Self-Regulated Learning and Academic Performance
A Study among Freshmen

Monique de Bruijn-Smolders

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Self-Regulated Learning and Academic Performance
A Study among Freshmen

Zelfregulerend leren en studiesucces
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CHAPTER 1

Introduction

> *As a freshman at university I failed my first exam. I concluded I was not smart enough to study at university level and decided to leave. On three more occasions, I started university and left during my first year of study. One day, when I was tutoring my niece voluntarily, I discovered what I had done wrong during my study - I had not put enough effort into it! Since then, I have put a lot of effort into learning and learned how to study. I am now a successful university student who helps freshmen to learn how to study* (Van de Wiel, 2014, p. 12).

The personal story above illustrates what decades of research on self-regulated learning (SRL) in the context of higher education have shown (Hattie, Biggs, & Purdie, 1996; Richardson, Abraham, & Bond, 2012; Robbins et al., 2004), namely that self-regulatory processes (SRPs) such as goal-setting, planning, monitoring, time management, and putting effort in learning are used by students to manage their learning and improve their grades. At the same time, research on freshmen performance indicates that freshmen do not get the support they need with respect to developing their SRPs. As a result, freshmen who need help, for example with their planning and time management or with exploring new learning strategies for studying hundreds of pages in a short period of time, thoroughly and efficiently, are insufficiently noticed by their mentors, which leads to study delay and/or to student leaving of the educational program (Gomes, 2016; Herweijer & Turkenburg, 2016; Poulussen & Roseval, 2016). It remains unclear whether and if so, why, mentors often do not assess their freshmen SRPs accurately, and how this could be improved. Consequently, conducting research into how well mentors assess their freshmen SRPs and how they might improve their assessment-accuracy would be valuable.

Before it is possible to conduct research in mentor-assessment accuracy with respect to freshmen SRPs for learning, it is first important to determine exactly which freshmen SRPs would have to be identified to be able to predict the effectiveness of their learning in a correct manner. However, the use of different constructs and conceptualizations of SRPs hampers a proper comparison between earlier studies on SRPs, leaving unknown which entrance-level SRPs are critical for freshmen performance (Boekaerts, Pintrich, & Zeidner, 2000). Before examining how freshmen entrance-level SRPs might be assessed by their mentors more accurately, it therefore is important to conduct research on which entrance-level SRPs are the strongest predictors of freshmen performance.

The work in this thesis draws on the SRL-literature and on assessment-accuracy models. Four studies were conducted: A systematic literature review and three empirical studies among freshmen in higher (paramedical) professional education. First, the systematic review of the research literature examined which SRPs relate to effective learning in higher education. Second, based on the SRPs found to predict effective learning in the review, an empirical study was conducted to determine which of these SRPs also best predict freshmen retention. Third, the predictive values of freshmen background variables, but also mentor-rated and self-

rated SRPs at entrance level were examined and related to freshmen performance. Finally, an intervention study showed whether and how entrance-level SRPs might be improved by freshmen and by their mentors, to improve their academic performance. Figures 1.1 and 1.2 visualize the independent and dependent variables as examined in the different chapters in the present dissertation. Table 1.1 presents a schematic overview of the four studies conducted, their study designs, the data that were collected, and the number of data units/participants included. In the following, the main concepts as examined in this thesis will be discussed and related to the studies conducted.

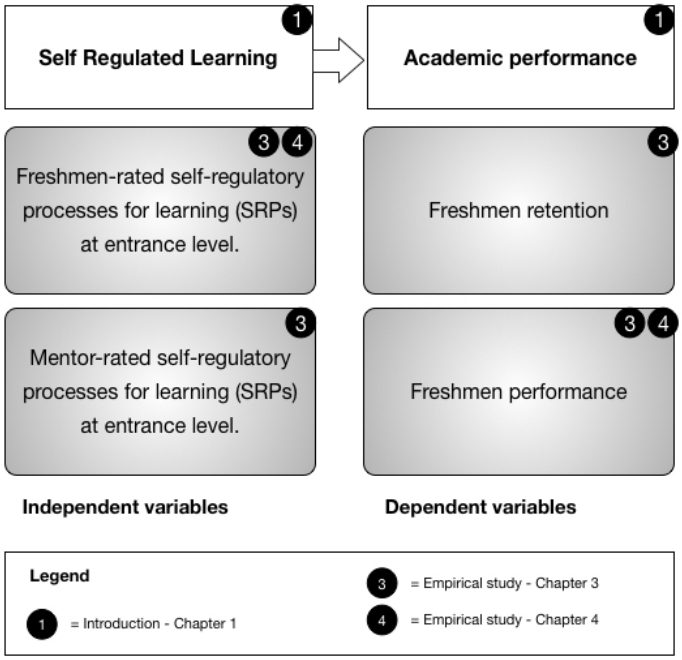

Figure 1.1 Main concepts in this dissertation (1)

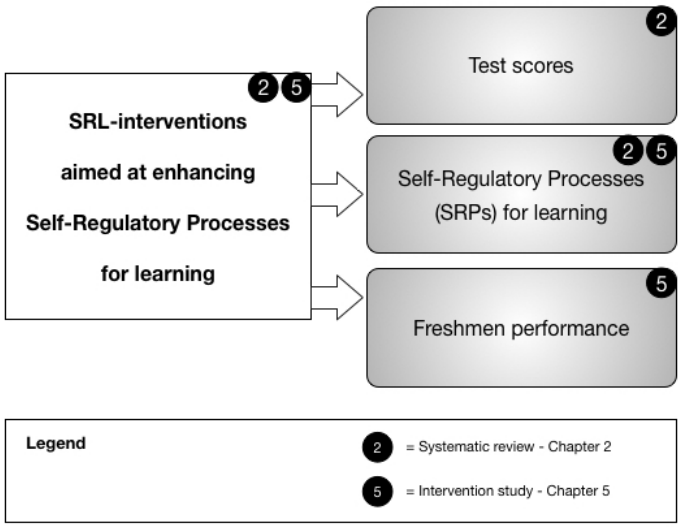

Figure 1.2 Main concepts in this dissertation (2)

Table 1.1 Schematic overview of studies in present dissertation

Research question	Chapter and study design	Sample
Which self-regulatory processes (SRPs) best predict academic performance[a] in higher education?	Chapter 2: Systematic review (Study 1)	10 primary empirical studies investigating SRPs in higher education (total sample *N* = 906)
Which of the SRPs that best predict academic performance in higher education are also the strongest predictors of freshmen retention?	Chapter 3: Empirical study (Study 2)	Study progress data as obtained by the Universities of Applied Sciences involved 1) Freshmen leavers (*n* = 83*) 2) Freshmen completers (*n* = 130*)
What are the predictive values of mentor-rated and freshman-rated entrance-level SRPs, up and above freshmen background variables (age, gender, ethnicity, physical/mental limitation, and pre-tertiary education level) with respect to freshmen performance, and how might these be combined to optimally predict freshmen delay/leaving?	Chapter 4: Empirical study (Study 3)	Study progress data as obtained by the Universities of Applied Sciences involved 1) Freshmen leavers (*n* = 48*) 2) Freshmen delayers (*n* = 67) 3) Freshmen completers (*n* = 73*)
To what extent can freshmen performance benefit from the improvement of entrance-level SRPs?	Chapter 5: Intervention study (Study 4) Quasi-experimental pretest-posttest design with a control group	Study progress data as obtained by the Universities of Applied Sciences involved 204 Freshmen filled out the pre-test. 108(53%) of these 204 freshmen completed the quasi-experiment: 1) Control group (*n* = 23) 2) Treatment group 1 (*n* = 29) 3) Treatment group 2 (*n* = 56)

*Freshmen leavers and freshmen completers of Study 2 were also included in Study 3, that is, if they allowed their mentor to predict their performance and rate their SRPs. Therefore, Study 2 and Study 3 were partly based on the same data: 48 of the 83 freshmen leavers (66%) and 73 out of the 130 freshmen completers (56%) who participated in Study 2 were also included in Study 3.

[a] Note that in Study 1, academic performance was labeled as learning outcomes.

Main concepts

Academic performance internationally

Academic performance is essential for enhancing an individual's social and economic prospects, and the economic growth of society at large [Organization for Economic Co-operation and Development (OECD), 2010, 2013]. However, for over 100 years, studies on academic performance consistently have reported that too many students underperform. For example, in a review on 35 studies, Summerskill (1965) repeatedly found that between 1913 and 1962 one out of two students in the USA had not been retained during a 4-year program. Similar findings appeared in the 70s for Canada (Mehra, 1973), Great Britain (Richling, 1971), and Australia (Baumgart & Johnstone, 1977). More recent data show that, on average, 30% of the students in Western countries who enter tertiary education do not graduate at this level of education (OECD, 2010, 2013). The percentage of non-graduates in higher education varies between countries, ranging from ≥ 40% of students in Mexico, New Zealand, Sweden and the USA to ≤ 25% in Belgium, Denmark, France, Japan, Korea, Spain and the Russian Federation (OECD, 2010, 2013). These graduation rates were measured after six years in the case of a 4-year program, and after three years in the case of a 2-year program.

Academic performance in the Netherlands

The work presented in this thesis was conducted in the Netherlands. Since 1999, an expert is asked to present the annual Kohnstammlecture [Kohnstammlezing] on Dutch education or upbringing. These Kohnstammlectures were initiated by the Dutch Kohnstamm Institute that conducts research on education and upbringing. In the 2015 Kohnstammlecture, Rinnooy Kan elaborated on Dutch *professional* education. He stated that the goal of Dutch professional education, whether this implies lower, middle, or higher professional education, is threefold. First, this type of education should create *equal opportunities* for all who enroll: age, gender, ethnicity, whether or not suffering from a mental/physical limitation, pre-tertiary education level or socio-economic status, should not have an effect on the probability of obtaining a diploma. Second, the *qualitative effectiveness* of Dutch professionals is an important goal, which refers to the content of the educational program, that is to what extent students are sufficiently qualified to enter the labor market. The third goal is the *quantitative effectiveness* of Dutch professional education, which refers to the percentage of students who graduate during the allotted time.

The work in this thesis examines the *quantitative effectiveness* of Dutch higher professional education. Compared with the academic performance as measured in other Western countries, the Netherlands scores average. That is, one out of three students who enroll in a 4-year program do not graduate within six years of study (OECD, 2010, 2013). Focusing on the

first year of one's study, the following data emerge: in the academic years 2002–2013, each year 15% of the freshmen left Dutch higher professional education within one year of study (Herweijer & Turkenburg, 2016). Moreover, on average, each year another 20% switched to another educational program (Herweijer & Turkenburg, 2016). Thus, annually, around 35% of the freshmen leave their initial higher professional education within the first year of study.

In the Netherlands, the quantitative effectiveness of a 4-year program in higher professional education is usually measured in two steps. The first step concerns the assessment of the effectiveness of the first year of study: Freshmen are expected to earn the maximum number of credits for the first year of study (60 European Credits) within one year of study and, if they succeed, they receive the so-called propaedeutic diploma. In general, the effectiveness of the first year of study in Dutch higher professional education is measured as the percentage of freshmen who obtain the minimum required amount of study credits at the end of the first year of study, and, in addition, earn their propaedeutic diploma within two years of study (Bormans, Bawja, Van Braam, & Dekker, 2015; Van Berkel, Jansen, & Bax, 2012). The second step concerns the effectiveness of the overall 4-year program. The effectiveness of the 4-year program is measured as the percentage of students who graduate within five years of study.

The present work focuses on entrance-level variables that predict the quantitative effectiveness of freshmen performance and prevent them from delaying or leaving the program. Therefore, in this thesis, freshmen are considered to perform well academically if they have acquired 60 European Credits (EC) in the first year of study. If they have not earned the propaedeutic diploma (60 EC) within one year of study, this dissertation considers these students to be 'delayers'. Lastly, students who have left their educational program during the first-year of study, are defined as 'leavers'.

Student leaving

A variety of concepts for student leaving has emerged, each emphasizing a certain aspect of 'student leaving', such as the reasons for leaving, where the students went to, or who was held responsible for the students' leaving. In 2005, Berger and Lyon distinguished the following terms for students' leaving: 1) attrition, that is the failure to re-enroll in the following study period; 2) dismissal, referring to students who leave involuntarily (a dismissal is generally based on having an insufficient number of study credits); 3) dropout, that is students who leave higher education before graduating; 4) mortality, regarding the failure to re-enroll through graduation; 5) stop out, standing for students who temporarily withdraw from an educational program; 6) withdrawal, pointing out students' leave from college voluntarily, and g) retention, referring to institutions' ability to retain students through graduation (Berger & Lyon, 2005).

In the present work, it is examined how institutions for higher education might improve freshmen performance by assessing entrance-level characteristics and by intervening (if

required) to prevent freshmen from delaying/leaving. Therefore, in the current study, the term 'freshmen retention' as depicted by Berger and Lyon (2005) is used to describe the prevention of freshmen delaying/leaving by the institution for professional higher education involved. To summarize, in this thesis the retained students who earn 60 EC after one year of study are labeled (first-year) completers, the retained students who earn less than 60 EC after one year of study are regarded as delayers, and the freshmen who leave the program during the first-year of study are referred to as leavers.

Self-regulation

According to Boekaerts, Pintrich, and Zeidner (2000), in the 1980s many publications on self-regulation emerged, mainly published in social psychology and personality journals. In the 1990s, studies on self-regulation also started to be published in educational, organizational, clinical, and health psychology journals. Boekaerts et al. concluded that a number of related, but different, self-regulation constructs and labels emerged between 1980 and 2000. Also, the term 'self-regulation' was used in slightly different ways depending on the research context. For example, self-management refers to self-regulation of a patient's health, whereas SRL means self-regulation for students in a learning context. In order to establish a coherent framework for self-regulation, Boekaerts et al. (2000) compiled a panel of experts from three different fields of interest (health psychology, educational psychology, and organizational psychology) to discuss similarities and differences between constructs and conceptualizations with respect to self-regulation. Subsequently, the authors published an overview showing that the experts had reached consensus about what constitutes 'self-regulation'. That is, the experts agreed that self-regulation involves the cognitive, affective, motivational, and behavioral components required to reach an individual's goals (Zeidner, Boekaerts, & Pintrich, 2000). Also, the experts concluded that self-regulation can be broken down into a number of integrated micro-processes, including goal setting, planning, the use of learning strategies, monitoring and meta-cognition, time management, and self-motivating beliefs such as self-efficacy (Zeidner et al., 2000).

Self-regulatory processes and academic performance

The current dissertation focuses on the use of SRPs in a learning context, which is commonly referred to as SRL. Similar to self-regulation in general, SRL has been described from different perspectives. Various models have been proposed, including different constructs and conceptualizations (Pintrich, 2000).

In the specific context of SRL in higher education, the variety of constructs and conceptualizations used for SRPs is striking. This fuzziness with respect to defining SRPs makes it complicated to compare different studies investigating SRPs, leaving unknown which SRPs exactly have a beneficial impact on learning outcomes in higher education. Consequently,

it is unknown which SRPs should be trained to improve academic performance. The reasons for the un-clarity with respect to which SRPs might be trained to improve academic performance are: 1) until now, former reviews on the effectiveness of SRL-interventions describe SRL in a holistic fashion without unraveling them into individual SRPs (Dignath, Buettner, & Langfeldt, 2008; Hattie et al., 1996), and 2) a meta-analysis which did examine the effectiveness of SRPs, focused on adult learning in the context of work-related training (Sitzmann & Ely, 2011), and did not mention the SRL-interventions involved (e.g., a training on how to plan, monitor and manage time for studying (Gettinger & Seibert, 2002; Hattie, 2009; Plant, Ericsson, Hill, & Asberg, 2005), leaving unknown how to train SRPs that benefit academic performance.

In conclusion, to date, an overview is lacking stating which SRPs predict academic performance in the context of higher education and how these SRPs can be trained. Therefore, a systematic review was conducted to examine which SRPs constitute academic performance in the context of higher education and how these SRPs can be improved by interventions (Chapter 2).

Self-regulatory processes for learning and student retention

The research literature suggests that different SRPs are important when predicting student retention (Black, 2008; Robbins et al., 2004) versus effective learning (Richardson et al., 2012; Robbins et al., 2004; Sitzmann & Ely, 2011). Again, different definitions of SRPs make it difficult to identify a specific set of SRPs for student retention, as opposed to SRPs for effective learning. Therefore, a second study (Chapter 3) was conducted, that built on the first study (Chapter 2). As will be seen in Chapter 2 (Study 1), the systematic review showed thirteen SRPs to specifically constitute effective learning in higher education. In Study 2 (Chapter 3), it was explored which of these thirteen SRPs are the best predictors of freshmen retention.

Self-regulatory processes for learning and mentoring

Although it is possible for a person to independently, by him or herself, develop SRL-competences, this is a difficult and de-motivating journey which often has little impact (Cranney & Dalton, 2012; Montessori, 2014; Zeidner et al., 2000). Instead, these authors recommend that individuals be taught to become self-regulated learners by other persons, such as parents, peers, or teachers. In higher education, mentors generally undertake supporting SRPs for learning.

The word ‘mentor’ first appeared in Greek mythology. In the Odyssey, the main character (Odysseus) is supported by his friend Mentor who coaches him for combat in the Trojan War. Mentor is described as a wise and responsible advisor who supports the development of Odysseus’ competences (Miller, 2002). In the context of higher education, although mentoring has been in use for over 100 years, two meta-analyses concluded that there is still a need for a

clear definition of mentoring (Crisp & Cruz, 2009; Jacobi, 1991). According to Nora and Crisp (2007), mentoring involves four major aspects: 1) psychological and emotional support, 2) support for setting goals and choosing a career path, 3) coaching with respect to mastering the academic content as taught, and 4) being a role model. In relation to the current dissertation, supporting SRPs concentrates on the aspect of *support for setting goals and choosing a career path*, aspect (2), as this involves an assessment of students' strengths, weaknesses, and abilities, as well as assistance with setting academic goals. In this regard, mentoring involves requesting detailed information from the mentee, as well as advising the mentee how to change current plans in order to achieve goals. Academic mentoring thus can be seen as a strategy to improve student retention and academic performance.

Mentor-assessment-accuracy

To be able to offer students proper support with respect to their SRPs, it is essential that mentors identify any shortcomings in students' SRPs, and act accordingly. Although teachers are generally found to be very accurate in assessing their students' future achievements (Hoge & Coladarci, 1989; Südkamp, Kaiser, & Möller, 2012), they are also reported to be better at predicting which students will perform academically well, than at predicting which students will not perform well (Wijnia, Loyens, Derous, Koendjie, & Schmidt, 2013). That mentors are not good at identifying which students will underperform is also reflected in recent studies on freshmen retention (Gomes, 2016; Herweijer & Turkenburg, 2016; Poulussen & Roseval, 2016). These studies concluded that teachers are not sufficiently sensitive in identifying a lack of SRPs for learning among their students: The freshmen in these studies retrospectively stated that a shortcoming in SRPs for learning had led them to leave the program, but that their mentors had not noticed their shortcoming in SRPs at that time. Considered from the so-called trait-visibility theory, a difference in mentor-freshmen rating accuracy with respect to SRPs for academic performance might occur due to a difference in observability and/or evaluativeness (Connolly, Kavanagh, & Viswesvaran, 2007; McDonald & Letzring, 2016; Vazire, 2010). Observability in the context of SRL refers to the degree to which an SRP is regarded as more or less visible. For example, SRPs that are generally conducted outside the learning context (e.g., planning, monitoring, time management) might be less visible for a mentor than for freshmen themselves. Evaluativeness in the context of SRL indicates the extent to which an SRP is regarded as more or less desirable. For instance, de-motivation might be a less desirable SRP, which freshmen might want to conceal from their mentor. Study 2 (Chapter 3) examines to what extent freshman-rated SRPs explain additional variance in freshmen leaving, over and above students' background variables (gender, ethnicity, and pre-tertiary education level). Study 3 (Chapter 4), builds on Study 2 by estimating the predictive values of the set of SRPs found to be related to freshmen retention in Study 2, as rated by mentors versus as rated by

freshmen themselves. The convergent validity (Campbell & Fiske, 1959) – also commonly referred to as inter-rater reliability or inter-rater agreement accuracy – was measured between mentor-rated SRPs, freshmen-rated SRPs and freshmen background variables, with respect to students' academic performance. Furthermore, it was determined to what extent mentor- and freshman-rated SRPs could be combined to more optimally predict freshmen delay/leaving. It must be remarked that the sample used in Study 3 is an extension of the sample used in Study 2. That is, approximately half of sample with respect to freshmen leavers (60%) and freshmen completers (56%) as used in Study 2 was also used in Study 3.

Improving self-regulatory processes for benefiting academic performance

The development of students' SRPs may be trained by their mentors by implementing one or more educational interventions that are believed to enhance SRL and, subsequently, to enhance academic performance. Former meta-analyses have focused either on interventions for improving SRL-components (e.g., affect or study behavior) and academic performance (Dignath & Buettner, 2008; Dignath et al., 2008; Hattie et al., 1996), or on one or more SRPs and how these relate to academic performance (Robbins et al., 2004; Sitzmann & Ely, 2011). Thus, while earlier research reported one or more SRPs to relate to academic performance in higher education, the current thesis focuses on 1) identifying all SRPs that predict academic performance in higher education, and 2) which SRPs of the set that predicts effective learning in higher education, are the strongest predictors for freshmen performance.

Based on their meta-analysis on SRPs and training transfer, Sitzmann and Ely (2011) presented a framework for a specific set of SRPs assumed to be related to adult learning in the context of work-related training. As mentioned earlier, their framework of SRPs for learning was used in Study 1, which led to an extension and slightly altered set of Sitzmann and Ely's set of SRPs, this time for academic performance in the context of higher education. After having tested the set of SPRs empirically amongst freshmen in higher education (Studies 2 and 3), Study 4 was conducted, which was an intervention study with a quasi-experimental pretest-posttest design. First, freshmen entrance-level SRPs were measured in a pretest. The freshmen as well as their mentors received the score on the pretest along with tailored interventions for each SRP that needed to be improved in order to improve academic performance. Second, in a posttest (nine months later) it was determined to what extent freshmen SRPs had been improved. Finally, at the end of the academic year it was examined to what extent an increase in SRPs related to enhanced academic performance.

Summary of studies conducted: Research questions, overview of the chapters, and research aims

The work in this dissertation examined performance in higher education and entrance-level SRPs in higher professional education in the Netherlands. One systematic review and three empirical studies were performed. Below, the research questions, an overview of the chapters, and the research aims are depicted. Table 1.1 provides the specific details for each study with regard to study design, data collection and the number of data units/ participants included.

Research question 1: *Which SRPs best predict academic performance in higher education?* Chapter 2 (**Effective Self-Regulatory Processes in Higher Education: Research Findings and Future Directions)** presents a systematic review (k = 10; N = 906) of empirical studies on SRL-interventions, SRPs, and academic performance in higher education. It must be noted that in Study 1 academic performance was labeled as learning outcomes.

Research question 2: *Which of the SRPs that best predict academic performance in higher education are also the strongest predictors of freshmen retention?*

This question is addressed in Chapter 3 (**Student Retention and Self-Regulated Learning**) by means of a survey conducted among 213 freshmen in higher professional education.

Research question 3: *What are the predictive values of mentor-rated and freshman-rated entrance-level SRPs, up and above freshmen background variables (age, gender, ethnicity, physical/mental limitation, and pre-tertiary education level) with respect to freshmen performance, and how might these be combined to optimally predict freshmen delay/leaving?*

These questions were investigated in Chapter 4 **(Academic Performance and Self-Regulated Learning)** among a sample of 188 freshmen and 28 mentors of these freshmen in higher professional education.

Research question 4: *To what extent can freshmen performance benefit from the improvement of entrance-level SRPs?*

Chapter 5 (**Interventions, Academic Performance, and Self-Regulated Learning)** describes an intervention study using a quasi-experimental pretest-posttest design among a sample of freshmen to examine to what extent entrance-level SRPs can be improved in order to benefit freshmen performance, by tailored mentor and/or freshman interventions. 204 freshmen filled out the SRPs at entrance-level, whereas, 108 (53%) of these 204 freshmen filled out their SRPs both at the pretest and the posttest.

This thesis closes with a general discussion on the findings, the methodological strengths and weaknesses of the individual studies, implications for future research and possibilities for practical application of the findings in professional higher education.

CHAPTER 2

Effective Self-Regulatory Processes in Higher Education: Research Findings and Future Directions

This chapter has been published as:

De Bruijn-Smolders, M., Timmers, C. F., Gawke, J. C. L., Schoonman, W., & Born, M. Ph. (2016). Effective self-regulatory processes in higher education: Research findings and future directions. *Studies in Higher Education, 41*(1), 139–158. doi:10.1080/03075079.2014.915302

Abstract

Although self-regulated learning (SRL) is assumed to benefit learning outcomes, gaps in the literature make it difficult to describe what constitutes effective SRL in higher education. That is, SRL that relates positively to learning outcomes. In accordance, at present it is unclear how to train effective SRL in higher education. The current systematic review breaks down SRL into self-regulatory processes (SRPs) and reviews the evidence for teaching adolescents effective SRPs. Of the wide variety of SRPs, which are known in the field, the following were investigated in the studies: metacognitive strategies, motivation, self-efficacy, handling task difficulty and demands, and resource management. The studies included (k = 10; N = 906) generally affirmed that all SRL-interventions that were investigated related positively to SRPs. These SRPs also related positively to learning outcomes. Research is needed to advance the field's understanding of how adolescents develop the wide array of effective SRPs.

Keywords: self-regulatory processes, self-regulatory constructs, self-regulated learning, learning outcomes, systematic review, higher education

Introduction

Self-regulated learning (SRL) refers to regulating affective, cognitive and behavioral processes in order to learn in a successful manner (Boekaerts & Niemiverta, 2000; Pintrich, 2000; Sitzmann & Ely, 2011; Winne, 2011; Zimmerman, 2000a). SRL is essential for individuals, particularly with regard to employability and lifelong learning (Schunk, 2001). In addition, SRL is related positively to success in higher education, such as better grades and less academic delay (Grunschel, Patrzek, & Fries 2013; Tuckman, 2003). Thus, to prepare individuals for life long learning, and to stimulate academic success, higher education should encourage their students to develop SRL.

At present, there is no overview of what exactly *constitutes* effective SRL in higher education. In other words, which self-regulatory processes (SRPs) relate positively to learning outcomes in higher education, is yet unclear. In accordance, it is unknown how effective SRPs can be trained in higher education. The reason for this lack of knowledge is twofold. First, former reviews on the effectiveness of SRL-interventions describe SRL in a holistic fashion (Dignath & Buettner, 2008; Dignath, Buettner, & Langfeldt, 2008; Hattie, Biggs, & Purdie, 1996). That is, without specifying the different SRPs that underlie SRL. Second, one recent meta-analysis that examined SRPs in adult learning, investigated only one specific learning outcome, namely training transfer (Sitzmann & Ely, 2011). The authors defined the latter as the permanence of trained skills after trainees leave the learning environment. In addition, Sitzmann and Ely did not mention the SRL-interventions that influenced both SRPs and training transfer. In conclusion, to date, there is no overview of SRPs that predict learning outcomes in higher education, and how these can be trained. Thus, the main purpose of the current review is to gain insight into SRL-intervention studies concerning SRPs and learning outcomes in higher education.

Prior to describing the method used for this systematic review, it is first necessary to briefly outline the theory on SRL and the current knowledge on effective SRPs.

Coming to terms with concepts: self-regulated learning, self-directed learning, and effective self-regulatory processes for learning

Self-regulated learning

According to Pintrich (2000), four basic assumptions can be identified in SRL-theories. The first is that students construct their learning in an active way. Related to this, a second general assumption in SRL-theories is that self-regulated learners undertake their learning in a purposeful manner. That is, they use standards such as learning goals to decide whether adjustments in SRL are needed. The third general assumption of SRL is that all students are able to self-regulate their learning, but that there are learning environment variables and

student characteristics that can prohibit students' SRL. Finally, most SRL-models assume that SRL benefits learning outcomes. Numerous SRL-models have been developed, differing in their underlying theories and, accordingly, in SRL-terminology. In 2000, Pintrich examined the commonalities between SRL-models and developed a general framework for SRL. In this SRL-framework, the author describes four SRL-phases: forethought, monitoring, control, and reflection. Pintrich states that in each phase students' SRL consists of regulating the SRL components cognition, motivation, behavior, and task/context content. Finally, for each SRL phase, Pintrich defined SRPs that students pursue. For example, in the forethought phase it is claimed that students regulate their cognition by SRPs such as goal-setting and prior content knowledge activation (Pintrich, 2000).

Self-regulated learning and self-directed learning

SRL shows significant resemblance to self-directed learning (SDL), a central concept in adult education. Both SDL and SRL expect students to control their learning by governing SRPs (Garrison, 1997; Loyens, Magda, & Rikers, 2008; Pilling-Cormick & Garrison, 2007). Nevertheless, in contrast with SRL, in SDL it is assumed that the learner exercises more independence in deciding the learning content and learning approach, regardless of educational standards (Garrison, 1997; Loyens et al., 2008; Pilling-Cormick & Garrison, 2007). As a result, it can be assumed that the SRPs which Sitzmann and Ely (2011) described specifically for SRL-literature, may also be identified in SDL-literature. Therefore, SDL-literature will also be included in this current review — under the condition that one or more SRPs are investigated with respect to learning outcomes in higher education.

Effective self-regulatory processes for learning

As stated before, there are learning environment variables that can prohibit students' SRL (Pintrich, 2000). Conversely, SRL can be stimulated by adjusting learning environments to SRL. This can be done by implementing one or more educational interventions that are believed to enhance SRL. As it is assumed that SRL influences learning outcomes (Pintrich, 2000), an intervention that stimulates SRL also should foster learning outcomes. Former meta-analyses already investigated the implementation of educational interventions and their effectiveness on SRL and learning outcomes (Dignath & Buettner, 2008; Dignath et al., 2008; Hattie et al., 1996). These meta-analyses did not investigate whether SRL and learning outcomes were related. So far, only one meta-analysis examined effective SRPs (Sitzmann & Ely, 2011).
Sitzmann and Ely (2011) studied whether and how SRPs are effective in college education and workplace training. The authors identified nine predictors for one specific learning outcome — training transfer. Sitzmann and Ely (2011) defined training transfer as the permanence of trained skills after trainees leave the learning environment. The authors distinguished three

kinds of SRPs. First, students' self-set performance goal-level is labeled as the initiator for students' SRL. Second, a variety of SRPs that students apply in order to achieve their formulated goal-levels are distinguished, such as planning and monitoring. Finally, students' learning beliefs, for instance about the causes of their study progress, form a separate category of SRPs (Sitzmann & Ely, 2011). See Table 2.1 for the nine effective SRPs that were found by Sitzmann and Ely (2011).

It must be noted that Sitzmann and Ely (2011) initially found that another subset of SRPs also constituted SRL: (1) help seeking; (2) emotion control; (3) persistence; (4) planning, and (5) monitoring. However, in their meta-analysis, help seeking, emotion control and persistence could not be significantly and positively linked to training transfer. For planning and monitoring accounted that the authors labeled these SRPs as metacognitive strategies, together with metacognition and learning strategies.

Table 2.1. Self-regulatory processes that predict training transfer (Sitzmann & Ely, 2011)

Self-regulatory processes	Definition
SRL initiator	
Goal-level	Self-set performance goal level (Vancouver & Day, 2005)
Processes that students use for goal-achieving	
Metacognitive strategies	Metacognition, planning, monitoring, and learning strategies
Attention	The degree to which students stay focused during training (Zimmerman, 2000b)
Time management	Making a time-schedule for learning
Environmental structuring	Choosing a study location that is fruitful for learning (Pintrich, 2000)
Motivation	The willingness to learn
Effort	The time that students devote to their learning (Zimmerman & Risenberg, 1997)
Students' learning beliefs	
Attributions	Students' beliefs about the causes of their study progress (Zimmerman, 2000b)
Self-efficacy	Students' beliefs regarding their learning capability (Bandura, 1977)

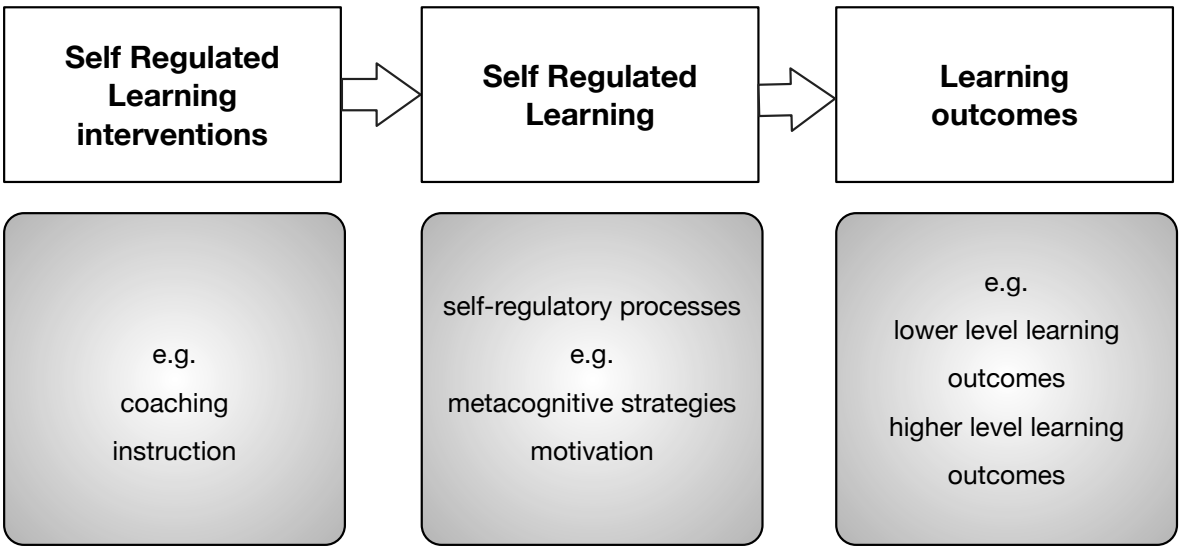

Figure 2.1 Conceptual model self-regulated learning-interventions, self-regulatory processes, and learning outcomes

To summarize, previous research on effective SRPs showed a positive influence on training transfer: The permanence of trained skills after trainees leave the learning environment. Which SRPs benefit learning outcomes in higher education remains unknown.

The main goal of the current systematic review is the investigation of relations between SRL-interventions, SRPs, and learning outcomes in higher education.

The aim of this review is to provide researchers an evidence-based summary in order to guide future research in this area. Thus, the following two research questions were formulated. According to SRL-intervention studies in higher education:

1. Which SRL-interventions influence which SRPs, simultaneously with learning outcomes?
2. Which SRPs relate to learning outcomes?

See figure 2.1 for a visualization of these two research questions.

Method

Procedure

This study followed Petticrew and Roberts (2006) method for conducting systematic reviews. Therefore, the review contained the following phases. First, the criteria for inclusion were determined. Second, the appropriate databases and search terms were formulated. Third, extensive literature research was conducted. Fourth, computing effect sizes resulted in standardized data. Finally, the data were synthesized by type of SRP and related with learning outcomes. Because of the heterogeneity of the studies with respect to the SRPs, a meta-analysis was not performed. That is, the different effect sizes were computed, but not the mean effect sizes.

Criteria for inclusion

1. *Purpose of the study:* This review focuses on the effectiveness of SRL-interventions in higher education. This type of learning can unfold in different learning environments: In the classroom, in simulated learning environments, or during workplace learning. Important is that the learning and learning outcomes are embedded in the prevailing curriculum. Therefore, laboratory sessions were not included.
2. *SRL-interventions:* The SRL-interventions as investigated in this systematic review should aim at developing SRPs and learning outcomes within higher education.
   Both SDL and SRL expect students to control their learning by governing the different SRPs that can be identified in SRL-literature (Garrison, 1997; Loyens et al., 2008; Pilling-Cormick & Garrison, 2007). Therefore, the SDL-literature was also included in the current review.
3. *SRPs*: This review builds on the meta-analysis of Sitzmann and Ely (2011). In accordance, three kinds of SRPs were distinguished. First, students' self-set performance goal-level was labelled as the initiator for students' SRL. Second, a variety of SRPs that students apply in order to achieve their formulated goal-levels were distinguished, such as planning and monitoring. Finally, students' learning beliefs, for instance about the causes of their study progress, formed a separate category of SRPs (Sitzmann & Ely, 2011). See Table 2.1 for the nine SRPs that guided this systematic review (Sitzmann & Ely, 2011).
4. *Learning outcomes:* According to Bloom's taxonomy (1956), learning can be distinguished in higher-order-level learning (HLL) and lower-order-level learning (LLL). HLL refers to applying, analyzing, evaluating, and creating. LLL stands for remembering and understanding (Anderson et al., 2001). In accordance with Anderson et al. (2001), in the current review learning outcomes were labeled as either LLL or HLL. For example, a knowledge test consisting of multiple-choice questions measures how well students remember facts, hence LLL. Yet, if students need to design a website by applying knowledge, this was defined as HLL.
5. *Student characteristics:* In order to generalize the results to school learning in higher education, studies should concern students in (post-) tertiary education. Participating students should not be selected on being excellent, gifted, or suffering from learning disabilities. Rather, they should be representative for the general school community.
6. *Research design:* For assuring a methodological standard, the design in the included studies had to be an experimental pretest-posttest design including a control group.
7. *Results:* In order to be able to standardize the results, the data had to be quantitative, either reporting effect sizes, or present sufficient information to compute effect sizes.
8. *Quality of the study:* Studies had to be published in English, and had to be listed in the Social Science Citations Index (Expanded). Finally, the study had to be accurate in

reporting results, for example, the number of participants must have been mentioned in the article.

Databases and search terms

The most commonly used databases for educational research, namely ERIC, Psychinfo, and Scopus were explored. As studies on the effectiveness of curricula promoting SRL are spread amongst health disciplines, Pubmed and Cinahl were also examined. Search terms related to SRL-interventions concerned *educational environment*; *independent study*; *student activism*; *individualized instruction*; *education*; *active learning*; *learner centered instruction*; *learning methods*; *school environment*; *portfolio*; and *feedback (response)*. Search terms that regarded SRL were: *self-regulat** and *self-direct**. The search term for learning outcomes was *learning outcomes*.

Study selection and data extraction

The selection of studies and the interpretation of data were done independently by two co-authors and the first author, by using a self-devised data-extraction form. An inter-rater reliability of 90% was reached for both the selection of studies and the coding of the outcome measures, as obtained individually. The remaining 10% of the articles were discussed thoroughly, due to divergent individually obtained results. Finally, consensus was reached in these sessions.

Coding of outcome measures

SRL-outcome variables should match one of the SRPs that Sitzmann and Ely (2011) defined as a predictor for training transfer. lf an SRP could not be matched with one that was found by Sitzmann and Ely's meta-analysis (2011), this was included in the category 'other'.

Applying the taxonomy of Bloom, learning outcomes were categorized in LLL and HLL (Anderson et al., 2001).

Effect size computations for self-regulatory processes and learning outcomes

The coded outcome variables were quantified in a standardized way, by using effect sizes. This was done for two reasons. The first reason for using effect sizes was to assure the different outcome variables concerning SRL-processes and learning outcomes could be compared. The second was to value the potential of an SRL-intervention. Especially for studies with a small sample size an effect size may indicate that, although a significance level is not reached, there is an SRL-intervention impact. Therefore, either the effect sizes of the included studies were reported, or, if not available, were computed (See also Crutzen, 2010). Concerning the latter, for each obtained measure the mean difference was computed between the treatment group and

the control group, divided by the pooled standard deviation. This standardized mean difference is Cohen's *d* (Cohen, 1992). If the mean and standard deviation were not reported, effect sizes were computed by using the formulas as described by Lipsey and Wilson (2001). The same procedure was followed for standardizing the SRL measurements. Following Cohen (1992), an effect size was considered low ($0.20 < d \leq 0.50$), moderate ($0.50 < d \leq 0.80$), or high ($d \geq 0.80$). As noted before, several effect sizes could be computed for each study.

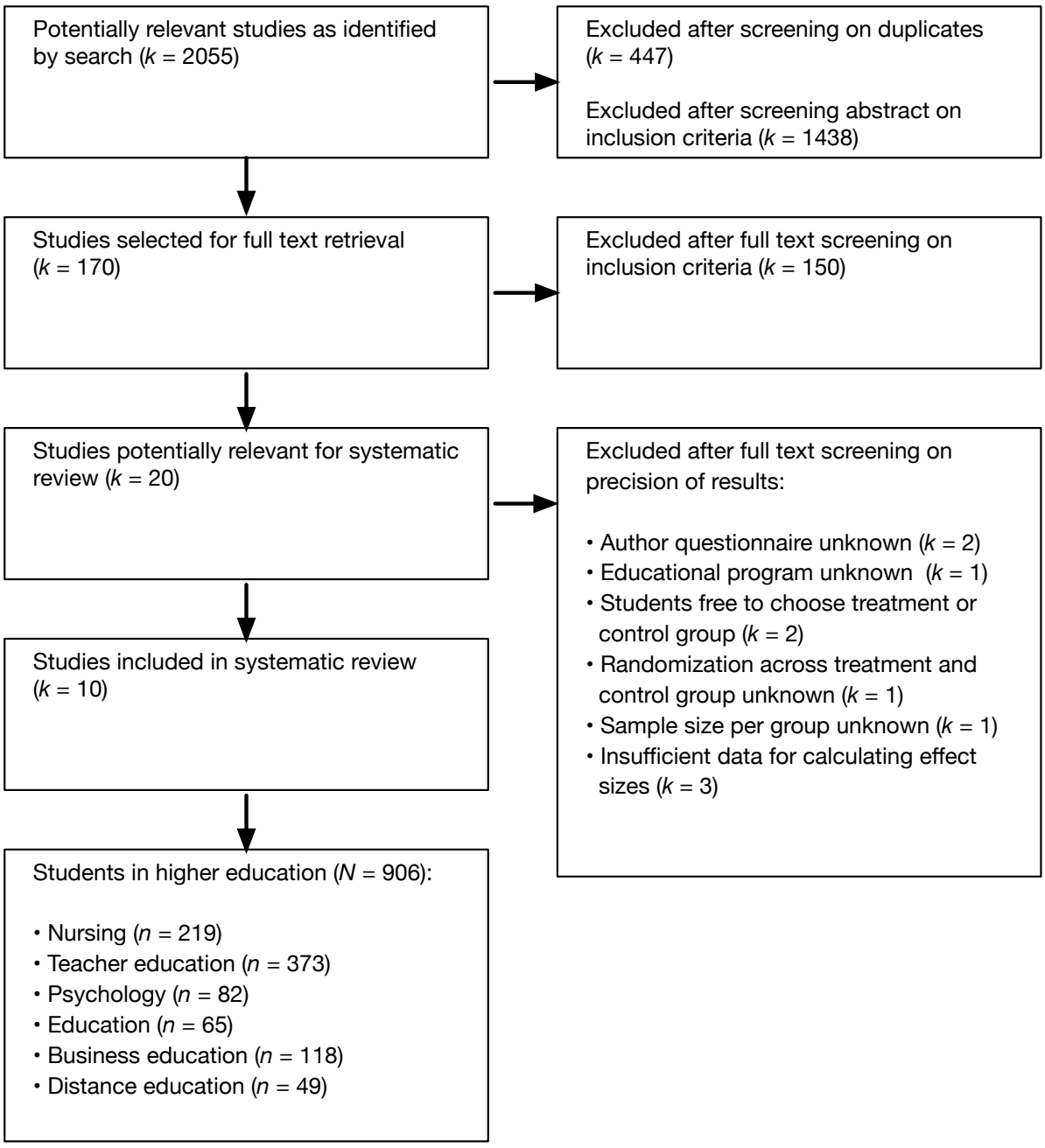

Figure 2.2 Study selection process

Results

Results search strategy

Ten studies were included in the final analysis and data synthesis. The different steps in the study selection process and the obtained studies are visualized in Figure 2.2.

Presence versus absence of various self-regulatory processes across different intervention studies

In the studies included, three out of the nine SRPs that Sitzmann and Ely (2011) concluded to be related to learning outcomes had been examined, namely metacognitive strategies, motivation, and self-efficacy. In addition, two studies included investigated two SRPs that Sitzmann and Ely (2011) did not found to be a predictor for training transfer. These were *handling task difficulty and demands* and *resource management*. See Table 2.2 for an overview of the SRPs that had been examined in the studies included.

Which interventions influence which self-regulatory processes, simultaneously with learning?

In the following, the 10 studies included are described according to the SRPs that they investigated. The participants, the SRL-interventions, and their effects on SRPs and learning outcomes are discussed in the below. For specific study details see Table 2.3.

Metacognitive strategies

Two studies (3 and 4) investigated self-metacognitive questioning amongst teacher students. These questions focus on students' understanding of the task and on students' self-regulation. Both studies, undertaken by the same researchers showed a positive influence on students' metacognitive strategies and HLL.

Table 2.2 Self-regulatory processes examined in studies included in the systematic review (as found by Sitzmann and Ely (2011)*

	Self-regulatory processes in order to achieve learning goals		Learning belief	Other self-regulatory processes[a]	
	Metacognitive strategies	**Motivation**	**Self-efficacy**	**Handling task difficulty and demands**	**Resource management**
1. Azevedo, Greene, & Moos (2007)	✓	✓		✓	
2. Jang et al. (2005)		✓			
3. Kramarski and Michalsky (2009)	✓	✓			
4. Kramarski and Michalsky (2010)	✓	✓			
5. Leflore et al. (2007)			✓		
6. McMullan, Jones, & Lea (2011)			✓		
7. Moos (2011)	✓		✓		
8. Nietfeld, Cao, & Osborne (2006)	✓				
9. Santhanam, Sasidharan, & Webster (2008)		✓	✓		
10. Van den Boom, Paas, & Van Merriënboer (2007)	✓	✓			✓

Note. The following self-regulatory processes that Sitzmann and Ely (2011) found to be related positively to training transfer were not examined in the studies
included: goal-level, attention, time management, environmental structuring, effort, and attributions.
[a]A self-regulatory process that was examined in the studies included. Sitzmann and Ely (2011) did not found this self-regulatory process to be related positively to training transfer.

A third study (10) investigated the effectiveness of reflection prompts, with and without tutor feedback. The reflection prompts were meant to evoke reflections on the students' learning process. The reflection prompts condition generated no impact on LLL. The reflection prompts condition with feedback condition had a moderate impact on LLL. The students concerned distance education students.

The three studies as described above investigated SRL-interventions with respect to metacognitive strategies, in general (3, 4, and 10). Another three studies examined certain metacognitive strategies — planning, monitoring, learning strategies, and calibration (1, 7, and 8).

The first study (1) prompted psychology students to use metacognitive strategies such as planning and monitoring, and to develop cognitive strategies, for example, summarizing or hypothesizing. This SRL-intervention influenced planning, monitoring, LLL, and HLL in a positive manner. However, this study reported a negative effect on learning strategies.

The second study found that four guiding questions had a high impact on planning, monitoring, and learning strategies, and a moderate effect on HLL. The participants concerned education students. However, in a second treatment group, the participants were provided with four guiding questions and, additionally, with digital feedback. The four guiding questions with digital feedback condition were found to have a high impact on planning and monitoring, but none on learning strategies, and a marginal effect on HLL. The author concluded that students in the feedback condition performed less well because the feedback consisted of knowledge of results (7). The students who received positive feedback may have concluded that they had learned sufficient, concerning this part of study. This may have led to a decrease or discontinuation of students' learning strategies, and thus to lower performance (7).

The third study (8) examined whether digital feedback on monitoring exercises was related to students' calibration competence. The latter refers to the students' ability of matching their *perception* of their own performance with their *actual level* of performance. For the teacher students it turned out that digital feedback had both moderate effects on calibration and test performance.

Table 2.3 Training information of the intervention studies that measured the effectiveness of SRL-interventions on self-regulatory processes and learning outcomes (*k* = 10)

	Participants	Treatment group, learning environment	Control group, learning environment	Self-regulatory processes (SRPs)	*d*	Effect *d*	Measurement instrument SRPs	Measurement test Learning outcomes	LLL/ HLL[a]	*d*	Effect *d*	SRP and LLL/ HLL[b]
1	Psychology students (*N* = 82)	1.An overall learning goal and scaffolding, hypermedia learning (*n* = 41)	An overall learning goal, hypermedia learning (*n* = 41)	*Metacognitive strategies*			Think aloud protocols; students' verbalizations about SRL constructs, recorded on audio and videotape. Coding scheme designed by Azevedo, Cromley, & Seibert (2004)	- Matching task	LLL	0.08*	0	nr
								- Labeling task	LLL	0.67*	++	r
				Planning	0.56	++		- Blood flow diagram	HLL	0.60*	++	r
				Monitoring	0.43	+						
				Strategy use	-0.07	-		- Mental model task	HLL	0.49	+	r
				Motivation	-0.23	-						
				Handling task difficulty and demands	0.23	+						
2	Nursing students (*N* = 105)	1.Web-based ECG learning program + immediate, digital, feedback (*n* = 54)	Face-to-face learning + human coaching (*n* = 51)	*Motivation*	-0.15	-	Korean version of Keller's Instructional Materials Motivation Survey (1987)	- Mpc test	LLL	-0.68	-	ni
								- Interpreting test	HLL	0.54*	++	ni

Note. An effect size was considered negative ($d \leq 0.00$), zero ($0.00 < d \leq 0.20$), small ($0.20 < d \leq 0.50$), moderate ($0.50 < d \leq 0.80$), or high ($d \geq 0.80$). Subsequently, in table 2.3 effect sizes are labeled negative (-), zero (0), small (+), moderate (++) or high (+++).
a Lower order level learning (LLL) / Higher order level learning (HLL)
b related (r) / not related (nr) / not investigated (ni)
* Significant effects as reported in study

Table 2.3 Training information of the intervention studies that measured the effectiveness of SRL-interventions on self-regulatory processes and learning outcomes (*k* = 10) *(Continued)*

	Participants	Treatment group, learning environment	Control group, learning environment	Self-regulatory processes (SRPs)	*d*	Effect *d*	Measurement instrument SRPs	Measurement test Learning outcomes	LLL/ HLL[a]	*d*	Effect *d*	SRP and LLL/ HLL[b]
3	Teacher students (*N* = 194)	1.E-learning (*n* = 53)	Face-to-face learning (*n* = 46)	*Metacognitive strategies*			Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich et al., 1991)	Comprehending skills test	HLL	0.25*	+	ni
				Cognition	-0.08	-		- Designing skills test	HLL	0.33*	+	ni
				Metacognition	-0.08	-						
				Motivation	0.11	0						
		2. Self-metacognitive questioning (digitally), e-learning (*n* = 47)		*Metacognitive strategies*				Comprehending skills test	HLL	1.01*	+++	ni
				Cognition	0.78	++		- Designing skills test	HLL	1.20*	+++	ni
				Metacognition	0.57	++						
				Motivation	0.61	++						
		3.Self-metacognitive questioning (on paper), face-to-face learning (*n* = 48)		*Metacognitive strategies*				Comprehending skills test	HLL	0.40*	+	ni
				Cognition	0.30	+		- Designing skills test	HLL	0.57*	++	ni
				Metacognition	0.23	+						
				Motivation	0.33	+						

Note**.** An effect size was considered negative ($d \leq 0.00$), zero ($0.00 < d \leq 0.20$), small ($0.20 < d \leq 0.50$), moderate ($0.50 < d \leq 0.80$), or high ($d \geq 0.80$). Subsequently, in table 2.3 effect sizes are labeled negative (-), zero (0), small (+), moderate (++) or high (+++).

a Lower order level learning (LLL) / Higher order level learning (HLL)

b related (r) / not related (nr) / not investigated (ni)

* Significant effects as reported in study

Table 2.3 Training information of the intervention studies that measured the effectiveness of SRL-interventions on self-regulatory processes and learning outcomes (*k* = 10) *(Continued)*

	Participants	Treatment group, learning environment	Control group, learning environment	Self-regulatory processes (SRPs)	*d*	Effect *d*	Measurement instrument SRPs	Measurement test Learning outcomes	LLL/ HLL[a]	*d*	Effect *d*	SRP and LLL/ HLL[b]
4	First year teachers for high schools in the sciences (*N* = 95)	1. Online self-metacognitive questioning, hypermedia learning (*n* = 47)	Hypermedia learning (*n* = 48)	*Metacognitive strategies* Cognition Metacognition *Motivation*	 1.07 0.93 0.85	 +++ +++ +++	MSLQ, developed by Pintrich et al., 1991)	Comprehension skills - Design skills	HLL HLL	1.64 1.43	+++ +++	r r
5	Nursing students on master's level (*N* = 16)	1. A clinical simulated experience. Afterwards, human coaching, instructor-modeled learning (*n* = 6)	A traditional lecture and a clinical simulated experience, traditional didactic learning (*n* = 5)	*Self-efficacy*	1.46*	+++	Michael's adaptation of the self-efficacy tool (Michael, 2005), originally developed by Schwarzer and Jerusalem in 1979 (Schwarzer & Jerusalem, 1995)	- Knowledge test - Technical evaluation - Behavioral Assessment	LLL HLL HLL	1.58 -0.27 0.57*	+++ - ++	nr nr r

Note**.** An effect size was considered negative (*d* ≤ 0.00), zero (0.00 < *d* ≤ 0.20), small (0.20 < *d* ≤ 0.50), moderate (0.50 < *d* ≤ 0.80), or high (*d* ≥ 0.80). Subsequently, in table 2.3 effect sizes are labeled negative (-), zero (0), small (+), moderate (++) or high (+++).
a Lower order level learning (LLL) / Higher order level learning (HLL)
b related (r) / not related (nr) / not investigated (ni)
* Significant effects as reported in study

Table 2.3 Training information of the intervention studies that measured the effectiveness of SRL-interventions on self-regulatory processes and learning outcomes (*k* = 10) *(Continued)*

	Participants	Treatment group, learning environment	Control group, learning environment	Self-regulatory processes (SRPs)	*d*	Effect *d*	Measurement instrument SRPs	Measurement test Learning outcomes	LLL/ HLL[a]	*d*	Effect *d*	SRP and LLL/ HLL[b]
		2. A clinical simulated experience. Afterwards, students were provided with a facilitated debriefing, self-regulated learning (*n* = 5)		*Self-efficacy*	2.12*	+++		- Knowledge test - Technical evaluation - Behavioral Assessment	LLL HLL HLL	0.58 -0.36 0.43	++ - +	nr nr r
6	Nursing students (*N* = 98)	1. September cohort: an interactive e-drug calculations package, e-learning (*n* = 32)	A paper handout, face-to-face learning (*n* = 16)	*Self-efficacy* Drug calculation self-efficacy	0.52	++	Six items, validated in a pilot with 22 students (Coefficient's alpha 0.9), by McMullan (2011)	- A drug calculation test	HLL	0.67*	++	ni**

Note**.** An effect size was considered negative ($d \leq 0.00$), zero ($0.00 < d \leq 0.20$), small ($0.20 < d \leq 0.50$), moderate ($0.50 < d \leq 0.80$), or high ($d \geq 0.80$). Subsequently, in table 2.3 effect sizes are labeled negative (-), zero (0), small (+), moderate (++) or high (+++).
a Lower order level learning (LLL) / Higher order level learning (HLL)
b related (r) / not related (nr) / not investigated (ni)
* Significant effects as reported in study

Table 2.3 Training information of the intervention studies that measured the effectiveness of SRL-interventions on self-regulatory processes and learning outcomes (*k* = 10) *(Continued)*

	Participants	Treatment group, learning environment	Control group, learning environment	Self-regulatory processes (SRPs)	*d*	Effect *d*	Measurement instrument SRPs	Measurement test Learning outcomes	LLL/ HLL[a]	*d*	Effect *d*	SRP and LLL/ HLL[b]
		2. As described above, for the February cohort (*n* = 26)	A paper handout, face-to-face learning (*n* = 24)	*Self-efficacy* Drug calculation self-efficacy	0.67*	++		- A drug calculation test	HLL	0.48*	+	ni**
7	Education students (*N* = 65)	1.Four guiding questions, hypermedia learning (*n* = 26)	No four guiding questions, hypermedia learning (*n* = 21)	*Metacognitive strategies* Planning Monitoring Strategies *Self-efficacy*	 1.45* 1.43* 0.88* 0.68*	 +++ +++ +++ ++	-A modified MSLQ self-efficacy scale (Pintrich et al., 1991). -Think aloud protocol (Ericsson, 2006a; Ericsson & Simon, 1994)	- Essay	HLL	0.47*	+	r

Note**.** An effect size was considered negative (*d* ≤ 0.00), zero (0.00 < *d* ≤ 0.20), small (0.20 < *d* ≤ 0.50), moderate (0.50 < *d* ≤ 0.80), or high (*d* ≥ 0.80). Subsequently, in table 2.3 effect sizes are labeled negative (-), zero (0), small (+), moderate (++) or high (+++).
a Lower order level learning (LLL) / Higher order level learning (HLL)
b related (r) / not related (nr) / not investigated (ni)
* Significant effects as reported in study

Table 2.3 Training information of the intervention studies that measured the effectiveness of SRL-interventions on self-regulatory processes and learning outcomes (*k* = 10) *(Continued)*

	Participants	Treatment group, learning environment	Control group, learning environment	Self-regulatory processes (SRPs)	*d*	Effect *d*	Measurement instrument SRPs	Measurement test Learning outcomes	LLL/ HLL[a]	*d*	Effect *d*	SRP and LLL/ HLL[b]
		2.Four guiding questions, and immediate digital feedback on answers (knowledge of results), hypermedia learning (*n* = 18)		*Metacognitive strategies* Planning Monitoring Strategies *Self-efficacy*	 1.31* 0.94* 0.13 0.28*	 +++ +++ 0 +	-A modified MSLQ self-efficacy scale (Pintrich et al., 1991). -Think aloud protocol (Ericsson, 2006a; Ericsson & Simon, 1994)	- Essay	HLL	0.03*	0	r
8	Students teacher education (*N* = 84)	1.Instruction: Monitoring exercises and digital feedback, learning environment undefined (*n* = 45)	Monitoring exercises, learning environment undefined (*n* = 39)	*Metacognitive strategies* Calibration *Self-efficacy*	 0.64* -0.14	 ++ -	Monitoring accuracy test (Keren, 1991; Yates, 1990)	- Test score - Schema score	LLL HLL	0.76* 0.64*	++ ++	r r

Note**.** An effect size was considered negative ($d \leq 0.00$), zero ($0.00 < d \leq 0.20$), small ($0.20 < d \leq 0.50$), moderate ($0.50 < d \leq 0.80$), or high ($d \geq 0.80$). Subsequently, in table 2.3 effect sizes are labeled negative (-), zero (0), small (+), moderate (++) or high (+++).
a Lower order level learning (LLL) / Higher order level learning (HLL)
b related (r) / not related (nr) / not investigated (ni)
* Significant effects as reported in study

Table 2.3 Training information of the intervention studies that measured the effectiveness of SRL-interventions on self-regulatory processes and learning outcomes (*k* = 10) *(Continued)*

	Participants	Treatment group, learning environment	Control group, learning environment	Self-regulatory processes (SRPs)	*d*	Effect *d*	Measurement instrument SRPs	Measurement test Learning outcomes	LLL/ HLL[a]	*d*	Effect *d*	SRP and LLL/ HLL[b]
9	Business education students (*N* = 118)[b]	1.Instruction: A pre-training script on task analysis and learning goals. Also, this script stimulated self-efficacy beliefs, e-learning (*n* = 61)	A pre-training control script without SRL-information, e-learning (*n* = 57)	*Motivation self-efficacy*	0.37*	+	Learning orientation	- Declarative knowledge test	LLL	0.58*	++	nr
				Computer learning self-efficacy	0.23	+	scale and computer learning self-efficacy scale (Zweig & Webster, 2004).	- Hands-on performance test	HLL	0.35*	+	nr
		2.Instruction: A midpoint script that asked to focus on aspects of self-regulated learning, e-learning (*n* = 61)	A midpoint control script, not focused on SRL, e-learning (*n* = 57)	*Motivation self-efficacy*	0.35*	+	Learning orientation	- Declarative knowledge test	LLL	0.36*	++	nr
				Computer learning self-efficacy	0.21	+	scale and computer learning self-efficacy scale (Zweig & Webster, 2004).	- Hands-on performance test	HLL	0.27*	+	nr

Note**.** An effect size was considered negative ($d \leq 0.00$), zero ($0.00 < d \leq 0.20$), small ($0.20 < d \leq 0.50$), moderate ($0.50 < d \leq 0.80$), or high ($d \geq 0.80$). Subsequently, in table 2.3 effect sizes are labeled negative (-), zero (0), small (+), moderate (++) or high (+++).
a Lower order level learning (LLL) / Higher order level learning (HLL)
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* Significant effects as reported in study

Table 2.3 Training information of the intervention studies that measured the effectiveness of SRL-interventions on self-regulatory processes and learning outcomes (*k* = 10) *(Continued)*

	Participants	Treatment group, learning environment	Control group, learning environment	Self-regulatory processes (SRPs)	*d*	Effect *d*	Measurement instrument SRPs	Measurement test Learning outcomes	LLL/ HLL[a]	*d*	Effect *d*	SRP and LLL/ HLL[b]
10	Distance education students engaging in a course psychology (*N* = 49)	1.Reflection prompts, hypermedia learning (*n* = 16)	Neither reflection prompts nor tutor feedback, hypermedia learning (*n* = 18)	*Metacognitive strategies* Cognitive strategy scale Metacognitive strategy scale *Motivation* Value scale Expectancy scale Test anxiety scale** *Resource management scale*	0.72 0.28 0.65* 0.03 0.28 0.24	++ + ++ 0 - +	Motivated Strategies for Learning Questionnaire (Pintrich et al., 1991)	- Knowledge test	LLL	0.12	0	r

Note. An effect size was considered negative ($d \leq 0.00$), zero ($0.00 < d \leq 0.20$), small ($0.20 < d \leq 0.50$), moderate ($0.50 < d \leq 0.80$), or high ($d \geq 0.80$). Subsequently, in table 2.3 effect sizes are labeled negative (-), zero (0), small (+), moderate (++) or high (+++).
a Lower order level learning (LLL) / Higher order level learning (HLL)
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* Significant effects as reported in study

Table 2.3 Training information of the intervention studies that measured the effectiveness of SRL-interventions on self-regulatory processes and learning outcomes (*k* = 10) *(Continued)*

Participants	Treatment group, learning environment	Control group, learning environment	Self-regulatory processes (SRPs)	*d*	Effect *d*	Measurement instrument SRPs	Measurement test Learning outcomes	LLL/ HLL[a]	*d*	Effect *d*	SRP and LLL/ HLL[b]
	2.Reflection prompts. In addition, feedback was given by a tutor, hypermedia learning (*n* = 15)		*Metacognitive strategies*				- Knowledge test	LLL	0.60*	++	r
			Cognitive strategy scale	0.92	+++						
			Metacognitive strategy scale	0.68	++						
			Motivation								
			Value scale	0.81*	++						
			Expectancy scale	-0.18	-						
			Test anxiety scale**	-0.73	++						
			Resource management scale	0.38	+						

Note. An effect size was considered negative ($d \leq 0.00$), zero ($0.00 < d \leq 0.20$), small ($0.20 < d \leq 0.50$), moderate ($0.50 < d \leq 0.80$), or high ($d \geq 0.80$). Subsequently, in table 2.3 effect sizes are labeled negative (-), zero (0), small (+), moderate (++) or high (+++).
a Lower order level learning (LLL) / Higher order level learning (HLL)
b related (r) / not related (nr) / not investigated (ni)
* Significant effects as reported in study

Motivation

One study (9) found that instruction had a small, positive, effect on students' motivation to learn. Another two studies (3 and 4) concluded that self-metacognitive prompts influenced motivation in a positive manner. Finally, one study (10) found that reflection prompts and tutor feedback generated positive effects on motivation. However, for studies 3 and 4 accounted that motivation was conceptualized as a combination of two different SRPs: motivation and self-efficacy. For this reason, it is unclear what effect concerned motivation to learn, and which effect regarded self-efficacy.

In contrast with the four studies that described positive effects on motivation (3, 4, 9, and 10), two studies showed that feedback had a negative effect on the motivation of psychology students (1) and nursing students (2). With respect to study 2, learning motivation included a self-efficacy scale. As a result, it is unclear, which effect was on learning motivation and which one was on self-efficacy. Concerning study 1, it must be remarked that, although motivation was influenced negatively, metacognitive strategies as well as learning outcomes were influenced in a positive manner. The goal of study 2 was to improve students' electrical reading of the heart (ECG-recordings), in order to investigate heart disease. The authors concluded that students who were taught using a traditional lecture format *interpreted* ECG-recordings significantly more effectively, compared to students taught using web-based instruction. The authors suggest that the immediate feedback opportunity in web-based learning influenced the ability to interpret ECG-recordings positively, perhaps due to its visual stimulation and flexibility. However, although students in the treatment group outperformed the students in the control group for interpretation of ECG-knowledge, this did not account for ECG-knowledge. The ECG-knowledge as obtained by students in the treatment group was significantly lower than that of the students in the control group.

Self-efficacy

The first study (5) investigated the relations between debriefing of nursing students by an instructor, self-efficacy and learning outcomes. This showed to be effective with respect to self-efficacy, a knowledge test (LLL) and a behavioral assessment test (HLL), but not in relation with a technical evaluation test (HLL).

In another study concerning nursing students (6), an interactive e-drug calculations package was introduced. This SRL-intervention was moderately effective on drug calculation self-efficacy and HLL.

A third study investigated self-efficacy (9). This time, the participants concerned were business education students who received a training script including SRL-information, prior to the training. This pre-training script asked them to focus on learning goals. In addition, statements such as "You are a capable learner" stimulated students' self-efficacy. The pre-

training script had a positive influence on computer learning self-efficacy, LLL, and HLL. In the second experiment, the same cohort of students was randomly assigned to the treatment or control group. This second condition concerned a script *during* the training; a midpoint control script that evaluated students' learning and asked them to focus on SRL aspects, such as paying attention and monitoring their learning progress. The latter had a small effect on computer learning self-efficacy, LLL, and HLL.

It must be remarked that another four studies investigated self-efficacy, but as a subscale of motivation (2, 3, 4 and 10). All four studies generated positive effects on motivation, including the mentioned subscale of self-efficacy. As a consequence, it is unclear what effect size was generated by self-efficacy and which one by motivation (See also the section on motivation for the concerning effect sizes). Finally, one study reported no effect on self-efficacy (8). It is unclear what caused this.

Handling task difficulty and demands, and resource management

Two studies investigated an SRP that was not identified as a predictor of training transfer by Sitzmann and Ely (2011). In one study, handling task difficulty and demands was investigated (1). The latter referred to *control of context, help seeking behavior, expressing task difficulty, expect adequacy of information,* and *time and effort planning*. The authors suggested that human coaching had a small impact on handling task difficulty and demands. In addition, small to moderate effects were found with respect to LLL and HLL. In study 10 a similar SRP as handling task difficulty and demands was studied. The authors called this SRP *resource management*, which referred to time and study environment, peer learning, help seeking, and effort regulation. Similar to study 1 that reported a small impact on handling task difficulty and demands, study 10 reported a small impact on resource management. Study 1 concerned two treatment groups. The reflection prompts condition generated no impact on LLL. The reflection prompts with tutor feedback condition showed a moderate impact on LLL.

Which SRPs relate to LLL and HLL?

In seven studies, the authors hypothesized and found that SRPs were related positively to learning outcomes (1, 4, 5, 7, 8, 9 and 10). Three other studies (2, 3 and 6) did not investigate the hypothesis that SRPs and learning outcomes are related. In Table 3, the last column, it is specified whether or not the SRPs as investigated, were found to be related positively to learning outcomes. It must be noted that in study 10, the authors only reported positive correlations between LLL and two out of the six motivated strategies for learning questionnaire (MSLQ)-scales (Pintrich et al., 1991); the expectancy scale (control of learning beliefs and self-efficacy) and the test anxiety scale. The authors argued that the reflection prompts applied to other SRPs than were measured by the MSLQ-scales (Pintrich et al., 1991).

Discussion

The dual aim of this review was 1) to examine the effectiveness of SRL-interventions with respect to SRPs and learning outcomes in higher education, and 2) to investigate whether improved SRPs benefit learning outcomes in higher education. The overall results reveal that in all studies included ($k = 10$) SRL-interventions related positively to SRPs as well as to learning outcomes. These SRL-interventions concerned (non-) human coaching, instruction, and the introduction of a SRL-stimulating environment. The introduction of e-learning alone, did not relate positively to metacognitive strategies (2) and motivation (2 and 3). This is in line with the study of Azevedo, Johnson, Chauncey, and Graesser (2011) that showed that the introduction of e-learning should be accompanied by human coaching in order to be fruitful for SRL and learning. In three studies included, SRL-interventions influenced motivation negatively (1, 2 and 10). However, it is difficult to interpret this negative influence on motivation. The first reason is that two studies accounted that motivation included a subscale; self-efficacy (2,10). Thus, for these studies it is unclear whether motivation and/or self-efficacy was negatively influenced (2 and 10). Related to this, the fact that self-efficacy was not measured separately from motivation (2 and 10), or was not measured at all (1), could have led to valuable missing information. Namely, it is stated that self-efficacy influences motivation positively (Multon, Brown, & Lent, 1991). Possibly, in the studies concerned, a positive influence on self-efficacy had not yet been established. As a result, motivation may have been influenced in a negative manner.

In the studies, three out of the nine SRPs distinguished by Sitzmann and Ely (2011) have been studied — namely metacognitive strategies, motivation, and self-efficacy. The following SRPs have not been addressed: goal-level, attention, time management, environmental structuring, effort, and attributions. In addition, two studies examined two SRPs that Sitzmann and Ely (2011) did not find do be a predictor for training transfer. These were handling task difficulty and demands and resource management.

Seven studies included showed a positive relation between SRPs and learning outcomes. Another three studies did not hypothesize SRPs to be related to learning outcomes. However, it is likely that the SRPs studied would relate positively to learning outcomes, if only this had been investigated. Namely, if effect sizes concerning SRPs were positive, effect sizes for learning outcomes also revealed to be positive (See Table 2.3).

In sum, the current review indicates that the following SRPs constitute effective SRL in higher education, that is, SRL that benefits learning outcomes: metacognitive strategies, motivation, self-efficacy, handling task difficulty and demands, and resource management. With this knowledge of effective SRPs, as presented in this review, students' SRL-level can be diagnosed. Such a SRL-diagnosis could be used by the student to improve his/her learning. Another opportunity is to use this SRL-diagnosis for the customization of coaching and

instruction to the student, in order to benefit students' SRPs as well as learning outcomes. This review also provides an overview of SRL-interventions that can be used to train effective SRPs in higher education (See Table 2.3).

Strengths and limitations of this systematic review

A strength of this current review was that for each study the effect sizes were included, or computed, for the outcome measures. As a result, Cohen's *d* was computed for SRPs as well as for learning outcomes, that is, for LLL and HLL. This process led to comparable statistics for SRPs, LLL, and HLL across studies. In addition, the effect sizes generated extra information concerning the potential of SRL-interventions, on top of the significance levels that had been reported in the studies included (See also Crutzen, 2010).

A limitation of this study concerns the number of participants of study 5, namely 16. Although this study met our criteria for inclusion, the validity of this study's results can be seriously doubted.

Recommendations for further research

The SRPs that Sitzmann and Ely (2011) found to predict one specific learning outcome, training transfer, have shown to be a worthwhile means for identifying SRPs that relate positively to learning outcomes in higher education. However, only three out of the nine SRPs that Sitzmann and Ely (2011) found to be positively related to learning outcomes were investigated in the 10 studies included. These were metacognitive strategies, motivation, and self-efficacy. For future research, it would be worthwhile to investigate how individuals develop the wide array of different SRPs over time, and how these can be trained in higher education.

In their meta-analysis, Sitzmann and Ely (2011) did not find planning and monitoring to influence training transfer, individually. Therefore, the authors labeled planning and monitoring as metacognitive strategies, together with metacognition and learning strategies. In contrast, in this systematic review, two studies found that coaching influenced both planning, monitoring, and learning outcomes. Learning strategies were not found to be influenced by coaching (1 and 7). Therefore, it is recommended that future research into SRPs investigates metacognition, planning, monitoring, and learning strategies separately, instead of categorizing these variables under metacognitive strategies. Furthermore, Sitzmann and Ely (2011) concluded that help seeking did not predict learning outcomes. However, two studies reported positive effects on help seeking (1 and 10). The first study (1) found that handling task difficulty and demands positively influenced learning outcomes in higher education. Handling task difficulty and demand concerned help seeking behavior, and also control of context, expressing task difficulty, expect adequacy of information, and time and effort planning. The second study reported a small impact on resource management. The authors defined this concept as help seeking, time

and study environment, peer learning, and effort regulation. As a result, future research into SRPs and learning outcomes should also include *help-seeking*, or *resource management* as an SRP.

The studies on motivation generated mixed results. Four studies reported a positive effect on motivation (3, 4, 9 and 10). However, it must be noted that in three of these studies motivation included a subscale of self-efficacy (3, 4 and 10). Therefore, the true effect size for motivation is unclear for these studies. It is recommended that future research addresses motivation — that is, the willingness to learn — separately from self-efficacy.

Finally, it is noteworthy that although the literature claims that several SRL-stimulating environments are effective (Biggs, 1999; 2003; Buckley et al., 2009; Narciss, Proske, & Koerndle, 2007), only e-learning and hypermedia learning were specifically mentioned in the studies included. Other SRL-stimulating environments, such as problem-based learning and portfolio-based learning were not examined in a pretest-posttest design with a control group. It would be worthwhile to compare the effectiveness of SRL-stimulating environments such as PBL, portfolio-based learning, or e-learning to each other or to traditional learning environments.

CHAPTER 3

Self-Regulated Learning and Student Retention

Abstract

Despite the comprehensive knowledge base on students' self-regulatory processes (SRPs) and effective learning, it is yet unclear which entrance-level SRPs best predict student retention. In a sample of freshmen in Dutch higher professional education (N = 213), it was found that the entrance-level SRPs critical thinking, metacognitive strategies, attention, motivation, and effort predicted freshmen retention most strongly. These entrance-level SRPs predicted 16% of the variance in freshmen retention incrementally over students' educational program, gender, ethnicity, and pre-tertiary education level.

The entrance-level SRPs that were found in the current study to best predict freshmen retention differed in all cases but one from those that related to effective learning, which were goal-setting, effort, and self-efficacy. With this knowledge, teachers may implement tailored SRP-interventions, whether the goal is to raise freshmen retention or to facilitate effective learning.

Keywords: self-regulatory processes, self-regulatory constructs, self-regulated learning, academic performance, student retention

Introduction

Student retention in higher education is a well-known issue and under research for more than a century. For example, Summerskill (1965) reviewed 35 studies between 1913 and 1962 and found that the median loss of students in the United States in four years was 50% and had not changed significantly between 1920 and 1962. Similar findings have been reported for Canada (Mehra, 1973), Great Britain (Richling, 1971), and Australia (Baumgart & Johnstone, 1977). Recent data show that the percentage of students in Western countries not graduating in higher education continues to be stable at an alarming 30% (Organization for Economic Co-operation and Development (OECD), 2010; 2013). It must be remarked that these graduation rates were measured after six years for a 4-year program, and after three years for a 2-year program. In addition to losing students due to leaving higher education, institutions for higher education frequently loose students who switch to other educational programs. To illustrate this, in the Netherlands, 17% of the freshmen who started a 4-year program in 2013 left higher professional education within the first-year of study, and another 21% switched to another educational program within the context of higher professional education. Hence, the total percentage of students who were not retained after the first year is a staggering 38% (Dutch Inspectorate of Education, 2015). Losing students results in financial losses for society, institutions, students, and the parents involved. It is a waste of time and other resources and may frustrate students as well as their teachers.

Predictors for academic performance

Several learning environment variables, background variables, and self-regulatory processes for learning are related to academic performance. With respect to the learning environment scholars often refer to Tinto (1975) and Bean (1980). Tinto (1975) found that student leaving is related to the lack of congruency between students, the intellectual climate of the institution, and the social system composed of his peers. Correspondingly, institutions for higher education should stimulate academic and social integration to prevent students from dropping out of education. Bean (1980) concluded that organizational factors such as the degree of feeling that one fits in at an institution for higher education, and loyalty to the institution for higher education influences students' satisfaction, which in turn affects students' decision to continue their education. Background variables are a second group of predictors for student retention. For example, male students have a higher risk of dropping out than females (Herweijer & Turkenburg, 2016; McNeeley, 1938). Also, a lower age (Astin, 1975), suffering from a physical/mental limitation (Plemper, 2005), and a lower pre-tertiary education level imply a higher risk of students to leave (Herweijer & Turkenburg, 2016). A last background variable is ethnicity. Ethnic minority students have a higher probability of student-leaving, compared

to ethnic majority students (Allen, 1999; Dutch Inspectorate of Education, 2015; Herweijer & Turkenburg, 2016; Meeuwisse, Severiens, & Born, 2010; Ooijevaar, 2010).

In addition to the learning environment and background variables, authors also acknowledge that self-regulated learning (SRL) is related to academic performance (Richardson, Abraham, & Bond, 2012; Robbins et al., 2004; Sitzmann & Ely, 2011). SRL can be defined as managing affective, cognitive and behavioral processes for learning in a successful manner (Boekaerts & Niemiverta, 2000; Pintrich, 2000; Sitzmann & Ely, 2011; Winne, 2011; Zimmerman, 2000a). SRPs are related to grades (Richardson et al., 2012; Sitzmann & Ely, 2011) as well as to student retention (Robbins et al., 2004). The literature suggests that SRPs predicting student retention differ from the ones that predict effective learning (grade point average (GPA)/training transfer). The current study builds forth on the review of De Bruijn-Smolders, Timmers, Gawke, Schoonman, and Born (2016) who presented a set of SRPs that predict effective learning in higher education. These SRPs are an adapted version of the SRPs as proposed by Sitzmann and Ely (2011). In the current study a closer look was taken which of the known SRPs for effective learning, at entrance-level best predict retention in a Dutch sample of freshmen in higher professional education.

In accordance with Sitzmann and Ely (2011) three kinds of SRPs are distinguished. First, SRL has to be initiated by goals the student sets for learning (goal-setting). Second, after applying this *initiator for SRL*, the student is expected to use a variety of *SRPs for goal-achieving*, such as planning, monitoring, and time management. Third, it is important that the student has *learning beliefs* that are conducive for learning, e.g. a belief in one's learning capability (self-efficacy). Table 3.1 presents the specific SRPs that were examined in the current study.

Table 3.1 Self-regulatory processes that according to earlier publications predict successful learning, definitions and sample items as used in the current study

Self-regulatory process	Definition	Example item
Initiator for self-regulated learning		
1. Goal-setting	Self-set performance goal level (Locke & Latham, 2002).	My goal is to earn a better grade.
Processes that students use for goal-achieving		
2. Critical thinking	The establishment of reasoned judgments (Beyer, 1987).	I judge whether or not the lesson material is based on sufficient argumentation.
3. Planning	The planning of learning activities, both short-term and long-term.	For each course, I create a time schedule for studying.
4. Monitoring	The controlling and rescheduling of planning activities when needed	If I study slower than expected, I alter my planning.
5. Learning strategies	The strategies students apply to learn the study content. This includes knowing how to study and making decisions about the use of study tactics (e.g. summarizing, underlining, rereading) (Gettinger & Seibert, 2002).	In order to check whether or not I studied well, I answer questions that I formulated about the lesson material myself.
6. Attention	The degree to which students stay focused during training (Zimmerman, 2000b).	I am able to understand a written text, after reading it once.
7. Time management	Applying a time-schedule for learning, leisure, and unexpected things, such as sickness.	I find it difficult to follow a time-schedule, although I constructed it myself.
8. Environmental structuring	Choosing a study location that is fruitful for learning (Pintrich, 2000).	When I cannot concentrate while studying, I make sure I find a better study location.
9. Motivation	The willingness to learn (Noe, 1986; Noe & Schmitt, 1986; Pintrich, Smith, Garcia, & McKeachie, 1991).	In general, I think this course will be fruitful for me.

Note: The items used were either copied from or based on a Dutch translation of the Motivated Strategies for Learning Questionnaire; MSLQ (Van den Boom, Paas, & Van Merriënboer, 2007), from the original MSLQ as developed by Pintrich, Smith, Garcia, & McKeachie (1991), or formulated by the authors of the current study.

Table 3.1 Self-regulatory processes that according to earlier publications predict successful learning, definitions and sample items as used in the current study *(Continued)*

Self-regulatory process	Definition	Example item
10. Effort	The time that students devote to their learning (Zimmerman & Risenberg, 1997).	When I do not enjoy a lesson, I will go home.
11. Help-seeking	The degree to which students actively seek assistance when they experience academic difficulties (Pintrich et al., 1991).	When I do not understand a subject well, I ask my tutor to explain this to me.
Students' learning beliefs		
12. Attributions	Students' beliefs about the causes of their study progress (Zimmerman, 2000b).	If I do not understand the course material, I will have to study more.
13. Self-efficacy	Students' beliefs regarding their learning capability (Bandura, 1977).	I am sure that I will be able to understand all subjects the tutor will discuss.

Note: The items used were either copied from or based on a Dutch translation of the Motivated Strategies for Learning Questionnaire; MSLQ (Van den Boom, Paas, & Van Merriënboer, 2007), from the original MSLQ as developed by Pintrich, Smith, Garcia, & McKeachie (1991), or formulated by the authors of the current study.

According to three meta-analyses, different SRPs matter, depending on the learning outcome (GPA/training transfer versus retention) (Richardson et al., 2012; Robbins et al., 2004; Sitzmann & Ely, 2011). In the following, this literature will be discussed by structuring the SRPs in the same way as in Table 3.1.

Robbins et al. (2004) conducted a meta-analysis on SRPs that predict college outcomes. Two college outcomes were distinguished, namely GPA and student retention (the length of time a student remains enrolled at an institution). In a high percentage of the studies included (80%), student retention was measured as entry into the second year of school, and in 75% of the studies included, performance was measured as freshmen cumulative GPA (75%). As a result, this meta-analysis can be regarded as focusing on freshmen GPA and freshmen retention. Sitzmann and Ely (2011) studied whether and how SRPs are effective in college education and workplace training. They related SRPs to one specific outcome, namely training transfer, which they defined as the permanence of trained skills after trainees leave the learning environment. In 2012, Richardson, Abraham, and Bond published a meta-analysis on psychological correlates of academic performance. They distinguished personality traits, motivational factors, self-regulatory learning strategies, students' approaches to learning, and psychosocial influences as psychological correlates. Academic performance was measured as university students' GPA. They used measures of GPA over semesters and years as well as test scores for a single test or an assessment situation.

Self-regulatory processes, training transfer, grade point average, and freshmen retention

In Table 3.2, the results as found by Richardson, Abraham, and Bond (2012), Robbins et al. (2004), and Sitzmann and Ely (2011) are structured by the SRPs as listed in Table 3.1. In the following, the highlights of Table 3.2 are discussed.

Both Richardson et al. (2012), and Sitzmann and Ely (2011) found that goal-setting, effort, and self-efficacy were the strongest predictors for successful learning, that is GPA and training transfer. The meta-analysis of Robbins et al. (2004) indicates that self-efficacy has a strong impact on freshmen GPA, but a smaller impact on freshmen retention. In contrast, the SRP academic related skills was found to have a small impact on freshmen GPA, but a high impact on freshmen retention. The authors defined academic related skills as: time management, study skills and habits, leadership skills, problem-solving and coping strategies, and communication skills. Several primary studies also found that specific entrance-level SRPs matter with respect to freshmen retention, whereas other SRPs become important when measured at a later moment during the study.

Table 3.2 Results meta-analyses on self-regulatory processes and learning (Richardson et al., 2012; Robbins et al., 2004; Sitzmann & Ely, 2011)

Meta-analysis	Robbins et al. (2004)								Sitzmann and Ely (2011)				Richardson et al. (2012)			
Dependent variable	Grade point average				Retention				Post-training assessments of learning				Grade point average			
Measures[a]	ρ	*k*	*N*	β	ρ	*k*	*N*	β	ρ	*k*	*N*	β	ρ	*k*	*N*	β
1. Goal-setting	.18	34	17,575	.08	.34	33	20,010	.17	.44	24	3,565	-.29	.49	13	2,670	.17
2. Critical thinking													.16	9	3,824	
3. Planning									.15	9	1,022					
4. Monitoring									.17	12	1,185					
5. Learning strategies									.16	72	16,613		.14	12	2,057	
6. Attention									.24	39	9,949		.18	12	6,798	
7. Time management									.21	31	8,518		.20	7	5,847	
8. Environmental structuring									.20	6	779		.20	7	5,847	
9. Motivation	.30	17	9,330	.14	.07	7	3,208		.18	67	11,612		.16	22	7,414	
10. Effort									.28	61	8,569	.28	.35	19	8,862	.22
11. Help-seeking									.08	24	4,827		.17	8	2,057	
12. Attributions									.18	35	8,667		-.01	8	1,026	
13. Self-efficacy	.50	18	9,598	.22	.36	6	6,930	.15	.35	160	25,798	.07	.28	67	46,570	.18
14. Academic related skills[b]	.16	33	16,282		.37	8	1,627	.26								
15. Persistence									.27	30	6,979	.37				
Total % explained variance (R^2)[c]				.06				.11				.17				.11

[a]Spearman's ρ, *k* = number of studies included, *N* = number of participants, β = beta coefficient, [b]academic related skills = time management, study skills and habits, leadership skills, problem-solving and coping strategies, and communication skills (Robbins et al., 2004), [c]R^2 =total % explained variance.

In 2008, Black published a study that examined whether a set of SRPs predicted first-year college student retention. With this goal, 673 freshmen filled out the 15 subscales of the Motivated Strategies for Learning Questionnaire (MSLQ). Discriminant analyses indicated that four SRPs (time and study management, critical thinking, peer learning, and control of learning beliefs) could discriminate between students who were retained and who were not. The retained group of freshmen had higher mean scores on time and study environment management, and on peer learning, while the group of freshmen who were *not* retained had higher mean scores on critical thinking and control of learning beliefs.

Kahn and Nauta (2001), Vancouver, Thompson, Tischner, and Putka (2002), Wright, Jenkins-Guarnieri, and Murdock (2012), and Zajacova, Lynch, and Espenshade (2005) all found that self-efficacy and goal-setting did not play a significant role in predicting freshmen retention, if measured at entrance level. However, Kahn and Nauta (2001) as well as Wright et al. (2012) reported that self-efficacy and goal-setting became significant predictors of return to college in the second year, if measured in the second semester.

Present study

Freshmen may leave very soon. Accordingly, interventions for improving SRPs and learning that focus on students who might not be retained, must be implemented early and must show effects almost immediately. The current study builds upon a set of SRPs that are assumed to constitute effective learning in higher education (See Chapter 2). These SRPs are adapted from the ones as proposed by Sitzmann and Ely (2011). In the current study, it is explored which of these SRPs for successful learning: best predict freshmen retention, if measured at entrance-level.

Method

Participants and procedure

Participants were freshmen studying occupational therapy at one of the four Dutch institutes for higher professional education that offered this program in 2013–2014. The total population of 743 students was invited to fill out two questionnaires. 488 students (66% of the total population) filled out the first questionnaire. Of these 488 students, 325 (67%) students gave permission to the researchers to obtain data concerning study progress.

Subsequently, respondents were labeled either as freshmen completers, freshmen delayers, or freshmen leavers. Freshmen completers are those freshmen who obtained their first year diploma after one year of study. For this freshman diploma the freshman had to earn 60 European Credits (EC). Respondents were labeled as freshmen delayers if they had not earned 60 EC for obtaining their freshmen diploma, but instead had acquired the minimum

of EC required for entering the second year of their educational program. This minimum of EC varied per educational program, ranging from 42 to 45 EC. Freshmen leavers were those students who withdrew from occupational therapy, switched programs, or enrolled in other higher education institutes in the first year of study. After the first year of study, 130 students (40%) had earned 60 EC during the first-year of study (freshmen completers), 112 students (34%) had delayed their studies (freshmen delayers), and another 83 freshmen (26%) had left the educational program (freshmen leavers).

In the current study, the exact EC for freshmen delayers were unknown. That is, in the current study a freshman delayer could have earned almost all EC required for first-year completion (60). In contrast, a freshman might have earned only one EC more than a leaver (46 EC), which makes him or her a nearly-leaver. Therefore, to establish a clear cut-off point between freshmen completers and freshmen leavers, freshmen who delayed their study were left out of the analyses. As a consequence, in the current study freshmen who were retained (freshmen completers) were compared to freshmen who were *not* retained (freshmen leavers). The final sample for further analyses was $N = 213$. Background information on this sample is provided in Table 3.3.

Measurement method self-regulatory processes

Depending on whether or not SRPs are regarded as general or context-specific processes, competence measures or event measures are used. Competence measures evaluate SRPs as practiced by students during a period of study and can be based on self-report questionnaires (Pintrich, Smith, Garcia, & McKeachie, 1991), structured interviews (Zimmerman & Martinez-Pons, 1988), or other-report such as parent- or teacher-rating scales (Cleary & Callan, 2014). Event measures capture the usage of SRPs at a specific moment, when conducting a learning task. Event measures include direct observations (Corno, 2011), report of usage of SRPs in diaries (Schmitz, Klug, & Schmidt, 2011), think-aloud methods in which techniques are used for analyzing verbalizations of students during learning (Greene, Robertson, & Croker Costa (2011), and SRL micro analysis in which micro-analytic protocols study how students shift in the usage of different SRPs (Cleary, 2011). In the current study, the goal is to determine entrance-level SRPs that predict student retention. For this reason, the current study measures SRPs in a general manner, that is, as a competence.

Table 3.3 Participant characteristics (*N* = 213)

	N	%
Freshman retention*		
Freshman leaver	83	39.0
Freshman completer	130	61.0
Age	*M* = 19.52 years (*SD* = 2.52)	
Gender		
Male	45	21.1
Female	168	78.9
Ethnicity		
Member of a minority group	39	18.3
Member of a majority group	174	81.7
Physical or mental limitation		
Yes	29	13.6
No	184	86.4
Pre-tertiary education level		
Higher secondary vocational education	108	50.7
Intermediate vocational education	54	25.4
Pre-university education	51	23.9
Institute for professional higher education		
University of Applied Sciences A	47	22.1
University of Applied Sciences B	33	15.5
University of Applied Sciences C	41	19.2
University of Applied Sciences D	92	43.2

Note: *N* = Number of participants, *M* = Mean, *SD* = Standard Deviation
*The total sample initially was: *N* = 325, with the following freshmen retention data: Freshmen completers: 130 (40%); Freshmen delayers: 112 (34%), and Freshmen leavers: 83 (26%): Freshmen delayers (*n* = 112) were left out of further analyses.

Measures

Self-regulatory processes

The SRPs as measured were based on the parsimonious framework of predictors for learning as developed by Sitzmann and Ely (2011). For the current study, this set of SRPs was altered slightly as follows, based on the findings of De Bruijn-Smolders et al. (2016). The SRPs that Sitzmann and Ely (2011) had categorized under metacognitive strategies, namely metacognition, planning, monitoring, and learning strategies, were measured separately.

Furthermore, metacognition was labeled as critical thinking. (See Table 3.1 for the SRPs, their definitions, and example items.) The Dutch translation of the MSLQ by Van den Boom, Paas, and Van Merriënboer (2007), from the original MSLQ as developed by Pintrich et al. (1991) was found to provide reliable measures for the SRPs. Black (2008) already reported the MSLQ to be valuable for describing freshmen competencies in university education with regard to SRPs for the retained students, compared to the not-retained. The MSLQ consists of 81 statements with regard to SRPs. The MSLQ asks students to rate SRPs on a 7-point Likert-type scale, from 1 (not at all true of me) to 7 (very true of me). Detailed information regarding which items were based on the (Dutch) MSLQ, and which items were self-formulated by the authors, can be obtained from the first author of the current study.

Background variables

The following background variables that are known to predict academic performance were measured: age, gender, ethnicity, physical or mental limitations, and pre-tertiary education level. Ethnic majority and ethnic minority participants were defined according to the definition of the Dutch Central Bureau for Statistics in the Netherlands (2015a). Correspondingly, students belong to a minority group if they were born outside the Netherlands, or if at least one of their parents was.

Learning environment variables

To determine to what extent the educational programs that taught occupational therapy differed from each other, the authors interviewed a management member from each program. From these interviews it could be concluded that each of the four participating programs concerned portfolio-based learning with a similar curriculum. As a consequence, no specific items were formulated to measure unique characteristics of the learning environment. It has been shown that a learning environments' effect on learning differs on the guidance of a mentor providing feedback (Candy, 1991; Knowles, Holton, & Swanson, 2005). However**,** to be able to control for other possible differences in the educational program such as the guidance of a mentor, the students were asked at which educational institution they were enrolled.

Principal Component Analysis of the self-regulated learning processes questionnaire (SRLPQ)

In their meta-analysis, Sitzmann and Ely (2011) found that all SRPs were highly correlated. They assumed that it might not be possible to engage in some of these SRPs without being engaged in other SRPs. For example, students who are good planners will also be inclined to focus their attention on the course material. Correspondingly, in the current study it

was assumed that the different SRPs would correlate positively. For this reason, Principal Component Analysis with Oblique Rotation was carried out on the 91 items concerning SRPs. An exploratory analysis was run to obtain eigenvalues for each component in the data. Thirteen components had eigenvalues over Kaiser's criterion of 1 and in combination they explained 60.1% of the variance. The scree plot, however, showed inflexions that would justify retaining 13, nine, or five components. Given the convergence of the scree plot, Kaiser's criterion, and the theoretical framework of 13 SRPs that underlies the current study, this is the initial number of components that were retained in the final analysis. However, the items that clustered on the same components suggested that component 1 represents a clustering of three aspects, namely, planning, monitoring, and time management. Hence this component was named meta-cognitive strategies. Thus, 11 components were retained in the final analysis.

Results

To measure the relationships between all SRPs, background variables, and student retention, Pearson correlations were calculated (See Table 3.4). For pre-tertiary education level Spearman's Rho was calculated, due to the ordinal level of this variable.

Correlations

In line with findings reported by Richardson et al. (2012), and Sitzmann and Ely (2011), the majority of the SRPs were significantly and positively inter-correlated (See Table 3.4). The following SRPs significantly correlated with student retention: critical thinking, metacognitive strategies, attention, motivation, and effort. That is, better metacognitive strategies, attention, motivation, and effort were related to a higher probability to stay. In contrast, critical thinking correlated negatively with freshmen retention. With respect to the background variables, gender, ethnicity, and pre-tertiary education level, correlated significantly with student retention. Being a female, an ethnic majority student, and educated at a higher pre-tertiary education level implied a higher probability of staying enrolled.

Table 3.4 Means, Standard Deviations, Coefficient alpha's, and Pearson correlations among all variables (*N* = 213)

Self-regulatory processes 1-11 (number of items) Background variables 12-16	***M*[a]**	***SD*[b]**	**α[c]**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**RET[d]**
1. Goal-Setting (4)	2.80	.97	.69	-	-.03	-.19*	-.23**	-.12*	-.24**	-.34**	-.24**	-.20*	-.19**	-.11	-.06
2. Critical thinking (6)	3.87	.94	.74		-	.25**	.35**	.19**	.14*	.17**	-.01	.16*	.04	.24**	-.14*
3. Metacognitive strategies (10)	4.16	1.05	.86			-	.54**	.52**	.39**	.44**	.29**	.41**	.12*	.17**	.26**
4. Learning strategies (6)	4.34	1.04	.76				-	.35**	.23**	.39**	.30**	.43**	.01	.23**	.03
5. Attention (5)	4.28	1.13	.77					-	.25**	.37**	.14*	.33**	.17**	.23**	.24**
6. Environmental structuring (3)	5.86	.93	.74						-	.53**	.36**	.37**	.36**	.34**	.13
7. Motivation (8)	5.84	.74	.85							-	.58**	.43**	.44**	.46**	.15*
8. Effort (3)	6.20	1.02	.78								-	.33**	.32**	.22**	.20**
9. Help-seeking (6)	5.11	.89	.70									-	.15*	.20**	.11
10. Attributions (3)	5.84	.73	.65										-	.40**	.10
11. Self-efficacy (8)	5.05	.84	.85											-	.03
12. Age in years	19.51	2.52	-	.02	.23**	.23**	.10	.16**	.00	.04	-.03	-.03	.02	.11	.06
13. Gender[e]	.79	.41	-	-.03	-.15*	.16**	-.02	.11	-.05	.08	.15*	.07	.11	-.16*	.16*
14. Ethnicity[f]	.82	.39	-	-.05	-.18**	-.08	-.10	-.00	-.04	.03	.09	-.05	.00	.03	.20**
15. Physical/mental limitation[g]	.86	.34	-	.07	-.04	.00	.02	.05	.06	-.01	.03	.00	.02	.02	.08
16. Pre-tertiary education level[h]	1.73	.82	-	-.02[i]	.19**[i]	.30**[i]	.08[i]	.27**[i]	.18**[i]	.10[i]	.06[i]	.26**[i]	.03[i]	-.03[i]	.29**[i]

*$p < .05$, **$p < .001$, [a]Mean (*M*), [b]Standard Deviation (*SD*), [c]Coefficient alpha (α), [d]RET: freshmen retention: no = 0, yes = 1, [e]gender: male = 0, female = 1, [f]ethnicity: ethnic minority student = 0, ethnic majority student = 1, [g]physical/mental limitation: yes = 0, no = 1, [h]pre-tertiary education level: higher secondary vocational education = 1, intermediate vocational education = 2, pre-university education = 3, [i]Spearman's ρ

Note: self-regulatory processes 1-11: Likert items = 1 (totally disagree) - 7 (totally agree)

Table 3.5 Hierarchical binary logistic regression analyses freshman retention (*N* = 213)

	Freshman retention (no = 0, yes = 1)							
			Model 2					
	Model 1		*Confidence Interval*					
	B	***SE B***	***B***	***SE B***	***OR***	***Lower***	***Upper***	***ΔR²***
Step 1[a]								29%
Constant	-.05	.60						
Background variables								
Educational program								
-University of Applied Sciences A[c]	.73	.49						
-University of Applied Sciences B[c]	.97	.44						
-University of Applied Sciences C[c]	.95*	.38						
Gender[d]	.68	.39						
Ethnicity[e]	2.03**	.50						
Pre-tertiary education level								
-Higher secondary vocational education[f]	-2.67**	.59						
-Intermediate vocational education[f]	-2.45**	.62						
Step 2[b]								16%
Constant			-5.31	.01	.06			
Background variables								
Educational program								
-University of Applied Sciences A[c]			1.95*	.57	.06	2.31	21.57	
-University of Applied Sciences B[c]			2.18*	.67	8.84	2.39	32.64	
-University of Applied Sciences C[c]			1.14*	.49	3.12	1.18	8.21	
Gender[d]			.13	.44	1.05	.44	2.49	
Ethnicity[e]			2.38**	.59	7.83	2.48	24.67	
Pre-tertiary education level								
-Higher secondary vocational education[f]			-3.00**	.66	.07	.02	.24	
-Intermediate vocational education[f]			-2.98**	.68	.06	.02	.24	
Self-Regulatory Processes[g]								
Critical thinking			-.49*	.22	.61	.40	.94	
Metacognitive strategies			.66*	.24	1.93	1.21	3.08	
Attention			.27	.20	1.31	.89	1.93	
Motivation			-.16	.32	.85	.46	1.58	
Effort			.73*	.26	2.08	1.24	3.48	

Note: Beta (*B*), Standard Error (*SE*), Odds Ratio (*OR),* Confidence Interval *(CI)*

[a]Model 1: R^2 = .21 (Cox & Snell, 1989), R^2 = .29 (Nagelkerke, 1991), Model χ^2 (7) = 50.46, p < .001

[b]Model 2: R^2 = .33 (Cox & Snell, 1989), R^2 = .45 (Nagelkerke, 1991), Model χ^2 (12) = 85.18, p < .001

[c]Educational program: University of Applied Sciences D = 0, Universities of Applied Sciences A, B, and C = 1

[d]Gender: male = 0, female = 1

[e]Ethnicity: ethnic minority student = 0, ethnic majority student = 1

[f]Pre-tertiary education level: higher secondary vocational education = 0, intermediate vocational education = 0, pre-university education = 1

[g]Self-regulatory processes: Likert items = 1 (totally disagree) - 7 (totally agree)

*p < .05 **p < .001

The dataset of the current study consists of multiple levels: level 1 (213 students) and level 2 (four universities of applied sciences). For datasets with a multi-level structure multi-level analysis usually is preferred. In the current study the number of universities of applied sciences is only four. According to Hox (2010), and Snijders and Bosker (2012) 50 groups (level 2) containing a minimum of five cases each (level 1) are required in multi-level analysis for sufficient statistical power to find significance. In addition, in case of fewer than five cases per group and fewer than 50 groups, standard errors for fixed effects will be too small (increased Type 1 errors). In addition, random effects (variance) and their standard errors may be underestimated in multi-level analysis as applied in such samples. For this reason, it was decided not to conduct multi-level analysis. Instead, an alternative analysis that is appropriate for the data set at hand was applied, that is binary logistic regression analysis (Field, 2009). See Del Prette et al. (2012) and Gijsel, Bosman, and Verhoeven (2006) for similar study designs and data analyses as applied in the current study.

Cox and Snell's R^2 (1989) as well as Nagelkerke's R^2 (1991) will be reported, which are similar in interpretation to R^2-values in linear regression analysis (Field, 2009). The odds ratio for the analyses will also be presented. An odds ratio larger than one implies a positive relationship, whereas an odds ratio smaller than one means that a negative relationship was found.

In addition, for each step, the increase in explained variance (ΔR^2) will be reported.

Binary logistic regression analyses

All SRPs and background variables that correlated significantly with student retention (see Table 3.4) were included in the analysis. In step 1 (See Table 3.5), the background variables educational program, gender, ethnicity, and pre-tertiary education level were entered (model 1). In step 2, the SRPs critical thinking, metacognitive strategies, attention, motivation, and effort were included (model 2).

Taken together, educational program, gender, ethnicity, and pre-tertiary education level explained 29% of the variance in freshmen retention (See Table 3.5). The odds ratio for educational program differed. That is, the odds ratio for university of applied sciences A was smaller than 1, indicating that studying at university of applied sciences A meant a lower probability of freshmen retention, compared to studying at university of applied sciences D (the reference category). In contrast, the odds ratio's for studying at university of applied sciences B or C were higher than 1, referring to a higher probability of freshmen retention, than studying at university of applied sciences D (the reference category). The odds ratio for gender was higher than 1, meaning that being a female implied a higher probability of freshmen retention compared to males (the reference category). The odds ratio for ethnicity was higher than 1, meaning that being an ethnic majority student implied a higher probability

of freshmen retention compared to ethnic minority students (the reference category). In contrast, for pre-tertiary education level the odds ratio was smaller than 1, implying that having studied at higher secondary education level or intermediate vocational education resulted in a smaller probability of freshmen retention, than having studied at pre-university education level (the reference category). When the SRPs critical thinking, metacognitive strategies, attention, motivation, and effort were entered, results indicated that these SRPs additionally and significantly explained 16% of the variance in freshmen retention (See model 2). Of these SRPs, critical thinking, metacognitive strategies, and effort significantly predicted freshmen retention. The SRPs metacognitive strategies and effort resulted in an odds ratio larger than 1. This implies that freshmen who at entrance-level scored higher on the SRP metacognitive strategies were likely to be retained, compared to freshmen who scored lower on metacognitive strategies. Similarly, more effort at entrance-level resulted in a higher probability of student retention. In contrast, students who scored *higher* on critical thinking were more likely *not* to be retained in their first-year of study, compared to students who scored lower on critical thinking (See model 2). This is indicated by the odds ratio of critical thinking (smaller than 1).

Discussion

The literature suggests that different SRPs matter when predicting effective learning (GPA (Richardson et al., 2012; Robbins et al., 2004), training transfer (Sitzmann & Ely, 2011)), or student retention (Black, 2008; Robbins et al., 2004). However, different definitions of SRPs make it difficult to identify specific sets of SRPs for either effective learning or student retention. Therefore, the current study built forth on the systematic review as described in Chapter 2 that presented 13 SRPs that specifically predicted effective learning in higher education. The current study explored which of the predictors for effective learning would constitute the best predictors of freshmen retention.

A hierarchical binary logistic regression analysis showed that the SRPs metacognitive strategies, attention, motivation, and effort most strongly and positively predicted freshmen retention. In addition, the SRP critical thinking predicted freshmen retention negatively. The aforementioned SRPs predicted freshmen retention on top of students' educational program, gender, ethnicity, and pre-tertiary education level (Nagelkerke R^2 = .16). Taken together, all predictors collectively explained 45% of the variance in freshmen retention (Nagelkerke R^2 = .45).

In the current study, freshmen retention depended significantly on the particular educational program involved. Interviews as held before the start of the current study pointed out that the learning environments at the educational programs involved all considered portfolio-based learning with a similar curriculum. However, the manner of mentoring has a substantial impact on whether or not a learning environment has its effect as intended (Candy, 1991; Knowles et

al., 2005). Presumably, in the current study, mentoring and/or the amount of time as invested in mentoring differed depending on the educational program. The finding that males have a higher probability of leaving is in line with previous research (Herweijer & Turkenburg, 2016; McNeeley, 1938). In the current study, ethnic minority students had a higher probability of not being retained. This is also similar to earlier findings (Meeuwisse et al., 2010; Ooijevaar, 2010). The same holds for the result that being educated at a higher pre-tertiary education level leads to a higher probability of student retention (Dutch Central Bureau for Statistics, 2012; Wartenbergh & Van den Broek, 2008).

The results of the current study confirm the idea that SRPs for goal-achieving predict student retention, whereas goal-setting and students' learning beliefs (attributions, and self-efficacy) do not. In the current study the SRPs for goal-achieving that were found to be predictive of freshmen retention were metacognitive strategies (planning, monitoring, and time management), and effort (Sitzmann & Ely, 2011). In line with previous literature (Richardson et al., 2012; Robbins et al., 2004; Sitzmann & Ely, 2011), in the current study, motivation was significantly correlated with successful learning. Also in line with earlier studies, the following SRPs were concluded to be only weakly correlated with successful learning: learning strategies, environmental structuring (Sitzmann & Ely, 2011), and attributions (Sitzmann & Ely, 2011). In line with earlier findings, the current study showed that self-efficacy was not correlated to freshmen retention. Kahn and Nauta (2001), Wright et al. (2012) found that self-efficacy as measured in the first semester did not significantly predict return to college in the second year. These authors, however, found that self-efficacy, if measured in the second semester of the first year, did play a significant role in predicting return to college in the second year. This might suggest that it is only later on that self-efficacy becomes a predictor for learning. This might also explain why meta-analyses on SRPs and academic performance report self-efficacy as being one of the strongest SRPs for predicting academic performance (Richardson et al., 2012; Robbins et al., 2004; Sitzmann & Ely, 2011), whereas Robbins et al. (2004) found that with respect to student retention, academic related skills had a strong impact whereas self-efficacy had not.

In contrast with earlier literature on SRPs and effective learning (Richardson et al., 2012; Sitzmann & Ely, 2011), the SRP critical thinking related significantly and *negatively* to student retention. However, this finding is in line with Black (2008) who also found that the not-retained group of college freshmen scored higher on critical thinking than freshmen in the retained group. Table 3.4 shows that critical thinking relates positively to all SRPs except for effort. Possibly, highly critical students spend more time in considering arguments, conclusions, and seeking alternative explanations for given problems, which may prohibit them from putting effort in learning, directly.

Strength and limitation of the current study

The measurement of all SRPs that are known to relate to successful learning (Richardson et al., 2012; Robbins et al., 2004; Sitzmann & Ely, 2011), taking into account background variables, is considered a strength of the current study. In this manner it was possible to study to what extent the relationships of SRPs and learning differs depending on whether the outcome variable concerns GPA/training transfer, or student retention.

Limitations of the current study are the large number of predictor variables (nine) and the small sample size ($N = 213$). Both can lead to over-fitting. This implies that the relationships as found in the current study might be weaker in a new data set. As a result, a reduction in explained variance is likely to occur (Hawkins, 2004).

Recommendations for future research

The current study indicates that a certain set of entrance-level SRP, namely critical thinking, metacognitive strategies, attention, motivation, and effort, most strongly predicts freshmen retention. Except for one (effort), these SRPs differ from the set of SRPs that predict academic performance (these are self-efficacy, goal-setting, and effort). Future research could use these findings to implement appropriate interventions to improve learning in the first-year of study, at entrance-level. This could increase freshmen retention. It would be especially worthwhile to explore the effect of a multi-target approach: The implementation of one intervention for each of the aforementioned SRPs, simultaneously.

The outcome variable concerned a binomial one (retained versus not-retained). For future research of SRPs and freshmen performance, again it would be valuable to measure the wide array of known SRPs and freshmen retention, but this time in relation to the number of earned EC, as well as to GPA. The results of such study designs could be more easily compared to the prevailing research related to SRPs, EC, and GPA, that until now has focused on students after their first year of study.

The current study used a modest sample of 213 freshmen in one setting, namely occupational therapy. It would be worthwhile to broaden the current knowledge of how the SRPs collectively predict student retention: In larger samples and in other settings. This knowledge might help institutions for higher education to actively identify potential student leavers for intervention and support. Mentoring could be tailored, freshmen SRPs could be improved with a multi-target approach, and student retention could be improved. Freshmen retention might become more manageable in this manner.

In the current study, a self-report self-regulated learning processes questionnaire (SRLPQ) was used that can be useful in assessing students' entrance level SRPs in a fast and efficient manner. We agree with Cleary and Callan (2014) that on top of students' self-report measures, teachers, mentors, and peers may play a significant role in assessing students' SRPs. If other-

report measures and student-report measures show conflicting results, it is highly recommended to conduct additional, direct, measures of SRPs, such as direct observations (Corno, 2011), diaries (Schmitz et al., 2011), think-aloud methods (Greene et al., 2011), and SRL micro analysis (Cleary, 2011).

CHAPTER 4

Self-Regulated Learning and Academic Performance

Abstract

This study examined the convergent and predictive validities of mentor-rated self-regulatory processes for learning (SRPs), freshman-rated SRPs, and freshmen background variables with respect to academic performance. Data were collected among a sample of 188 Dutch freshmen in higher professional education. The high base rate for delayers and leavers in this program implied that it would have been easier to predict delay and leaving, rather than freshmen completing the first year. Nonetheless, mentors ($N = 28$) were found to be better than freshmen at predicting which freshmen would complete their first-year. In contrast, freshmen themselves were better at predicting whether they would delay or leave, as opposed to their mentors. Thus, freshman-rated SRPs matter most for deciding which freshmen need support with respect to their SRPs.

Keywords: self-regulated learning, self-regulatory processes, self-regulatory constructs, academic performance, freshmen, mentors

Introduction

In 1965, Summerskill concluded that between 1913 and 1962, one out of two students in American higher education left a 4-year program before graduation. Since then, similar findings have been consistently presented and found to be widespread (e.g., Australia: Baumgart & Johnstone, 1977; Canada: Mehra, 1973; Great-Britain: Richling, 1971). Recent data from the Organization of Economic Cooperation and Development show that, on average, one out of three Western students leaves higher education before graduating (OECD, 2010, 2013). It must be noted that the OECD measured graduation rates after *six* years for a 4-year program. In general, students who leave, do this in their first year of study (Quinn et al., 2005; Yorke, 1997; Yorke & Longden, 2007). Next to leaving the first year of higher education, another substantial number of freshmen continues higher education but switches to another educational program. In Dutch higher professional education, which is the focus of the current study, between 2002 and 2013, each year around 15% of the freshmen left higher education all together, and another 20% of the freshmen switched to another educational program (Herweijer & Turkenburg, 2016).

Freshmen leaving leads to spilled resources like money, teaching, mentoring, time, and effort, and it might lead to feelings of unfulfillment by teachers, students, and their parents. Besides freshmen who leave, there is another category of students which needs attention. Namely, a considerable part of the students who do not leave exceeds the available period of four years to obtain the bachelor degree in higher professional education. To illustrate, in the Netherlands only 57% of the cohort 2009-2013 (a 4-year program) had earned a degree in higher professional education measured within five years of study. After seven years of studying/enrollment, the number of students that had earned a degree still was only 64% (Dutch Central Bureau for Statistics, 2015b). Thus, of the students who continue higher education, one out of three needs three years of extra teaching and mentoring due to study delay, on top of the regular 4-year program. As freshmen leaving and freshmen delay are problematic for higher education, finding predictors for freshmen performance is a key to be able to implement measures to improve students graduating in the intended time.

Academic performance

Entrance-level predictors

When freshmen enter higher education, several variables are predictive for subsequent academic performance. First, background variables have been identified to relate to a higher probability of freshmen leaving in higher education. For example, being a male (Herweijer & Turkenburg, 2016; McNeeley, 1938), being younger (Astin, 1975) and having been educated at a lower pre-tertiary education level (Herweijer & Turkenburg, 2016) imply a higher probability of student

leaving. The same finding holds for ethnic minority students, compared to ethnic majority students (Allen, 1999; Dutch Inspectorate of Education, 2015; Herweijer & Turkenburg, 2016; Meeuwisse, Severiens, & Born, 2010; Ooijevaar, 2010).

Teachers can take students' background variables into account, and pay more attention with respect to how these students are progressing. However, teachers of course cannot change background variables and in this way increase academic performance. A way in which teachers might increase students' academic performance is by improving their freshmen engagement in self-regulated learning (SRL). SRL refers to managing one's own learning in a successful fashion by applying self-regulatory processes (SRPs) like planning, monitoring, and time management (Boekaerts & Niemiverta, 2000; Pintrich, 2000; Sitzmann & Ely, 2011; Winne, 2011; Zimmerman, 2000a). An insufficient use of SRPs for learning contributes to student delay and/or student leaving, especially in the first year of study (Gomes, 2016; Herweijer & Turkenburg, 2016; Poulussen & Roseval, 2016; Robbins et al., 2004). According to Sitzmann and Ely (2011) three kinds of SRPs that are related to academic performance can be distinguished. First, SRL has to be initiated by goals the student sets for his or her own learning (goal-setting). Second, the student is expected to use a variety of SRPs, not one SRP only, for goal-achieving. These SRPs concern metacognitive strategies such as planning, monitoring, and time management. Environmental structuring, meaning that students choose a study location that is fruitful for learning (Pintrich, 2000), is also an SRP for goal-achieving. The other SRPs for goal-achieving are the following. Attention: the degree to which students stay focused during training (Zimmerman, 2000b); motivation: the willingness to learn; and effort: the time that students devote to their learning (Zimmerman & Risenberg, 1997). According to Sitzmann and Ely (2011) a third group of SRPs consists of students' beliefs about learning. For instance, attribution refers to what students believe to be the causes of their study progress (Zimmerman, 2000b). In addition, self-efficacy refers to trainees' beliefs regarding their learning capability (Bandura, 1977).

Depending on the specific learning outcome, research has shown that different SRPs matter. With regard to the SRPs as formulated by Sitzmann and Ely (2011), earlier studies have found goal-setting, effort, and self-efficacy to be the strongest predictors for successful learning (successful learning is expressed in the grade point average and the quality of training transfer; Richardson, Abraham, & Bond, 2012; Robbins et al., 2004; Sitzmann & Ely, 2011). In Study 2 (Chapter 3) it was found that the strongest freshman-rated entrance-level SRPs that predict freshmen retention differ from those that predict successful learning (i.e., grade point average, training transfer) except for one: effort. That is, students' metacognitive strategies (planning, monitoring, and time management), attention, motivation, and effort, were the strongest predictors of their retention. In addition, critical thinking was concluded to be the strongest predictor for freshmen retention, however in a negative way: critical thinkers were

more inclined to leave or be delayed. Note that effort was concluded to be a strong predictor for both successful learning and freshmen retention.

Mentoring

Although it is possible to become a more self-regulated learner by oneself, it has been highly recommended to teach students better SRPs (Zeidner, Boekaerts, & Pintrich, 2000). In higher education, providing students support with respect to SRPs generally belongs to mentoring. Crisp and Cruz (2009) state that mentoring has the following main goals: 1) psychological and emotional support, 2) support for setting goals and choosing a career path, 3) academic subject knowledge support, and 4) being a role model. Mentoring students with respect to their SRPs can be categorized under *setting goals and choosing a career path* (goal 2). Such mentoring includes an assessment of the students' strengths, weaknesses, and abilities and assistance with setting academic as well as career goals. Also, Crisp and Cruz (2009) report that the stimulation of students' critical thinking and giving feedback on students' plans, progress, achieving their goals, and facilitation of students' actions is important. In line with these authors' ideas, the current study focuses on a mentor-assessment of students' SRPs for academic performance at entrance-level, in order to be able to give feedback and implement interventions for improving their SRPs — and thus their academic performance.

A large variety of interventions exists that teachers might implement to increase students' SRPs, ultimately aimed at improving their academic performance (De Bruijn-Smolders, Timmers, Gawke, Schoonman, & Born, 2016; Dignath & Buettner, 2008, Dignath, Buettner, & Langfeldt, 2008; Hattie, Biggs, & Purdie, 1996). Thus, in order to offer tailored interventions to their freshmen, mentors play a crucial role in identifying to what extent students (in)sufficiently use entrance-level SRPs. However, research suggests that teachers might not be sensitive to freshmen needs with regard to SRPs that lead to delay/leaving (De Bruijn & Leeman, 2011; Gomes, 2016; Herweijer & Turkenburg, 2016; Poulussen & Roseval, 2016). In these studies, students retrospectively reported that incompetency with regard to their SRPs might have contributed to their leaving, and that their teachers had not identified a shortcoming in their SRPs, and thus had not intervened (Gomes, 2016; Herweijer & Turkenburg, 2016; Poulussen & Roseval, 2016). In the following, the literature on teacher-assessment-accuracy is reviewed to examine why mentors might not be sensitive with regard to assessing entrance-level SRPs, leading up to the present study.

Teacher-assessment-accuracy

Completion base-rate

In 1989, Hoge and Coladarci reported in a meta-analysis of 16 studies a median correlation of .66 between teacher-based assessment and students' achievement on a standardized test. In line with these findings, Südkamp, Kaiser and Möller (2012) concluded in another meta-analysis, based on 75 studies which had been published or were in press between 1989 and 2009 that teachers' assessments correlated highly with students' academic achievement (.59). Although teachers are assumed to be able to predict their students' academic performance, there are indications that they are better at predicting who will do well than who will not. In 2013, Wijnia, Loyens, Derous, Koendjie, and Schmidt published a study on the predictive validity of tutor prediction with respect to academic performance in a problem-based learning program. Fifteen tutors were asked to rate each student in their tutorial group in terms of the probability that these students would successfully finish the first year, and subsequently the entire bachelor program. Their results indicated that tutors were able to predict students' first-year academic performance even on top of prior grades. Also, Wijnia et al. (2013) found that tutors were better in predicting completion of the first year and the bachelor program, than in predicting delay or leaving. The authors concluded that this finding might be caused by the higher base rate of completion, indicating that generally many more students complete their studies in time, than delay or leave. As in their research more students completed their study in time instead of delaying /leaving their study, the probability of a prediction for study completion to be correct was higher than a prediction regarding delay/leaving.

Personality assessment perspective

Seen from a personality assessment research perspective, a difference in mentor- and freshman-assessment accuracy with respect to SRPs may be explained by variables that predict self-other agreement (in the current study: student-mentor agreement) on traits. In the current study, a trait is defined as the typical manner in which persons tend to behave (Connolly, Kavanagh, & Viswesvaran, 2007; McDonald & Letzring, 2016; Vazire, 2010). Funder's realistic accuracy model (1995) presents four variables that may improve self-other agreement with respect to the assessment of traits. First, Funder states that *the environment* must 1) allow a person to express the trait (Relevance), and 2) allow the observer to perceive this trait expression (Availability). Next, *observers* must 3) notice trait-relevant cues (Detection), and 4) appropriately assemble these cues to form an impression of the target (Utilization). Funder's accuracy model is also known as the RADU-model (Relevance, Availability, Detection, and Utilization). To improve the detection of traits, the trait-visibility theory (McDonald & Letzring, 2016; Vazire, 2010) is relevant. According to the trait-visibility theory, the self-other agreement in the assessment

of traits varies depending on the degree to which a trait is observable/visible and/or evaluative (the degree to which a trait is desirable or favorable) (McDonald & Letzring, 2016; Vazire, 2010). That is, a highly observable trait (e.g., extroversion) is easy to assess even with little information, whereas less observable traits (e.g., neuroticism) are not. With respect to evaluativeness, others are expected to predict a trait with more accuracy than the person him/herself when this is a more favorable trait (e.g., intellect) than when favorableness is considered to be less (e.g., anxiety). People may try to hide undesirable behaviors and emphasize desirable behaviors, resulting in fewer valid cues for evaluative traits. Thus, accurate trait perception can differ due to the degree of observability and/or evaluativeness, which may disturb an accurate detection of cues which are relevant for rating a trait.

In line with Funder's RADU-model (1995), freshmen learning environment and thus their mentors must allow them to express their SRPs (Relevance). Freshmen might express their SRPs in class or they might describe these during mentor-freshman meetings in which the mentor questions a freshman with respect to managing his or her own SRPs. The mentor must have enough meetings (time) available for detecting the freshen SRPs (Availability). The mentor needs to also detect shortcomings in the freshmen SRPs, which may be relevant for his or her academic performance (Detection). If an SRP is less visible and/or less desirable, then freshmen are expected to assess themselves more accurately than mentors would be able to do. If an SRP mostly occurs outside the learning environment, the mentor might ask the student how he/she is progressing on a certain SRP (for example on planning). However, if an SRP is considered less desirable, the student might conceal his or her behavior on these SRPs and self-ratings might then offer more valid information on these SRPs compared to the mentor-rated SRPs. Last, the mentor will have to form conclusions and to take appropriate actions (Utilization). That is, the mentor will need to intervene to improve freshmen SRPs for learning purposes.

Teacher rating scales as developed earlier

Since 1988, several SRL teacher-rating scales are available (Zimmerman & Martinez-Pons, 1988). These scales, however, were not constructed parallel to a freshman-rated SRP-questionnaire. Only recently, Cleary and Callan (2014) developed the Self-Regulation Strategy-Inventory-Teacher Rating Scale (SRSI-TRS) and examined its concurrent and predictive validity parallel to the student-version of this questionnaire. The SRSI-TRS is a 28-item measure of self-regulation with three subscales: managing (student) behavior and (learning) environment, seeking and learning information, and maladaptive regulatory behavior (Cleary & Callan, 2014). In a sample of 87 high school students, the authors concluded that the SRSI-TRS correlated moderately with the student-reported rating scale. Hierarchical regression analysis showed that the SRSI-TRS emerged as the most important SRL-predictor of academic

achievement, although student reports remained significant in the final model. In this study, the teachers were not asked to predict the probability of academic achievement. Also this study did not report whether or not teachers might be better at predicting students who do academically well or not as a result of their SRPs. The present study has its focus on both of these issues.

Present study

Research questions

Academic underperformance remains a topic receiving much attention. However, attempts to improve academic performance until now show only marginal effects. As explained below, in the current study the convergent and the predictive validity of mentor-rated SRPs, freshman-rated SRPs, and freshmen background variables with respect to academic performance are studied. The study offers suggestions for ways to combine mentor- and freshman-rated SRPs for predicting academic performance optimally.

The study among students in higher scientific education by Wijnia et al. (2013) reported that teachers were better at predicting freshmen who completed their first year than those who did not. As mentioned earlier, these authors stated that the high base rate for freshmen completers might have caused this result, implying that it was easier for teachers to predict freshmen completion than freshmen delaying/leaving. The current study regards freshmen in Dutch higher professional education. Although freshmen in Dutch higher professional education are expected to earn 60 European Credits (EC) in one year of study, freshmen performance is used to be measured after 2 years of study. Subsequently, national data with respect to the percentages of freshmen leaving, delaying, and completing in higher professional education are not available. However, a longitudinal study among freshmen between 2009 and 2013 at one Dutch Institution for higher professional education showed that each year again only one out of four students (25%) had completed their first-year in time (Bajwa, 2016). Therefore, in contrast with the study of Wijnia et al. (2013) wherein a higher base rate for first-year completers was reported, in the current study it is expected that the base rate for first-year completion will be *lower* than that of first-year delay/leaving. If so, then it will be easier for both mentors and freshmen to predict first-year delay/leaving than first-year completion in the current study. However, in line with personality assessment research (McDonald & Letzring, 2016; Vazire, 2010), in our study it may still expected that mentors will be better at predicting freshmen completion than at predicting freshman delay/leaving, whether or not a lower base rate for freshmen completers might be present.

The following research question was formulated.

What are the predictive validities of mentor-rated and freshman-rated entrance-level SRPs, and of freshmen background variables with respect to academic performance, and how might these be combined to better predict delay/leaving?

This main research question is answered by examining the following three sub questions.

1. *What is the convergent validity of background variables, and of mentor- and freshman-rated SRPs, with respect to their academic performance?*
2. *What are the predictive validities of mentor-rated and freshman-rated entrance-level SRPs with respect to their academic performance?*
3. *How might mentor- and freshman-rated SRPs be combined in order to predict freshmen performance optimally?*

The current study used a sample of freshmen (N = 188) as well as a sample of mentors (N = 28) in Dutch higher professional education. It must be noted that, with respect to the freshmen sample, the current study partially contains data of Study 2 (Chapter 3). That is, the freshmen leavers and freshmen completers who had participated in Study 2 (Chapter 3) were again included in the current study, except for those students who had *not* allowed their mentors to rate their own entrance-level SRPs. As a result, 48 of the 83 freshmen leavers who had participated in Study 2 were again included in the current study. Moreover 73 of the 130 freshmen who completed their first year of study in time, in Study 2 were also included in the current study. Furthermore, the current study extended Study 2 (Chapter 3) by the participation of 67 freshmen delayers and 28 mentors (See also chapter 1, Table 1.1 for a schematic overview of the studies in this dissertation).

Method

Participants, procedure, and measures

The current study was conducted in the academic year 2013-2014. Participants were freshmen and their mentors at the four Dutch institutions for higher professional education that offered occupational therapy. In Dutch higher professional education, mentors coach their students in their academic career during one or more years of study. Mentorship may be a full-time job, but in general mentors are teachers who mentor students as part of their job. On average, freshmen receive guidance from their mentor once a month, during a face-to-face meeting. Such meetings take place individually (30 minutes) or in a group of 15-30 fellow students. The duration of a group meeting on average is 100 minutes. However, if the mentor and/or freshmen believe more meetings are needed in order to prevent student delay/leaving, these meetings will occur more frequently. The type of guidance depends on the needs of the particular freshman involved. For instance, a student may need mentoring with respect to the development of time management skills, whereas another student may need extra feedback with respect to academic writing. In the current study, those teachers were included who mentored the freshmen who participated in the study. Therefore, these teachers are referred to as mentors. Characteristics of this mentor group are given in Table 4.1.

Table 4.1 Participants' background variables

Background variables	Mentors (*N* = 28)		Freshmen (*N* = 188)	
	N	%	*N*	%
Gender				
Female	22	78	140	75
Male	6	22	48	25
Ethnicity				
Member of a majority group	25	89	161	86
Member of a minority group	3	11	27	14
Institute for higher professional education				
University of Applied Sciences A	8	28	68	36
University of Applied Sciences B	5	17	23	12
University of Applied Sciences C	1	3	6	3
University of Applied Sciences D	15	52	91	84
Age (in years)				
M / SD	*M* = 37.74 years (*SD* = 10.64)		*M* = 19.30 years (*SD* = 3.33)	
Degree				
Pre-university	1	4		
Bachelor	16	57		
Master	11	39		
Experience with mentoring (in years)				
M / SD	*M* = 5.70 years (*SD* = 6.51)			
Freshmen performance				
Completer			73	39
Delayer			67	36
Leaver			48	26
Pre-tertiary education level				
Higher secondary vocational education			111	59
Intermediate vocational education			38	20
Pre-university education			39	21

N = Number of participants; *M* = Mean; *SD* = Standard Deviation

The total population of 743 freshmen was invited to self-rate their SRPs. 488 freshmen (66% of the total population) voluntarily filled out this questionnaire. Of these 488 freshmen, 325 (67%) allowed the researcher to obtain their data concerning first-year completion. 188 (58%) of the 325 freshmen who agreed that the first researcher would obtain their data concerning first-year completion, also allowed their mentors (N = 28) to rate their SRPs. As a result, the final sample for further analyses equaled 188 freshmen and 28 mentors. See Table 4.1 for an overview of the freshman sample. Each freshman needed to rate 32 items with respect to his or her SRPs, on a Likert scale ranging from 1 (totally disagree) to 7 (totally agree). With respect to the mentor-rated SRPs, their mentors were asked for each particular freshman they mentored, whether he/she might improve his/her learning by improving one or more SRPs. If the mentor confirmed that the freshman involved might improve learning by improving one or more SRPs, the mentor was asked to rate each SRP (no = 0, yes = 1): If a mentor filled out "yes" for an SRP (e.g., attention) this meant that the mentor predicted that that freshman involved could improve his/her learning by improving this particular SRP (e.g., attention).

It must be remarked that in the current study it was not chosen to drop items measuring SRPs from our study which might be less observable or evaluative. For example, Cleary and Callan (2014) commented on the construction of their teacher-rating scale that they dropped 7 items that, according to three high school teachers, were not suitable because they referred to covert processes or student behaviors that mostly find place outside the school context. However, mentors in higher education are supposed to academically coach their students on their SRPs. As a consequence, they are expected to observe their students but also to ask their students how they execute certain SRPs outside the learning context (for example, time management). Therefore, we expect that mentors might also have information about less observable and less developed SRPs.

To ensure that mentors and their freshmen interpreted the SRPs in the same manner, the first author instructed all mentors and their freshmen about the SRPs as measured in the current study, including their definitions and accompanying items. Furthermore, each mentor and freshman received a list of definitions and example items for each SRP, and an exemplary item of the student-SRP-questionnaire. For example, for the SRP 'attention', the mentor read the definition and the five items that the freshmen had to rate, and subsequently was asked whether or not the particular freshman might increase his/her probability of first-year completion by improving 'attention'.

After having obtained the first-year data, freshmen were labeled either as completers, delayers, or leavers. Students were identified as delayers if they had acquired the minimum of European Credits (EC) they needed for entering the second year of study (this varied between 42 and 45 EC), but had not as yet obtained the 60 EC to receive the first-year diploma. Freshmen were defined as leavers if they had withdrawn from occupational therapy, had switched to another program, or had enrolled in another institution of higher education in the first year

of study. These freshmen had maximally earned 45 EC. Thus, in the current study, freshmen delay/leaving was compared to first-year completion.

Results

Descriptives

The means, standard deviations, coefficient alpha's (if applicable), and inter-correlations among all variables (academic performance, background variables, mentor-rated SRPs, and freshman-rated SRPs) are presented in Table 4.2. Pearson correlations were calculated for all variables. In line with Richardson et al.'s (2012), and Sitzmann and Ely's (2011) findings, the majority of the SRPs, both mentor-rated and freshman-rated, were significantly correlated.

With regard to the background variables, there was a significant relationship between ethnicity and pre-tertiary education (-.33), meaning that students from minority groups in general had a lower prior education. Some significant correlations were observed between several background variables and SRPs (mentor- and freshman-rated). For example, ethnicity was significantly correlated with the freshman-rated SRPs metacognitive strategies, attention, and motivation: Thus, an ethnic minority student had a higher probability than an ethnic majority student to score lower on these SRPs.

Convergent validity between mentor- and self-rated SRPs

The convergent validity (Campbell & Fiske, 1959) — also commonly referred to as inter-rater reliability or inter-rater agreement accuracy — was measured between mentor-rated SRPs, freshmen-rated SRPs and freshmen background variables, with respect to students' academic performance. With respect to mentor-and freshman-rated SRPs, half of the SRPs showed agreement between the mentor- and the self-ratings. Two of these correlations were significantly positive, however, the agreement in these cases was not high (see the bordered correlations in Table 4.2). Two correlations were significantly negative and one was not significant. One can conclude that there is a difference in ratings between mentors and students, probably because mentors have only limited access to information, which the students possess, as described by the RADU-model (Funder, 1995) and the trait-visibility theory (Connelly & Ones, 2010; Connolly et al., 2007; McDonald & Letzring, 2016; Vazire, 2010).

Predictive validity

Replicating earlier findings from Bajwa (2016), the percentage of first-year completers is lower (39%) than that of first-year delayers/leavers (61%; See Table 4.1). As a result, in our study it seems that for mentors predicting first-year delay/leaving will be easier than predicting first-year completion.

Table 4.2 Means (*M*), Standard Deviations (*SD*), Coefficient alpha's (α), and Pearson correlations among all variables (*N* = 188)

Variable (number of items)	*M*	*SD*	*α*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Freshmen performance[a]	.39	.49		-														
Background variables																		
2. Age (in years)	19.30	3.33	-	-.03	-													
3. Gender[b]	.74	.44	-	.17*	-.20*	-												
4. Ethnicity[c]	.86	.35	-	.05	.03	-.14*	-											
5. Physical/mental limitation[d]	.88	.32	-	.02	.01	-.10	-.01	-										
6. Pre-tertiary education level[e]	2.01	.64	-	.16*	-.10	.02	-.33**	-.06	-									
Mentor-rated SRPs[f]																		
7. Critical thinking (1)	.15	.36	-	.21*	-.00	.03	.08	.22*	.17*	-								
8. Metacognitive strategies (1)	.16	.37	-	-.35**	-.04	-.13*	-.06	-.11	-.09	-.42**	-							
9. Attention (1)	.09	.29	-	.18*	.05	.16*	-.08	.17*	.03	.18*	-.51**	-						
10. Motivation (1)	.09	.28	-	.13*	.06	.08	-.02	.07	.00	.19*	-.38**	.50**	-					
11. Effort (1)	.08	.27	-	.24*	-.00	.10	-.07	.08	.09	.26**	-.61**	.59**		-				
Freshman-rated SRPs[g]																		
12. Critical thinking (6)	4.16	.94	.77	-.19*	.13*	-.17*	-.10	.02	.01	-.06	.03	.04	.22*	-.05	-			
13. Metacognitive strategies (10)	4.13	.99	.84	.19*	.07	.21*	-.15*	.02	-.02	-.01	-.19*	.22*	.22*	.13*	.20*	-		
14. Attention (5)	4.24	1.10	.78	.09	-.01	.11	-.09	.02	.11	.09	-.12*	.22*	.10	.10	.21*	.44**	-	
15. Motivation (8)	5.81	.72	.84	.04	-.00	.10	-.18*	-.08	-.04	-.08	-.15*	.09	-.12*	.20*	.15*	.38**	.29**	-
16. Effort (3)	6.19	1.02	.77	.05	.00	.11	-.11	-.03	-.02	-.01	-.15*	.10	.08	.24*	-.01	.27**	.10	.63**

*$p < .05$, **$p < .001$ [a]Freshmen performance: no = 0 (delay/leaving), yes = 1 (first-year completion), [b]Gender: male = 0, female = 1, [c]Ethnicity: ethnic minority student = 0, ethnic majority student = 1, [d]Physical/mental limitation: yes = 0, no = 1 [e]Pre-tertiary education level: intermediate vocational education = 1, higher secondary education = 2, pre-university education = 3 [f]Mentor-rated self-regulatory processes (SRPs):freshman incompetent = 0, freshman competent = 1, [g]Freshman-rated self-regulatory processes (SRPs): Likert items 1 = (totally disagree) – 7 (totally agree)
Note: The bordered correlations show the agreement in freshman-rated SRPs and mentor-rated SRPs

Table 4.2 (Column number 1) shows the correlations between three groups of predictor variables (background variables, mentor-rated SRPs, and freshman-rated SRPs) and the criterion (freshmen performance). Besides correlation analyses, the predictive validity of SRPs were studied on a more detailed level (See Table 4.3).

Table 4.3 Classification of (in-)correct predictions of freshmen performance, and sensitivity/ specificity indices

		Predicted freshmen performance	
		Low probability of first-year completion	High probability of first-year completion
Observed Freshmen performance	Completed	A Incorrect prediction	B Correct prediction
	Delayed/dropped out	C Correct prediction	D Incorrect prediction
Sensitivity/specificity indices			
Sensitivity		B/(B + A)	
Specificity		C/(C + D)	

The prediction of first year completion was modeled in a two by two matrix with two axes: predicted and observed completion. Both axes contain two values: completed - not completed (delay / leave), offering the possibility to calculate two indicators for the predictive validity, as shown in the lower half of Table 4.3.

For this prediction model, it is necessary to determine the cut-offs to categorize the predictions provided by the mentors and by the students themselves into a binary value. The cut-off score for the mentor-rated SRPs was determined as follow. The results showed that for the freshmen for whom the mentors had filled out a probability of first-year completion of 70% or less, their mentors also consistently filled out which SRPs might be improved to heighten the probability of first-year study completion. Therefore, the students for whom the mentor had filled out a probability of completing the first year of study in time to be more than 70% were defined as (predicted) completers. All students of whom their mentor had indicated that the probability of completing the first year in time was 70% or less were labeled as mentor-predicted delayers/leavers.

Table 4.4 Predictive validity mentor-rated self-regulatory processes (SRPs), and freshman-rated SRPs with respect to first-year completion (no = 0 / yes = 1) (28 mentors made predictions with respect to 188 freshmen)

Correct prediction completion	Correct prediction completion	Incorrect prediction completion	Correct prediction delay/leaving	Incorrect prediction delay/leaving	Sensitivity for predicting completion	Specificity with regard to predicting delay/leaving	ROC-value	Φ[a]
Mentor-rated SRPs								
Critical thinking	69	91	24	4	.95	.21	-	.21*
Metacognitive strategies	73	84	31	0	1.00	.27	-	.35**
Attention	71	100	15	2	.97	.13	-	.18*
Motivation	70	102	13	3	.96	.00	-	.13
Effort	73	100	15	0	1.00	.13	-	.24*
Mentor-rated SRPs total	69	91	24	4	.95	.21	3.00	.18*
Freshman-rated SRPs								
Critical thinking	26	23	92	47	.36	.80	4.42	.17*
Metacognitive strategies	21	23	92	52	.39	.80	4.85	.10
Attention	20	21	94	53	.27	.82	5.05	.11
Motivation	18	23	92	55	.25	.80	6.44	.06
Effort	32	41	74	41	.44	.64	6.83	.08
Freshman-rated SRPs total	5	23	92	68	.07	.80	4.32	.18*

[a]Mean square contingency coefficient, the association measured between SRPs and first-year completion
*$p < .05$, **$p < .001$

The cut off score for freshman-rated SPRs was based on receiver operating characteristic (ROC)-curves. In an ROC-curve, the sensitivity and specificity indices are visualized for each possible cut off score. Depending whether the goal is to have a high sensitivity, a high specificity, or both, the ROC-value has to be determined by the researchers. As the goal of the current study primarily was to identify students at risk for delaying/leaving, the ROC-value with a sensitivity index of .80 (80% of the students who actually delay/leave have been correctly identified by their SRPs, regardless of the accompanying specificity index), was chosen. The reason for this was that in the current study it was considered to be more important to identify students who had a heightened probability to delay/leave, than to label students who did not have a heightened probability to delay/leave.

Table 4.4 shows the different predictive validity indices for mentor- and freshmen-rated SRPs. Sensitivity indices for the total of mentor-rated SRPs as well as for the specific mentor-rated SRPs were high, indicating that 95-100% of the freshmen of whom mentors had predicted that they would complete their first-year program, indeed had done so. In contrast, specificity indices were low. That is, only 0-27% of the freshmen who had been predicted by their mentors to delay or leave their educational program actually had delayed or left.

Sensitivity indices for SRPs were low: .25 (motivation) to .44 (effort). Specificity indices for the predictive validity of students' SRPs were high, ranging from .64 (effort) to .82 (attention). The different SRPs as rated by the freshmen were also combined into one overall scale. The predictive validity of this combined scale was similar to that of the separate SRP-scales, namely: .07 (sensitivity) / .80 (specificity).

Agreement between ratings

Table 4.5 provides the agreement between mentors and their freshmen with respect to predicting SRPs for first-year completion. Whether or not a student completed the first-year in time: in general the mentor and the freshman did not agree. Specifically, eight freshmen and their mentors agreed on their correct predictions with respect to first-year completion, and another 21 mentors and their freshmen agreed on their correct predictions with respect to delay/leaving. However, 139 freshmen and their mentors disagreed with respect to their predictions. Specifically, 79 freshmen and their mentors disagreed on their predictions with respect to delay/leaving, and another 60 freshmen and their mentors disagreed on their predictions with regard to first-year completion. Therefore, combining both mentor- and freshman-predictions into one prediction is not an added value. Instead, mentor- and freshman-rated SRPs show predictive validity with respect to different outcomes: If the goal is predicting first-year completion, mentor-rated SRPs have more predictive validity, when compared to freshman-rated SRPs. In contrast, if the goal is predicting freshmen delay/leaving, freshman-rated SRPs have more predictive validity as opposed to mentor-rated SRPs.

Table 4.5 Agreement of mentors (*N* = 28) and their freshmen (*N* = 188) in their predictions on freshmen performance by means of their self-regulatory processes (SRPs)

		Freshman-rated					
		Total sample (*N* = 188)		**Delayers/leavers (*n* = 115)**		**Completers (*n*= 73)**	
		incorrect	correct	incorrect	correct	incorrect	correct
Mentor-rated	correct	68	29	8	21	60	8
	incorrect	20	71	15	71	5	0
ϕ[a]		.09		-.11		-.09	

[a]Mean square contingency coefficient, the association measured between SRPs and first-year completion
*p < .05, **p < .001

Discussion

The first goal of this study was to investigate the convergent validity, that is the agreement between mentor- and freshman-rated SRPs. The findings, namely that the agreement was at most moderate, can be interpreted in accordance with Funder's RADU-model (1995). A first interpretation is that the low mentor-freshman agreement with respect to SRPs might be caused by the *relatively low availability* of expression of SRPs. Namely; mentors involved in the current study frequently told the main researcher that they should have had more time for identifying SRPs and for mentoring their students appropriately with respect to their SRPs. A second interpretation is that differences in assessment-accuracy with respect to mentor and freshmen ratings of entrance-level SRPs can be explained by the trait-visibility theory (Connelly & Ones, 2010; Connolly et al., 2010; McDonald & Letzring, 2016; Vazire, 2010). In the current study, two mentor-rated and freshman-rated SRPs were related negatively, implying that when mentors rated a student to score high on these SRPs, the freshmen tended to rate themselves as scoring low on these SRPs. The first of these two SRPs concerns metacognitive strategies (planning, monitoring, time management). Presumably, this SRP is not so observable for mentors, for students usually apply metacognitive strategies outside the study context. The second SRP concerns motivation. It could be imagined that motivation is high in evaluativeness. That is, it is desirable to be a motivated student, therefore, the student might conceal low motivation for the mentor.

The second goal was to examine the predictive validity of freshmen background variables, mentor-rated SRPs, and freshman-rated SRPs with respect to freshmen performance. In line with Wijnia et al. (2013), sensitivity indices showed that mentors were better at predicting which freshmen would complete their first-year of study in the expected time (95-100%), than at predicting which freshmen might delay/leave (0-21%). Reversely, freshmen-ratings of SRPs were better predictors for delay/leaving (64-82%), than for first-year completion (7-44%).

The third goal of this study was to determine in what way mentor- and freshmen-rated SRPs might be combined to predict freshmen performance optimally. The study shows that freshman-rated SRPs can provide their mentors (teachers) the information these teachers lack on insufficient student-use of SRPs, which might help them to offer tailored interventions for preventing freshmen from delaying/leaving. This is a valuable finding, because in contrast to background variables such as being a male or belonging to an ethnic minority group, which are well-known predictors for delaying/leaving but cannot be changed, mentors and their freshmen might improve freshmen SRPs, and thus their academic performance. In this manner, the current study shows that measuring entrance-level SRPs by the mentor as well as by the student can contribute in making freshmen delay and leaving more manageable for the mentors in Dutch higher professional education involved.

Strengths and limitations

Wijnia et al. (2013) concluded that tutors were better at predicting which students would complete their study than which students would not. As said earlier, these authors commented that this finding could be explained by the higher base rate for completion, indicating that more students complete than would delay/leave their study. In our study, the base rate for freshmen delayers/leavers (115) was higher than for freshmen completers (73), but still mentors were better at predicting which students would do better, than which students would not. This finding is considered a strength for this study as it confirms the idea that teachers are better at predicting who will do better, than who will not, even though the base rate of the students who delay or leave was higher.

The current study used a freshman-rated and a mentor-rated questionnaire to be able to assess freshmen entrance-level SRPs in an efficient manner. However, a questionnaire solely measures the *perception* of the freshmen and mentors involved. We agree with Cleary and Callan (2014) that it is important to take into account other measurement methods as well. If student-reported SRPs and mentor-rated SRPs show conflicting results, it is highly recommended to conduct additional, direct, measures of SRPs, such as direct observations (Corno, 2011), diaries (Schmitz, Klug, & Schmidt, 2011), think-aloud methods (Greene, Robertson, & Croker Costa (2011), and SRL micro analysis (Cleary, 2011).

Future research

It would be worthwhile to conduct similar studies as the current one, but then grounded in the trait-visibility theory (Connelly & Ones, 2010; Connolly et al., 2007; McDonald & Letzring, 2016; Vazire, 2010). This might give more systematic insight into the extent to which students and their mentors rate SRPs as observable/visible and/or evaluative and to what extent their predictions depend thereon. With this information, predictions of mentors and students with

respect to students' SRPs might become of more added value in comparison to one another. In other words, it could be imagined that certain SRPs might be better predictors when rated by students themselves, whereas their mentors might more accurately predict other SRPs.

Future research could use (quasi-) experimental designs to determine the extent to which identifying entrance-level SRPs in higher education by the freshmen as well as by their mentors and offering tailored intervention will diminish freshmen delay/leaving.

It would be valuable to provide knowledge and training to improve mentors' assessment-accuracy with regard to freshmen insufficient use of relevant SRPs. In accordance, in a quasi-experimental design it may then be determined whether or not mentors' sensitivity to discern SRPs that impact upon freshmen leaving has improved.

Conclusion

This study shows that mentors are better at predicting which freshmen will perform academically well, given their entrance-level SRPs, than at predicting who will not. The high base rate of freshmen delayers/leavers implies that it would have been easier to predict study delay/student leaving than first-year completion, yet mentors were better at predicting who would do better. The study shows that a student-questionnaire can be helpful for mentors to be able to identify any shortcoming in freshmen SRPs for academic performance, particularly as it is impossible to change any background variables that are known to be predictive of student performance. Future research should explore what causes this asymmetry in mentor-freshman assessment accuracy with respect to SRPs or academic performance, and how this can be diminished. It is recommended to focus further research into this topic in the trait-visibility theory (Connelly & Ones, 2010; Connolly et al., 2010; McDonald & Letzring, 2016; Vazire, 2010). A better insight in how more mentor-student agreement with respect to assessing freshmen SRPs and academic performance can be reached would be of great value for making mentoring a more powerful strategy for improving academic performance. In this manner, academic performance might become more manageable for institutions for higher education.

CHAPTER 5

Self-Regulated Learning, Interventions, and Academic Performance

Abstract

This study aimed to improve freshmen self-regulated learning (SRL) and, accordingly, freshmen performance. Although mentors in higher education are expected to identify shortcomings in freshmen self-regulatory processes for learning (SRPs) (e.g., planning, monitoring), and to intervene if needed, recent research shows that mentors have difficulty in identifying shortcomings in freshmen SRPs, in due time, preventing them to intervene (Gomes, 2016; Herweijer & Turkenburg, 2016; Poulussen & Roseval, 2016; Study 3). Therefore, in the present intervention study the freshmen and their mentors in two quasi-experimental groups were informed by the researchers about the self-assessed SRPs by the freshmen during entrance in higher professional education. Subsequently, these freshmen and their mentors were recommended specific SRP-interventions, to heighten their academic performance (delay/ leaving versus first-year completion). Freshmen and their mentors in the control group were neither informed about the self-assessed SRPs at entrance, nor were they recommended SRP-interventions. Of the 204 freshmen who self-assessed their entrance-level SRPs (pretest), 108 (53%) also self-assessed their SRPs after the intervention, nine months later (posttest).

The results showed that one of the two SRPs which were meant to be improved by means of the researcher-recommended SRP-interventions (metacognitive strategies and attention) indeed was improved, namely, attention. Additionally, the extent to which the freshmen had stated that they had followed up on the SRP-recommendations together with their mentors implied an increase in their metacognitive strategies from pre- to posttest. Apparently, the mere availability of recommendations for how to improve one's SRPs regardless of the freshmen pretest SRP-scores implied that freshmen pro-actively together with their mentors were willing and able to improve their metacognitive strategies. Finally, these results indicated that giving freshmen and their mentors insight in freshmen entrance-level scores on their attention and metacognitive strategies and advice on how to intervene for an improvement of their academic performance, led to significantly more freshmen retention.

Keywords: self-regulated learning, self-regulatory processes, self-regulatory constructs, academic performance, freshmen, intervention, retention

Introduction

Self-regulated learning (SRL) has been defined as students' management of their cognitive, metacognitive and affective self-regulatory processes (SRPs) for academic performance (Boekaerts & Niemiverta, 2000; Pintrich, 2000; Sitzmann & Ely, 2011; Winne, 2011; Zimmerman, 2000a). Examples of SRPs are planning, monitoring, time management, and the willingness to learn (motivation).

Meta-analyses have shown that goal-setting, effort, and self-efficacy are among the strongest SRP-predictors of academic performance (i.e., earning a higher grade point average and showing more training transfer; e.g., Richardson et al., 2012; Robbins et al., 2004; Sitzmann & Ely, 2011). In contrast, recent empirical studies (Studies 2 and 3) have reported that metacognitive strategies, attention, motivation, and effort most strongly predict both freshmen retention and freshmen performance (delay/leaving versus first-year completion). Furthermore, in these recent studies, freshmen scoring high on critical thinking were found to have a higher risk to leave during their first year of study (see Chapters 3 and 4). Hattie, Biggs, and Purdie (1996) concluded that especially SRL-interventions that fit the students' needs, as well as the learning environment in which the students engage, impact upon their SRL. In line with the findings of Hattie et al. (1996), the current study implemented SRL-interventions that specifically aimed to improve those SRPs which a particular student lacked according to his or her self-assessment of SRPs at entrance level. Using a quasi-experimental pretest-posttest design (including a control group), the present study investigated to what extent individually tailored interventions had a beneficial impact on freshmen entrance-level SRPs in order to improve their performance (first-year completion as opposed to delay/leaving).

SRL-interventions can be pro-actively initiated and implemented by researchers (researcher-directed), mentors (mentor-directed), or students themselves (student-directed). Earlier research showed that SRL-interventions have a significantly stronger effect on academic performance when they are student-directed rather than teacher-directed (Hattie et al., 1996), In addition, De Boer, Donker, and Van der Werf (2014) concluded that researcher-directed SRL-interventions have significant more effect on SRPs and academic performance, as opposed to teacher-directed SRL-interventions (De Boer et al., 2014). In accordance with these findings, our study compared two quasi-experimental groups with a control group. That is, in an *optional group* the researchers *advised* the mentors to follow up on certain SRL-interventions, based on their freshmen self-assessed entrance-level SRPs: In this group the mentors were free to choose to implement these SRL-interventions or not, and/or to implement other SRL-interventions. In contrast, in an *obligatory group* the mentors agreed to implement the SRL-interventions as advised by the researchers to be most helpful for improving their freshmen performance, based on their freshmen assessment of entrance-level SRPs.

In the past decades, extensive knowledge has been accumulated on the effect of SRL-interventions with respect to improving SRL and academic performance (ranging from pupils in primary school through students in higher education) (De Boer et al., 2014; Donker, De Boer, Kostons, Dignath-van Ewijk, & Van der Werf, 2014; Lazowski & Hulleman, 2016; Richardson et al., 2012; Robbins et al., 2004; Sitzmann & Ely, 2011). Before describing the present study more extensively, earlier meta-analyses on SRL-interventions and effects of these interventions on SRL and academic performance in higher education will be outlined below.

SRL-interventions

Types of SRL-interventions

Meta-analyses on SRL-interventions for academic performance have described different types of interventions. The following categories of SRL-interventions have been used, according to how they improve SRL for academic performance: cognitive interventions, metacognitive interventions, and affective interventions. *Cognitive* interventions are those that focus on improving managing and memorizing information, such as underlining, note-taking, and summarizing (Weinstein & Mayer, 1986). Examples of interventions for improving *metacognition* include learning students a better planning, monitoring, and time management. *Affective* interventions are meant to improve feelings and beliefs about learning (e.g., attributions such as thoughts about whether the student or the teacher is responsible for the student's learning). Intervention programs may concern the implementation of one or more of such interventions. These intervention programs may focus on cognition, metacognition and affect, or on only one or two of these.

As an alternative to labeling interventions by the goal of each SRL-intervention (that is, improving students' cognition, metacognition, or affect), SRL-interventions can also be categorized according to whether they are intended to improve students' handling of a learning task. For example, Hattie et al. (1996) based their Structure Of the Learning Outcomes (SOLO) taxonomy of interventions on the SOLO taxonomy as introduced by Biggs and Collins (1982). Biggs and Collins (1982) formulated the following stages which students may go through to become competent learners: 1) the student engages in a task, but the task is not handled appropriately (pre-structural); 2) one (uni-structural) or several (multi-structural) aspects of the task are picked up separately, but not at an integrated level; 3) different aspects of a task are integrated (relational); and 4) the integrated aspects of a task are generalized to a higher level of abstraction (extended abstract).

Based on this taxonomy of Biggs and Collins (1982), Hattie et al. (1996) categorized interventions as follows: 1) uni-structural (based on enhancing one strategy: e.g., re-reading texts to earn a higher examination score); 2) multi-structural (focused on a range of independent strategies: e.g., summarizing, re-reading, rehearsing, and rephrasing, and using all of them

together to earn a better grade); 3) relational (all the interventions fit the individual's and contextual needs: e.g., after assessments of students' study skills, tailored interventions are implemented that fit the particular learning context); and 4) extended abstract (students apply their newly learned strategies in different contexts). The latter can refer, for instance, to students who have learned to handle a learning task on their own (at school) with simulation patients; subsequently, they are asked to conduct a similar task on the work floor with 'real' patients.

Meta-analyses on interventions to improve self-regulated learning and academic performance

Below, several meta-analyses are discussed that have examined the implementation of educational interventions and their effectiveness on SRL and (academic) performance in higher education. The overall results are discussed first, after which the effectiveness is reported for different kinds of interventions. To interpret the strength of the effect (the effect size) of SRL-interventions on academic performance, Cohen's *d* is used, which can have the following values: negative effect ($d < 0.00$); zero effect ($0.00 < d < 0.20$); small effect ($0.20 < d < 0.50$); moderate effect ($0.50 < d < 0.80$), or large effect ($d \geq 0.80$) (Cohen, 1977).

Overall results

Hattie et al. (1996) conducted a meta-analysis (51 primary studies) on study skills interventions to improve student learning, ranging from primary school pupils to adult learners. The results showed that SRL-interventions hardly had any effect on study skills ($d = 0.16$) (study behavior), and a moderate impact on affect (consisting of self-efficacy, self-concept, or attitude; $d = 0.48$). With respect to performance, the authors also reported that SRL-interventions had a moderate effect ($d = 0.57$).

Lazowski and Hulleman (2016) conducted a meta-analysis (74 primary studies) on motivation interventions (i.e., affective interventions) to improve learning outcomes, ranging from primary school pupils to students in post-secondary schooling. The authors reported moderate effects on the following learning outcomes: 1) participant self-report (e.g., interest, achievement goals; $d = 0.54$); 2) performance outcome scores (e.g., standardized test scores, course grades; $d = 0.52$); and 3) behavioral outcomes (e.g., discipline referrals, retention; $d = 0.62$). Note that although Lazowski and Hullleman specifically focused on studies with respect to motivation interventions, similarly to Hattie et al. (1996), Lazowski and Hulleman (2016) included studies on primary school pupils through students in post-secondary schooling, Therefore, a number of studies as included by Lazowski of Hulleman were the same as included by Hattie et al. (1996).

Effectiveness of different kind of interventions

Hattie et al. (1996) concluded that uni-structural interventions, focusing on a single point of change, had the strongest effect on performance and a moderate effect on affect. Furthermore, relational interventions (tailored to address both students' needs and the specific learning environment wherein students engage) were found to be highly effective, both on performance and affect. Multi-structural interventions (several separate interventions implemented at the same time) were considered to be moderately successful. Although the extended abstract intervention (targeted at the usage of newly learned skills in another context) showed a strong effect on performance, this type of intervention was conducted in only one of the included studies. Hattie et al.'s meta-analysis (1996) showed that student-directed interventions had more effect ($d = 0.70$) than teacher-directed interventions ($d = 0.44$).

Self-regulatory processes for learning that benefit academic performance

The meta-analyses described above examined SRL-interventions with respect to both SRL and academic performance (e.g., grade point average), treating SRL and academic performance as two separate outcome variabeles. Yet, these meta-analyses did not examine to what extent an improvement in SRPs benefited academic performance (e.g., grade point average). Discussed below are three meta-analyses that investigated to what extent an improvement in SRPs has an impact on learning in higher education.

In a meta-analysis published in 2011, Sitzmann and Ely reported that goal-setting (which they referred to as goal-level), effort, self-efficacy, and persistence explained 17% of the variance in student learning (as measured with post-training assessments). In a meta-analysis (241 studies) on psychological correlates of grade point average (GPA) in tertiary education, Richardson et al. (2012) concluded that goal-setting, effort, and self-efficacy explained 11% of the variance in GPA. Another meta-analysis (109 studies) by Robbins et al. (2004) was conducted among American students enrolled in a 4-year program at colleges/universities. Their findings indicated that SRPs have a different impact on GPA than on freshmen retention. That is, self-efficacy had a strong impact on freshman GPA, but a smaller impact on freshman retention. In contrast, the SRP academic-related skills was found to have a small impact on freshman GPA, but a high impact on freshman retention. The authors defined academic-related skills as: time management, study skills/habits, leadership skills, problem-solving and coping strategies, and communication skills.

Present study

Recent research showed that although mentors in higher professional education are expected to identify shortcomings in their freshmen entrance-level SRPs, if needed, they have difficulty

doing this in a timely manner, preventing them to intervene (Gomes, 2016; Herweijer & Turkenburg, 2016; Poulussen & Roseval, 2016; Study 3).

Therefore, the present study aimed at helping mentors to identify shortcomings in their freshmen entrance-level SRPs and to intervene in time. That is, in this intervention study the freshmen and their mentors in two quasi-experimental groups were informed by the researchers about the self-assessed SRPs by the freshmen during entrance in higher professional education. Subsequently, these freshmen and their mentors were recommended SRP-interventions by the researchers for improving their entrance-level SRPs and to heighten their academic performance (delay/leaving versus first-year completion). Freshmen and their mentors in the control group were neither informed about the self-assessed SRPs at entrance, nor were they instructed about how they might improve SRPs.

Choice of self-regulatory processes for the intervention study

The present study aims at improving freshmen SRPs and freshmen performance (delay/leaving versus first-year completion) in higher professional education. Accordingly, the SRL-interventions in the current study were labeled as SRP-interventions. The present study built on the findings from Studies 2 and 3 of this dissertation. The following describes how exactly Study 4 built on Studies 2 and 3. (See also Figure 5.1.)

In Studies 2 and 3 a certain subset of entrance-level SRPs was found to best predict freshmen retention (Study 2) and freshmen performance (delay/leaving versus first-year completion; Study 3). More specifically, metacognitive strategies, attention, motivation, and effort were found to predict freshmen retention (Study 2) and freshmen performance (delay/leaving versus first-year completion, Study 3), whereas freshmen scoring high on critical thinking were found to have a higher risk to leave during their first year of study (Study 2).

Therefore, SRPs that were meant to be improved by the SRP-interventions in the current study contained the same SRPs as were found to be significant predictors of freshmen retention (Study 2) and freshmen performance (delay/leaving versus first-year completion; Study 3), except for two. First, in the present study it was chosen not to intervene with respect to motivation. The reason for this was that in the present study freshmen already scored relatively high with respect to motivation at entrance level (See Table 5.1). Instead, the entrance-level SRP that in Study 2 was found to correlate most strongly with freshmen retention, when excluding critical thinking, metacognitive strategies, effort, motivation, and attention, was chosen to be used in the intervention: environmental structuring (See Table 3.3 in Chapter 3). Second, it was chosen not to intervene with respect to critical thinking, because at this moment in time, it is still unclear how to interpret the negative relationship between critical thinking and freshmen performance and therefore what to recommend related to critical thinking.

Table 5.1 Means, Standard Deviations, Coefficient alphas, and Spearman's Rho correlations among all variables with regard to the freshmen who filled out the pretest (N = 204)

Self-regulatory processes[a] 1-11 (no. of items) Background variables 12-16	***M*[b] (*SD*[c])**	**α[d]**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**FP[e]**
1. Goal-Setting (4)	2.74 (.93)	.61	-	-.26**	-.31**	-.34**	-.17**	-.35**	-.34**	-.23**	-.37**	-.18**	-.14**	-.00
2. Critical thinking (6)	4.42 (.93)	.77		-	.59**	.52**	.51**	.31**	.39**	.16*	.22**	.31**	.40**	.11
3. Metacognitive strategies (10)	4.32 (.90)	.77			-	.61**	.48**	.48**	.46**	.27**	.33**	.30**	.32**	.26**
4. Learning strategies (6)	4.40 (.97)	.72				-	.51**	.40**	.49**	.32**	.47**	.29**	.33**	.13*
5. Attention (5)	4.52 (.92)	.66					-	.27**	.32**	.23**	.26**	.27**	.43**	.15*
6. Environmental structuring (3)[j]	5.46 (1.02)	.59						-	.37**	.19**	.31**	.35**	.26**	.06
7. Motivation (8)	5.96 (.63)	.82							-	.46**	.38**	.52**	.41**	.13*
8. Effort (3)[j]	5.94 (1.00)	.53								-	.24**	.20**	.06	.15*
9. Help-seeking (6)[j]	4.78 (.72)	.46									-	.38**	.29**	.07
10. Attributions (3)[j]	5.96 (.70)	.53										-	.51**	.04
11. Self-efficacy (8)	5.18 (.74)	.83											-	.21**
12. Age	19.96 (2.56)		-.06	.23**	.11	.14*	.16*	.06	.14*	-.14*	-.08	.09	.21**	.10
13. Gender[f]	.63 (.48)		.02	-.01	.19**	.07	.00	.12	.23**	.00	.06	.10	-.07	.18**
14. Ethnicity[g]	.94 (.24)		.02	-.07	.01	-.02	-.05	-.00	-.09	.14*	.04	-.10	-.09	.10
15. Physical/mental limitation[h]	.81 (.39)		-.03	.09	.08	.15*	.23**	.03	.08	-.08	.12*	.22**	.17**	.08
16. Pre-tertiary education level[i]	1.82 (.60)		.12*	-.21**	-.21**	-.20**	-.09	-.13*	-.16*	.19**	-.08	-.06	.02	.11

*p < 0.05, **p < 0.001, [a]Freshman-rated self-regulatory processes (SRPs): Likert items 1 (totally disagree) -7 (totally agree), [b]Mean (M), [c]Standard Deviation (SD), [d]Coefficient alpha (α), [e]FP: Freshmen performance: freshman leaver = 1, freshman delayer = 2, freshman completer = 3, [f]gender: male = 0, female = 1, [g]ethnicity: member of an ethnic minority group = 0, member of an ethnic majority group = 1, [h]physical/mental limitation: yes = 0, no = 1,[i]pre-tertiary education level: intermediate vocational education = 1, higher secondary vocational education = 2, pre-university education = 3, [j]Due to too low coefficient alpha's (< .60), this SRP was dropped from further analyses

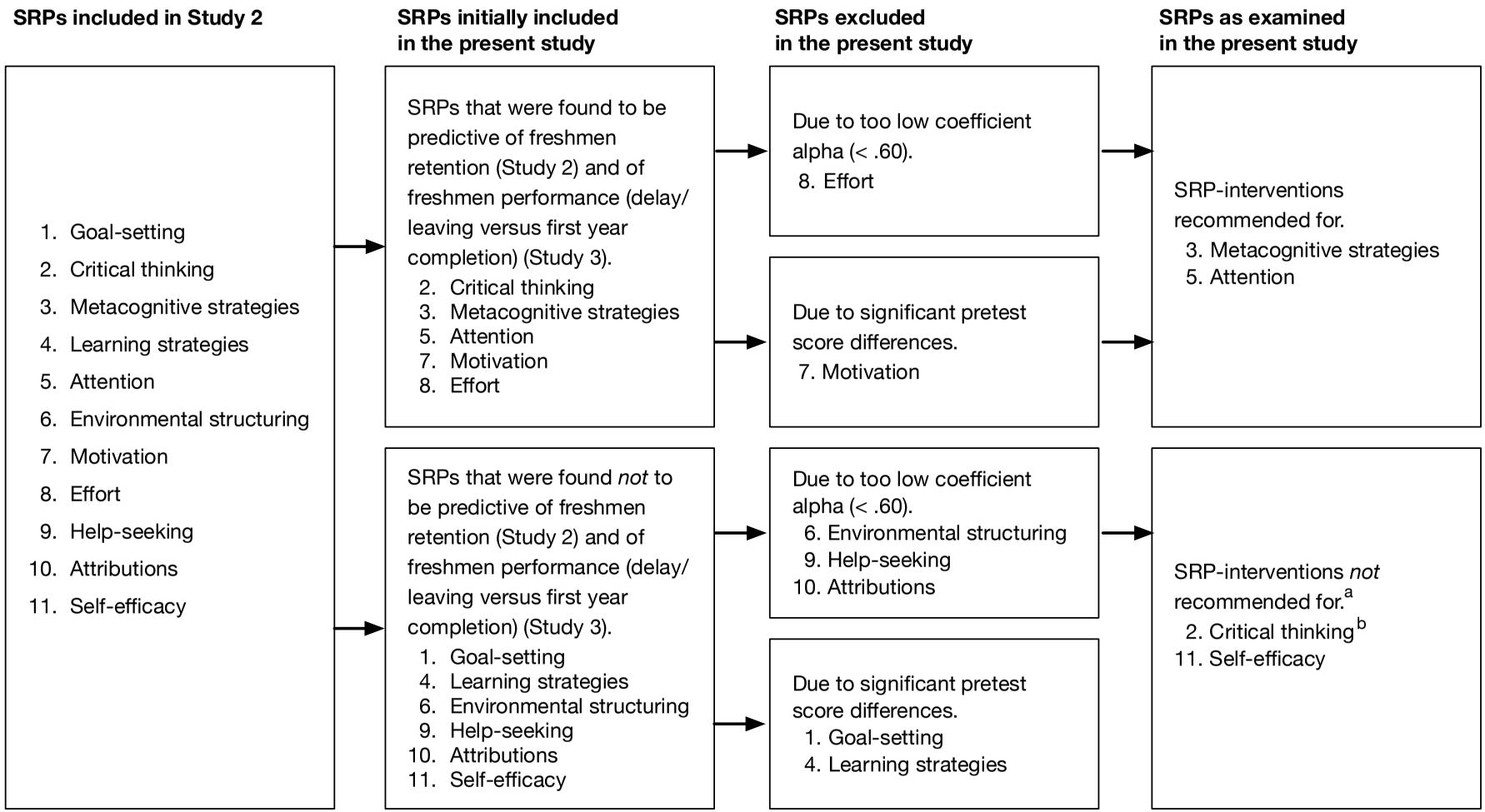

Figure 5.1 Flowchart inclusion- and exclusion criteria self-regulatory processes (SRPs) as examined in present study

[a] To check whether or not other SRPs might be unintentionally impacted by the SRP-intervention in the present study, critical thinking and self-efficacy were also included

[b] In Study 2, critical thinking was found to predict freshmen leaving. Therefore, in the present study (Study 4), it was chosen not to intervene with respect to critical thinking

Furthermore, it was tested whether or not the SRP-interventions, as predicted, affected freshmen performance (delay/leaving versus first-year completion) in the quasi-experimental groups (optional group and obligatory group) but not the control group. Therefore, all SRP-scales that were found to be predictive of freshmen retention and freshmen performance in Studies 2 and 3, initially were included in the present study. The SRP-scales which either were found to be unreliable (environmental structuring, effort, help-seeking, and attributions), or significantly differed at pretest (goal-setting, learning strategies, and motivation) were excluded from further analyses. Subsequently, it was first expected that in the quasi-experimental groups (optional group and obligatory group), the interventions specifically should improve metacognitive strategies and attention. Second, it was expected that the two SRPs which were not targeted by the intervention (critical thinking and self-efficacy) should *not* show increased score-levels on the posttest.

Hattie et al. (1996) showed that specific relational interventions have an effect on SRL and academic performance, namely those interventions that are tailor-made to fit 1) The learning environment in which the student engages, and 2) The students' needs. In line with the findings of Hattie et al. (1996), all freshmen in the two quasi-experimental groups (optional group and obligatory group) who had participated at the pretest, and their mentors, received their scores with respect to their entrance-level SRPs, and were suggested how they might improve their SRPs. However, how to exactly improve their SRPs depended on how high the freshmen had rated their entrance-level SRPs as follows. If a freshman had scored below the 25th percentile on one or more of the two SRPs (metacognitive strategies and attention), this was regarded as a low score. The freshman and his or her mentor then were informed by the first researcher that he or she had a heightened probability to delay/leave due to these SRPs, and at the same time the freshman and his/her mentor received an intervention that might improve the freshman's SRPs and hopefully academic performance.

Thus, one intervention was provided for each (low score) SRP of the freshmen involved. The freshmen and their mentors could read a comprehensive description of these SRP-interventions in the same document by clicking on a hyperlink. If the freshman did not have low scores on his/her entrance-level SRPs, the freshman was provided information in writing that he/she did not have a heightened probability to leave/delay. However, these freshmen could also click on hyperlinks to see the SRP-interventions that would have been suggested had they scored low on these SRPs.

As mentioned before, Hattie et al. (1996) found that student-directed interventions (SRP-interventions as pro-actively initiated and implemented by students themselves) had a higher impact than teacher-directed interventions (SRP-interventions as pro-actively initiated and implemented by teachers: e.g., mentors). In addition, a meta-analysis by De Boer et al. (2014) found that researcher-based interventions (SRP-interventions as pro-actively initiated and implemented by researchers) had a higher impact on learning than teacher-based interventions

(SRP-interventions as pro-actively initiated and implemented by teachers, e.g.: a mentor); note that this meta-analysis was conducted in the context of primary and secondary education.

In line with the findings of Hattie et al. (1996) and De Boer et al. (2014), in the current study, SRP-interventions were offered in two ways. Namely, in an *optional group* (n = 29), freshmen and their mentors were *advised* to pro-actively initiate and implement certain SRP-interventions, but could choose whether or not to do so. The freshmen and their mentors had the freedom to (also) implement other SRP-interventions. In contrast, freshmen and their mentors in an *obligatory group* (n = 56) *agreed to pro-actively initiate and implement* the SRP-interventions as prescribed by the researchers. Finally, the freshmen who participated in the control group (n = 23) attended their regular courses. That is, they did neither receive their scores with respect to their entrance-level SRPs, nor were interventions recommended for improving their SRPs. Accordingly, the present study ran analyses in which findings for the control group, the optional group, and the obligatory group were compared.

However, assigning participants to the optional or obligatory quasi-experimental group does not guarantee that the mentors actually implemented the SRP-interventions as offered by the researchers (obligatory group) and/or SRP-interventions as initiated by the mentors themselves (optional group). Therefore, to confirm that the present study indeed tested to what extent SRP-interventions had an effect on SRPs, and on academic performance, freshmen later were asked, at the posttest, to what extent they had indeed followed up on the recommendations. Freshmen who reported that they had indeed worked with the SRP-interventions, were re-labeled as the 'freshman-directed group'. The freshmen who filled out to have applied the interventions with their mentor were re-labeled as the 'mentor-directed group'. Those freshmen who reported that they had *not* implemented the SRP-interventions as initiated by their mentors were re-assigned to the control group. The analyses then were re-conducted to test whether the SRPs had improved, this time according to the reported intervention-related behavior by the control group (n = 58), the freshman-directed group (n = 30), and the mentor-directed group (n = 20).

In line with the findings of Hattie et al. (1996), and Lazowski and Hulleman (2016), it was expected that the SRP-interventions would have a small to moderate effect on the SRPs that were meant to be improved in the quasi-experimental groups (optional group and obligatory group) (metacognitive strategies and attention) and a subsequent moderate effect on freshmen performance (delay/leaving versus first-year completion), when compared to the control group. To be sure whether indeed specifically metacognitive strategies and attention were affected by the SRP-interventions in the present study but *not* the other SRPs, it was checked if SRPs that remained after excluding those that were found to be either unreliable or to significantly differ at the pretest were not unintentionally impacted by the SRP-interventions (critical thinking and self-efficacy) and would *not* subsequently predict freshmen performance (delay/leaving versus first-year completion).

Research Questions

The main research question (RQ) as examined in the present study is:
To what extent can freshmen performance benefit from the improvement of entrance-level SRPs?
This question was addressed by answering the following five sub questions:

1. *How do freshmen in the groups (optional group, obligatory group, and control group) differ with respect to their SRPs as measured at the pretest?*
2. *How do freshmen in the groups (optional group, obligatory group, and control group) differ with respect to their SRPs as measured after their first nine months of study (posttest), when controlling for their entrance-level SRPs (pretest)?*
3. *How do freshmen in the altered groups (freshman-directed group, mentor-directed group, and control group) differ in their SRPs as measured after their first nine months of study (posttest), when controlling for their entrance-level SRPs (pretest)?*
4. *How do freshmen in the groups (optional group, obligatory group, and control group) differ in their academic performance (delay/leaving versus first-year completion), as measured after their first year of study?*
5. *How do freshmen in the groups (freshman-directed group, mentor-directed group, and control group) differ in their academic performance (delay/leaving versus first-year completion), as measured after their first year of study?*

Method

Participants

Participants were regular freshmen in Dutch higher professional education. These freshmen attended their first year of study (at Bachelor level) in the academic year 2014-2015. The initial sample consisted of 204 freshmen who had filled out their entrance-level SRPs (pretest) and had given permission to obtain the data on their study progress after their first year of study. Of these 204 freshmen who had filled out the pretest, 108 (53%) also filled out the posttest, nine months later; the remaining 96 were unable to fill out the second questionnaire because they had already left the educational program at that time. Data on study progress were obtained for all 204 (108 + 96) freshmen. However, since only 108 freshmen filled out the SRP-questionnaire on the two required occasions, only 53% (108) of the total sample of freshmen who had filled out the first questionnaire completed the quasi-experiment (pretest and posttest).

All freshmen followed one of the four educational programs taught at that time at one of the two universities of Applied Sciences (A and B) that participated in this study. Based on the preferences of the educational program that the freshmen attended (i.e. occupational therapy at the University of Applied Sciences A or B; physiotherapy at the University of Applied Sciences B; or midwifery at the University of Applied Sciences B), the freshmen were automatically

assigned to the control group (n = 49; 24%), the optional group (n = 77; 38%) or the obligatory group (n = 78; 38%). The freshmen who completed the quasi-experiment took part in a lottery in which four of them (one freshman from each educational program involved) could win a gift voucher of 50 Euro as provided by the employer of the first researcher of the current study. Table 5.2 presents the characteristics of the sample.

Table 5.2 Characteristics of sample of the included freshmen (N = 204), pretest

	N	**%**
Age in years	*M* = 19.96 (*SD* = 2.56)	
Freshmen performance		
First-year non-completion		
· Freshman leaver	98	48.0
· Freshman delayer	57	27.9
First-year completion		
· Freshman completer	49	24.0
Gender		
· Male	75	36.8
· Female	129	63.2
Ethnicity		
· Member of an ethnic minority group	13	6.4
· Member of the ethnic majority group	191	93.6
Physical or mental limitation		
· Yes	38	18.6
· No	166	81.4
Pre-tertiary education level		
· Intermediate vocational education	58	28.4
· Higher secondary vocational education	125	61.2
· Pre-university education	21	10.4
Research groups		
Control group	**49**	**24.0**
Occupational therapy at University of Applied Sciences A	49	24.0
Quasi-experimental groups		
Optional group[a]	**77**	**37.7**
Physiotherapy at University of Applied Sciences B	65	31.9
Midwifery at University of Applied Sciences B	12	5.9
Obligatory group[b]	**78**	**38.2**
Occupational therapy at University of Applied Sciences B	78	38.2

Note: *N* = Number of participants, *M* = Mean, *SD* = Standard Deviation

[a]the mentors in the optional group were advised by the researchers to implement certain SRP-interventions, based on their freshmen self-assessment of entrance-level SRPs: The mentors were free to choose to implement these SRP-interventions or not, and/or to implement other SRP-interventions

[b]the mentors in the obligatory group agreed to implement the SRP-interventions based on their freshmen self-assessment of entrance-level SRPs, as advised by the researchers to be most helpful for improving their freshmen performance

Procedure

Before the start of the study, all freshmen in the quasi-experimental groups (optional group and obligatory group), and their mentors, were instructed by the first researcher. The first researcher visited the mentor teams (each consisting of four to twenty mentors) of the educational programs that participated as a quasi-experimental group (optional group or obligatory group). In the meetings of these teams, the first researcher informed the mentors about the procedure by means of a PowerPoint presentation. The SRPs, their definitions and the SRP-interventions were discussed. The mentors were told that they would receive their freshmen scores on their entrance-level SRPs as soon as their freshmen had filled out the questionnaire. Also, the mentors were instructed about the SRPs, about which SRP-interventions were meant to improve which SRPs, and how they were expected to implement these SRP-interventions. The mentors also received documentation about the SRPs and SRP-interventions.

Likewise, the first researcher visited the freshmen in each educational program before the start of the study and presented the procedure by means of a PowerPoint presentation. In addition, the freshmen were invited to fill out the SRP-questionnaire 'on the spot'. Similar to the mentors, the freshmen were informed at the start of their study about the SRPs as examined in this study by providing them the definitions of the SRPs and example items, and possible interventions to improve these SRPs. Also, the freshmen were asked to fill out an informed consent twice. One informed consent was meant to allow the first researcher to request their academic success data at the end of their first year of study from the Universities of Applied Sciences involved. A second informed consent related to allowing the first researcher to send the freshmen self-assessed entrance-level SRP-scores with, if needed, recommendations for improvement to their mentor.

With regard to the posttest, the researcher again requested to visit each educational program to be able to collect data 'on the spot'. However, this time only one educational program allowed the researcher to visit, due to full curricula. For this reason, for the other three educational programs digital questionnaires were sent out to the freshmen via email.

Manipulation check

In order to be able to check to what extent SRP-interventions as recommended had indeed been followed up by the freshmen and/or their mentors in the quasi-experimental groups (optional group and obligatory group) the following manipulation check was conducted. The freshmen in the quasi-experimental groups received additional questions the second time they filled out the SRP-questionnaire, namely during the posttest. On a Likert scale ranging from 1-7 (totally disagree to totally agree) the freshmen scored to what extent they had actually followed up on the recommendations to improve their SRPs, either on their own or with their mentor. If a participant scored on or higher than the mean of the scale (> 4), this was defined as 'followed

up on the recommendations to improve their SRPs'. The group of freshmen who reported they had worked with the SRP-interventions, on their own, were re-labeled as the 'freshman-directed group'. The group of freshmen who reported they had worked with the interventions with their mentors, were re-labeled as the 'mentor-directed group'. If freshmen reported not to have worked with the SRP-interventions, neither on their own nor with their mentor, they were re-assigned to the control group.

Measures

SRPs

Since the present study builds on Study 2 (Chapter 3), the same SRP-questionnaire was used as in that study, namely the student version of the Self-Regulated Learning Processes Questionnaire (SRLPQ). The SRLPQ is based on the Dutch translation of the Motivated Strategies for Learning Questionnaire (MSLQ) by Van den Boom, Paas, and Van Merriënboer (2007), from the original MSLQ as developed by Pintrich et al. (1991).

Freshmen performance

Freshmen performance was operationalized as first-year completion (the freshman earned 60 European Credits (EC) after one year of study), delay (the freshman did neither earn 60 EC during the first year of study, nor leave the educational program), or leaving (the freshman left the educational program during the first year of study). The University of Applied Sciences attended by each individual freshman was requested to inform the first researcher about the number of study credits the participating freshmen had earned during the first year of study (if the particular freshman had granted permission to do so).

The other variables measured in Study 2 were also measured in the present study (see Chapter 3 for the measures with respect to background variables, SRPs, and for the reliability of these measures).

SRP-interventions

All freshmen in the quasi-experimental groups (optional group and obligatory group) received the SRP-interventions that might be used to improve their SRPs and academic performance. However, only when freshmen scored below the 25th percentile on one or more SRPs, these freshmen and their mentors were recommended SRP-interventions that were specifically aimed to enhance these SRPs. For example, if a freshman scored low on attention, then the freshman and his/her mentor were told that the freshman had a heightened probability of delay/leaving the educational program, and that the freshman could improve attention by implementing certain SRP-interventions. The freshman and his/her mentor could click on a hyperlink for a detailed description of this intervention and read how to implement this intervention.

Below, the SRP-interventions are described which the freshmen and their mentors in the quasi-experimental groups (optional group and obligatory group) were informed and instructed about by the researchers.

Metacognitive strategies

The freshmen and their mentors were offered guidelines for planning and monitoring their study, and for managing their time (Gettinger & Seibert, 2002; Hattie, 2009; Plant, Ericsson, Hill, & Asberg, 2005). For example, freshmen were suggested to study each day, to study the most difficult parts first, and to use a "to-do" list when studying. In addition, they were recommended to use an app for planning, or to discuss their planning with their mentor if they needed more help with their metacognitive strategies.

Attention

With respect to attention, the freshmen were offered guidelines for following a healthy lifestyle: e.g., how to attain sufficient and high-quality sleeping hours, and how to stay fit and alert during the day (e.g., Carskadon, Acebo, & Jenni, 2004; Lim & Dinges, 2010; Smith, 2002).

Environmental structuring

Considering environmental structuring, the freshmen were offered options for securing a comfortable and quiet location for studying. Freshmen were, for instance, advised to download an app named 'Cold Turkey' with which social media could be blocked during a certain time span (e.g., Christenson, Rounds, & Gorney, 1992; Xu & Corno, 2003).

Effort

With regard to effort, the freshmen were instructed how to conduct "deliberate practice": They were told that it is not the number of hours that counts in exerting effort for studying, but rather how the effort is applied. They further were instructed to identify their learning needs, to set personal learning goals based on their learning needs, to plan and monitor their learning activities, to evaluate their learning goals, to reformulate their learning goals, and to start all over again (setting learning goals, planning and monitoring, and so on) (e.g., Ericsson, 2006b; Michaels & Miethe, 1989). Also, the freshmen were suggested how to learn in a better manner. For example, the freshmen were informed about the inefficiency with regard to summarizing, underlining, and rereading, and were advised to conduct other learning strategies such as self-explaining, and self-testing of the study content to be learnt.

Results

Descriptives

A missing value analysis showed that with respect to the SRPs six different respondents had one missing value with respect to one item. Likewise, analyzing missing values with regard to background variables, resulted in zero to one missing for each variable. Therefore, similar to Studies 2 and 3, missing values were replaced with the mean. To establish the relationships between all variables, first correlations were computed among the variables based on the data collected among the 204 participants who had self-rated their SRPs during the pretest. Due to the ordinal level of freshman performance (freshman leaver = 1, freshman delayer = 2, freshman completer = 3), Spearman's rho was used.

Correlations were computed between the variables based on the data collected among the 108 participants who had completed both the SRP-questionnaire during the pretest and nine months later during the posttest. Only 2 of the 98 freshmen who had left during the first year of study had filled out the questionnaire at both times. Therefore, the levels of the dependent variable freshmen performance were changed from leaver, delayer, and completer, into delayer/leaver and completer. Thus, for the 108 participants who had completed both the pretest and the posttest, freshmen performance (delay/leaving versus first-year completion) concerned a dichotomous variable. Accordingly, for these 108 participants Pearson's correlations were computed among their pretest and posttest-SRP-scores, their background variables and their performance ((first-year) completion versus delay/leaving) (see Appendices 1 and 2 for the correlations). Note that to establish the relationship between pre-tertiary education level and other variables, Spearman's rho was computed (Table 5.1 and Appendices 1 and 2), due to the ordinal level of this variable.

With respect to the 204 participants who filled out the pretest (Table 5.1), in line with the findings of Richardson et al. (2012), Sitzmann and Ely (2011) and Study 1, the majority of the SRPs were significantly and positively intercorrelated. Coefficient alpha was computed for determining the reliability of the SRP-scales. Due to coefficient alpha values which were too low (< .60) it was decided to drop the following SRPs from further analyses: environmental structuring (.59), effort (.53), help-seeking (.46), and attributions (.53).

Table 5.1 shows that the following SRPs significantly and positively correlated with freshmen performance (delay/leaving versus first-year completion): metacognitive strategies, learning strategies, attention, motivation, and self-efficacy. That is, improved metacognitive strategies, learning strategies, attention, motivation, and self-efficacy were related to a higher probability to be retained during the first year of study. With respect to the background variables, gender correlated significantly with freshmen performance (delay/leaving versus first-year completion): Being female implied a higher probability of performing well.

Results related to the research questions

Differences in self-regulatory processes as measured at the pretest between the groups (optional group, obligatory group, and control group) (RQ1)

Table 5.3 presents the means and standard deviations for the freshmen entrance-level SRPs as reported by the freshmen belonging to the control group ($n = 23$), the optional group ($n = 29$), and the obligatory group ($n = 56$), respectively. A MANOVA of the pretest SRP-scores showed that the quasi-experimental groups (optional group and obligatory group) and the control group did not differ significantly from each other on the SRPs critical thinking, metacognitive strategies, attention, and self-efficacy (See Table 5.3). However, the quasi-experimental groups (optional group and obligatory group) and the control group significantly differed with respect to: goal-setting, learning strategies, and motivation (RQ1).

Table 5.3 Means (*M*), Standard Deviations (*SD*), F-ratio's (*F*) and partial eta squared $(\eta_p)^2$ entrance-level self-regulatory processes for the quasi-experimental groups (optional group and obligatory group) and the control group ($N = 108$) (pretest)

Self-regulatory processes[a]	Pretest scores self-regulatory processes[a]			Multivariate analysis of variance		
	Control Group *n* = 23	Optional[b] group *n* = 29	Obligatory[c] group *n* = 56			
	M (SD)	*M (SD)*	*M (SD)*	*F (2, 105)*	*p*	η_p^2
1. Goal-Setting	3.15 (1.20)	2.44 (.76)	2.72 (.96)	3.35	.033*	.06
2. Critical thinking	4.14 (.89)	4.67 (.92)	4.64 (1.03)	2.48	.089	.05
3. Metacognitive strategies	4.16 (.90)	4.62 (.90)	4.58 (.89)	2.09	.129	.04
4. Learning strategies	4.03 (1.10)	5.03 (.67)	4.44 (.94)	7.96	.001**	.13
5. Attention	4.39 (.81)	4.72 (.68)	4.75 (.87)	1.69	.190	.03
6. Motivation	5.74 (.57)	6.28 (.55)	6.04 (.62)	5.35	.006**	.09
7. Self-efficacy	5.34 (.62)	5.26 (.68)	5.38 (.67)	0.29	.748	.01

[a]Freshman-rated self-regulatory processes: Likert items 1 (totally disagree) -7 (totally agree)
[b]the mentors in the optional group were advised by the researchers to implement certain SRP-interventions, based on their freshmen self-assessment of entrance-level SRPs: The mentors were free to choose to implement these SRP-interventions or not, and/or to implement other SRP-interventions
[c]the mentors in the obligatory group agreed to implement the SRP-interventions based on their freshmen self-assessment of entrance-level SRPs, as advised by the researchers to be most helpful for improving their freshmen performance
*$p < 0.05$, **$p < 0.001$

It is unclear what might have caused this significant pretest score differences in the SRPs goal-setting, learning strategies, and motivation. Therefore, it was decided to exclude goal-setting, learning strategies, and motivation from further analyses. As a result, in the following

analyses it was first examined to what extent the SRPs metacognitive strategies and attention were improved by the SRP-interventions in the quasi-experimental groups (optional group and obligatory group), when compared to the control group. Second, it was analyzed whether critical thinking and self-efficacy indeed were not improved in the quasi-experimental groups (optional group and obligatory group), when compared to the control group. This was done to investigate whether the SRP-interventions did not also affect SRPs which were *not* meant to be improved.

Differences in self-regulatory processes as measured at the posttest between the groups (optional group, obligatory group, and control group) (RQ2)

The dataset of the present study consists of multiple levels: level 1 (108 freshmen), level 2 (three educational programs: occupational therapy, physiotherapy, and midwifery), and level 3 (two Universities of Applied Sciences). For datasets with such a multi-level structure, it is recommended to conduct multi-level analysis. According to Hox (2010), and Snijders and Bosker (2012) 50 groups (level 2) containing a minimum of five cases each (level 1) are required in multi-level analysis for sufficient statistical power to find significance. In addition, in case of fewer than five cases per group and fewer than 50 groups, standard errors for fixed effects will be too small (increased Type 1 errors). Random effects (variance) and their standard errors may be underestimated in multi-level analysis as applied in such samples.

Furthermore, a Chi Square Test of independence comparing the educational programs as nested in the Universities of Applied Sciences (educational program & University of Applied Sciences) with the intervention (control group versus quasi-experimental group 1 (obligatory group), and quasi-experimental group 2 (optional group) showed a significant correlation between "educational program & University of Applied Sciences", the quasi-experimental groups (optional group and obligatory group), and the control group; $X^2(6) = 216.00, p = .000$. Therefore, it can not be expected that in the current study the variable "educational program & University of Applied Sciences" will generate significant additional variance on top of the intervention (control group versus quasi-experimental group 1 (obligatory group), and quasi-experimental group 2 (optional group).

Instead, an alternative analysis that is appropriate for the data at hand (e.g., Van Breukelen, 2013; Zhang et al., 2014) was applied, namely multivariate analysis of covariance (MANCOVA). Although the groups (optional group, obligatory group, and control group) were not found to significantly differ with respect to the four SRPs that were examined (critical thinking, metacognitive strategies, attention, and self-efficacy), it was chosen to control for possible pretest score differences. An a priori power analysis using the G-power software package was conducted following the instructions of Faul et al. (2007). To obtain a medium effect size ($f = 0.25$), with a significance level of alpha < .05, and a power of .80, a MANOVA (special effects and

interactions) with the four SRPs that were examined as dependent variables (critical thinking, metacognitive strategies, attention, and self-efficacy), the four entrance level SRPs (critical thinking, metacognitive strategies, attention, and self-efficacy) as covariates, and the groups (optional group, obligatory group, and control group) as a fixed factor, required a minimum sample size of 52. Therefore, a sample size of 108 participants was concluded to be sufficient for a MANCOVA. Post hoc comparisons using the Bonferroni correction were conducted to analyze the differences between the control group and the quasi-experimental groups (optional group and obligatory group). It must be remarked that a Bonferroni correction is assumed to result in greatly diminished power (e.g., Narum, 2006). Therefore, if the Bonferroni correction might fail to show a significant difference between groups, whereas MANCOVA did, post hoc comparisons using Least Significant Differences (LSD) were also conducted.

Table 5.4 Means (*M*), Standard Deviations (*SD*), F-ratio's (*F*), and partial eta squared $(\eta_p)^2$ self-regulatory processes as measured after the first nine months of study, for the quasi-experimental groups (optional group and obligatory group) and the control group (*N* = 108) (posttest)

Self-regulatory processes[a]	**Posttest scores self-regulatory processes[a]**			**Multivariate analysis of covariance[b]**		
	Control Group *n* = 23	**Optional[b] group *n* = 29**	**Obligatory[c] group *n* = 56**			
	M (SD)	***M (SD)***	***M (SD)***	***F (2, 105)***	***p***	η_p^2
1. Critical thinking	4.32 (.75)	4.61 (.96)	4.48 (.86)	0.34	.716	.01
2. Metacognitive strategies	4.27 (.71)	4.69 (.99)	4.39 (1.05)	1.23	.296	.02
3. Attention	4.12 (.86)	4.79 (.84)	4.40 (.88)	3.35	.039*[de]	.06
4.Self-efficacy	5.32 (.65)	5.43 (.96)	5.45 (.52)	0.47	.626	.01

[a]Freshman-rated self-regulatory processes (SRPs): Likert items 1 (totally disagree) -7 (totally agree)

[b]Entrance-level SRPs as covariates showed no significant effects

[c]the mentors in the optional group were advised by the researchers to implement certain SRP-interventions, based on their freshmen self-assessment of entrance-level SRPs: The mentors were free to choose to implement these SRP-interventions or not, and/or to implement other SRP-interventions

[c]the mentors in the obligatory group agreed to implement the SRP-interventions based on their freshmen self-assessment of entrance-level SRPs, as advised by the researchers to be most helpful for improving their freshmen performance

[d]Post hoc comparisons using the Bonferroni correction showed no significant difference between the quasi-experimental groups (optional group and obligatory group), and the control group

[e]Post hoc comparisons using Least Significant Difference showed a significant difference between the optional group and the control group (p = .032) and a significant difference

between the optional group and the obligatory group (p = .021).

*p < 0.05, **p < 0.001

A MANCOVA was conducted, treating the four SRPs at the posttest (critical thinking, metacognitive strategies, attention, and self-efficacy) as dependent variables, the entrance-

level SRPs (critical thinking, metacognitive strategies, attention, and self-efficacy, measured at pretest) as covariates, and the intervention (optional group, obligatory group, control group) as a fixed factor. Subsequently, MANCOVA was used to estimate to what extent the quasi-experimental groups (optional group and obligatory group) differed significantly with respect to SRPs at the posttest which were meant to be improved by the SRP-interventions as used in the present study: metacognitive strategies and attention (RQ2), when compared to the control group. At the same time, it was checked whether the quasi-experimental groups (optional group and obligatory group) differed with respect to the SRPs critical thinking and self-efficacy, which were *not* meant to be improved by the SRP-interventions as used in the present study.

The MANCOVA showed that the quasi-experimental groups (optional group and obligatory group) significantly differed with respect to attention (p = .039; See Table 5.4). Post hoc comparisons using the Bonferroni correction showed no significant difference between the quasi-experimental groups (optional group and obligatory group), and the control group. However, post hoc comparisons using Least Significant Differences showed that the freshmen in the optional group had a significant higher score at the posttest on attention, in other words on the ability to stay focused during training (M = 4.79, SD = .84), when compared to the control group (M = 4.12, SD = .86; p = .032). Furthermore, from the post hoc comparisons using Least Significant Differences it could be concluded that the optional group (M = 4.79, SD = .84) outperformed the obligatory group (M = 4.40, SD = .88; p = .021) with respect to the ability to stay focused during training.

Differences in self-regulatory processes as measured at the posttest between the altered groups (freshman-directed group, mentor-directed group, and control group) (RQ3)

All freshmen in the quasi-experimental groups (optional group and obligatory group) had received their pretest scores and general information on how SRPs might be improved. Only if freshmen scored below the 25th percentile on one or more SRPs, they were specifically recommended to follow up one or more SRP-interventions to improve the SRP(s) involved. Table 5.5 shows exactly how many freshmen had received recommendations for improving SRPs and how many freshmen indeed improved their SRPs, according to themselves. The results show that 50 of the 108 freshmen had reported that SRP-interventions had (generally) pro-actively initiated and implemented, either by themselves (n = 30), or in cooperation with their mentor (n = 20). 18 freshmen had received recommendations to improve one or more SRPs but reported not to have followed up on these recommendations. However, 28 freshmen reported to have pro-actively initiated and implemented SRP-interventions without being specifically advised to improve one or more of their SRPs.

Table 5.5 Recommendation of SRP-interventions versus factual implementation of these SRP-interventions, according to the freshmen involved (*N* = 108)

Recommendation to implement SRP-intervention	Factual implementation of SRP-intervention(s), according to the freshman		
	No	Freshman-directed[a]	Mentor-directed[b]
	n (%)	*n* (%)	*n* (%)
No implementation recommendation, belonged to the control group	23 (40)	0 (0)	0 (0)
No implementation recommendation, belonged to a quasi-experimental group	17 (29)	16 (53)	12 (60)
Implementation recommendation, belonged to a quasi-experimental group	18 (31)	14 (47)	8 (40)
Total *N* = 108 (100)	**58 (100)**	**30 (100)**	**20 (100)**

[a]Freshmen who reported indeed to have implemented SRP-interventions, on their own
[b]Freshmen who reported indeed to have implemented SRP-interventions, with their mentor

Subsequently, again freshmen SRPs during the posttest were analyzed, this time, however, using an altered composition of the quasi-experimental groups (freshman-directed group and mentor-directed group) and the control group (See Table 5.6). That is, freshmen who either belonged to the control group or who had reported not to have worked with the SRP-interventions, were re-assigned to the control group (n = 58). The group of freshmen, who had filled out that they indeed had implemented SRP-interventions themselves was re-labeled as the 'freshman-directed' group (n = 30). The group of freshmen, who reported indeed to have implemented SRP-interventions, with their mentor, was re-labeled as 'mentor-directed' group (n = 20). A MANCOVA was conducted, treating the SRPs at posttest as the dependent variables (critical thinking, metacognitive strategies, attention, and self-efficacy). In addition, the variable Educational Program & University of Applied Sciences was included as a covariate, and the altered intervention (freshman-directed group, mentor-directed group, control group) as a fixed factor (RQ3).

Table 5.6 shows that with respect to the two SRPs that initially were meant to be improved by SRP-interventions (metacognitive strategies and attention), in the altered quasi-experimental groups (freshman-directed group and mentor-directed group) and the control group significantly differed with regard to metacognitive strategies (consisting of planning, monitoring, and time management), p = .011. The covariate Educational Program & University of Applied Sciences showed no significant effects. Post hoc comparisons using the Bonferroni correction showed that the freshmen in the mentor-directed group had a significantly higher score on metacognitive strategies. To be specific, the freshmen in the mentor-directed group (M = 5.05, SD = .87) significantly outperformed the freshmen in the control group (M = 4.38, SD = .92) with respect to metacognitive strategies (consisting of planning, monitoring, and time management), p =

.048). The finding that freshmen in the mentor-directed group outperformed the freshmen in the student-directed group with respect to metacognitive strategies was confirmed by post hoc comparisons using Least Significant Differences ($p = .016$). In addition, post hoc comparisons using Least Square Differences found the freshmen in the mentor-directed group and the control group to be significantly different with respect to metacognitive strategies, $p = .049$, with the freshmen in the mentor-directed group ($M = 5.05$, $SD = .87$) significantly outperforming the freshmen in the control group ($M = 4.38$, $SD = .92$).

With respect to the SRPs that were *not* meant to be improved by the SRP-interventions in the current study, it was found that these SRPs indeed were not improved (critical thinking and self-efficacy).

Table 5.6 Means (*M*), Standard Deviations (*SD*), F-ratio's (*F*), and partial eta squared $(\eta_p)^2$ self-regulatory processes as measured after the first nine months of study for the altered quasi-experimental groups (freshman-directed group and mentor-directed group) and the control group ($N = 108$) (posttest)

Self-regulatory processes[a]	**Posttest scores self-regulatory processes[a]**			**Multivariate analysis of covariance[bc]**		
	Control Group *n* = 58	**Freshman-directed[d] group *n* = 30**	**Mentor-directed[e] group *n* = 20**			
	M (SD)	***M (SD)***	***M (SD)***	***F (2, 105)***	***p***	η_p^2
1. Critical thinking	4.43 (.89)	4.43 (.84)	4.72 (.81)	0.51	.600	.01
2. Metacognitive strategies	4.38 (.92)	4.16 (1.00)	5.05 (.87)	4.77	.011*[fg]	.09
3. Attention	4.33 (.88)	4.49 (.97)	4.78 (.72)	0.86	.426	.02
4. Self-efficacy	5.38 (.57)	5.34 (.91)	5.63 (.58)	2.33	.103	.05

[a]Freshman-rated self-regulatory processes (SRPs): Likert items 1 (totally disagree) -7 (totally agree)
[b]Entrance-level SRPs as covariates showed no significant effects
[c]Educational program & University of Applied Sciences as a covariate showed no significant effects
Categories of Educational program & University of Applied Sciences were:
-Occupational Therapy & University of applied Sciences A
-Occupational Therapy & University of Applied Sciences B
-Physiotherapy & University of Applied Sciences B
-Midwifery & University of Applied Sciences B
[d]Freshmen who reported indeed to have implemented SRP-interventions, on their own
[e]Freshmen who reported indeed to have implemented SRP-interventions, with their mentor
[f]Post hoc comparisons using the Bonferroni correction showed a significant difference between the freshman-directed group and the mentor-directed group)
, and the control group ($p = .048$)
[g]Post hoc comparisons using Least Significant Difference showed a significant difference between the freshman-directed group and the mentor-directed group ($p = .016$)
and a significant difference between the control group and the mentor-directed group ($p = .049$)
*$p < 0.05$, **$p < 0.001$

Differences in freshmen performance between the groups (optional group, obligatory group, and control group) (RQ4)

Finally, the current study questioned to what extent the quasi-experimental groups (optional group and obligatory group) differed from the control group, in their academic performance, as measured after the first year of study (RQ4). Table 5.7 provides the numbers and percentages of freshmen leavers, delayers and completers for the quasi-experimental groups (optional group and obligatory group) and the control group. An ANOVA on freshmen performance (delay/leaving versus first-year completion) including all participants who had filled out the pretest (N = 204) yielded a significant main effect of quasi-experimental condition on freshmen completion, F (2, 201) = 3.25, p = .041. Post hoc comparisons using the Bonferroni correction indicated that the obligatory group and the optional group differed significantly on their freshmen performance (delay/leaving versus first-year completion). That is, the freshmen in the obligatory group had a significantly lower probability to leave during their first year of study (n = 22 (28%)), than the freshmen in the optional group (n = 49 (64%)).

Also, an ANOVA on freshmen performance with respect to the freshmen in the quasi-experimental groups (optional group and obligatory group) who had filled out both the pretest and posttest (N= 108), yielded a significant main effect of quasi-experimental condition on freshmen performance (delay/leaving versus first-year completion), F (2, 105) = 5.95, p = .004. Again, post hoc comparisons using the Bonferroni correction indicated that the obligatory group and the optional group differed significantly from each other on their freshmen performance (delay/leaving versus first-year completion). That is, the freshmen in the optional group had a significantly lower probability to be delayed (n = 10 (34%)), than the freshmen in the obligatory group (n = 39 (70%)).

Differences in freshmen performance between the altered groups (freshman-directed group, mentor-directed group, and control group) (RQ5)

Table 5.7 shows that the number and percentage of freshmen-completers is *not* higher in the altered intervention groups (freshman-directed group; n = 12 (40%), mentor-directed group; n = 7 (35%)), when compared to the control group; n = 30 (52%). In addition, a higher percentage of freshmen in the altered intervention groups delayed or left their educational program (freshman-directed; n = 18 (60%), mentor-directed; n = 13 (65%), when compared to the control group; n = 28 (48%). ANOVA-analyses did not show significant differences in freshmen performance between the altered groups (freshman-directed group, mentor-directed group, and control group).

Table 5.7 Freshmen performance per group on the pretest and the posttest

Participants pretest *(N* = 204)	**Leaver *n* (%)**	**Delayer *n* (%)**	**Completer *n* (%)**
Control group (*n* = 49)	27 (55)	9 (18)	13 (27)
Optional group (*n* = 77)	49 (64)	9 (12)	19 (25)
Obligatory group (*n* = 78)	22 (28)	39 (50)	17 (22)
Participants pretest and posttest *(N* =108) initial quasi-experimental pretest-posttest design with control group	**Leaver or delayer *n* (%)**		**Completer *n* (%)**
Control group (*n* = 23)	10 (43)		13 (57)
Optional group (*n* = 29)	10 (34)		19 (66)
Obligatory group (*n* = 56)	39 (70)		17 (30)
Participants pretest and posttest *(N* =108) altered quasi-experimental pretest-posttest design with control group	**Leaver or delayer *n* (%)**		**Completer *n* (%)**
Control group (*n* = 58)	28 (48)		30 (52)
Freshman-directed group (*n* = 30)	18 (60)		12 (40)
Mentor-directed group (*n* = 20)	13 (65)		7 (35)

Discussion

The main goal of this study was to determine whether providing freshmen and their mentors a report on freshmen entrance-level SRPs and SRP-recommendations would result in developing their SRPs and in better freshmen performance (delay/leaving versus first-year completion). The present study used a quasi-experimental pretest posttest design with a control group in the context of higher professional education. Freshmen self-assessed entrance-level SRPs, and SRP-recommendations were provided to the freshmen themselves and their mentors in two quasi-experimental groups. That is, in the obligatory group, the mentors were obligated to apply the SRP-interventions as recommended, and in the optional group, the mentors were free to choose whether to follow up the recommendations or not, or to apply their own SRP-interventions instead. In the control group, neither the freshmen nor their mentors received freshmen scores and no interventions were recommended.

The SRPs as examined in Study 4 were based on the results from Study 2. First, it was examined to what extent the freshmen in the quasi-experimental groups (optional group and obligatory group) differed from the freshmen in the control group, with respect to the development of their metacognitive strategies and attention during their first nine months of study, when controlling for their pretest scores. MANCOVA showed that the freshmen in the optional group significantly outperformed both the freshmen in the obligatory group and the control group with respect to the degree to which they stayed focused during training (attention). Critical thinking and self-efficacy, two SRPs that were *not* meant to be improved, indeed were not.

Second, it was examined to what extent SRP-interventions indeed had been followed up, as reported by the freshmen themselves. 18 freshmen reported not to have followed up the advice as written in their entrance-level SRPs report. However, another 28 freshmen filled out to have worked with the interventions, although they had not scored on any SRPs below the 25th percentile and thus had not received recommendations for improvement. Based on these results, the group of freshmen who reported to have pro-actively initiated and implemented the SRP-interventions themselves were re-labeled as freshman-directed. Freshmen who filled out to have worked with the SRP-interventions, with their mentor, were re-labeled as mentor-directed. The freshmen who had reported not to have applied the SRP-interventions were re-assigned to the control group. This time MANCOVA showed that the freshmen who had reported to have applied SRP-interventions with their mentor significantly outperformed the freshmen in the student-directed group and in the control group with respect to metacognitive strategies (consisting of planning, monitoring and time management), at posttest. In this MANCOVA was controlled for educational program (occupational therapy, physiotherapy, and midwifery) & University of Applied Sciences (A or B), and for the entrance-level SRPs. Again, critical thinking and self-efficacy, two SRPs that were not meant to be improved, indeed were not. Apparently, the mere availability of recommendations for how to improve one's SRPs regardless of the freshmen pretest SRP-scores implied that freshmen pro-actively together with their mentors were willing and able to improve their metacognitive strategies.

After one year of study, the optional group consisted of significantly less freshmen delayers than the obligatory group. Thus, the optional group seems to have outperformed the obligatory group with respect to freshmen performance (delay/leaving versus first-year completion). However, with respect to freshmen retention, it must be concluded that the obligatory group significantly had outperformed the optional group. This finding is in line with De Boer et al. (2014) who concluded in their meta-analysis that researcher-based interventions (interventions as implemented by the researcher) had more effect on academic performance than teacher-based interventions (interventions as implemented by the teacher). In contrast, the participants in the optional group had a higher probability to complete their first year of study in time, when compared to either the obligatory group or the control group. Possibly, retaining more freshmen, when compared to the other groups, has led to more delayers in the obligatory group. For it seems plausible that freshmen whose mentors in the obligatory group had prevented them to leave, accordingly had a heightened risk of delaying their studies.

Limitations

A first limitation of the current study is that environmental structuring and effort, two SRPs that were meant to be improved by the intervention, were reliably measured in study 2, but unfortunately were insufficiently reliably measured in the current study. As a consequence,

environmental structuring and effort had to be excluded from further analyses. In future research the reliability of these scales needs to be further improved.

A second limitation of the current study is the modest sample size. After nine months of study, 96 of the freshmen who had filled out the pretest (N = 204) had already left their educational program. This resulted in only 108 participants who had completed the quasi-experiment. Research with larger samples is needed to establish under what conditions the implementation of SRP-interventions, by freshmen and by their mentors, might affect exactly which SRPs, and might affect freshmen retention, and freshmen performance (delay/leaving versus first-year completion).

A third limitation of the present study is that excluding the unreliable scales (environmental structuring and effort), implied that only two SRPs remained that were meant to be improved by the SRP-interventions (metacognitive strategies and attention), of which only attention was found to significantly differ at the posttest. That is, freshmen who belonged to the optional group significantly outperformed the freshmen in the obligatory group and in the control group with respect to attention (the degree to stay focused during training). Furthermore, it was checked if the freshmen in the quasi-experimental groups (optional group and obligatory group) and the control group differed after they were reshuffled according to the extent that they had reported to have worked with the SRP-interventions. The freshmen who reported to have worked with the SRP-interventions, either on their own or with their mentor, significantly differed from the freshmen in the freshman-directed group and in the control group with respect to one SRP: metacognitive strategies (consisting of planning, monitoring, and time management).

In summary, after excluding the unreliable SRPs (environmental structuring and effort) the findings show an impact of the intervention with respect to the two SRPs that were meant to be improved, namely metacognitive strategies and attention. It was expected that SRPs would develop by giving freshmen and their mentors insight in their entrance-level SRPs and by recommending freshmen and their mentors SRP-interventions for better freshmen performance (delay/leaving versus first-year completion). However, given the initial composition of groups (optional group, obligatory group, and control group), the intervention only resulted in a significant impact on attention. An altered composition of the quasi-experimental groups (optional group and obligatory group) and the control group, based on the extent to which freshmen self-reported to have worked with the SRP-interventions, with or without their mentor, implied a significant impact on metacognitive strategies. To speak with Hattie et al. (1996), the interventions of the current study were meant to improve entrance-level SRPs for better freshmen performance (delay/leaving versus first-year completion), but they might not have had the effect as intended if they did not meet the freshmen needs and/or the learning environment which they engaged in. The results do not show that the SRP-interventions in the present study do not fit the freshmen needs. On the contrary, the findings implied that regardless

of the freshmen pretest SRP-scores freshmen pro-actively were willing and able to improve their metacognitive strategies, together with their mentors. Possibly, freshmen entrance-level SRP-reports and customized SRP-interventions for better freshmen performance (delay/leaving versus first-year completion) did not fit the mentors well. Namely, the first researcher frequently had been told by the mentors that they had appreciated the entrance-level SRP-reports and the SRP-interventions, but that they could not guarantee to have enough time to speak with their freshmen about their entrance-level SRPs and to execute the intervention. The first researcher tried to coach the mentors with this respect, for example by clustering freshmen with similar scores, so that they could be coached at the same time, during a regular group meeting. However, this may not have been helpful enough to apply the SRP-interventions in practice, as intended.

The following recommendations for future research can be formulated based on the present study. Before conducting new research on SRP-interventions, SRPs and freshmen performance (delay/leaving versus first-year completion) in higher professional education, it is important that mentors have enough time available in the curriculum for working with these SRP-interventions together with their freshmen. Furthermore, it would be valuable if the researcher would be allowed to visit the mentors when they apply SRP-interventions in practice. At the same time, when visiting mentors in the field, coaching on the job to mentors may be offered. Finally, observations of how mentoring with respect to SRPs is realized in the field, may give researchers more insight in how to set up additional training to mentors for identifying freshmen SRPs and intervening.

Appendix 1

Means, Standard Deviations, Coefficient alphas, and Pearson correlations among all variables at pretest, with regard to the freshmen who filled out both the pretest and posttest (*N* = 108) T1

Self-regulatory processes[a] 1-11 (number of items) Background variables 12-16	*M*[b]	*(SD)*[c]	α[d]	1	2	3	4	5	6	7	8	9	10	11	FP[e]
1. Goal-Setting (4)	2.74	(.99)	.66	-	-.34**	-.37**	-.39**	-.12	-.32**	-.30**	-.41**	.15	-.18*	-.04	.05
2. Critical thinking (6)	4.54	(.99)	.81		-	.63**	.50**	.58**	.45**	.45**	.27**	-.18*	.44**	.33**	-.07
3. Metacognitive strategies (10)	4.50	(.91)	.78			-	.64**	.50**	.64**	.56**	.29**	-.27**	.39**	.22*	.12
4. Learning strategies (6)	4.51	(.97)	.73				-	.42**	.56**	.54**	.48**	-.31**	.37**	.14	.02
5. Attention (5)	4.66	(.82)	.60					-	.33**	.33**	.21*	-.17*	.29**	.41**	-.03
6. Environmental structuring (3)	5.52	(1.04)	.62						-	.50**	.40**	-.15	.48**	.19*	.10
7. Motivation (8)	6.04	(.62)	.81							-	.51**	-.26**	.62**	.39**	.02
8. Effort (3)	3.44	(.72)	.53								-	.03	.44**	.25**	-.04
9. Help-seeking (6)	4.83	(.77)	.54									-	-.07	.14	-.01
10. Attributions (3)	5.97	(.67)	.57										-	.58**	.13
11. Self-efficacy (8)	5.34	(.66)	.82											-	.04
12. Age	19.74	(2.75)		-.06	.23**	.21*	.21*	.25**	.21*	.24**	.04	-.27**	.15	.22**	.10
13. Gender[f]	.70	(.46)		.04	-.06	.12	-.09	-.10	.09	.09	-.03	-.06	.04	-.16	.18*
14. Ethnicity[g]	.95	(.21)		-.01	-.16	-.11	-.01	-.06	-.06	-.10	.13	.03	-.08	.06	.02
15. Physical/mental limitation[h]	.82	(.38)		.00	.09	.07	.24**	.18*	.16*	.16*	.20*	-.18*	.36**	.24**	.13
16. Pre-tertiary education level[i]	1.87	(.66)		.14	-.15	-.22*	-.17*	-.10	-.13	-.15	-.12	-.28**	.05	.06	.12

*$p < 0.05$, **$p < 0.001$, [a]Freshman-rated self-regulatory processes (SRPs): Likert items 1 (totally disagree) -7 (totally agree), [b]Mean (*M*), [c]Standard Deviation (*SD*), [d]Coefficient alpha (α), [e]FP: Freshmen Performance: Freshman leaver/freshman delayer = 0, Freshman completer = 1, [f]gender: male = 0, female = 1, [g]ethnicity: member of an ethnic minority group = 0, member of an ethnic majority group = 1, [h]physical/mental limitation: yes = 0, no = 1,[i]pre-tertiary education level: intermediate vocational education = 1, higher secondary vocational education = 2, pre-university education = 3

Appendix 2

Means, Standard Deviations, Coefficient alphas, and Pearson correlations among all variables at posttest, with regard to the freshmen who filled out both the pretest and posttest (*N* = 108) T2

Self-regulatory processes[a] 1-11 (number of items) Background variables 12-16	*M*[b]	*(SD)*[c]	α[d]	1	2	3	4	5	6	7	8	9	10	11	FP[e]
1. Goal-Setting (4)	5.16	(1.00)	.69	-	.30**	.30**	.42**	.19*	.17*	.36**	.40**	.15	.28**	.09	.09
2. Critical thinking (6)	4.48	(.86)	.81		-	.51**	.51**	.46**	.16*	.41**	.16	.14	.27**	.40**	.16*
3. Metacognitive strategies (10)	4.44	(.97)	.84			-	.48**	.44**	.41**	.43**	.31**	.10	.32**	.33**	.20*
4. Learning strategies (6)	4.38	(.91)	.72				-	.39**	.43**	.46**	.53**	.21*	.31**	.23**	.23**
5. Attention (5)	4.45	(.89)	.65					-	.33**	.34**	.12	.03	.21*	.36**	.10
6. Environmental structuring (3)	5.49	(.91)	.53						-	.43**	.38**	.11	.46**	.25**	.05
7. Motivation (8)	5.74	(.78)	.87							-	.41**	.37**	.56**	.43**	.16*
8. Effort (3)	5.88	(1.09)	.76								-	.28**	.13	.11	-.20*
9. Help-seeking (6)	5.16	(.93)	.76									-	.38**	.14	.06
10. Attributions (3)	5.81	(.77)	.70										-	.52**	.16
11. Self-efficacy (8)	5.41	(.68)	.81											-	.15
12. Age	19.74	(2.75)		.03	.45**	.30**	.25**	.25**	.06	.23**	-.02	-.03	.14	.32**	.18*
13. Gender[f]	.95	(.21)		.01	-.11	-.01	.01	-.24**	-.01	.10	.10	-.05	-.05	-.21*	.18*
14. Ethnicity[g]	.82	(.38)		.05	-.16	-.07	-.10	-.05	.03	-.13	.12	-.03	.04	.01	-.07
15. Physical/mental limitation[h]	1.87	(.66)		.11	.11	.18*	.14	.14	.11	.13	.13	.04	.24**	.23**	.13
16. Pre-tertiary education level[i]	.70	(.46)		-.03	-.12	-.11	-.10	-.02	-.07	-.08	.03	-.00	.16	.14	.13

*p <0.05, **p < 0.001, [a]Freshman-rated self-regulatory processes (SRPs): Likert items 1 (totally disagree) -7 (totally agree), [b]Mean (*M*), [c]Standard Deviation (*SD*), [d]Coefficient alpha (α), [e]FP: Freshmen Performance: Freshman leaver/freshman delayer = 0, Freshman completer = 1, [f]gender: male = 0, female = 1, [g]ethnicity: member of an ethnic minority group = 0, member of an ethnic majority group = 1, [h]physical/mental limitation: yes = 0, no = 1,[i]pre-tertiary education level: intermediate vocational education = 1, higher secondary vocational education = 2, pre-university education = 3

CHAPTER 6

Summary and Discussion

Summary and Discussion

The extent to which students can effectively manage their learning has an effect on their academic performance. For example, if students have to study for a particular examination, they need to plan specific study moments in their learning. Moreover, these students need to focus on actually studying at the moments planned, without giving in to distractions. Even if a student finds it difficult to study, he/she needs to continue believing in his/her learning capability and has to persist. This example reflects what researchers have consistently reported since the 1980s: That self-regulated learning (SRL) benefits academic performance (e.g., Dignath & Buettner, 2008; Dignath, Buettner, & Langfeldt, 2008; Hattie, Biggs, & Purdie, 1996).

Self-regulated learning refers to applying self-regulatory processes (SRPs) for learning, such as planning, effort, and students' belief in their learning capability (self-efficacy) to learn in a successful manner (Boekaerts & Niemiverta, 2000; Pintrich, 2000; Sitzmann & Ely, 2011; Winne, 2011; Zimmerman, 2000a). Over the years an extensive amount of knowledge has accumulated on how to improve SRPs and, consequently, academic performance. However, research also suggests that freshmen leave higher education due to insufficient usage of SRPs (Gomes, 2016; Herweijer & Turkenburg, 2016; Poulussen & Roseval, 2016). In the study of Gomes, the Herweijer and Turkenburg study, and the Poulussen and Roseval study, the freshmen retrospectively reported the reasons why they had left their educational program. The freshmen reported as one of the reasons for their study delay/leaving: A shortcoming in SRPs, such as planning and learning strategies. At the same time, these freshmen reported that their mentors had not identified shortcomings in their SRPs in due time.

The current dissertation examines to what extent mentors do assess their freshmen SRPs for academic performance properly/adequately, and how to improve freshmen entrance-level SRPs for better academic performance. In the search for freshmen SRPs that need to be identified by their mentors, it became clear that the current literature uses numerous SRPs with different definitions, thereby complicating the process of comparing the studies (Boekaerts, Pintrich, & Zeidner, 2000). As a result, it remains unclear which SRPs relate to academic performance in higher education. Therefore, this dissertation started with an overview study on SRPs and effective learning in higher education, which formed the first of four studies. These studies were conducted to answer the following four research questions:

1. *Which SRPs best predict academic performance in higher education?*
2. *Which of the SRPs that best predict academic performance in higher education are also the strongest predictors of freshmen retention?*
3. *What are the predictive values of mentor-rated and freshman-rated entrance-level SRPs, up and above freshmen background variables (age, gender, ethnicity, physical/mental limitation, and pre-tertiary education level) with respect to freshmen performance, and how might these be combined to optimally predict freshmen delay/leaving?*

4. *To what extent can freshmen performance benefit from the improvement of entrance-level SRPs?*

This dissertation contributes to earlier research on self-regulated learning and academic performance in higher professional education by offering insight into which freshmen entrance-level SRPs need to be identified and improved, to achieve better freshmen performance (delay/leaving versus first-year completion). Subsequently, this dissertation examined whether and how offering freshmen and their mentors recommendations for SRP-interventions, based on freshmen self-assessed entrance-level SRP, may improve their SRPs and consequently their performance (delay/leaving versus first-year completion).

Below, a summary is presented of the main results followed by an overview of the theoretical and practical implications of the four studies. This chapter closes by discussing the methodological limitations of the four studies and by presenting some recommendations for further research.

Summary of the main results

The main findings of the four studies are discussed below by addressing the four research questions presented above.

Research question 1: *Which self-regulatory processes best predict academic performance in higher education?*

The first study was a systematic review of the empirical literature (Chapter 2) to gain insight into which SRPs best predict academic performance in higher education. Earlier meta-analyses (Dignath & Buettner, 2008; Dignath, Buettner, & Langfeldt, 2008; Hattie, Biggs, & Purdie, 1996) had described SRL in a holistic fashion, without unraveling SRL into separate SRPs. Furthermore, these meta-analyses focused on the impact of SRL-interventions on SRL and on academic performance, measuring both SRL and academic performance as separate learning outcomes. In 2011, Sitzmann and Ely published a meta-analysis that investigated SRL by breaking them down into separate SRPs, and then they examined to what extent these predicted adult learning, namely in college education and work-related training transfer (Sitzmann & Ely, 2011). These authors defined training transfer as the permanence of trained skills once trainees had left the learning environment.

The 13 SRPs which in the systematic review were found to predict learning outcomes in higher education are presented in Table 6.1. In search for the SRPs that facilitate effective learning in higher education, the systematic review was guided by the framework of SRPs for adult learning as proposed by Sitzmann and Ely (2011). With respect to Table 6.1, note that Sitzmann and Ely had not established help-seeking as a predictor for learning. In contrast with

Table 6.1, Sitzmann and Ely originally proposed to examine planning, monitoring, learning strategies, and metacognition (in Table 6.1 metacognition is labeled as 'critical thinking') as one multidimensional SRP: metacognitive strategies.

Table 6.1 Self-regulatory processes that according to earlier publications predict successful learning, definitions as used in the current study

Self-regulatory process	Definition
Initiator for self-regulated learning	
1. Goal-setting	Self-set performance goal level (Locke & Latham, 2002).
Processes that students use for goal-achieving	
2. Critical thinking	The establishment of reasoned judgments (Beyer, 1987).
3. Planning[a]	The planning of learning activities, both short-term and long-term.
4. Monitoring[a]	The controlling and rescheduling of planning activities when needed.
5. Learning strategies	The strategies students apply to learn the study content. This includes knowing how to study and making decisions about the use of study tactics (e.g. summarizing, underlining, rereading) (Gettinger & Seibert, 2002).
6. Attention	The degree to which students stay focused during training (Zimmerman, 2000b).
7. Time management[a]	Applying a time-schedule for learning, leisure, and unexpected things, such as sickness.
8. Environmental structuring	Choosing a study location that is fruitful for learning (Pintrich, 2000).
9. Motivation	The willingness to learn (Noe, 1986; Noe & Schmitt, 1986; Pintrich et al. 1991).
10. Effort	The time that students devote to their learning (Zimmerman & Risenberg, 1997).
11. Help-seeking	The degree to which students actively seek assistance when they experience academic difficulties (Pintrich et al., 1991).
Students' learning beliefs	
12. Attributions	Students' beliefs about the causes of their study progress (Zimmerman, 2000b).
13. Self-efficacy	Students' beliefs regarding their learning capability (Bandura, 1977).

Note: The items used were either copied from or based on a Dutch translation of the Motivated Strategies for Learning Questionnaire; MSLQ (Van den Boom, Paas, & Van Merriënboer, 2007), from the original MSLQ as developed by Pintrich, Smith, Garcia, & McKeachie (1991), or formulated by the authors of the current study.

[a]Study 2 concluded that planning, monitoring, and time management are best measured as one multidimensional self-regulatory process: metacognitive strategies.

The systematic review (Chapter 2) revealed that in all the included studies (k = 10; N = 906) three of the nine SRPs as distinguished by Sitzmann and Ely (2011) had been investigated: metacognitive strategies, motivation, and self-efficacy. The remaining six SRPs had not been examined: goal-setting, attention, time management, environmental structuring, effort, and

attributions. In addition, it was concluded in the systematic review that the SRPs planning, monitoring, learning strategies, and metacognition, which Sitzmann and Ely (2011) had labeled as one SRP (metacognitive strategies) could also be adequately examined as four separate SRPs (planning, monitoring, learning strategies, and metacognition). Finally, in the systematic review was found that another SRP predicted learing outcomes as well, that is help-seeking. In summary, this systematic review found 13 SRPs to be predictive of learning outcomes (See Table 6.1).

Seven studies showed a positive effect of SRPs on learning outcomes, whereas three studies did not include any SRPs that were related to learning outcomes. However, both the effect sizes for the development of SRPs and the effect sizes for learning outcomes were found to be positive in the studies included. Therefore, it is likely that the SRPs studied would relate positively to learning outcomes if only this had been investigated.

Research question 2: *Which of the SRPs that best predict academic performance in higher education are also the strongest predictors of freshmen retention?*

Study 2 was an empirical investigation of this specific question (Chapter 3). Depending on whether the intended outcome is academic performance (Richardson et al., 2012; Robbins et al., 2004), training transfer (Sitzmann & Ely, 2011), or student retention (Black, 2008; Robbins et al., 2004), the literature suggests that different SRPs have a stronger influence. Study 2 built on Study 1, which resulted in 13 SRPs (See Table 6.1) that specifically predict effective learning in higher education, despite of the specific dependent variable (e.g., grade point average, training transfer).

Among a sample of 213 freshmen in Dutch higher professional education who studied occupational therapy, Study 2 explored which of these 13 SRPs would constitute the best predictors of freshmen retention. At the start of the academic year, the freshmen were asked to fill out to what respect they applied SRPs, on 7-point Likert-type scales, ranging from 1 (totally disagree) to 7 (totally agree). The Dutch version of the Motivated Strategies for Learning Questionnaire (MSLQ) by Van den Boom, Paas, and Van Merriënboer (2007), translated from the original MSLQ by Pintrich, Smith, Garcia, and McKeachie (1991), was found to provide reliable measures for the SRPs. Black (2008) already reported the MSLQ to be valuable for describing freshmen competencies in university education with regard to SRPs for the retained freshmen, compared to the non-retained. (Detailed information regarding which items were based on the (Dutch) MSLQ, and which items were self-formulated by the authors, can be obtained from the present author.) Subsequently, the questionnaire that was used in the dissertation was named the Self-Regulated Learning Processes Questionnaire (SRLPQ). At the start of the academic year, freshmen were also requested to fill out an informed consent form if they allowed the first researcher to obtain their study progress data after their first year of study. These study progress data consisted of information with regard to which freshmen

had completed their first year of study in time, which freshmen had delayed their educational program, and which freshmen had left during the first year of study.

Principal component analysis of the SRLPQ showed that component 1 represented a clustering of three aspects, namely planning, monitoring, and time management. Hence, this component was named metacognitive strategies. By clustering the SRPs planning, monitoring, and time management into the SRP metacognitive strategies, the initial 13 SRPs as measured in Study 2, were reduced to 11 SRPs (See also Table 6.1).

A hierarchical binary logistic regression analysis showed that the SRPs metacognitive strategies, attention, motivation, and effort most strongly and positively predicted freshmen retention (Nagelkerke $R^2 = .16$), when controlling for freshmen educational program, gender, ethnicity, and pre-tertiary education level. These results implied that freshmen with better metacognitive strategies, attention, motivation, and effort at entrance level, had a heightened probability to be retained after the first year of study. The SRP critical thinking also predicted freshmen retention, but negatively, meaning that freshmen who had rated themselves to be higher critical thinkers had a heightened probability to leave or delay their first year of study. This latter finding is in line with Black's (2008) study, who also found that higher critical thinkers in college education had a lower probability to be retained after one year of study.

Thus, in this empirical study, the entrance-level SRPs that were found to best predict freshmen retention (metacognitive strategies, attention, motivation, and effort) differed from those that in earlier studies (Richardson et al., 2012; Robbins et al., 2004; Sitzmann & Ely, 2011) were found to be most strongly related to grade point average/training transfer (goal-setting, effort, and self-efficacy), except for one: effort.

Research question 3: *What are the predictive values of mentor-rated and freshman-rated entrance-level SRPs, over and above freshmen background variables (age, gender, ethnicity, physical/mental limitation, and pre-tertiary education level) with respect to freshmen performance, and how might these be combined to optimally predict freshmen delay/leaving?*

Study 3 was an empirical study aimed to determine the predictive validities of mentor- and freshman-rated entrance-level SRPs, and freshmen background variables, and how these might be combined to optimally predict freshmen at risk (delay/leaving) (Chapter 4). Data were collected from a sample of 188 freshmen and their mentors ($N = 28$) in Dutch higher professional education. It must be noted that Study 3 was an extension of Study 2. That is, the freshmen completers and freshmen leavers who had self-rated their SRPs in Study 2 had been asked if they allowed their mentors also to rate their SRPs. If so, these freshmen were also included in Study 3. Finally, also freshmen delayers and their mentors participated in Study 3.

Of the 188 freshmen who participated in Study 3, 115 (61%) had delayed or left their

educational program during the first year of study, whereas 73 (39%) had completed their first year of study in time. Unfortunately, to our knowledge no (inter-)national data on freshmen performance (delay/leaving, versus first-year completion) in higher professional education are available. However, longitudinal research among freshmen during 2009 and 2013 at one Dutch Institution for higher professional education showed that, each year, only one out of four freshmen (25%) had completed their first year in time (Bajwa, 2016). Therefore, it could be concluded that the high base rate for freshmen delayers/leavers that was found in study 3 (61%) is roughly in line with earlier findings.

The high base rate for freshmen delayers/freshmen leavers (n = 115 (61%)) implied that it would have been more difficult to predict freshmen completion (n = 73 (39%)) than to predict freshmen delay/freshmen leaving. However, the results of Study 3 showed that mentors were better at predicting which freshmen would complete their first year of study, whereas freshmen themselves were better at determining their own risk for delaying/leaving. Study 3 therefore implies that informing mentors of the SRPs which are self-rated by their freshmen, can be helpful for these mentors, as this information will help them to identify any shortcoming in their freshmen SRPs so that they can try to intervene.

As expected, in line with earlier studies, Study 3 showed that freshmen background variables (age, gender, ethnicity, physical/mental limitation, and pre-tertiary education level) are predictive of their retention (e.g., Astin, 1975; Herweijer & Turkenburg, 2016; Meeuwisse, Severiens, & Born, 2010; Ooijevaar, 2010; Plemper, 2005). Obviously, mentors cannot change freshmen background variables to achieve better academic performance. However, Study 3 shows that, regardless of freshmen background variables, mentors might increase freshmen performance (delay/leaving versus first-year completion) by improving their engagement in SRPs.

Research question 4: *To what extent can freshmen performance benefit from the improvement of entrance-level SRPs?*

Although mentors in higher professional education are expected to identify shortcomings in their freshmen entrance-level SRPs and to intervene if needed, recent studies report that they have difficulty doing this in due time, preventing them to intervene (Gomes, 2016; Herweijer & Turkenburg, 2016; Poulussen & Roseval, 2016; Study 3). In Study 4, freshmen and their mentors in two quasi-experimental groups were informed by the researchers about the self-assessed SRPs by the freshmen during entrance in Dutch higher professional education. Subsequently, these freshmen and their mentors were recommended specific SRP-interventions to heighten their academic performance (delay/leaving versus first-year completion). Freshmen and their mentors in the control group were neither informed about the self-assessed SRPs at entrance, nor were they recommended SRP-interventions. Of the 204 freshmen who self-assessed their entrance-level SRPs (pretest), 108 (53%) also self-assessed their SRPs after the intervention,

nine months later (posttest).

Study 4 concerned a quasi-experimental pretest-posttest design with a control group. Data were collected from a sample of 204 freshmen in higher professional education who either studied occupational therapy, physiotherapy, or midwifery in the academic year 2014-2015. Similar to Study 2, freshmen entrance-level SRPs were measured with the SRLPQ in Study 4. That is, in Study 4, 204 freshmen filled out the SRLPQ at entrance-level (pretest). 108 (53%) of the 204 freshmen who had filled out the pretest, filled out the SRLPQ again, nine months later (posttest). Also similar to Study 2, freshmen study progress data were collected at the end of the first year of study (information on which freshmen had completed their first year of study in time, who had delayed/left their educational program) in Study 4.

Although SRL-interventions are considered to generally impact SRPs and academic performance in a moderate fashion (e.g., Hattie et al., 1996; Lazowski & Hulleman, 2016), Hattie et al. (1996) showed that, in particular, relational interventions have an effect on SRL and academic performance. With such interventions the authors imply interventions that are tailored to address each student's needs and/or that fit the learning environment in which the student engages. In line with the findings of Hattie et al. (1996), especially for those SRPs on which the freshman scored below the 25th percentile in Study 4, an intervention was offered to the freshman to improve each particular SRP (to address the freshmen needs). Accordingly, these interventions were labeled SRP-interventions. Furthermore, to fit the learning environment the freshmen engaged in, the SRPs for which freshmen were informed about their scores (if these were considered low) were specifically those SRPs that in earlier studies were found to be the strongest predictors for freshmen retention (Study 2) and freshmen performance (delay/leaving versus first-year completion) (Study 3). That is, all SRP-scales that were found to be predictive of freshmen retention and freshmen performance in Studies 2 and 3, initially were included in Study 4. The SRP-scales which either were found to be unreliable (environmental structuring, effort, help-seeking, and attributions), or significantly differed at pretest (goal-setting, learning strategies, and motivation) were excluded from further analyses. Subsequently, it was first expected that in the quasi-experimental groups (optional group and obligatory group), the interventions specifically should improve metacognitive strategies and attention. Second, it was expected that the two SRPs which were not targeted by the intervention (critical thinking and self-efficacy) should not show increased score-levels on the posttest.

The freshmen in the control group (n = 23) attended the formal curriculum. At the start of the educational program, the first researcher instructed the freshmen and their mentors in the quasi-experimental groups (optional group (n = 29) and obligatory group (n = 56)) in detail about the procedure, the SRPs and SRP-interventions. All the freshmen in the quasi-experimental groups (optional group and obligatory group) who had filled out the pretest received the score on freshmen entrance-level SRPs and recommendations with regard to SRP-

interventions that might be used to improve their freshmen SRPs and freshmen performance (delay/leaving versus first-year completion). In addition, the mentors of the freshmen who had filled out their entrance-level SRPs also received their freshmen scores on entrance-level SRPs and possible interventions for improving these. Only when freshmen scored below the 25th percentile on one or more SRPs, the freshmen and their mentors in the quasi-experimental groups were either *obligated* to implement SRP-interventions that were specifically aimed to enhance these SRPs (*obligatory group*), or they were *free to choose* not to follow up the advice as given (*optional group*). In the digital document that the freshmen and their mentors received with respect to the freshmen entrance-level SRPs, they could click on a hyperlink for a detailed description of the SRP-interventions. Each description consisted of information, instruction, and examples for developing the freshmen SRPs. For example with regard to effort, the recommended SRP-intervention focused on how to conduct "deliberate practice": The freshmen were instructed to identify their learning needs, to set personal learning goals based on their learning needs, to plan and monitor their learning activities, to evaluate their learning goals, to reformulate their learning goals, and to start all over again (setting learning goals, planning and monitoring, and so on) (e.g., Ericsson, 2006b; Michaels & Miethe, 1989). Also, the freshmen were suggested how to learn in a better manner. For example, the freshmen were informed about the inefficiency with regard to summarizing, underlining and rereading, and were advised to conduct other learning strategies such as self-explaining, and self-testing of the study content to be learnt.

The results showed that one of the two SRPs which were meant to be improved - by recommending freshmen and their mentors SRP-interventions based on their freshmen self-assessed entrance-level SRPs (metacognitive strategies and attention) - indeed was improved, namely, attention. However, recommending freshmen and their mentors SRP-interventions does not guarantee that they will follow up these recommendations. Subsequently, a manipulation check was conducted to check to what extent the freshmen indeed had worked with the SRP-interventions as had been recommended, according to themselves, either on their own (freshmen-directed) or with their mentor (mentor-directed). The results showed that freshmen who had reported to have tried to improve their SRPs, with their mentors, significantly outperformed both the freshmen in the freshmen-directed group and in the control group, with respect to metacognitive strategies (planning, monitoring, and time management) at the posttest. In addition, it was found that the SRP-interventions did not also affect other SRPs, which were not meant to be improved in the quasi-experimental groups (optional group and obligatory group), when compared to the control group (critical thinking and self-efficacy). The results furthermore indicated that giving freshmen and their mentors insight in freshmen entrance-level SRPs, and SRP-recommendations for an improvement of their academic performance, led to significantly more freshmen retention.

Scientific relevance

Below, the scientific relevance of each of the four studies is described.

Study 1

This study resulted in an overview of SRPs for effective learning in higher education. In the primary studies included in the overview, only three of the nine SRPs as distinguished by Sitzmann and Ely (2011) had been investigated: metacognitive strategies, motivation, and self-efficacy. This finding shows that the majority of SRPs for adult learning as distinguished by Sitzmann and Ely (Table 1) were not yet measured in a pretest-posttest design with a control group, in the context of higher education. Therefore, this review can guide future studies in this field: Where do we stand with regard to SRP research regarding academic performance in higher education, and which direction does future research need to take?

Study 2

In Study 2, a specific subset of entrance-level SRPs was established that most strongly predicts freshmen retention. These SRPs are critical thinking, metacognitive strategies, attention, motivation, and effort. These SRPs do not correspond with the SRPs most important for academic performance, except for one: effort. (The SRPs predictive for academic performance (GPA, training transfer) were identified to be goal-setting, effort, and self-efficacy.)

Study 3

Study 3 showed that mentors were good at predicting which freshmen would do well and succeed in their first year of the educational program. However, mentors were not particularly good at predicting which freshmen would *not* do well and either delay or leave the program. In contrast, the freshmen were good at predicting themselves whether they would *not* perform well. Seen from a personality assessment perspective (Connelly & Ones, 2010; Connolly et al., 2010; McDonald & Letzring, 2016; Vazire, 2010), in Study 3 the difference in mentor-freshman accuracy with respect to predicting freshmen delay/leaving might be explained by Funder's RADU (Relevance, Availability, Detection, and Utilization) model (Funder, 1995). Applying Funder's RADU-model to Study 3, it is important that the learning environment allows freshmen to apply SRPs (Relevance). Furthermore, mentors must have enough meetings (time) available to detect the freshmen SRPs (Availability). The mentor needs to detect shortcomings in the freshman's SRPs, which may be relevant for his/her academic performance (Detection). If an SRP is less visible for a mentor (SRPs that freshmen tend to use outside the learning environment, i.e., planning, monitoring) and/or if it is less desirable or favorable (e.g., demotivation), then freshmen are expected to assess themselves more accurately than mentors

would be able to do. Lastly, mentors would need to determine the (in-)competency of their freshmen SRPs (Utilization).

Study 4

Study 4 showed that both metacognitive strategies and attention were impacted by providing freshmen and their mentors with recommendations about SRP-interventions, based on freshmen self-assessed entrance-level SRPs. Furthermore, it was tested whether the SRP-interventions did not unintentionally also affect other SRPs which were not meant to be improved. Indeed, critical thinking and self-efficacy were not improved in the quasi-experimental groups.

The study showed that implementing SRP-interventions as offered by the researcher may have successfully retained a number of freshman leavers (leaving versus non-leaving). To be specific, the number of freshman leavers in the obligatory group was significantly lower than that of the control group and that of the optional group. This finding is in line with findings of De Boer et al. (2014), who concluded in their meta-analysis that researcher-based interventions (interventions as implemented by the researcher) had more effect on academic performance than teacher-based interventions (interventions as implemented by the teacher). In contrast, the participants in the optional group had a higher probability to complete their first year of study in time, when compared to either the obligatory group or the control group. Possibly, retaining more freshmen in the obligatory group may simultaneously imply that more delayers were retained.

Limitations and strengths

Some limitations of the studies need to be addressed. The first is the use of self-reported questionnaires by means of which freshmen assessed their own SRPs. However, the relevance of SRPs can differ according to the specific learning context. For example, a freshman may experience difficulty with SRPs such as planning, monitoring, and time management when working on an assignment in cooperation with several other freshmen, whereas he/she may easily manage these SRPs (planning, monitoring, time management), when working alone. Therefore, if a shortcoming in freshmen SRPs has been detected, additional tests may have to be carried out to determine what exactly constitutes the problematic learning context for a particular freshman.

A second limitation is that Studies 2, 3, and 4 were conducted in the context of higher professional education among freshmen in paramedical disciplines. This sample of one particular type of student may have implications for the generalizability of the results. It may be questioned to what extent the results of these four studies might also be valid for freshmen in other disciplines (e.g., freshmen studying business education). Therefore, these studies need to be replicated in other contexts of higher education.

Finally, several limitations relate to Study 4 in particular. The first is its modest sample size. After nine months of study, 96 of the freshmen who had filled out the pretest (N = 204) had already left their educational program. For studies using similar designs, it is recommended to use larger samples. Another limitation of Study 4 relates to measurement reliability. Study 4 showed that the two SRPs that were meant to be improved, indeed were improved, namely metacognitive strategies and attention. However, initially two other SRPs also were meant to be improved by the interventions, namely environmental structuring and effort. Yet the scales with which environmental structuring and effort were measured had to be dropped from further analyses due to their low reliability. It is recommended to revise the scales of environmental structuring and effort, and to improve their reliability in future studies on SRPs and freshmen performance (delay/leaving versus first-year completion). Finally, the intervention in Study 4 can be regarded as a relatively weak intervention, as merely recommendations could be given on how to improve freshmen SRPs but mentors or students who did not follow up on the recommendations could not be sanctioned. A study with a stronger intervention therefore is needed.

Practical implications

With the knowledge of which SRPs are effective for academic performance in higher education, as presented in the first study (a systematic review), freshmen entrance-level of these relevant SRPs can be assessed. Such an SRP-assessment might lead to the implementation of tailored SRP-interventions by a freshman's mentor, with the aim to benefit his/her SRPs and performance.

Study 2 revealed which specific entrance-level SRPs best predict freshmen retention. That is, better metacognitive strategies, attention, motivation, and effort positively predicted freshmen retention, whereas critical thinking was found to positively predict freshmen leaving. These SRPs (critical thinking, metacognitive strategies, attention, motivation, and effort) differ from those that earlier studies found to be related to effective learning (GPA, training transfer), namely goal-setting, effort, and self-efficacy, except for effort. The aforementioned SRPs predicted freshmen retention over and above freshmen educational program, gender, ethnicity, and pre-tertiary education level. With this knowledge on which SRPs specifically relate either to freshmen retention or freshmen performance (delay/leaving versus first-year completion), mentors may implement tailored interventions, whether the goal is to raise freshmen retention or to increase freshmen performance (delay/leaving versus first-year completion).

Study 3 allows the conclusion that both mentor-rated and freshman-rated SRPs are important to decide which freshmen need mentoring with respect to their SRPs related to which goal: Freshmen retention or freshmen performance (delay/leaving versus first-year completion). This study demonstrated that informing mentors about freshmen self-rated SRPs may help them to

identify any shortcomings in freshmen SRPs for academic performance, over and above their background variables. This is an important issue, because (obviously) mentors cannot change freshmen performance-related background variables such as their age and gender. They can, however, be informed about freshmen self-rated SRPs and intervene accordingly, aiming for better SRPs and improved academic performance. Two specific SRPs were identified which, when rated high by the mentors, were rated low by the freshmen. The first of these SRPs was metacognitive strategies (planning, monitoring, and time management). From the viewpoint of personality assessment theory (Connelly & Ones, 2010; Connolly et al., 2007; McDonald & Letzring, 2016; Vazire, 2010), this SRP may be less observable for mentors as freshmen usually apply metacognitive strategies outside the school environment (e.g., at home). The second SRP was motivation: It can be assumed that demotivation is a so-called less desirable SRP. Therefore, the freshman might conceal low motivation from the mentor.

Based on the findings of Study 4, it can be concluded that the degree to stay focused during training (attention) and planning, monitoring, and time management (metacognitive strategies) indeed can be improved by recommending freshmen and their mentors interventions based on freshmen self-assessed entrance-level SRPs attention and metacognitive strategies. In addition, there are indications that freshmen retention was improved by means of the intervention as conducted in Study 4.

Conclusion

This dissertation shows that a certain subset of SRPs predicts freshmen retention and freshmen performance (delay/leaving versus first-year completion): metacognitive strategies (consisting of planning, monitoring, and time management), attention, motivation, and effort. Furthermore, critical thinking was found to predict freshmen leaving. Freshmen-rated SRPs were predictive of whether they would delay or leave the educational program during their first year of study. At the same time, mentor-rated SRPs were found to be predictive of which freshmen would complete their first year of study in time, but less of which freshmen would delay/leave. Therefore, a self-assessment of freshmen entrance-level SRPs is considered to be helpful for mentors to identify shortcomings in their freshmen SRPs, and for intervening for better SRPs, better freshmen retention, and for better freshmen performance (delay/leaving versus first-year completion). In an intervention study, this dissertation showed that the SRPs attention and metacognitive strategies indeed can be improved by providing freshmen and their mentors insight in freshmen self-assessed entrance-level SRPs attention and metacognitive strategies, and by recommending interventions for developing these if needed. Furthermore, indications were found that freshmen retention can be improved by SRP-interventions.

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Samenvatting en Discussie

Summary and Discussion in Dutch

Inleiding

De mate waarin studenten in staat zijn hun leren effectief te managen heeft effect op hun studiesucces. Ter illustratie: Als een student moet studeren voor een toets, wordt verwacht dat hij/zij een aantal studiemomenten inplant. Vervolgens zal deze student daadwerkelijk moeten studeren op de ingeplande studiemomenten, zonder hierbij toe te staan te worden afgeleid. Zelfs als de student het moeilijk vindt om te studeren, zal deze moeten blijven geloven in het eigen leervermogen en blijven doorzetten om studiesucces te behalen.

Dit voorbeeld reflecteert wat onderzoekers consistent hebben gerapporteerd sinds de 80er jaren van de 20ste eeuw: Dat zelfregulerend leren een positieve invloed heeft op studiesucces (e.g., Dignath & Buettner, 2008; Dignath, Buettner, & Langfeldt, 2008; Hattie, Biggs, & Purdie, 1996).

Zelfregulerend leren verwijst naar het toepassen van zelfregulerende leer*processen* (SRPs) ten behoeve van het leren. Te denken valt aan plannen, het leveren van inspanning, en het geloof in eigen kunnen (Boekaerts & Niemiverta, 2000; Pintrich, 2000; Sitzmann & Ely, 2011; Winne, 2011; Zimmerman, 2000a). In de loop der tijd is een uitgebreide kennisbasis opgebouwd over hoe zelfregulerende leerprocessen verbeterd kunnen worden voor meer studiesucces. Echter, er wordt ook gerapporteerd dat eerstejaars studenten het hoger onderwijs verlaten ten gevolge van incompetentie in zelfregulerende leerprocessen. In drie studies, namelijk van Gomes (2016), Herweijer en Turkenburg (2016), en van Poulussen en Roseval (2016) benoemden eerstejaars studenten in het hoger onderwijs achteraf de reden(en) waarom zij hadden besloten hun studie te staken. Deze studenten benoemden als een van de redenen voor het staken van hun studie: Zelfregulerende leerprocessen zoals planning en het toepassen van adequate leerstrategieën. Tegelijkertijd rapporteerden deze studenten dat hun studieloopbaancoaches bij hen geen tekortkomingen in zelfregulerende leerprocessen hadden opgemerkt.

In dit proefschrift wordt onderzocht in hoeverre studieloopbaancoaches zelfregulerende leerprocessen die van invloed zijn op het studiesucces van hun eerstejaars studenten, adequaat beoordelen, en hoe zelfregulerende leerprocessen verbeterd kunnen worden met als doel het studiesucces te vergroten. Tijdens de zoektocht naar de zelfregulerende leerprocessen die zouden moeten worden geïdentificeerd door studieloopbaancoaches, werd duidelijk dat de huidige literatuur een veelheid aan zelfregulerende leerprocessen beschrijft met net zoveel definities, wat het moeilijk maakt om deze studies met elkaar te kunnen vergelijken (Boekaerts, Pintrich, & Zeidner, 2000). Het lastig kunnen vergelijken van de studies heeft als resultaat dat het onduidelijk is welke zelfregulerende leerprocessen precies gerelateerd zijn aan studiesucces in het hoger onderwijs. Vanwege deze reden startte deze dissertatie met een systematische overzichtsstudie over zelfregulerende leerprocessen en studiesucces in het hoger onderwijs (Studie 1), de eerste van een reeks van vier studies. Deze vier studies werden verricht om de volgende vier onderzoeksvragen te kunnen beantwoorden.

1. *Welke zelfregulerende leerprocessen voorspellen studiesucces in het hoger onderwijs het beste?*
2. *Welke zelfregulerende leerprocessen die studiesucces in het hoger onderwijs het beste voorspellen, zijn tevens de sterkste voorspellers van het behoud van studenten (vervolg opleiding na het eerste leerjaar versus studiestaking voor het tweede leerjaar) na het eerste leerjaar?*
3. *Wat zijn de voorspellende waarden van zelfregulerende leerprocessen van eerstejaars studenten, zoals beoordeeld door de studenten zelf en door hun studieloopbaancoaches bij de start van het hoger onderwijs, en hoe kunnen deze gecombineerd worden voor het optimaal voorspellen van studiesucces (behalen van het eerste leerjaar versus studievertraging of studiestaking) onder eerstejaars studenten? Hierbij wordt gecontroleerd voor de achtergrondvariabelen leeftijd, geslacht, etniciteit, fysieke/mentale beperking, en vooropleiding.*
4. *In welke mate kan het studiesucces van eerstejaars studenten in het hoger onderwijs (behalen van het eerste leerjaar versus studievertraging of studiestaking) positief beïnvloed worden door het verbeteren van hun zelfregulerende leerprocessen, zoals gemeten bij de start van het hoger onderwijs?*

Dit proefschrift hoopt door het beantwoorden van bovenstaande vragen bij te dragen aan eerder onderzoek naar studiesucces onder eerstejaars studenten in het Nederlands hoger beroepsonderwijs (hbo), door het bieden van inzicht in welke zelfregulerende leerprocessen onder eerstejaars hbo-studenten dienen te worden geïdentificeerd en verbeterd voor het verkrijgen van meer studiesucces. Ook hoopt het bij te dragen aan eerder onderzoek door de vraag te beantwoorden in hoeverre interventies voor het verbeteren van zelfregulerende leerprocessen – zoals gemeten bij eerstejaars studenten bij de start van het hbo – hun zelfregulerende leerprocessen alsook hun studiesucces kunnen verbeteren.

Hieronder volgt een samenvatting van de belangrijkste resultaten van de vier studies, gevolgd door een overzicht van de theoretische en praktische implicaties die voortvloeien uit deze studies. Dit hoofdstuk besluit met een discussie over methodologische beperkingen van de vier studies en met aanbevelingen voor vervolgonderzoek.

Samenvatting van de belangrijkste resultaten

De belangrijkste bevindingen uit de vier studies worden hieronder per onderzoeksvraag besproken.

Onderzoeksvraag 1: *Welke zelfregulerende leerprocessen voorspellen studiesucces in het hoger onderwijs het beste?*

De eerste studie (Hoofdstuk 2) betrof een systematisch overzicht van de sociaalwetenschappelijke literatuur over welke zelfregulerende leerprocessen de beste voorspellers zijn van studiesucces in het hoger onderwijs. In eerder uitgevoerde meta-analyses (Dignath & Buettner, 2008; Dignath, Buettner, & Langfeldt, 2008; Hattie, Biggs, & Purdie, 1996) werd zelfregulerend leren beschreven op een holistische wijze: Dat wil zeggen, een beschrijving waarin zelfregulerend leren niet werd uiteengerafeld in verschillende zelfregulerende leerprocessen. Bovendien richtten deze meta-analyses zich op het effect van interventies voor zelfregulerend leren en studiesucces waarbij zelfregulerend leren en studiesucces gemeten werden als twee aparte leeruitkomsten: In deze meta-analyses werd niet onderzocht in hoeverre zelfregulerend leren van invloed is op studiesucces.

In 2011 publiceerden Sitzmann en Ely een meta-analyse waarin zelfregulerend leren wel werd uiteengerafeld in verschillende zelfregulerende leerprocessen en waarin onderzocht werd in hoeverre deze leerprocessen studiesucces voorspellen in het volwassenenonderwijs, te weten in het hoger onderwijs en in werk-gerelateerde training. Deze auteurs definieerden studiesucces als 'training transfer': Het beklijven van aangeleerde vaardigheden bij trainees als zij eenmaal de leeromgeving hebben verlaten. In de zoektocht tijdens de eerste studie naar zelfregulerende leerprocessen voor studiesucces in het hoger onderwijs, was het kader van zelfregulerende leerprocessen voor leren onder volwassenen zoals voorgesteld door Sitzmann en Ely (2011) richtinggevend. De 13 zelfregulerende leerprocessen die op grond van de systematische overzichtsstudie in studie 1 werden geconcludeerd studiesucces in het hoger onderwijs te voorspellen, worden in Tabel 6.1 gegeven. Met betrekking tot Tabel 6.1 moet worden opgemerkt dat Sitzmann en Ely hulpvragen niet als een voorspeller voor leren hadden geformuleerd. Bovendien hadden Sitzmann en Ely in tegenstelling tot Tabel 6.1 voorgesteld plannen, monitoren, leerstrategieën en metacognitie (in Tabel 6.1 is metacognitie gelabeld als kritisch denken), te onderzoeken als een multidimensionaal zelfregulerend leerproces: metacognitieve strategieën.

Tabel 6.1 Zelfregulerende leerprocessen die volgens eerdere studies studiesucces in het hoger onderwijs voorspellen

Zelfregulerend leerproces	Definitie
Initiator voor zelfregulerend leren	
1. Doelbepaling	Prestatieniveau van leerdoelen zoals bepaald door de student (Locke & Latham, 2002)
Processen die studenten gebruiken voor het bereiken van een doel	
2. Kritisch denken	In staat zijn onderbouwde oordelen te kunnen formuleren (Beyer, 1987)
3. Plannen[a]	Het plannen van leeractiviteiten, op de korte en op de lange termijn
4. Monitoren[a]	Het monitoren en indien nodig herzien van ingeplande planningsactiviteiten
5. Leerstrategieën	De strategieën die studenten toepassen om zich de studie-inhoud eigen te maken. Dit houdt in kennis hebben van studietactieken en wanneer welke passend is (e.g., samenvatten, onderstrepen, herlezen) (Gettinger & Seibert, 2002)
6. Aandacht	De mate waarin studenten hun aandacht weten vast te houden tijdens leren (Zimmerman, 2000b)
7. Time management[a]	Het toepassen van een tijdschema voor leren en vrije tijd, waarin ook ruimte vrijgehouden wordt voor onverwachte gebeurtenissen, zoals ziek worden
8. Zorgdragen voor een adequate leeromgeving	Het zorgdragen van een studielocatie die adequaat is voor leren (Pintrich, 2000)
9. Motivatie	De bereidheid te willen leren (Noe, 1986; Noe & Schmitt, 1986; Pintrich et al. 1991)
10. Inspanning	De tijd die studenten wijden aan hun leren (Zimmerman & Risenberg, 1997)
11. Hulpvragen	De mate waarin studenten actief hulp zoeken als zij academische moeilijkheden ervaren (Pintrich et al., 1991)
Studentopvattingen over leren	
12. Gedachten over leren	Opvattingen van studenten over de oorzaken van hun studievoortgang (Zimmerman, 2000b)
13. Geloof in eigen kunnen	Vertrouwen van studenten in hun eigen leervermogen (Bandura, 1977)

Opmerking: De items zoals gebruikt, werden ontleend aan of gebaseerd op een Nederlandse vertaling van de *Motivated Strategies for Learning Questionnaire*; MSLQ (Van den Boom, Paas, & Van Merriënboer, 2007), van de originele MSLQ zoals ontwikkeld door Pintrich, Smith, Garcia, & McKeachie (1991), of geformuleerd door de onderzoekers, [a]Op basis van Studie 2 werd geconcludeerd dat planning, monitoring en time management het best gemeten wordt als een multidimensionaal concept: Metacognitieve strategieën.

Uit de systematische overzichtsstudie bleek dat in alle geïncludeerde primaire studies (*k* = 10 studies; *N* = 906) drie van de negen zelfregulerende leerprocessen waren onderzocht die onderscheiden waren door Sitzmann en Ely (2011), namelijk metacognitieve strategieën, motivatie, en geloof in eigen kunnen. De overige zes zelfregulerende leerprocessen bleken niet onderzocht te zijn in de geïncludeerde studies. Het betrof: doelbepaling, aandacht, time management, zorgdragen voor een adequate leeromgeving, inspanning, en gedachten over leren. In aanvulling hierop, bleek uit de systematische overzichtsstudie dat de zelfregulerende leerprocessen waaruit metacognitieve strategieën bestond, volgens Sitzmann en Ely (2011): plannen, monitoren, leerstrategieën en metacognitie, adequaat zelfstandig onderzocht kunnen worden. Tot slot bleek uit deze systematische overzichtsstudie dat nog een ander zelfregulerend leerproces ook studiesucces voorspelt in het hoger onderwijs, namelijk hulpvragen. Samenvattend leidde deze systematische overzichtsstudie tot een set van 13 zelfregulerende leerprocessen die voorspellend werden bevonden voor studiesucces in het hoger onderwijs (zie Tabel 6.1).

In zeven van de tien studies werd een positief effect van zelfregulerende leerprocessen op studiesucces gevonden. In drie studies bleken zelfregulerende leerprocessen niet gerelateerd te zijn aan studiesucces. Echter, de effectgroottes die werden aangetroffen voor de ontwikkeling van zelfregulerende leerprocessen en voor studiesucces bleken beide positief te zijn. Met andere woorden, als zelfregulerende leerprocessen toenamen, nam ook studiesucces toe in de geïncludeerde studies. Daarom lijkt het aannemelijk dat de zelfregulerende leerprocessen in de geïncludeerde studies voorspellers zijn van studiesucces, als dit zou zijn onderzocht.

Onderzoeksvraag 2: *Welke zelfregulerende leerprocessen die studiesucces in het hoger onderwijs het beste voorspellen, zijn tevens de sterkste voorspellers van het behoud van studenten (vervolg opleiding na het eerste leerjaar versus studiestaking voor het tweede leerjaar) na het eerste leerjaar?*

Studie 2 (Hoofdstuk 3) betrof een empirisch onderzoek naar deze specifieke vraag. De literatuur draagt aan dat de mate waarin (en welke) zelfregulerende processen van invloed zijn op studiesucces, afhangt van de uitkomstmaat: gemiddeld studiecijfer (Richardson et al., 2012; Robbins et al., 2004), training transfer (Sitzmann & Ely, 2011), of behoud van studenten voor de opleiding (Black, 2008; Robbins et al., 2004). Studie 2 bouwt voort op Studie 1, waarin 13 zelfregulerende leerprocessen werden verondersteld van invloed te zijn op studiesucces, onafhankelijk van de uitkomstmaat (gemiddeld studiecijfer, training transfer, behoud van studenten) (Zie Tabel 6.1).

In een steekproef onder 213 eerstejaars studenten in het hbo die ergotherapie studeerden, werd in Studie 2 onderzocht welke van de 13 zelfregulerende leerprocessen die in Studie 1 geconcludeerd waren studiesucces in het hoger onderwijs te voorspellen, het sterkste het

behoud van eerstejaars studenten na het eerste leerjaar zouden voorspellen. Bij de start van het academisch jaar werd de eerstejaars studenten gevraagd op 7-punts Likert-type items, oplopend van 1 (helemaal oneens) tot 7 (helemaal eens), in te vullen in hoeverre zij zelfregulerende leerprocessen toepasten. De zelfregulerende leerprocessen-vragenlijst in Studie 2 was gebaseerd op de Nederlandse vertaling van de *Motivated Strategies for Learning Questionnaire* (MSLQ) van Van den Boom, Paas, en Van Merriënboer (2007), van de originele MSLQ zoals ontwikkeld door Pintrich, Smith, Garcia, en McKeachie (1991). De zelfregulerende leerprocessen-vragenlijst in Studie 2 werd de *Self-Regulated Learning Processes Questionnaire* (SRLPQ) [de zelfregulerende leerprocessen vragenlijst] genoemd. (Gedetailleerde informatie over welke items uit de SRLPQ gebaseerd zijn op de (Nederlandse vertaling van de) MSLQ, en welke items door de onderzoekers zelf waren geformuleerd, kan worden opgevraagd bij de auteur van deze dissertatie.) Black (2008) rapporteerde dat de MSLQ waardevol bleek voor het beschrijven van zelfregulerende leerprocessen van eerstejaars studenten in het hoger onderwijs als voorspellers van het behoud van eerstejaars studenten na het eerste leerjaar. Bij het invullen van de SRLPQ bij de start van het hbo, werd de eerstejaars studenten ook gevraagd om een toestemmingsformulier in te vullen waarmee ze de onderzoeker toestonden om hun studievoortgangsdata bij de opleiding op te vragen na het eerste studiejaar. Deze studievoortgangsdata betrof informatie over welke eerstejaars studenten hun eerste leerjaar op tijd hadden behaald, welke eerstejaars studenten vertraagd waren en welke eerstejaars studenten hun studie hadden gestaakt.

Uit een principale componentenanalyse bleek dat plannen, monitoren en time management samen een component vormden die kon worden aangeduid als metacognitieve strategieën. Door het clusteren van plannen, monitoren en time management als een multidimensionaal zelfregulerend leerproces (metacognitieve strategieën), werd het aantal van 13 zelfregulerende leerprocessen zoals aanvankelijk onderzocht in Studie 2, gereduceerd tot 11 zelfregulerende leerprocessen (Zie ook Tabel 6.1).

Uit een hiërarchische binaire logistische regressie bleek dat de zelfregulerende leerprocessen metacognitieve strategieën (planning, monitoring en time management), aandacht, motivatie en inspanning het meest sterk en positief het behoud van eerstejaars studenten voorspelden (Nagelkerke R^2 = .16). Hierbij was gecontroleerd voor het leerprogramma van studenten, en hun geslacht, etniciteit en vooropleiding. Deze resultaten impliceren dat eerstejaars studenten die zichzelf bij de start van het hbo meer competent achtten in het uitoefenen van metacognitieve strategieën (planning, monitoring, en time management), aandacht, motivatie en inspanning, een verhoogde kans hadden op het continueren van hun opleiding na het eerste leerjaar. Een ander zelfregulerend leerproces, te weten kritisch denken, voorspelde ook het behoud van studenten na het eerste leerjaar, maar in negatieve richting. Dat wil zeggen, eerstejaars studenten die zichzelf hadden beoordeeld als zeer kritische denkers hadden een

verhoogde kans op studiestaking, in tegenstelling tot eerstejaars studenten die zichzelf als minder kritische denkers beschouwden. Deze bevinding komt overeen met die van Black (2008) die in haar studie concludeerde dat de zeer kritische denkers in universitair onderwijs een lagere kans hadden om de opleiding te continueren na het eerste leerjaar, in tegenstelling tot minder kritische denkers.

Samenvattend kan worden gesteld dat de zelfregulerende leerprocessen waarvan in Studie 2 werd bevonden dat deze het beste het behoud van eerstejaars studenten voorspellen (metacognitieve strategieën, aandacht, motivatie, en inspanning (positief) en kritisch denken (negatief)) verschilden van die waarvan in eerdere studies door Richardson et al. (2012), Robbins et al. (2004) en Sitzmann en Ely (2011) geconcludeerd werd dat deze gerelateerd zijn aan een hoger gemiddeld studiecijfer of meer training transfer (doelbepaling, inspanning en geloof in eigen kunnen), behalve voor een: inspanning.

Onderzoeksvraag 3: *Wat zijn de voorspellende waarden van zelfregulerende leerprocessen van eerstejaars studenten, zoals beoordeeld door de studenten zelf en door hun studieloopbaancoaches bij de start van het hoger onderwijs, en hoe kunnen deze gecombineerd worden voor het optimaal voorspellen van studiesucces (behalen van het eerste leerjaar versus studievertraging of studiestaking) onder eerstejaars studenten? Hierbij wordt gecontroleerd voor de achtergrondvariabelen leeftijd, geslacht, etniciteit, fysieke/mentale beperking, en vooropleiding.*

Studie 3 betrof een empirische studie met twee doelen. Het eerste doel was het bepalen van de voorspellende waarde van zelfregulerende leerprocessen van eerstejaars studenten bij de start van het hoger onderwijs, zoals gescoord door de eerstejaars studenten zelf, en zoals gescoord door hun studieloopbaancoaches. Het tweede doel was te bepalen hoe beoordelingen van hun zelfregulerende leerprocessen door eerstejaars studenten bij de start van het hoger onderwijs, en door hun studieloopbaancoaches, gecombineerd konden worden tot een optimale voorspelling van wie van hen risico lopen op studievertraging dan wel studiestaking in het eerste leerjaar. De steekproef betrof 188 eerstejaars studenten ergotherapie en hun studieloopbaancoaches (*N* = 28) in het Nederlands hbo. Opgemerkt moet worden dat Studie 3 een uitbreiding betrof van Studie 2. Namelijk, de groep eerstejaars studenten die hun eerste leerjaar op tijd behaalden en de groep studiestakers die hun zelfregulerende leerprocessen hadden beoordeeld in Studie 2, werden aanvullend gevraagd of hun studieloopbaancoaches ook hun zelfregulerende leerprocessen mochten beoordelen. Als dit het geval was, dan werden deze eerstejaars studenten uit Studie 2 ook geïncludeerd in Studie 3.

Van de 188 eerstejaars studenten die deelnamen aan Studie 3, vertraagden of vertrokken er 115 (61%) tijdens het eerste leerjaar, terwijl 73 (39%) eerstejaars studenten hun eerste leerjaar op tijd afrondden. Helaas zijn er, voor zover kon worden nagegaan, geen (inter-) nationale data

beschikbaar over studievertraging en studiestaking onder eerstejaars (hbo) studenten. Echter, onderzoek door Bajwa (2016) onder studenten die hun eerste leerjaar volgden tussen 2009 en 2013 aan een Nederlandse hbo-instelling toonde aan dat, elk jaar, slechts een op de vier eerstejaars studenten (25%) hun eerste leerjaar op tijd behaalde. Daarom kan geconcludeerd worden dat het hoge percentage studievertragers/studiestakers zoals gevonden in Studie 3 (61%) ruwweg overeenkomt met eerdere bevindingen.

Het hoge basispercentage voor eerstejaars studievertragers/studiestakers (n = 115 (61%)) impliceerde dat het moeilijker zou zijn eerstejaars studiesucces te voorspellen (n = 73 (39%)) dan eerstejaars studievertraging/studiestaking. Echter, de resultaten uit Studie 3 lieten zien dat studieloopbaancoaches beter waren in het voorspellen van welke eerstejaars studenten studiesucces zouden hebben, terwijl de eerstejaars studenten zelf beter waren in het voorspellen of zij risico liepen op studievertraging/studiestaking. Studie 3 toont aan dat het informeren van studieloopbaancoaches over de zelfregulerende leerprocessen zoals (zelf-) beoordeeld door hun eerstejaars studenten bij de start van het hbo, behulpzaam kan zijn voor deze studieloopbaancoaches. Informatie over de scores op zelfregulerende leerprocessen van eerstejaars studenten bij de start van het hbo kan hen immers helpen een tekortkoming in de zelfregulerende leerprocessen van hun studenten te identificeren, zodat ze kunnen proberen te interveniëren.

Zoals verwacht, toont Studie 3 ook aan dat achtergrondvariabelen van eerstejaars studenten (leeftijd, geslacht, etniciteit, fysieke/mentale beperking en vooropleiding) eerstejaars studiesucces voorspellen. Dit komt overeen met bevindingen van eerdere studies (bijvoorbeeld Astin, 1975; Herweijer & Turkenburg, 2016; Meeuwisse, Severiens, & Born, 2010; Ooijevaar, 2010; Plemper, 2005). Het is vanzelfsprekend dat studieloopbaancoaches de achtergrondvariabelen van studenten niet kunnen veranderen met als doel studiesucces van eerstejaars studenten te verhogen. Echter, Studie 3 toont aan dat studieloopbaancoaches de kans op studiesucces van eerstejaars studenten wel zouden kunnen verhogen door het verbeteren van hun zelfregulerende leerprocessen.

Onderzoeksvraag 4: *In welke mate kan het studiesucces van eerstejaars studenten in het hoger onderwijs (behalen van het eerste leerjaar versus studievertraging of studiestaking) positief beïnvloed worden door het verbeteren van hun zelfregulerende leerprocessen, zoals gemeten bij de start van het hoger onderwijs?*

Hoewel van studieloopbaancoaches in het hbo wordt verwacht dat zij incompetentie in zelfregulerende leerprocessen bij hun eerstejaars studenten herkennen en hierop indien nodig te interveniëren, wordt er in recente studies gerapporteerd dat studieloopbaancoaches er moeite mee te hebben op tijd deze zelfregulerende leerprocessen bij hun studenten te herkennen, waardoor zij niet interveniëren (Herweijer & Turkenburg, 2016; Poulussen & Roseval, 2016;

Studie 3). In Studie 4 werden eerstejaars studenten en hun studieloopbaancoaches door de onderzoekers geïnformeerd over de zelfregulerende leerprocessen zoals beoordeeld door de eerstejaars studenten zelf bij de start van het hbo. Vervolgens werd aan eerstejaars studenten en hun studieloopbaancoaches geadviseerd specifieke interventies voor het verbeteren van hun zelfregulerende leerprocessen op te volgen. Van de 204 eerstejaars studenten die hun zelfregulerende leerprocessen hadden beoordeeld bij de start van het hbo (pretest), hadden er 108 (53%) ook hun zelfregulerende leerprocessen beoordeeld na de interventie, negen maanden later (posttest).

Studie 4 betrof een interventiestudie met een quasi-experimenteel pretest-posttest design, met een controlegroep. Data werden verzameld van een steekproef onder 204 eerstejaars hbo-studenten die ergotherapie, fysiotherapie of verloskunde studeerden in het academisch jaar 2014-2015. Studie 4 bouwde voort op Studie 2, maar onderzocht een nieuwe steekproef studenten. De zelfregulerende leerprocessen van de eerstejaars studenten werden twee keer gemeten met de SRLPQ: Bij de start van het hbo (*pretest*) vulden 204 eerstejaars studenten de SRLPQ in, en als gezegd vulden108 (53%) van de 204 eerstejaars studenten die de pretest hadden ingevuld, de SRLPQ negen maanden later nog een keer in (*posttest*). Net als in Studie 2werden de studievoortgangsdata bij de opleidingen verzameld aan het einde van het eerste leerjaar. Het betrof informatie over welke studenten hun eerste leerjaar hadden behaald in de gestelde tijd, welke eerstejaars studenten waren vertraagd, dan wel hun studie hadden gestaakt.

In het algemeen wordt verondersteld dat interventies voor het verbeteren van zelfregulerend leren in zekere mate zelfregulerende leerprocessen maar ook studiesucces verbeteren (bijvoorbeeld Hattie et al., 1996; Lazowski & Hulleman, 2016). Echter, Hattie et al. toonden aan dat het specifiek *relationele* interventies zijn die effect hebben op zelfregulerende leerprocessen en studiesucces. Met relationele interventies bedoelen deze auteurs interventies op maat, om te beantwoorden aan de leerbehoeften van de specifieke student en/of de leeromgeving waarin deze student zich beweegt.

Gebaseerd op de bevindingen van Hattie et al. (1996), werd iedere eerstejaars student die deelnam in een interventiegroep een maatwerk interventie aangeboden specifiek om die zelfregulerende leerprocessen te vergroten waarop deze student onder het 25ste percentiel scoorde (*op maat geënt op de leerbehoeften van de student*). Bovendien waren de zelfregulerende leerprocessen waarover de eerstejaars studenten en hun studieloopbaancoaches werden geïnformeerd (als de scores van de eerstejaars student hierop inderdaad laag, dat wil zeggen onder het 25ste percentiel, bleken te zijn), die zelfregulerende leerprocessen die in twee van onze eerdere studies als de sterkste predictoren naar voren waren gekomen, namelijk voor respectievelijk het behoud van eerstejaars studenten (Studie 2) en eerstejaars studiesucces (Studie 3) (*passend bij de leeromgeving waarin deze eerstejaars studenten zich bewogen)*. Anders gezegd, alle schalen voor het meten van zelfregulerende leerprocessen waarvan

eerder geconcludeerd was dat deze behoud van eerstejaars studenten voorspelden (Studie 2) en studiesucces van eerstejaars studenten voorspelden (Studie 3), werden aanvankelijk geïncludeerd in Studie 4. De schalen van zelfregulerende leerprocessen die onbetrouwbaar bleken in Studie 4 (het betrof de schalen voor zorgdragen voor een adequate leeromgeving, inspanning, hulpvragen en opvattingen over leren), of waarop eerstejaars studenten in de quasi-experimentele groepen en de controlegroep significant bleken te verschillen ten tijde van de pretest, werden geëxcludeerd uit de vervolganalyses. Vervolgens werd ten eerste verwacht dat de interventies voor zelfregulerend leren in de quasi-experimentele groepen specifiek metacognitieve strategieën en aandacht zouden verbeteren. Ten tweede werd verwacht dat de twee zelfregulerende leerprocessen die niet doelbewust werden beïnvloed door de onderzoekers (kritisch denken en geloof in eigen kunnen) niet toegenomen zouden zijn ten tijde van de posttest.

De eerstejaars studenten in de controlegroep (n = 23) volgden het formele curriculum. Bij de start van het onderwijsprogramma instrueerde de promovendus de eerstejaars studenten in de quasi-experimentele groepen (optionele groep (n = 29) en follow up groep (n = 56)) in detail over de procedure, de zelfregulerende leerprocessen en de interventies voor het verbeteren van zelfregulerende leerprocessen. Alle eerstejaars studenten en hun studieloopbaancoaches die deelnamen aan de interventiegroepen en die de pretest hadden ingevuld, ontvingen de score van de eerstejaars studenten op hun zelfregulerende leerprocessen, zoals gemeten bij de start van het hbo – en ook de interventies die gebruikt zouden kunnen worden ter verbetering van hun zelfregulerende leerprocessen en studiesucces. Echter, alleen als de eerstejaars studenten onder het 25ste percentiel scoorden met betrekking tot een of meer zelfregulerende leerprocessen, dan hadden studenten en hun studieloopbaancoaches ermee ingestemd om de interventies toe te passen die specifiek bedoeld waren om deze zelfregulerende leerprocessen te verbeteren (*follow up groep*), of ze waren *vrij om te kiezen* of ze wel of niet het advies opvolgden zoals verstrekt (*optionele groep*).

In een digitaal document dat de eerstejaars studenten en hun studieloopbaancoaches ontvingen met betrekking tot de zelfregulerende leerprocessen zoals gemeten bij de eerstejaars studenten bij de start van het hbo, konden zij doorklikken via een hyperlink voor een gedetailleerde beschrijving van de interventies, bedoeld ter verbetering van zelfregulerende leerprocessen. Elke beschrijving bestond uit informatie, instructie, en uit voorbeelden voor het ontwikkelen van zelfregulerende leerprocessen. Met betrekking tot inspanning bijvoorbeeld, bestond de interventie uit het uitvoeren van doelgericht studeren (*deliberate practice*). De eerstejaars studenten werd uitgelegd hoe ze hun leerbehoeften konden identificeren, hun persoonlijke leerdoelen konden bepalen, en - afgestemd op hun leerbehoeften - hun studievoortgang konden plannen en monitoren, hun leerdoelen evalueren, leerdoelen herzien op basis van hun evaluatie - en wederom weer dezelfde activiteiten konden verrichten zoals hiervoor geschetst (zie ook

Ericsson, 2006b, en Michaels & Miethe, 1989). Ook werd de eerstejaars studenten geadviseerd hoe te leren op een betere manier. De eerstejaars studenten werden bijvoorbeeld geïnformeerd over de inefficiëntie van samenvatten, onderstrepen en herlezen en er werd geadviseerd andere leerstrategieën op te pakken zoals het uitleggen van de studiestof aan zichzelf, en zichzelf te toetsen op eenmaal geleerde studiestof.

Uit de resultaten van Studie 4 kon worden geconcludeerd dat een van de twee zelfregulerende leerprocessen waarvan bedoeld werd dat deze zouden verbeteren door de aangeboden interventies, inderdaad verbeterd was, namelijk, aandacht.

Echter, eerstejaars studenten en hun studieloopbaancoaches aan te bevelen om interventies op te volgen voor het verbeteren van zelfregulerende leerprocessen garandeert niet dat zij dit ook daadwerkelijk zullen doen. Daarom werd er een manipulatiecheck uitgevoerd om na te kunnen gaan in welke mate eerstejaars studenten, volgens henzelf, inderdaad de door de onderzoeker aanbevolen interventies voor zelfregulerende leerprocessen hadden opgevolgd, ofwel zelfstandig (student-gestuurd) ofwel met hun studieloopbaancoach (studieloopbaancoach-gestuurd). De resultaten toonden aan dat eerstejaars studenten die gerapporteerd hadden te hebben geprobeerd hun zelfregulerende leerprocessen te verbeteren met hun studieloopbaancoach, significant beter presteerden met betrekking tot metacognitieve strategieën (plannen, monitoren en time management) tijdens de posttest dan de studenten die rapporteerden zelfstandig of niet te hebben geprobeerd hun zelfregulerende leerprocessen te verbeteren. Daarnaast bleek uit de resultaten dat de interventies niet ook (onbedoeld) andere zelfregulerende leerprocessen hadden verbeterd (kritisch denken en geloof in eigen kunnen). Uit de resultaten van Studie 4 kon verder nog geconcludeerd worden dat het geven van inzicht in zelfregulerende leerprocessen en het verstrekken van verbetersuggesties aan eerstejaars studenten en hun mentoren bij de start van het hbo, leidde tot significant meer behoud van eerstejaars studenten.

Wetenschappelijke relevantie

Hieronder wordt de wetenschappelijke relevantie beschreven voor elk van de vier studies

Studie 1

Deze studie resulteerde in een overzicht van zelfregulerende leerprocessen voor studiesucces in het hoger onderwijs. In de primaire studies die in deze systematische overzichtsstudie waren geïncludeerd bleken drie zelfregulerende leerprocessen onderzocht te zijn in relatie tot studiesucces: metacognitieve strategieën, motivatie en geloof in eigen kunnen. Deze bevinding toont aan dat in de context van het hoger onderwijs slechts drie van de negen zelfregulerende leerprocessen voor studiesucces in het volwassenenonderwijs zoals eerder onderscheiden door

Sitzmann en Ely (2011) gemeten waren in een pretest-posttest onderzoeksontwerp. Met deze informatie kan deze systematische overzichtsstudie richting geven aan toekomstig onderzoek: Hoe staat het met het onderzoek naar zelfregulerende leerprocessen in relatie tot studiesucces in het hoger onderwijs, en welke richting zou toekomstig onderzoek op moeten gaan?

Studie 2

In Studie 2 is de specifieke set van zelfregulerende leerprocessen vastgesteld die het sterkst het *behoud* van eerstejaars studenten in het hbo voorspelt. Deze set bestaat uit kritisch denken, metacognitieve strategieën, aandacht, motivatie en inspanning. Deze zelfregulerende leerprocessen als voorspellers van behoud van eerstejaars hbo-studenten komen *niet* overeen met de zelfregulerende processen die het beste studiesucces (hoger gemiddeld studiecijfer en training transfer) in het hoger onderwijs voorspellen, op een na: inspanning. De zelfregulerende leerprocessen die het sterkst studiesucces voorspellen in het hoger onderwijs (hoger gemiddeld studiecijfer en training transfer) zijn geloof in eigen kunnen, doelbepaling en inspanning.

Studie 3

Studie 3 toonde aan dat studieloopbaancoaches goed waren in het voorspellen welke eerstejaars studenten hun eerste leerjaar op tijd zouden afronden. Echter, studieloopbaancoaches waren minder goed in het voorspellen welke eerstejaars zouden vertragen of uitvallen. In tegenstelling hiermee, waren de eerstejaars studenten juist goed in het voorspellen van hun kans op vertragen/uitvallen. Bekeken vanuit theorieën aangaande de beoordeling van persoonlijkheid (Connelly & Ones, 2010; Connolly et al., 2010; McDonald & Letzring, 2016; Vazire, 2010), zou het verschil in de nauwkeurigheid tussen studieloopbaancoaches en eerstejaars studenten met betrekking tot het voorspellen van hun studievertraging en studiestaking mogelijk kunnen worden verklaard vanuit Funder's zogeheten RADU (*Relevance, Availability, Detection, and Utilization*) model (Funder, 1995). Indien Funders RADU-model wordt toegepast op Studie 3, zou de leeromgeving moeten kunnen toestaan dat eerstejaars studenten hun leerprocessen kunnen toepassen (*Relevance*). Vervolgens zou de studieloopbaancoach genoeg bijeenkomsten (tijd) beschikbaar moeten hebben om de zelfregulerende leerprocessen van eerstejaars studenten te kunnen observeren (*Availability*). De studieloopbaancoach zou tekortkomingen in zelfregulerende leerprocessen van eerstejaars studenten bovendien moeten kunnen detecteren (*Detection*). Als een zelfregulerend leerproces minder observeerbaar is voor een studieloopbaancoach (zelfregulerende leerprocessen die eerstejaars studenten veelal buiten de leeromgeving toepassen, bijvoorbeeld plannen, monitoren) en/of minder wenselijk is (zoals demotivatie), dan kan worden verwacht dat eerstejaars studenten zichzelf beter beoordelen dan studieloopbaancoaches zouden (kunnen) doen. Tot slot zou de studieloopbaancoach de (in)competentie van eerstejaars studenten met betrekking tot zelfregulerende leerprocessen

moeten kunnen beoordelen en hierop moeten kunnen interveniëren, indien nodig (*Utilization*).

Studie 4

Studie 4 toonde aan dat zowel metacognitieve strategieën als aandacht werden bevorderd door eerstejaars studenten en hun studieloopbaancoaches inzicht te geven in de zelfregulerende leerprocessen zoals beoordeeld door deze studenten bij de start van het hbo, en door de eerstejaars studenten en hun studieloopbaancoaches suggesties voor interventies aan te bieden ter verbetering van hun zelfregulerende leerprocessen. Ook werd gecontroleerd of de interventies voor zelfregulerend leren niet ook, onbedoeld, andere zelfregulerende leerprocessen zouden bevorderen, namelijk kritisch denken en geloof in eigen kunnen. Uit de resultaten bleek inderdaad dat kritisch denken en geloof in eigen kunnen niet toe waren genomen in de quasi-experimentele (en controle-) groepen.

Uit Studie 4 kon geconcludeerd worden dat het aanbieden van verbetersuggesties met betrekking tot zelfregulerende leerprocessen uiteindelijk kan leiden tot meer behoud van studenten. Nader gespecificeerd, het aantal eerstejaars studiestakers in de follow up groep was significant lager dan in de optionele groep. Deze bevinding komt overeen met die van De Boer et al. (2014), die in hun meta-analyse concludeerden dat onderzoeker-gestuurde interventies meer effect hadden op studiesucces dan docent-gestuurde interventies (denk aan studieloopbaancoaches). In tegenstelling tot deze bevinding, bleek dat de deelnemers in de optionele groep een significant hogere kans hadden op het behalen van hun eerste leerjaar dan de deelnemers in de follow up groep en in de controlegroep. Mogelijk leidde meer behoud van studenten in de follow up groep ook tot (behoud van) meer vertragers.

Beperkingen en sterke punten van de vier studies

Deze dissertatie kent een aantal beperkingen. De eerste is het gebruik van vragenlijsten waarin eerstejaars studenten gevraagd is zelf te rapporteren over hun zelfregulerende leerprocessen. Immers, door dit type meting worden eventuele verschillen in leeromgevingen niet opgemerkt. Bijvoorbeeld, een eerstejaars student kan moeilijkheden ervaren met het toepassen van zelfregulerende leerprocessen zoals plannen, monitoren en time management als deze werkt aan een leeropdracht in samenwerking met andere eerstejaars studenten, terwijl dezelfde eerstejaars student wellicht heel goed kan zijn in plannen, monitoren en time management als het gaat om een leeropdracht waaraan alleen wordt gewerkt. Daarom is het belangrijk aanvullende tests te verrichten als een tekortkoming in zelfregulerende leerprocessen onder eerstejaars studenten is vastgesteld teneinde nader te bepalen in welke leercontext(en) eerstejaars studenten precies problemen ervaren.

Een tweede beperking is dat Studies 2, 3 en 4 zijn uitgevoerd onder eerstejaars hbo-studenten die paramedisch onderwijs volgden. Deze steekproef onder een specifiek type eerstejaars hbo-

studenten kan implicaties hebben voor de generaliseerbaarheid van de resultaten. De vraag is immers in welke mate de resultaten van deze drie empirische studies (Studies 2, 3 en 4) ook valide zijn voor eerstejaars studenten die niet-paramedisch onderwijs volgen (bijvoorbeeld eerstejaars studenten bedrijfskunde). Daarom is het belangrijk deze studies te repliceren in andere contexten van het hoger (beroeps-)onderwijs.

Tot slot geldt een aantal beperkingen voor Studie 4 in het bijzonder. De eerste is de relatief bescheiden steekproefgrootte. Na negen maanden hadden 96 van de eerstejaars studenten die de pretest hadden ingevuld ($N = 204$) hun studie al gestaakt, waardoor tijdens de posttest scores beschikbaar waren van slechts 108 studenten. Voor toekomstige studies met een vergelijkbaar onderzoeksontwerp wordt aangeraden grotere steekproeven te gebruiken. Een andere beperking van Studie 4 is de volgende. Studie 4 liet zien dat de twee zelfregulerende leerprocessen waarvan bedoeld werd deze te verbeteren via een interventie inderdaad verbeterden, namelijk: metacognitieve strategieën en aandacht. Echter, het was aanvankelijk de intentie om nog twee andere zelfregulerende leerprocessen te verbeteren met behulp van de interventies zoals aangeboden aan de eerstejaars studenten en hun studieloopbaancoaches: zorgdragen voor een adequate leeromgeving en inspanning. Maar de schalen waarmee deze twee zelfregulerende leerprocessen werden gemeten moesten worden verwijderd van vervolganalyses omdat de schaalbetrouwbaarheid te laag bleek te zijn. Het wordt aanbevolen in toekomstige studies de schalen zorgdragen voor een adequate leeromgeving en inspanning te herzien om hun betrouwbaarheid te verhogen. Tot slot kunnen de interventies in Studie 4 worden beschouwd als relatief zwakke interventies, omdat er slechts suggesties konden worden gegeven voor het verbeteren van zelfregulerende leerprocessen bij eerstejaars studenten, maar het niet opvolgen van de verbetersuggesties kon niet worden gesanctioneerd. Een studie met sterkere interventies is daarom belangrijk in de toekomst.

Praktische gevolgen

Met de kennis van welke zelfregulerende leerprocessen effectief zijn voor studiesucces in het hoger onderwijs, zoals gepresenteerd in de eerste studie (een systematische overzichtsstudie), kunnen zelfregulerende leerprocessen van studenten beoordeeld worden bij de start van het hbo. Een dergelijke beoordeling kan op maat opgevolgd worden door interventie(s) van een studieloopbaancoach met als doel zelfregulerende leerprocessen en ook studiesucces te verhogen.

Studie 2 toont aan welke zelfregulerende leerprocessen zoals gemeten bij de start van het hoger onderwijs, het sterkst het behoud van eerstejaars studenten in het hbo voorspellen. Deze zelfregulerende leerprocessen betreffen: Kritisch denken, metacognitieve strategieën, aandacht, motivatie en inspanning. Deze zelfregulerende leerprocessen verschillen van de zelfregulerende leerprocessen die in eerdere studies werden geconcludeerd de sterkste voorspellers te zijn van

een hoger gemiddeld studiecijfer en training transfer, namelijk doelbepaling, inspanning, en geloof in eigen kunnen, op een na: inspanning. Met deze kennis van welke zelfregulerende leerprocessen het sterkst het behoud van eerstejaars studenten of juist eerstejaars studiesucces voorspellen, kunnen studieloopbaancoaches op maat interveniëren, afhankelijk van of het doel een verhoging is van zelfregulerende leerprocessen voor het behouden van eerstejaars studenten, of meer studiesucces is.

Op basis van Studie 3 kan geconcludeerd worden dat kennis van zelfregulerende leerprocessen van eerstejaars studenten bij de start van het hoger onderwijs belangrijk is, zowel beoordeeld door eerstejaars studenten zelf als door hun studieloopbaancoaches. Deze studie toont ook aan dat het informeren van studieloopbaancoaches over de zelfregulerende leerprocessen zoals bij de start van het hoger onderwijs beoordeeld door eerstejaars studenten deze coaches kan helpen om tekortkomingen in de zelfregulerende leerprocessen van hun studenten te bepalen, onafhankelijk van hun achtergrondkenmerken zoals leeftijd, geslacht, etniciteit, fysieke/mentale beperking, en vooropleiding. Dit is belangrijk, omdat studieloopbaancoaches (natuurlijk) geen achtergrondkenmerken van hun studenten kunnen veranderen, maar wel geïnformeerd kunnen worden over de zelfregulerende leerprocessen van hun eerstejaars studenten, zodat ze indien nodig kunnen interveniëren ter verbetering van deze leerprocessen en het studiesucces van hun studenten. Twee specifieke zelfregulerende leerprocessen werden geïdentificeerd die veelal als minder goed ontwikkeld werden beoordeeld door eerstejaars studenten zelf terwijl hun studieloopbaancoaches deze als goed ontwikkeld beoordeelden onder hun studenten: metacognitieve strategieën (plannen, monitoren en time management) en motivatie. Beredeneerd vanuit theorieën over beoordeling van persoonlijkheid (Connelly & Ones, 2010; Connolly et al., 2007; McDonald & Letzring, 2016; Vazire, 2010) zijn metacognitieve strategieën wellicht niet zo observeerbaar voor studieloopbaancoaches, omdat eerstejaars studenten deze veelal buiten de leeromgeving (bijvoorbeeld thuis) toepassen. De lage observeerbaarheid van metacognitieve strategieën zou kunnen verklaren waarom studieloopbaancoaches deze hoger beoordelen dan eerstejaars studenten zelf. In lijn met de vorige redenering, is het aannemelijk dat eerstejaars studenten hun eventuele demotivatie proberen te verbergen voor hun studieloopbaancoach omdat dit sociaal minder wenselijk is.

Gebaseerd op de bevindingen van Studie 4 kan worden geconcludeerd dat de mate waarin aandacht wordt vastgehouden tijdens training (aandacht) en ook dat plannen, monitoren en time management (metacognitieve strategieën) inderdaad verbeterd kunnen worden. Dit kan gebeuren door eerstejaars studenten en hun studieloopbaancoaches interventies aan te bieden gebaseerd op de zelfbeoordeling van aandacht en metacognitieve strategieën door eerstejaars studenten bij de start van het hbo.

Conclusie

Deze dissertatie toont aan dat een specifieke set van zelfregulerende leerprocessen het behoud van eerstejaars studenten voorspelt en ook hun studiesucces (studievertraging/studiestaking versus het behalen van het eerste leerjaar): metacognitieve strategieën (bestaande uit planning, monitoren en time management), aandacht, motivatie en inspanning. Daarnaast werd geconcludeerd dat meer kritisch denken de kans op studiestaking vergroot. Zelfregulerende leerprocessen zoals beoordeeld door eerstejaars studenten bij de start van het hbo bleken voorspellend te zijn voor studievertraging en studiestaking. Zelfregulerende leerprocessen van eerstejaars studenten beoordeeld door hun studieloopbaancoaches bij de start van het hbo bleken goede voorspellers te zijn van het behalen van het eerste leerjaar, maar geen goede voorspellers van studievertraging en studiestaking onder eerstejaars studenten. Een zelfbeoordeling van zelfregulerende leerprocessen bij eerstejaars studenten bij de start van het hbo lijkt daarom behulpzaam te zijn voor studieloopbaancoaches om incompetentie in zelfregulerende leerprocessen bij hun eerstejaars studenten te identificeren en om vervolgens te kunnen interveniëren ter verbetering van zelfregulerende leerprocessen en studiesucces. In een interventiestudie liet deze dissertatie zien dat de zelfbeoordeling bij de start van het hbo van de zelfregulerende leerprocessen aandacht en metacognitieve strategieën (plannen, monitoren en time management) door eerstejaars studenten, met hierbij aangereikte adviezen voor interventies als dit nodig was, inderdaad aandacht en metacognitieve strategieën (plannen, monitoren en time management) kunnen verhogen. Tot slot impliceerden de bevindingen uit Studie 4 dat eerstejaars studenten vaker behouden kunnen worden voor de opleiding als deze studenten en hun studieloopbaancoaches verbetersuggesties ontvangen met betrekking tot hun zelfregulerende leerprocessen.

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Curriculum Vitae
and Publications

Curriculum Vitae

Monique de Bruijn-Smolders was born in Schiedam, the Netherlands, on April 3th, 1974. After completing secondary school, she obtained an intermediate vocational education degree in nursing in 1997, followed up by a bachelor's degree in Anesthetic Nursing in the year 2000. While working as an anesthetic nurse, she went to the Erasmus University Rotterdam to receive her Master of Science degree in the Sociology of Work and Organization in the year 2004. She worked as a consultant and researcher for three years in the fields of Human Resource Management and Quality in Healthcare. She started working as a lecturer at the institute of Health, Rotterdam University of Applied Sciences, in 2008. She teaches and coordinates mentoring and portfolio-based learning in the Master Advanced Nursing Practice. Furthermore, she trains trainers (lecturers as well as professionals who work in practice) how to assess their students by means of a portfolio and a structured interview, and how to achieve optimal inter-rater reliability as a team. Also, she advises and coaches educational teams in developing and implementing a new exam program, and in the appropriate mentoring. The Rotterdam University of Applied Sciences awarded her a PhD grant [Promotievoucher] that allowed her to write this dissertation in five years (two days a week).

Publications

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