sciences”, “advanced mathematics” and “Dutch Language and Culture” resulted in a higher number of credits in the first year. McKenzie and Schweitzer (2001) did suggest that the predictive capacity of secondary school differs for individuals and groups. They indicated that secondary school grades might not be such a good predictor for mature age students. Furthermore, beside age, they suggested that the method of entry and the ease with which the entry is made also matters.

Two variables that have been less commonly investigated in models of achievement are the student’s motivation and deep information processing approach (see for example, Covington, 2000; Lindblom-Ylänne & Lonka, 1999). As mentioned before, the basic assumptions related to motivation and achievement are that (a) a higher expectancy results in more or more appropriate processing strategies, (b) intrinsic values, e.g. interest in the study, positively affects the information processing strategy and (c) fear of failure both positively and negatively affects the quality and timing of the information processing approach. Even though this adaptation of the expectancy-value model of motivation has hardly been investigated as a whole, the results of studies that examined elements of the model confirm the first two assumptions. For example, Tuckman (1991) and Vollmeyer and Rheinberg (2000) found that cognitive and meta-cognitive strategy use mediate the relationship between expectancy and achievement. Covington (2000) indicated that intrinsic values influence achievement through the quality, timing and appropriateness of different cognitive strategies. However, the relationship between fear of failure (or test anxiety) and cognitive processing is not consistently found. On the one hand, studies show that test anxiety is related to cognitive and meta-cognitive strategy use, as well as to effort management (Pintrich & de Groot, 1990; Wolters & Pintrich, 1998). On the other hand, Pintrich and De Groot (1990) illustrated that highly anxious students appear to be as effortful and persistent as lowly anxious students, while in other studies highly anxious students are not persistent or are even avoiding tasks.

A deep approach to study is assumed to be consistent with the goals of higher education. The main assumption related to the relationship between approaches to study and achievement is therefore that a deep approach positively affects learning outcomes. However, studies on the relationship between the learning approach and academic grades show inconsistent results. That is, the approaches to study differed in
relation to the task (e.g. related to the content, context, the demands and assessment of the task) and the individual (gender, age and conceptions of learning).

Classroom Process Variables

The classroom process variables are divided into the quantity and the quality of instruction (Slavin, 1995). The quantity of instruction or time for instruction is usually measured by (a) the time allocated and actually used for learning and (b) the time needed for learning, which actually is a combination of other aspects of instruction, such as the quality of instruction, the appropriateness and the motivational aspect of instruction (Carroll, 1963; Slavin, 1995). Carroll (1963) suggested that school learning is a function of the time spent -the allocated time multiplied by the percentage of time in which students are actually involved in the task, i.e. engaged time or time-on-task - divided by the time needed -which is related to the aptitude, the ability to understand the instruction and the quality of instruction.

Less allocated time limits a students' learning opportunities and time on task and might restrict the possible learning outcomes (Hoeben, 1994). This assumption is related to the amount of content that is covered. In general, it is assumed that (a) the more time is allocated for instruction, the more content is covered and the more a student learns and (b) the more time a student is engaged in learning the higher the achievement. Despite this fact, more time allocated for instruction does not automatically lead to higher achievement. For example, Kember, Jamieson, Pomfret and Wong (1995) found that high attendance in class and more hours of independent study time was related to a surface approach to learning. It was suggested that surface learners needed the lecturer to define the course and due to the ineffective approach needed to spent more hours of independent studying.

Next to the quantity of instruction, the quality of instruction is an important factor in explaining academic achievement. Research into the factors that affect the quality of instruction first focused on aspects of the teacher, such as personality, appearance, intelligence and gender. Later on, achievement was related to teacher behaviours, such as enthusiasm, values, clear goals, high expectations, appropriate feedback and assessment, etc. In general, it is assumed that the quality of instruction refers to the degree in which information or skills are presented to students in a clear way (Slavin, 1995). This implies that the higher the quality of instruction, the more
the information presented makes sense and the more easily this information is remembered and applied.

Studies on the quality aspect of instruction have shown that knowledge and skills must be presented in an organised and structured manner (Feldman, 1989, 1998; Slavin, 1995; Reigeluth, 1983). This enhances encoding, memorising and retrieval and facilitates encoding new information (Starren, Bakker & van der Wissel, 1995). In classes, or courses, teachers can achieve structure and organisation by, for example, presenting information in an organised and orderly way, noting transitions to new topics, using clear and simple language, using many vivid images and examples and restating essential principles (Slavin, 1995; Starren et al. 1995).

In addition to presenting content in an organised and structured manner, research has shown that it is important that students know what to do and what to expect from a certain course (Creemers, 1994; Feldman, 1989, 1998, Finaly-Neumann, 1994). That is, clear specification of the objectives of the course is important. Related to that is the importance of aligning that what is taught to that what is assessed (Tyler, 1949). This feedback loop is one of the most important stimulating mechanism; what is being assessed determines what students study, how many hours they spend studying, how many classes they attend and the approaches they use for studying (Biggs, 1996; Gijbels et al. 2000).

Another important aspect related to the quality of instruction is the instructional pace. Whenever the teacher sets the pace appropriate to the needs of the students with the required background knowledge, the students lacking this required background knowledge will fall behind. On the other hand, setting the pace to the needs of the students without the required background knowledge will result in a motivational loss (Slavin, 1995). Hoeben (1994) stated that, since the amount of content-coveragge is related to achievement, the pace of instruction might be an indicator of educational quality.

A final aspect related to the quality of instruction is the stimulating effect of instruction. The student’s motivation to study may come from the intrinsic value of the subject that is being studied but can also be enhanced by extrinsic incentives, such as positive feedback, stimulation of interest in the course and subject-matter, encouraging students to ask questions, discussion and openness to opinions, intellectual challenge, encouragement of independent thought and teacher’s enthusiasm (Feldman, 1989, 1998). For example, Tuckman (1991) found that factors,
such as the task magnitude, informational feedback, encouragement, goal setting, group outcomes and preset versus normative standards had a considerable influence on effort and persistence.

1.6 Research Questions

Over the years, educational research has focused on the problem of academic achievement. Most of the studies in higher education have started from the integration approach in which the quality of interaction between the student and the department determines the decision to persist or to dropout, while in primary and secondary education school learning models have been prevalent. These studies have shown that many context, input, and classroom process factors affect achievement. However, despite this enormous amount of information on what affects achievement and dropout there are still some aspects that need to be examined in more detail.

First, we need more information on the relationships between student variables and departmental variables in models of academic achievement. Until recently, most of the models on academic achievement have focused on student characteristics, such as gender and ability, while the department variables or course variables were hardly included. Nowadays, and especially in Dutch higher education research, researchers have started to realise the importance of including both student and departmental variables in models for explaining academic achievement (see studies by van den Berg, 2002; Beekhoven, 2002; Bijleveld, 1993; Jansen, 1996; De Jong et al. 1997; Prins, 1997).

Second, related to the first aspect, academic achievement models should not only focus on quantitative aspects of instruction, such as the number of contact hours, but also on the qualitative aspect of instruction, such as the quality of the structure and organisation or the assessment of a course. More specifically, questions, such as “does a high quality of structure and organisation of a course positively affect achievement through motivation or the information processing approach?” need to be examined.

Third, we need more information on how variables, such as motivation and deep information processing, affect academic achievement. Though both integration theories and school learning theories have included motivational aspects in their models, the approaches to study have received less attention.
Fourth, more information is needed on how student learning processes in combination with course processes develop over time. That is, a longitudinal approach to academic achievement is desired (see Beekhoven, 2002; Goldstein, 1997).

The present study starts from these four aspects to study the effectiveness of higher education, in terms of academic achievement. Based on the theories of integration, educational productivity, approaches to study and the expectancy-value model of motivation, we distinguished a set of potentially influential factors that enable us to examine the central problem of this dissertation:

*Which context, process and input factors influence effectiveness in terms of achievement at four departments in the University of Groningen?*

The central research problem is divided into four research questions that are discussed in four separate studies. The first study focuses on the relationship between student input variables and achievement and aims to answer the question: “Does motivation affect academic achievement through approaches to study?” The second study focuses on the relationship between student input and achievement through process variables. The main research question in this study is: “What is the relationship between student background characteristics, perceptions of the quality of the learning environment, motivation, information processing and achievement?” The third study focuses on the effects of student input, process and context variables on achievement. More specifically, the study examines the Walberg educational productivity model and aims to answer the research question: “Do the variables as specified in the Walberg educational productivity model predict achievement in higher education?” The fourth study includes input, process, context variables, including the approach to study, which was not included in the Walberg model, to answer the question: “What influences academic achievement at two departments in the University of Groningen?”

These four research questions are each divided into various sub questions. Study one focuses on the expectancy-value of motivation in combination with the theories of the approaches to study to answer the questions:
1. What is the relationship between motivation and deep information processing (DIP)?

2. What is the relationship between motivation and achievement in terms of total number of credits (TNC),

3. What is the relationship between motivation, deep information processing and TNC after one year and after two years?

Study two starts from the integration models in combination with approaches to study, perceptions of the quality of the learning environment and student expectancy to answer the questions:

1. To what extent do student background variables influence perceptions of the learning environment?

2. What is the relationship between student perceptions of the learning environment and their motivation?

3. What is the relationship between student perceptions of the learning environment and their information processing approach?

4. What is the relationship between a student’s motivation, deep information processing approach and their achievement?

Study three discusses the educational productivity model applied to a sample of students in higher education and answers the following questions:

1. What proportion of achievement variance is explained by the four phases of variables in the elaborated Walberg educational productivity model i.e. by the home environment, the studentaptitude-attributes, the social psychological environment and, finally, the quantity and the quality of instruction?

2. What are the magnitude and the direction of the relationship between the factors of educational productivity and academic achievement?

Study four focuses on an integration of the four research lines to answer the questions:

1. How much variance found in academic achievement do the total models explain?
2. What is the magnitude and direction of the relationship between the explanatory variables and academic achievement? More specifically, (a) what is the relative influence of student, instruction and departmental characteristics respectively and (b) which of these variables are the most important indicators of academic achievement?

3. Are there any differences in models between departments and cohorts?

1.7 Structure of this Dissertation

The dissertation is divided into seven chapters, including this introduction chapter, the general methodology chapter and a final chapter that contains the conclusions of this study. Chapters three to six are chapters in article format. Each of these chapters have been submitted to educational journals and are under review. Even though the four studies are related to each other, they can be read separately. The specific theoretical background and methodologies are discussed in each of the four studies. As mentioned afore, the dissertation also includes a general theoretical background, which was discussed in this chapter, and it includes a description of the general data and methods in the second chapter.

The third chapter, *Motivation, deep information processing and achievement*,\(^4\) concerns the relationship between motivation and academic achievement through information processing. The chapter investigates the relationship between a student’s motivation, information processing strategies and the achievement of students in university education. This chapter proceeds from an expectancy-value model of motivation. This model assumes that expectancy, values and affect influence achievement through the quality and the timing of cognitive strategy use. The model is tested with a covariance analysis on the sample of 565 first-year students.

The fourth chapter, *Perceived quality of the learning environment, motivation, deep information processing and academic achievement*,\(^5\) examines questions on the relationship between student background characteristics and student perceptions of the learning environment, the relationship between these perceptions of the learning environment with motivation and deep information processing and the relationship

\(^4\) An earlier version of this chapter is published in *Pedagogische Studiën*.

\(^5\) A version of this chapter is submitted for publication.
between deep information processing and achievement in terms of total number of credits achieved.

The fifth chapter, *Educational productivity in higher education,* examines the Walberg educational productivity model, which assumes that nine factors influence achievement, with a sample of first-year students from the University of Groningen. Data on eight of these nine factors were collected through the departmental administration, self-report questionnaires, ratings questionnaires and through paper sources. These data were analysed with a multilevel analysis.

The sixth chapter, *Who succeeds at university? Factors predicting academic achievement in first-year Dutch students,* investigates a model in which variables related to the integration model, the educational productivity model, approaches to study and motivation to study were included.

The final chapter, *Summary, conclusions and discussion,* summarises the results of the chapters and discusses the general conclusions, the implications for theory, practice and policy and the recommendations for further research.

Finally, the appendices G and H contain two articles related to the problem of academic achievement and dropout. The first article examines the problem of achievement and dropout from a different viewpoint, i.e. it focuses on when students obtain their first-year degree instead of whether they obtain a degree. The second article concerns the so-called “curriculum map”, which is a tool for examining the elements and the relationship between the elements of the curriculum.

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6 A version of this chapter has been submitted for publication.