

STUDENT TEACHER SELF-EFFICACY AND STUDENT PERCEPTIONS OF ASSESSMENT IN COMPETENCE BASED EDUCATION

Proefschrift aangeboden tot het verkrijgen van de
Graad van Doctor in de Pedagogische Wetenschappen

door Mart van Dinther

Promotor: Prof. Dr. Filip Dochy
Copromotor: Prof. Dr. Mien Segers

2014



This doctoral dissertation was partially financed by the Stipendium Fund of
Fontys University of Applied Sciences.

Graphic Design: VissenCom, Sofie den Ouden, Oirschot
Printed by: Celed Reclame, Geldrop

ISBN 978-90-9028446-0
NUR 841

© 2014, M.H. van Dinther, Geldrop, The Netherlands

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system,
or transmitted, in any form or by any means, without the prior permission in writing of the author,
or as expressly permitted by law.

Summary

Teacher self-efficacy or “teachers’ beliefs in their ability to have a positive effect on student learning” (Ashton, 1985, p. 142), has been evidenced as affecting student achievement, motivation and attitude towards school. Therefore, enhancing student teacher self-efficacy should be high on the agenda of teacher educational programmes. The core goal of this doctoral thesis is to provide evidence for how assessment in a competence-based teacher education programme influences student teacher self-efficacy and in turn teacher competences.

In the first study (chapter 2), we addressed the question: which are the factors shown to affect the self-efficacy of students within higher educational settings? Our review study indicated the effectiveness in enhancing students’ self-efficacy of intervention programmes implementing enactive mastery experiences and social persuasion. With respect to a third source of self-efficacy; vicarious experiences, the results of former studies are inconclusive. These results are the basis for studies three and four. We derived from the aforementioned influencing self-efficacy sources two instructional factors that are expected to strongly influence student teacher beliefs in their teacher competence: authenticity of the assessment (enactive mastery experiences) and feedback provided during assessment (social persuasion).

However, in order to be able to measure the influence of both instructional factors on student teachers’ self-efficacy, and taking into account the context-specificity of the construct self-efficacy, we developed a self-efficacy measure. The purpose of this instrument is to diagnose student teachers’ self-efficacy for six competence aspects (interpersonal competence, pedagogical competence, subject knowledge and methodological competence, organisational competence, competence in collaboration with colleagues, competence in reflection and development) as well as to predict student teachers’ learning outcomes with respect to the six competence aspects. In the second study (chapter 3), we presented the results of the validation of this self-efficacy measure. The construct validity results delivered evidence for the multidimensionality of the student teacher self-efficacy construct and the bi-factor model as underlying structure, reflecting the teacher competence framework. This finding supports the theoretical assumption that incipient student teachers enter the programme with a global undifferentiated sense of teacher self-efficacy, after having had teaching experiences a further differentiation of teacher self-efficacy takes place. Furthermore, the predictive validity of the self-efficacy measure was confirmed. Student teacher self-efficacy subscales, as well as the measure as a whole, succeed in predicting student learning outcomes on all the six teacher competence aspects.

In the third study (chapter 4), we investigated the core question of this dissertation, the interplay between student teachers' self-efficacy, outcomes in terms of teacher competence and their perceptions of authenticity of the assessment and feedback provided. The findings indicated that student perceptions of the authenticity of the form of the assessment (i.e. requiring students to create a quality product or observable performance in a real-life situation) predict students' self-efficacy in the six teacher competence aspects. Moreover, the quality of the feedback provided (i.e. that it is understandable and learning focused feedback that is linked to the task and criteria), predicts students' beliefs in their competence relating to pedagogical, subject knowledge and methodological, collaboration with colleagues and reflection and development. In addition, self-efficacy mediates the relation between both aforementioned assessment factors and the six teacher competence aspects.

The fourth study (chapter 5) built further on some of the earlier found relationships in the former quantitative study and aimed to obtain an in-depth view on how student teachers' assessment experiences contribute to their self-efficacy. The results of the standardised open-ended interviews with student teachers revealed how different aspects of the authenticity of the assessment and feedback provided, exert a positive influence on students' self-efficacy during the different phases of the portfolio competence assessment. The findings also provide a fine-grained view of several types of self-efficacy information connected with the phases of portfolio competence assessment. In general, the findings confirm the role of mastery experiences, social persuasion and physiological and affective experiences as important sources of self-efficacy.

Samenvatting

Self-efficacy bij leraren wordt omschreven als “het geloof van leraren in hun vermogen om het leren van studenten positief te beïnvloeden” (Ashton, 1985, p. 142). Van self-efficacy bij leraren is aangetoond dat dit de prestaties, de motivatie en de schoolattitude van leerlingen beïnvloedt. Daarom dient het verhogen van de self-efficacy bij studenten, hoog op de agenda van lerarenopleidingen te staan. Het kerndoel van deze dissertatie is om aan te tonen hoe assessment binnen het competentiegericht opleiden van leraren, de self-efficacy van studenten beïnvloedt en hoe vervolgens hun lerarencompetenties worden beïnvloed.

In de eerste studie (hoofdstuk 2) hebben we de vraag beantwoord: van welke factoren binnen hoger onderwijs is gebleken dat deze de self-efficacy van studenten beïnvloeden? Uit de reviewstudie bleek dat interventieprogramma's waarin succeservaringen en verbale overreding zijn geïmplementeerd, effectief zijn in het verhogen van de self-efficacy van studenten. Met betrekking tot indirecte ervaringen, de derde bron van self-efficacy, gaven de resultaten van eerdere studies geen uitsluitel. De reviewresultaten vormen de basis voor de derde en vierde studie. Van de genoemde bronnen van self-efficacy zijn twee instructiefactoren afgeleid waarvan werd verwacht dat deze de self-efficacy van studenten m.b.t. de lerarencompetenties, sterk beïnvloeden: authenticiteit van assessment (succeservaringen) en feedback verstrekt tijdens het assessment (verbale overreding).

Om de invloed van beide instructiefactoren op de self-efficacy van studenten te kunnen meten, hebben we een self-efficacy instrument ontwikkeld waarbij rekening is gehouden met contextspecificiteit van het construct self-efficacy. Het instrument is bedoeld om de self-efficacy van studenten met betrekking tot de zes lerarencompetenties (interpersoonlijk, pedagogisch, vakinhoudelijk en didactisch, organisatorisch, samenwerking met collega's en reflectie en ontwikkeling) te diagnosticeren. In de tweede studie (hoofdstuk 3) zijn de validatieresultaten van het self-efficacy instrument gepresenteerd. Met betrekking tot de constructieve validiteit is er bewijs geleverd voor de multidimensionaliteit van het self-efficacy construct bij studenten met het bi-factor model als de onderliggende structuur dat de lerarencompetenties weerspiegelt. Dit resultaat ondersteunt de theoretische assumptie dat studenten aan een lerarenopleiding beginnen met een globale ongedifferentieerde self-efficacy, en dat als zij ervaringen opdoen met lesgeven er een verdere differentiatie van hun self-efficacy plaatsvindt. Daarnaast werd de predictieve validiteit van het self-efficacy instrument bevestigd. De subschalen van het instrument, evenals het instrument als geheel, slagen er in de leerresultaten van de studenten ten aanzien van alle zes lerarencompetenties, te voorspellen.

In de derde studie (hoofdstuk 4) onderzochten we de kernvraag van deze dissertatie, het samenspel tussen de self-efficacy van studenten, hun leeruitkomsten voor wat betreft de lerarencompetenties en hun percepties ten aanzien van de authenticiteit van het assessment en de verstrekte feedback. De resultaten geven aan dat student percepties met betrekking tot de authenticiteit van de vorm van het assessment (studenten dienen een kwaliteitsvol product of een observeerbare performance tot stand te brengen in een levensechte situatie), de self-efficacy van studenten met betrekking tot de zes lerarencompetenties voorspelt. Bovendien voorspelt de kwaliteit van de verstrekte feedback (begrijpelijke en op het leren gerichte feedback die aansluit op de taak en de criteria), de self-efficacy van studenten met betrekking tot de pedagogische competentie, de vakinhoudelijke en didactische competentie, de competentie samenwerken met collega's en de competentie reflectie en ontwikkeling. Tevens medieert self-efficacy de relatie tussen de bovengenoemde assessmentfactoren en de zes lerarencompetenties.

In de vierde studie (hoofdstuk 5) is voortgebouwd op enkele van de gevonden relaties uit de voorafgaande kwantitatieve studie teneinde een diepgaand beeld te verkrijgen over de wijze waarop assessmentervaringen van studenten bijdragen aan hun self-efficacy. De resultaten van de gestandaardiseerde open-einde interviews bij studenten onthulden hoe verschillende aspecten van authenticiteit van assessment en verstrekte feedback, de self-efficacy van studenten positief beïnvloeden tijdens de verschillende fasen van het portfolio competentie assessment. De resultaten verschaffen tevens een fijnmazige weergave van verschillende types self-efficacy informatie verbonden met de fasen van het portfolio competentie assessment. In het algemeen illustreren de resultaten van deze laatste studie de rol van succeservaringen, verbale overreding en fysiologische en affectieve ervaringen als belangrijke bronnen van self-efficacy.

Preface

Voorwoord

Een gewaarschuwd mens telt voor twee. ‘Waar begin je in hemelsnaam aan, een promotietraject combineren met een fulltime baan als hogeschool-docent’. En gewaarschuwd was ik, meerdere keren door verscheidene mensen. Maar mijn nieuwsgierigheid naar het daadwerkelijk beoefenen van wetenschap, dit aan den lijve ondervinden, won het van deze welgemeende waarschuwingen.

In de Chinese filosofie wordt de nadruk gelegd op het bewandelen van de weg in plaats van het bereiken van de bestemming. Mijn promotieweg bracht me langs interessante plekken, waaronder Leuven maar ook steden als Trier en Jyväskylä. Het bracht me boeiende en leerzame gesprekken met interessante, inspirerende mensen met name tijdens pauzes van een meeting of in de wandelingen tijdens een congres. Op cruciale momenten, bijvoorbeeld na vernietigend commentaar van een reviewer, was het goed om terug te kijken naar wat ik had afgelegd en vooruit te kijken naar de weg die nog voor me lag. Ik leerde mezelf nog beter kennen en realiseerde me meer dan ooit tevoren de sterke en zwakke kanten van mijn persoonlijkheid. De piketpaaltjes onderweg, in de vorm van gepubliceerde artikels, gaven mij de energie om door te pakken, temeer toen bleek dat mijn publicaties ook echt werden gelezen. De mailtjes die ik kreeg uit allerlei hoeken van de wereld met het verzoek om een exemplaar op te sturen van mijn eerste artikel, gaven veel voldoening.

Ondanks alle leerzame ervaringen vond ik het een jaar geleden tijd worden om een eindstreep te plannen om te voorkomen dat het een weg zonder einde werd.

Nu deze eindstreep is gehaald wil ik op deze plaats graag een aantal mensen noemen die een belangrijke rol hebben gespeeld in mijn promotietraject.

Rob van Esch, na jouw eigen promotie tot doctor in de rechtswetenschap stimuleerde je me om ook aan zo’n traject beginnen. Bedankt voor deze stimulans.

Jan van Leeuwen, ex-collega bij SPH, aan jou legde ik mijn eerste onderzoeksmethodologische ideeën voor. Bedankt voor je adviezen.

Harrie van de Ven, directeur van Fontys Hogeschool Kind en Educatie, bedankt voor de financiële ondersteuning, je geduld en jouw oprechte belangstelling.

Jos Lumanauw, directeur Fontys Hogeschool Pedagogiek, bedankt voor de financiële ondersteuning en support.

Jos van Gend, Fontys collega en werkzaam bij de Nieuwste PABO, hartelijk bedankt voor het uitzetten en doen retourneren van mijn vragenlijsten.

Marie-Louise, voormalig collega bij Fontys PABO Eindhoven en nu gepensioneerd, jij hebt het mogelijk gemaakt dat ik in een korte tijd mijn interviews kon afnemen. Bedankt hiervoor en ook voor jouw support.

Ellen van Yperen, Fontyscollega en werkzaam bij de mediatheek van TF, bedankt voor de vele artikels over self-efficacy die jij bij diverse universiteiten voor me aanvraagde.

Jenny Welling, ex-collega bij MWD, hartelijk bedankt voor het corrigeren van mijn Engelse teksten.

Gerrie, al sinds vele jaren mijn collega, eerst bij SPH en nu bij de Master Pedagogiek, jou dank ik voor jouw oprechte belangstelling en jouw jarenlange mentale support.

Filip en Mien, mijn promotoren, jullie dank ik voor het geduld dat jullie met mij hadden, het aanleren van een wetenschappelijke manier van redeneren en jullie kritische en stimulerende feedback op mijn teksten. Filip, bedankt voor de ruimte die je me gaf om mijn eigen ideeën te confronteren met het wetenschappelijke kader. Mien, met enkele opmerkingen zette je meerdere keren mijn hele wijze van redeneren 'op zijn kop', bedankt hiervoor.

Johan Braeken, toen ik je voor het eerst ontmoette werkte je nog op de Universiteit Tilburg en nu ben je werkzaam aan een Noorse universiteit. Hartelijk bedankt voor de vrijdagmiddagen tijdens welke je mijn methodologische kennis opfriste en tevens bedankt voor het meeschrijven aan twee van mijn publicaties.

In de loop van mijn traject hebben vele Fontyscollega's, teveel om op te noemen, hun welgemeende belangstelling getoond. Ik bedank jullie allen hiervoor.

De niet aflatende belangstelling van mijn zoons William en Jeffrey, 'hoe gaat het met je onderzoek pap?' Boys, bedankt. En Bianca, hartelijk bedankt voor het uittypen van de interviews.

De laatste alinea van dit voorwoord is voor Joke, mijn vrouw, zonder jou had ik dit niet tot stand gebracht. Niet alleen door jouw aanmoedigingen en opofferingen maar zeker ook door de 'schop onder de kont' die ik meermalen nodig had. Ontzettend bedankt en wat hebben we het toch goed samen!

Table of content

CHAPTER 1	11
General introduction	
CHAPTER 2	35
Factors affecting students' self-efficacy in higher education <i>Van Dinther, Dochy, & Segers (2011)</i> <i>Published in Educational Research review, 6(2), 95-108</i>	
CHAPTER 3	69
The construct validity and predictive validity of a self-efficacy measure for student teachers in competence-based education <i>Van Dinther, Dochy, Segers, & Braeken (2013)</i> <i>Published in Studies in Educational Evaluation, 39, 169-179</i>	
CHAPTER 4	103
Student perceptions of assessment and student self-efficacy in competence-based education <i>Van Dinther, Dochy, Segers, & Braeken (2014)</i> <i>Published in Educational Studies, 40(3), 330-351</i>	
CHAPTER 5	127
The contribution of assessment experiences tot student teachers' self-efficacy in competence-based education <i>Van Dinther, Dochy, & Segers (2014)</i> <i>Submitted to Teaching and Teacher education</i>	
CHAPTER 6	159
Conclusions and discussion	
List of publications and conferences	173

CHAPTER 1

GENERAL INTRODUCTION

Introduction

The subject of this doctoral thesis is the interplay between student teacher self-efficacy, student perceptions of assessment and student learning outcomes. This thesis combines the social-cognitive tradition, in reference to self-efficacy, with research concerning assessment and the role of student perceptions, and is situated in the context of competence-based teacher education.

The dissertation starts with a general introduction. In the first section, the theoretical framework underlying the four studies central in this research project is presented. Firstly, focus is put on social cognitive theory with its key concept self-efficacy. Subsequently we pay attention to the role of assessment in influencing student teachers' self-efficacy and, in addition, the competence based approach in teacher education, as the context for this study, is presented. The second section of this general introduction presents the aims of this doctoral thesis and the main concepts with their hypothesised relationships, visualised in the research model. Finally, an overview of the four studies is presented with the underlying rationale, the related research questions and the methodology followed.

Theoretical framework

Self-efficacy and teacher efficacy

Though competent behaviour is largely understood in terms of developing integrated sets of knowledge, skills and attitudes, researchers in educational settings are increasingly drawing attention to the role of students' beliefs and thoughts during the learning process (Pajares, 2006; Schunk, 2003). Theories of human behaviour which investigate the influence of these thoughts and beliefs are known as cognitive theories. In this doctoral thesis we focus on one specific type of personal belief: self-efficacy. Self-efficacy refers to "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3). Though self-efficacy is not the only type of self-belief, this construct as a key element of social cognitive theory, appears to be a significant variable in student learning, because it affects students' motivation and learning (Pajares, 1996, 2006; Schunk, 1995, 2003). Social cognitive theory views human functioning in a transactional way, depending on reciprocal interactions between an individual's behaviours, their internal personal factors (e.g., thoughts and beliefs), and environmental events (Bandura, 1986, 1997). Developing a social cognitive theory, Bandura (1986, 1997) assumed that a strong self-efficacy belief affects the choices people make, their ways of acting, the effort they spend, their perseverance and elasticity (Bandura, 1977). People are apt to choose activities for which they feel themselves capable and avoid those for which they do not. Self-efficacy helps individuals to decide how much effort they will spend on a task, how long they will persist when experiencing difficulties, and how resilient they will appear in detrimental situations. The stronger their notion of self-efficacy, the greater their effort, perseverance and elasticity (Bandura, 1986).

A considerable amount of research findings confirm these assumptions among several domains of human functioning such as health, sports and work-related performance (Luszczynska & Schwarzer, 2005; Schwarzer, Richert, Kreasukon, Remme, Wiedemann & Reuter, 2010; Stajkovic & Luthans, 1998). During recent decades, several researchers within educational settings extensively examined the influence of students' self-efficacy on motivation and learning (Bouffard-Bouchard, 1990; Bouffard-Bouchard, Parent, & Larivé, 1991; Lent, Brown & Hackett, 2002; Linnenbrink & Pintrich, 2003; Pintrich & De Groot, 1990; Schunk, 2003; Zimmerman, Bandura & Martinez-Pons, 1992). Their findings suggest that self-efficacy influences motivation and cognition by means of affecting students' task interest, task persistence, the goals they set, the choices they make and their use of cognitive, meta-cognitive and self-

regulatory strategies. With regard to the relation between self-efficacy and achievement, research has been performed at various levels of education (e.g. primary, secondary, tertiary), several areas (reading, writing, mathematics, computing science) and different ability levels (average, talented, below average). These studies (Bouffard-Bouchard, 1990; Carmichael & Taylor, 2005; Lane, Lane & Kyprianou, 2004; Pajares, 1996, 2006; Pajares & Miller, 1994; Relich, Debus & Walker, 1986; Schunk, 2003) show the direct and indirect effects of students' self-efficacy on their achievements, relating to several grades and ability levels. This substantial amount of research findings points out that self-efficacy plays a predicting and mediating role in relation to students' achievements, motivation and learning. Student's self-efficacy, as a key factor of human agency, mediates between the several determinants of competence (e.g. skill, knowledge, ability, or former achievements) and their subsequent performances (Bandura, 2006, Schunk & Pajares, 2001).

Within the educational field, the meaning of teacher efficacy, as a type of self-efficacy, has been the focus of many research studies. Teacher efficacy is usually defined as "the extent to which the teacher believes he or she has the capacity to affect student performance" (Berman, McLaughlin, Bass, Pauly, & Zellman, 1977, p. 137) or as "their belief in their ability to have a positive effect on student learning" (Ashton, 1985, p. 142). Several researchers (Ashton & Webb, 1986; Gibson & Dembo, 1984; Muijs & Reynolds, 2001; Ross, 1992, 1998) found significant relations between teacher efficacy and student achievement, students guided by high efficacy teachers achieved higher on subject-matters i.e. mathematics (Ashton & Webb, 1986; Ross, 1992) than did students guided by low efficacy teachers. Others connected teacher efficacy with student motivation (Midgley, Feldlaufer, & Eccles, 1989) and students' interest in and attitude towards school (Woolfolk, Rosoff & Hoy, 1990). Referencing teacher behaviour, research has pointed out that teachers with a high sense of self-efficacy differ from those with low sense of self-efficacy in their teaching behaviour regarding issues such as classroom management, instruction, teacher feedback. Results reveal that highly efficacious teachers are less controlling, spend more time in interactive instruction, demonstrate higher levels of planning, organisation and direct teaching, focus more on high standards, are more effective in leading students to correct responses by means of questioning than did low efficacy teachers and spent more time in working with and monitoring students who exhibit learning difficulties (Allinder, 1994; Chacon, 2005; Dembo & Gibson, 1985; Gibson & Dembo, 1984; Guskey, 1984; Muijs & Reynolds, 2001; Smylie, 1988; Soodak & Podell, 1993, 1996; Woolfolk & Hoy, 1990; Woolfolk, Rosoff & Hoy, 1990). These research findings point out that teacher self-efficacy plays a central role in teaching competence and teacher effectiveness, and it seems relevant for

teacher educational institutes to pay attention to student teachers sense of efficacy during the teacher preparation. According to Bandura (1997) and Woolfolk Hoy and Burk -Spero (2005), teacher self-efficacy may be most malleable during teacher preparation and the first years of teaching. However, teacher educational institutes pay scarce attention to student teacher self-efficacy and research to explore the development of student teacher self-efficacy is limited.

Social cognitive theory (Bandura, 1997) claims that student self-efficacy can be created by four main sources of information. Enactive mastery experiences are viewed as the most powerful source of self-efficacy information and refer to authentic successes in carrying out particular tasks within particular situations. The second source is vicarious experiences, referring to observational experiences provided by social models. Verbal persuasion serves as the third source of self-efficacy information and refers to encouragement and evaluative feedback expressed by important others. Physiological and affective states, form the fourth source of efficacy information and include experiences of e.g. excitement, tension and stress. In the nineteen-eighties, researchers started to examine the potency of these sources investigating the possible situational and instructional factors within educational contexts affecting students' self-efficacy. These studies, conducted within primary and secondary educational levels, demonstrated that factors as rewards (Schunk, 1983c, 1984); goal setting (Bandura & Schunk, 1981; Schunk, 1983a, 1985, 1995, 1996; Schunk & Rice, 1991; Schunk & Schwartz, 1993), modelling (Relich, Debus & Walker, 1986; Schunk & Hanson, 1985, 1989; Schunk, Hanson & Cox, 1987; Zimmerman & Ringle, 1981), feedback (Schunk, 1982, 1983a, 1983b, 1989a, 1995; Schunk & Cox, 1986), task strategies (Pintrich & De Groot, 1990; Schunk and Gunn, 1986; Graham & Harris, 1989a, 1989b; Schunk, 1989b; Schunk and Cox, 1986), self-monitoring/self-evaluation (Schunk, 1983d, 1989c, 1996; Zimmerman & Kitsantas, 1999), and assessment (Brookhart & DeVoge, 1999; Pajares & Miller, 1997), can enhance students' self-efficacy in several ways. During the nineties of the last century the first studies regarding this subject emerged within the higher educational level.

Given the evidenced relevance of students' self-efficacy in relation to their achievements, motivation and learning, in general it seems of importance for higher educational institutes to gain insight in the factors that can enhance student efficacy development. With regard to teacher education, which is the setting for this doctoral thesis, it specifically raises the question how educational programmes for student teachers should be designed in order to enhance student teachers' self-efficacy for teacher competence.

The role of assessment in influencing student teachers' self-efficacy

Several studies investigated the role and qualities of new modes of assessment within higher educational contexts (Black & William, 1998; Dochy, Segers, Gijbels & Struyven, 2007; Gibbs & Simpson, 2004; Segers, Dochy & Cascallar, 2003) and delivered empirical evidence for the impact of new modes of assessment on student learning, discerning pre-, pure- en post-assessment effects (Gielen, Dochy & Dierick, 2003).

In addition to this, Entwistle (1991) stated that the students' perception of the learning environment determines how he or she learns and not necessarily the educational context in itself. 'Reality as experienced by the student' has an important additional value in understanding student learning. Looking from the position of the student, student perceptions create a 'subjective learning environment', which is at least as important to explain student learning as the actual 'objective' learning environment (Biggs, 1993, 2001). Several researchers (Dochy, Segers, Van den Bossche & Struyven, 2005; Nijhuis, Segers & Gijbels, 2005; Struyven, Dochy, Janssens & Gielen, 2006; Segers, Nijhuis & Gijbels, 2006) investigated the influence of student perceptions on student learning and learning outcomes. Nijhuis (2006) e.g. showed that the perception of the learning environment, in terms of workload, clarity of goals, quality of teaching, assessment and freedom of learning, influence students' learning. Applying this insight to assessment, the findings of a review (Struyven, Dochy & Janssens, 2005) demonstrate that student perceptions about assessment influence students' approaches to learning. The perceived characteristics of assessment seem to have impact on students' learning approaches and these influences can be both positive or negative.

Several scholars have put forward the importance of student perceptions of two specific characteristics of assessment in students' learning, namely authenticity (Janssens, Boes, & Wante, 2002; Sambell, McDowell, & Brown, 1997; Gulikers, 2006) and feedback (Gibbs & Simpson, 2004; Higgins & Hartley, 2002; Segers, Gijbels, & Thurlings, 2008). Authenticity refers to the relatedness of assessment tasks to real-life situations and meaningful problems as part of the professional practice. Student perceptions of authenticity of assessment refer to how practice-oriented assessment is perceived by students (Gulikers, 2006). Because research on factors affecting students' self-efficacy in higher education (Lancaster & Bain, 2007; Palmer, 2006; Papastergiou, 2010; Van Dinther, Dochy & Segers, 2011) stresses the relevance of providing students with practice-oriented experiences and these practice-oriented learning experiences can be seen as a necessary condition for gaining mastery experiences, the assessment characteristic authenticity can be connected with this source of self-efficacy creation.

Perceptions of feedback, refer to how students perceive information about the outcome of assessment (Gibbs & Simpson, 2004). Because feedback from important others such as teachers (Schunk & Pajares, 2001, Van Dinther, Dochy & Segers, 2011), influences students' self-efficacy, this assessment characteristic can easily be connected with social persuasions as another source of creating self-efficacy.

Competence-based teacher education

The context for this study is competence-based teacher education. Although competence-based approaches within teacher education are not new, this approach emerged in the late nineties of the last century, more and more as a leading paradigm for innovation within higher (teacher) education (Dochy & Nickmans, 2005). A competence can be viewed as an integrated set of related knowledge, skills and attitudes, which enables the student to perform professional tasks (in accordance with e.g. Parry, 1996 and Lizzio & Wilson, 2004). Hence, competence-based teacher education emphasises the development of competences, instead of merely acquiring isolated knowledge, skills and attitudes. In the late nineties of the last century teacher educational institutes in several European countries developed, in collaboration with the work field and other educational institutes in the same occupational domain, a list of teaching competences student teachers need to acquire for qualification (Struyven & De Meyst, 2010). Parallel to this, changes in European Union policy, together with an increased interest in teachers and teacher education, resulted in consensus about the competences teachers currently need to acquire to meet the challenges of their role within education (Fredriksson, 2003). To support policy makers at a national or regional level, the European Commission set out common European principles for teaching competences and qualifications, and recommendations concerning the key competences of teachers (European Commission, 2004, 2005).

Dutch institutes for competence-based teacher education, the context for this study, use teacher competences which are developed by the Dutch 'Association for professional qualities of teachers' (2009). This Dutch Association (2009) developed and validated a framework for elementary teacher competences in close collaboration with a large representation of the professional group of teachers in the field (Dietze, Jansma & Riezenbosch, 2000). For developing this teacher competence framework, four different roles which are characteristic of the teaching profession were distinguished. These roles are: the interpersonal role, the pedagogical role, the role of expert in subject matter and teaching methods and the organisational role (figure 1, first column). Also characteristic of the teaching profession is that a teacher performs these roles within four different situations. These situations are: working with students, working with colleagues,

working with the school environment and working with him or herself (figure 1, first row). A cross-tabulation of these four professional roles and professional situations generates a framework for the description of seven teaching competence aspects which are essential for the teaching profession.

Contexts Roles	With students	With colleagues	With the school's environment	With him/herself
Interpersonal	INT	COL	ENV	REF
Pedagogical	PED			
Subject knowledge and methodological	SKM			
Organisational	ORG			

Figure 1. Teacher competence framework. Adapted from *A framework of competencies for secondary grade teacher education* (p. 8), by A. Dietze, F. Jansma, and A. Riezebosch, 2000.

Notes: INT = Interpersonal Competence, PED = Pedagogical Competence, SKM = Subject Knowledge and Methodological Competence, ORG = Organisational Competence, COL = Competence for Collaboration with Colleagues, ENV = Competence for Collaboration with the School's Environment, REF = Competence for Reflection and Development.

The resulting framework, serving as a teaching standard, resembles highly the teacher competencies from other international studies in the field of teacher education (see e.g. Fives & Buehl, 2008; Gonzales & Wagenaar, 2005; Kovacs-Cerovic, 2006; Pantic & Wubbels, 2010; Storey, 2006; Tigelaar, Dolmans, Wolfhagen & Van der Vleuten, 2004; Zgaga, 2006). Dutch institutes for competence-based teacher education apply the elementary aspects of teacher competence (figure 1) by defining levels of proficiency in terms of competence criteria that a teacher-student has to achieve given his/her specific phase in the study programme. To determine appropriate proficiency levels to assess student competence development, level variables such as: extent of independence, extent of responsibility, extent of task and situation complexity and extent of transfer, were considered (see e.g., Spencer & Spencer, 1993). These competence profiles serve as a standard that has to be achieved at the end of the educational process.

In addition to this, competence-based teacher education is characterised by the following features: realistic teaching tasks connected with the vocational practice, the centrality within teacher education of students' competence development, the increasing responsibility of students for their own learning, the assessments that are aimed at levels of teaching competences, the addressing of students as starting teachers, the systematic involvement of vocational practice, and the functioning of school as a learning organisation (Ritzen & Kösters, 2002).

Connected with this competence-based approach is the use of so-called new modes of assessment which strongly emphasise the integration of assessment and instruction and which focus on assessment of the learning process in addition to that of its products (Dochy, Segers & De Rijdt, 2002). As a consequence of this new view on assessment which is represented by the notion of assessment as a tool for learning (Black & William, 1998; Gielen, Dochy & Dierick, 2003), competence-based teacher education frequently uses formative assessment methods with which students competence development can be monitored and guided.

Goals of the doctoral thesis

In this doctoral thesis we combine the social-cognitive tradition, in reference to self-efficacy, with research concerning assessment and the role of student perceptions. This leads us to the core goal of this doctoral research project, which is provide insight into the interplay between student teacher self-efficacy, student perceptions of authenticity of assessment and feedback given, and student learning outcomes in terms of teacher competence.

In figure 2 we visualise the main concepts of this doctoral thesis and their hypothesized relationships. Regarding our theoretical framework, we hypothesize that student perceptions of authenticity of assessment and feedback given positively influence student self-efficacy and student learning outcomes. Furthermore, a considerable amount of research results points out that self-efficacy plays a predicting and mediating role in relation to students' achievements (Van Dinther, Dochy & Segers, 2011). In our conceptual model, student teacher self-efficacy for teacher competences, plays a mediating role, between student perceptions of assessment and student learning outcomes.

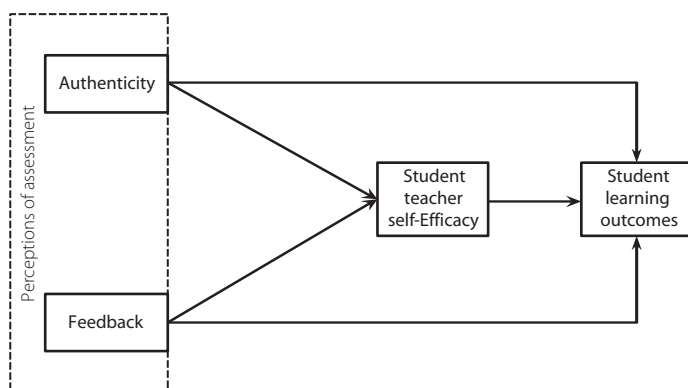


Figure 2. Research model.

Referencing our theoretical framework and the research model, in this doctoral thesis we investigate respectively the following research questions:

- Which are the factors shown to affect the self-efficacy of students within higher educational settings? (Study 1)
- What is the construct validity and predictive validity of a self-efficacy measure which is developed for predictive and diagnostic purposes for first-year student teachers in competence-based education? (Study 2)
- To what extent do student perceptions of the authenticity of competence based assessment and feedback given, influence students' self-efficacy? (Study 3)
- To what extent do student perceptions of the authenticity of competence-based assessment, have a more powerful influence on student self-efficacy, than feedback given? (Study 3)
- To what extent does student teacher efficacy influence student competence evaluation outcomes? (Study 3)
- To what extent does self-efficacy mediate the relation between student perceptions of the authenticity of and feedback given within competence-based assessment and student competence evaluation outcomes? (Study 3)
- How do students' assessment experiences regarding the authenticity aspect contribute to their self-efficacy? (Study 4)
- How do students' assessment experiences regarding the feedback given contribute to their self-efficacy? (Study 4)

Overview of the studies

This doctoral thesis consists of four studies. Study 1 presents a literature review, in study 2 we present the development and validation of a student teacher efficacy measure, in study 3 and 4 we investigate the conceptual model by means of quantitative and qualitative methods. In the following we describe the research questions, the methodology followed and rationale behind each study.

Study 1

To gain more insight in evidenced factors that influence student self-efficacy within the higher educational level, the first study of this doctoral project is a review in which we examined and tried to find an answer to our first research question:

Which are the factors shown to affect the self-efficacy of students within higher educational settings?

This research question was answered by means of an extensive literature review on empirical studies in which the role of students' self-efficacy in higher education was investigated. In conducting this review we searched the following databases listed in EBSCO HOST: Academic Search Elite, ERIC and PsycINFO. Within the studies found we selected those that met the following criteria for inclusion: 1) the level of the study had to be higher education; 2) the variable 'self-efficacy' had to be an operationalisation of the original Bandura construct; and 3) research on factors influencing self-efficacy had to be described. In total we selected thirty nine studies that met our criteria for inclusion. Since only a small number of empirical studies that had used a control group was found, we decided to perform a narrative review. A narrative review is a review method in which the researchers summarize different elementary studies from which conclusions may be drawn in a systematic way and from a holistic point of view, contributed by researchers' own experience and existing theories. Considering these narrative review characteristics the results of our review provide qualitative in-depth information (Dochy, Segers, Van den Bossche & Gijbels, 2003).

Study 2

We focused in the second study on teacher efficacy as specific form of self-efficacy. Within the educational field, considerable research has been conducted with regard to the relevance of teacher efficacy and the development of teacher efficacy measures (Tschannen-Moran & Woolfolk Hoy, 2001; Woolfolk Hoy & Davis, 2006). However, existing teacher efficacy measures are mostly concerned with graduated teachers working in the educational field, lacking the optimal level of task- and context specificity because they do not take into account student teacher's competence development and student teacher efficacy development during teacher education. This study aims to develop, for predictive and diagnostic purposes, a student teacher self-efficacy measure, that takes into account student teacher competence development and students'

incipient developmental stage of teacher self-efficacy. We want to validate the measure, more precisely we investigate the construct and predictive validity of the measure.

Regarding the development of the measure, we used the conceptual framework for elementary teacher competences developed and validated by the Dutch 'Association for the professional qualities of teachers' (2009) to create the initial item pool. To meet content validity we created the items within the framework using Bandura's guidelines for efficacy measures (2006). In order to validate the measure, we conduct confirmatory factor analysis to investigate the construct validity of the self-efficacy measure and logistic regression analyses to measure the predictive validity.

Study 3

The main question of this doctoral thesis is investigated in this study. Here we investigate the interplay between student teacher efficacy, student perceptions of key features of a competence-based assessment, and student learning outcomes. Referencing our theoretical framework and the research model, we discern: students' perceptions of the authenticity of assessment, students' perceptions of feedback given within assessment, student self-efficacy for the six teacher competence aspects and student learning outcomes in terms of the six teacher competence aspects. The relevant concepts and relationships under investigation are depicted in figure 2.

Referencing the theoretical framework, student perceptions of authenticity of assessment, refer to how practice-oriented assessment is perceived by students (Gulikers, 2006). Since practice-oriented learning experiences can be seen as a necessary condition for gaining mastery experiences (Palmer, 2006; Van Dinther et al., 2011), the assessment characteristic authenticity can be connected with this source of creating self-efficacy. Furthermore, student perceptions of feedback given, refer to how students perceive information about the outcome of assessment (Gibbs & Simpson, 2004). This assessment characteristic can easily be connected with social persuasions as another source of creating self-efficacy, because feedback from important others such as teachers, influences students' self-efficacy (Bandura, 1997). Based on the research in the theoretical framework, we formulate the following hypothesis:

Hypothesis 1: Student perceptions of the authenticity of competence-based assessment and feedback given have a positive effect on student self-efficacy.

Bandura (1997) states that mastery experiences are the most powerful source of self-efficacy information, research on factors affecting student self-efficacy in higher education confirms this assertion (Lancaster & Bain, 2007; Palmer, 2006; Papastergiou, 2010; Van Dinther et al., 2011). Following Bandura (1997) we presume that authenticity of assessment has a stronger influence on student self-efficacy than feedback given. This results in the following hypothesis of this study:

Hypothesis 2: Student perceptions of the authenticity of competence-based assessment have a more powerful effect on student self-efficacy than perceptions of feedback given.

Following social cognitive theory and, given the strong empirical results regarding the predicting role of self-efficacy in relation to students' achievements, motivation and learning (Bandura, 2006, Schunk & Pajares, 2001), we formulate the following hypothesis:

Hypothesis 3: Student self-efficacy positively predicts student competence evaluation outcomes.

In the foregoing we argued the following: student perceptions of the authenticity of assessment and feedback given play a positive role in student learning and learning outcome, student perceptions of the authenticity of and feedback given have a positive effect on student self-efficacy, and student's self-efficacy positively predicts student competence evaluation outcomes. Considering the substantial role self-efficacy plays in student learning and achievement (Bandura, 1997, 2006; Schunk & Pajares, 2001) we assume self-efficacy plays a mediating role between student perceptions of a formative competence-based assessment and their competence outcomes as a result of the final evaluation. This leads to the following hypothesis:

Hypothesis 4: Student perceptions of the authenticity of and feedback given within competence-based assessment have an indirect effect on student competence evaluation outcomes mediated through student self-efficacy.

These research questions and associated hypotheses were investigated in a quantitative study. The data for this study were collected at the end of a first year module including formative assessment but preceding the first year evaluation. Participants were asked to fill in an authenticity questionnaire

(Gulikers, Bastiaens & Kirschner, 2004, 2006), a feedback questionnaire (Gibbs & Simpson, 2003, 2004) and the 31-item student teacher efficacy questionnaire that was developed and validated in study 2. Subsequently we collected, at the end of the first year programme, the results of the first year evaluation. To test the assumed relationships we used multiple regression to test whether perceptions of assessment predict student teacher self-efficacy (Hypothesis 1). Hypothesis 2 involves a comparison between the contribution of two sets of predictors: a predictor block consisting of the two authenticity variables and a predictor block of the three feedback variables. Because there is no standard asymptotic method available to test such block effect, we used bootstrap, a resampling technique (see e.g. Efron & Tibshirani, 1993), to test hypothesis 2. We used a logistic regression to test if student teacher self-efficacy predicts the competence evaluation outcome (Hypothesis 3). To test Hypothesis 4 we used mediation analysis involving the computation of indirect effects through a combination of linear regression coefficients (perceptions of assessment → self-efficacy) and logistic regression coefficients ([perceptions of assessment +] self-efficacy → competence evaluation outcome). Since there is no standard method available for this type of computation, we used as recommended a bootstrap technique to conduct a mediation analysis (see e.g. Shrout & Bolger, 2002).

Study 4

In a large part of this doctoral thesis attention is paid to the connection between the sources of self-efficacy, put forward by social cognitive theory, and factors and characteristics of educational programmes and more specifically assessment. However it is not clear how, in students' experiences, assessment characteristics contribute to the development of their self-efficacy. In general, investigation regarding which educational conditions elicit which type of self-efficacy information, is an unexplored area within self-efficacy research. For that reason, this fourth study is a qualitative and explorative study in which we investigate in depth the outcomes of study 3 to explain and understand some of the relationships found. More specifically, the research questions of this study are:

1. How do students' assessment experiences regarding the authenticity aspect contribute to their self-efficacy?
2. How do students' assessment experiences regarding the feedback given contribute to their self-efficacy?

The data for this study were collected by means of standardized open-ended interviews among 15 second year teacher students. The students were interviewed at the beginning of the second year, a couple of months after they had finished the formative competence assessment. From the angle of the credibility of the study capturing a wide range of experiences, both female and male students, students with different views on assessment (i.e. positive as well as negative views) and, regarding the assessment results, students with sufficient as well as insufficient competence development were invited randomly.

For the design of the interview scheme we used study 3, including student perceptions of formative assessment predicting student self-efficacy, as a starting position. More specifically, we took some statements from the questionnaires used in that study regarding student perceptions of the authenticity aspect and the feedback aspect. Students were invited to react openly on these statements with their formative assessment experiences in mind. The interview questions were aimed at eliciting responses regarding how students describe these assessment characteristics and if and how, these assessment characteristics in students experiences, contribute to their sense of efficacy.

In order to obtain a fine-grained view on the contribution of students' assessment experiences to student teachers' self-efficacy, researchers used thematic content analysis. Thematic content analysis has been defined as "a method for identifying, analyzing and reporting patterns (themes) within data" (Braun & Clarke, 2006, p. 6). During the analysis we relied on an abductive strategy by moving back and forth between the data and prior understanding based on theories in order to obtain the most optimal understanding of the object of our study (Morgan, 2007).

Outline of the dissertation

In Table 1 an outline of the four conducted studies is provided. Information is given referencing the research aims, the type of study, instruments and data, methodology and participants.

Table 1. Outline of the dissertation.

Chapter	Research aims	Type of study	Instruments/data	Methodology	Participants
Chapter 1	General introduction				
Chapter 2	Studying the evidenced factors that influence student self- efficacy within higher education	Review study	Data drawn from 39 empirical studies	Narrative review using criteria for inclusion	
Chapter 3	Developing and studying the constructive and predictive validity of a self-efficacy measure for student teachers	Quantitative validation study	Self-efficacy questionnaire Competence evaluation outcomes	1.Exploratory factor analysis 2.Confirmatory factor analysis 3.Logistic regression analysis	1. N = 108 first year student teachers 2. N = 301 first year student teachers 3. N = 138 first year student teachers
Chapter 4	Studying the interplay between student perceptions of competence based assessment, student teacher efficacy and competence evaluation outcomes	Quantitative study	Self-efficacy questionnaire Authenticity perception questionnaire Feedback perception questionnaire Competence evaluation outcome	1. Multiple regression analysis 2. Logistic regression analysis 3. Mediation analysis	1/2/3. N = 138 first year student teachers
Chapter 5	Studying how student assessment experiences contribute to their sense of efficacy	Quantitative study	Standardised open-end interviews	Qualitative content analysis	N = 15 second year student teachers
Chapter 6	Conclusions and discussion				

References

- Allinder, R.M. (1994). The relations between efficacy and the instructional practices of special education teachers and consultants. *Teacher Education and Special Education*, 17, 86-95.
- Ashton, P. T. (1985). Motivation and teachers' sense of efficacy. In: C. Ames & R. Ames (Eds.), *Research on motivation in education: Vol. 2. The classroom milieu* (pp. 141-174). Orlando, FL: Academic Press.
- Ashton, P., & Webb, R. (1986). *Making a difference: Teachers' sense of efficacy and student achievement*. New York: Longman.
- Association for Professional Qualities of Teachers (2009). *Professions in Education Act*. Retrieved from <http://www.lerarenweb.nl>.
- Bandura, A (1977). Self-efficacy: Toward a unifying theory of behavioural change. *Psychological Review*, 84, 191-215.
- Bandura, A (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: Freeman.
- Bandura, A. (2006). Guide for creating self-efficacy scales. In: F. Pajares, & T. Urdan, *Self-Efficacy Beliefs of Adolescents* (pp. 307-337). Greenwich, Connecticut: Information Age.
- Bandura, A. & Schunk, D.H. (1981). Cultivating competence, self-efficacy and intrinsic interest through proximal self-motivation. *Journal of Personality and Social Psychology*, 41(3), 586-598.
- Berman, P., McLaughlin, M., Bass, G., Pauly, E., & Zellman, G. (1977). *Federal programs supporting educational change: Vol. VII. Factors affecting implementation and continuation* (Rep. No. R-1589/7-HEW). Santa Monica, CA: RAND (ERIC Document Reproduction Service No. 140 432).
- Biggs, J. (1993). What do inventories of students' learning processes really measure? A theoretical review and clarification. *British Journal of Educational Psychology*, 63, 3-19.
- Biggs, J. (2001). Enhancing learning: A matter of style or approach? In R.J. Sternberg & L. Zhang (Eds.), *Perspectives on thinking, learning and cognitive styles* (pp. 73-102). Mahwah, NJ: Lawrence Erlbaum.
- Black, P., & William, D. (1998). Assessment and Classroom learning. *Assessment in Education*, 5(1), 7-74.
- Bouffard-Bouchard, T. (1990). Influence of self-efficacy on performance in a cognitive task. *The Journal of Cognitive Psychology*, 130(3), 353-363.
- Bouffard-Bouchard, T., Parent, S., & Larivée, S. (1991). Influence of self-efficacy on self-regulation and performance among junior and senior high-school age students. *International Journal of Behavioral Development*, 14(2), 153-164.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77-101.

- Brookhart, S.M., & DeVoge, J.G. (1999). Testing a theory about the role of classroom assessment in student motivation and achievement. *Applied Measurement in Education*, 12(3), 409-426.
- Carmichael, C., & Taylor, J.A. (2005). *Analysis of student beliefs in a tertiary preparatory mathematics course. International Journal of Mathematical Education in Science and Technology*, 36(7), 713-719.
- Chacon, C.T. (2005). Teachers' perceived efficacy among English as a foreign language teachers in middle schools in Venezuela. *Teaching and Teacher Education*, 21, 257-272.
- Dembo, M., & Gibson, S. (1985). Teachers' sense of efficacy: An important variable in school improvement. *Elementary School Journal*, 86(2), 173-184.
- Dietze, A., Jansma, F., & Riezebosch, A. (2000). *Een kijkkader voor competenties voor de tweedegraads lerarenopleidingen [A framework of competencies for secondary grade teacher education]*. Utrecht, The Netherlands: Educatief Partnerschap.
- Dochy, F., & Nickmans, G. (2005). *Competentiegericht opleiden en toetsen. Theorie en praktijk van flexibel leren. [Competence-based instruction and assessment. Theories and practice of flexible learning]*. Utrecht, The Netherlands: Lemma.
- Dochy, F., Segers, M. & De Rijdt, C. (2002). Nieuwe ontwikkelingen: De assessmentcultuur. [New developments: The Assessmentculture]. In F. Dochy, L. Heylen, & H. Van de Mosselaer (Eds.), *Assessment in onderwijs. [Assessment in Education]*. (pp. 11-26). Utrecht, The Netherlands: Lemma.
- Dochy, F., Segers, M., Gijbels, D., & Struyven, K. (2007). Breaking down barriers between teaching, learning and assessment: Assessment Engineering. In D. Boud & N. Falchikov (Eds.). *Rethinking assessment in higher education: Learning for the longer term* (pp. 83-100). London, UK: Routledge.
- Dochy, F., Segers, M., Van den Bossche P., & Gijbels, D. (2003). Effects of problem-based learning: a meta-analysis. *Learning and Instruction*, 13(5), 533-568.
- Dochy, F., Segers, M., Van den Bossche, P., & Struyven, K. (2005). Students' perceptions of a problem-based learning environment. *Learning Environments Research*, 8, 41-66.
- Efron, B., & Tibshirani, R. (1993). *An introduction to the bootstrap*. Boca Raton, FL, USA: Chapman & Hall/CRC.
- Entwistle, N. (1991). Approaches to learning and perceptions of the learning environment. *Higher Education*, 22, 201-204.
- European Commission (2004). *Commission staff working paper: Progress towards the common objectives in education and training. Indicators and benchmarks*. Brussels, Belgium: European Commission.
- European Commission (2005). *Testing Conference on the Common European principles for Teacher Competences and Qualifications 20th – 21st June 2005*. Brussels, Belgium: European Commission.
- Fives, H., & Buehl, M.M. (2008). What do teachers believe? Developing a framework for examining beliefs about teachers' knowledge and ability. *Contemporary Educational Psychology*, 33(2), 134-176.

- Fredriksson, U. (2003). Changes of Education Policies within the European Union in the Light of Globalisation. *European Educational Research Journal*, 2(4), 522-546.
- Gibbs, G., & Simpson, C. (2003). *Measuring the response of students to assessment: the Assessment Experience Questionnaire*. Paper presented at the 11th Improving Student Learning Symposium, Hinckley, England.
- Gibbs, G., & Simpson, C. (2004). Conditions under which assessment supports student's learning. *Learning and Teaching in Higher Education*, 1(1), 3-31.
- Gibson, S., & Dembo, M. (1984). Teacher efficacy: A construct validation. *Journal of Educational Psychology*, 76(4), 569-582.
- Gielen, S., Dochy, F., & Dierick, S. (2003). Evaluating the consequential validity of new modes of assessment: The influence of assessment on learning, including pre-, post-, and true assessment effects. In M. Segers, F. Dochy, & E. Cascallar (2003), *Optimising new modes of assessment: In search of qualities and standards* (pp. 37-54). Dordrecht, The Netherlands: Kluwer.
- Gonzales, J., & Wagenaar, R. (2005). *Tuning educational structures in Europe II: Universities contribution to the Bologna process*. Bilbao, Spain: University of Duesto & Groningen, The Netherlands: University of Groningen.
- Graham, S. & Harris, K.R. (1989a). Improving learning disabled students' skills at composing essays: Self-instructional strategy training. *Exceptional Children*, 56(3), 201-214.
- Graham, S. & Harris, K.R. (1989b). Components analysis of cognitive strategy instruction: Effects on learning disabled students' compositions and self-efficacy. *Journal of Educational Psychology*, 81(3), 353-361.
- Gulikers, J.T. (2006). *Authenticity is in the eye of the beholder: Beliefs and perceptions of authentic assessment and the influence on student learning*. PhD dissertation. Heerlen, Netherlands: Open University.
- Gulikers, J.T., Bastiaens, ThJ., & Kirschner, P.A. (2004). A five-dimensional framework for authentic assessment. *Educational Technology Research & development*, 52, 67-85.
- Gulikers, J.T., Bastiaens, ThJ., & Kirschner, P.A. (2006). Authentic assessment, student and teacher perceptions: the practical value of the five-dimensional framework. *Journal of Vocational Education and Training*, 58, 337-357.
- Guskey, T. R. (1984). The influence of change in instructional effectiveness upon the affective characteristics of teachers. *American Educational Research Journal*, 21, 245-259.
- Higgins, R., & Hartley, P. (2002). The conscientious consumer: Reconsidering the role of assessment feedback in student learning. *Studies in Higher Education*, 27(1), 53-64.
- Janssens, S., Boes, W., & Wante, D. (2002). Portfolio's: een instrument voor toetsing en begeleiding. [Portfolios: an instrument for assessment and teaching]. In F. Dochy, L. Heylen, & H. Van de Mosselaer (Eds.), *Assessment in onderwijs*. [Assessment in Education]. (pp. 203-224). Utrecht, The Netherlands: Lemma.
- Kovács-Cerović, T. (2006). National Report – Serbia. In P. Zgaga (Ed.), *The prospects of teacher education in South-East Europe* (pp. 487-526). Ljubljana, Slovenia: University of Ljubljana.

- Lancaster, J., & Bain, A. (2007). The design of inclusive education courses and the self-efficacy of preservice teacher education students. *International Journal of Disability, Development and Education*, 54(2), 245-256.
- Lane, J., Lane, A. & Kyprianou, A. (2004). Self-efficacy, self-esteem and their impact on academic performance. *Social Behaviour and Personality*, 32, 247-256.
- Lent, R.W., Brown, S.D., & Hackett, G. (2002). Social cognitive career theory. In D. Brown (Ed.), *Career choice and development* (pp. 255-311). San Francisco, CA: Jossey-Bass.
- Linnenbrink, E.A., & Pintrich, P.R. (2003). The role of self-efficacy beliefs in student engagement and learning in the classroom. *Reading and writing quarterly: overcoming learning difficulties*, 19(2), 119-137.
- Lizzio, A., & Wilson, K. (2004). Action learning in higher education; an investigation of its potential to develop professional capability. *Studies in higher education*, 29, 469-488.
- Luszczynska, A., & Schwarzer, R. (2005). The role of self-efficacy in health self-regulation. In W. Greve, K. Rothermund, & D. Wentura (Eds.), *The adaptive self: Personal continuity and intentional self-development* (pp. 137-152. Göttingen, Germany: Hogrefe/Huber.
- Midgley, C., Feldlaufer, H., & Eccles, J.S. (1989). Change in teachers' efficacy and student self and task related beliefs in mathematics during the transition to junior high school. *Journal of Educational Psychology*, 81, 247-258.
- Morgan, D.L. (2007). Paradigms lost and paradigms regained: Methodological implications of combining qualitative and quantitative methods. *Journal of mixed methods research*, 1(1), 48-76.
- Muijs, D., & Reynolds, D. (2001). Teachers' beliefs and behaviours: What really matters. *Journal of classroom interaction*, 37, 3-15.
- Nijhuis, J. (2006). *Learning strategies, students' characteristics and their perceptions of the learning environment*. PhD Dissertation. Maastricht, The Netherlands: Maastricht University.
- Nijhuis, J., Segers, M. & Gijsselaers, W. (2005). Influence of redesigning a learning environment on student perceptions and learning strategies. *Learning Environment Research*, 8, 67-93.
- Pajares, F. (1996). Self-efficacy Beliefs in Academic Settings. *Review of Educational Research*, 66(4), 543-578.
- Pajares, F. (2006). Self-efficacy during childhood and adolescence: Implications for teachers and parents. In F. Pajares & T. Urdan (Eds.), *Self-efficacy Beliefs of Adolescents* (pp. 339-367). Greenwich, CT: Information Age.
- Pajares, F., & Miller, M.D. (1994). Role of self-efficacy and self-concept beliefs in mathematical problem solving: a path analysis. *Journal of Educational Psychology*, 86(2), 193-203.
- Pajares, F., & Miller, M.D. (1997). Mathematics self-efficacy and mathematical problem solving: Implications of using different forms of assessment. *Journal of Experimental Education*, 65(3), 313-229.
- Palmer, D.H. (2006). Sources of self-efficacy in a science methods course for primary teacher education students. *Research in Science Education*, 36, 337-353.

- Pantic, N., Wubbels, T. (2010). Teacher competencies as a basis for teacher education – Views of Serbian teachers and teacher educators. *Teaching and Teacher Education*, 26, 694-703.
- Papastergiou, M. (2010). Enhancing physical education and sport science students' self-efficacy and attitudes regarding information and communication technologies through a computer literacy course. *Computers & Education*, 54, 298-308.
- Parry, S.R. (1996). The quest for competence. *Training Magazine*, 8, 48-56.
- Pintrich, P. & De Groot, E. (1990). Motivational and self-regulated learning, components of classroom academic performance. *Journal of Educational Psychology*, 82, 33-40.
- Relich, J.D., Debus, L., & Walker, R. (1986). The mediating role of attribution and self-efficacy variables for treatment effects on achievement outcomes. *Contemporary Educational Psychology*, 11, 195-216.
- Ritzen, M. & Kösters, J. (2002). Mogelijke functies van een portfolio binnen een ompetentiegestuurd curriculum. [Possible functions of portfolio within a competence-based curriculum]. *Tijdschrift Onderzoek van Onderwijs*, 31(1), 3-7.
- Ross, J.A. (1992). Teacher efficacy and the effect of coaching on student achievement. *Canadian Journal of Education*, 17(1), 51-65.
- Ross, J. (1998). The antecedents and consequences of teacher efficacy. In: J. Brophy (Ed.), *Advances in research on teaching* (Vol. 7, pp. 49-73). Greenwich, CT: JAI Press.
- Sambell, K., McDowell, L., & Brown, S. (1997). But is it fair?: An exploratory study of student perceptions of the consequential validity of assessment. *Studies in Educational Evaluation*, 23, pp. 349-371.
- Schunk, D.H (1982). Effects of effort attributional feedback on children's perceived self-efficacy and achievement. *Journal of Educational Psychology*, 74(4), 548-556.
- Schunk, D.H (1983a). Developing children's self-efficacy and skills: The roles of social comparative information and goal setting. *Contemporary Educational Psychology*, 8, 76-86.
- Schunk, D.H (1983b). Ability versus effort attributional feedback: Differential effects on self-efficacy and achievement. *Journal of Educational Psychology*, 75(6), 848-856.
- Schunk, D.H (1983c). Reward contingencies and the development of children's skills and self-efficacy. *Journal of Educational Psychology*, 75, 511-518.
- Schunk, D.H (1983d). Progress self-monitoring: Effects on children's self-efficacy and achievement. *Journal of Experimental Education*, 51, 89-93.
- Schunk, D.H (1984). Enhancing self-efficacy and achievement through rewards and goals: Motivational and informational effects. *Journal of Educational Research*, 78, 29-34.
- Schunk, D.H (1985). Participation in goal setting: effects on self-efficacy and skills of learning-disabled children. *The journal of Special Education*, 19(3), 307-317.
- Schunk, D.H. (1989a). Self-efficacy and achievement behaviours. *Educational Psychology Review*, 1, 173-208.
- Schunk, D.H. (1989b). Self-efficacy and cognitive skill learning. In C. Ames & R. Ames (Eds.), *Research on motivation in education: Vol. 3, Goals and cognitions* (pp. 13-44). San Diego: Academic.

- Schunk, D.H. (1989c). Social Cognitive Theory and Self-regulated learning. In B.J. Zimmerman & D.H. Schunk (Eds.), *Self-Regulated Learning and Academic Achievement. Theory, Research and Practice* (pp. 83-110). Berlin, Heidelberg, New York: Springer-Verlag.
- Schunk, D.H (1995) Self-efficacy and education and instruction. In J.E. Maddux (Ed.), *Self-efficacy, adaptation and adjustment: Theory, research and application* (pp. 281-303). New York: Plenum Press.
- Schunk, D.H (1996). Goal and Self-evaluative influences during children's cognitive skill learning. *American Educational Research Journal*, 33(2), 359-382.
- Schunk D.H. (2003). Self-efficacy for reading and writing: influence of modelling, goal setting and self-evaluation. *Reading and writing quarterly: overcoming learning difficulties*, 19(2), 159-172.
- Schunk, D.H. & Cox, P.D. (1986). Strategy training and attributional feedback with learning disabled students. *Journal of Educational Psychology*, 78(3), 201-209.
- Schunk, D. & Gunn, T.P. (1986) Self-efficacy and skill development: Influence of task strategies and attributions. *Journal of Educational Research*, 79, 238-244.
- Schunk, D.H. & Hanson A.R (1985). Peer models: Influence of children's self-efficacy and achievement. *Journal of Educational Psychology*, 77, 313-322.
- Schunk, D.H. & Hanson A.R. (1989). Self-modeling and children's cognitive skill learning. *Journal of Educational Psychology*, 81(2), 155-163.
- Schunk, D.H, Hanson A.R. & Cox P.D. (1987). Peer model attributes and children's achievement behaviours. *Journal of Educational Psychology*, 79, 54-61.
- Schunk D.H. & Pajares F. (2001) The Development of academic self-efficacy. In A. Wigfield & J.S. Eccles (Eds). *Development of Achievement Motivation* (pp. 15-32). San Diego, CA: Academic Press.
- Schunk, D.H & Rice J.M (1991). Learning goals and progress feedback during reading comprehension instruction. *Journal of Reading Behavior*, 23(3), 351-364.
- Schunk, D.H & Schwartz C.W. (1993). Goals and progress feedback: Effects on self-efficacy and writing achievement. *Contemporary Educational Psychology*, 18, 337-354.
- Schwarzer, R., Richert, J., Kreausukon, P., Remme, L., Wiedemann, A.U., & Reuter, T. (2010). Translating intentions into nutrition behaviors via planning requires self-efficacy: Evidence from Thailand and Germany. *International Journal of Psychology*, 54, 260-268.
- Segers, M., Dochy, F. & Cascallar, E. (2003). *Optimising new modes of assessment: In search of qualities and standards*. Dordrecht, The Netherlands: Kluwer Academic Publishers.
- Segers, M., Nijhuis, J., & Gijssels, W. (2006). Redesigning a learning and assessment environment: The influence on students' perceptions of assessment demands and their learning strategies. *Studies in Educational Evaluation*, 32, 223-242.
- Segers, M., Gijbels, D., & Thurlings, M. (2008). The relationship between students' perceptions of portfolio assessment practice and their approaches to learning. *Educational Studies*, 34(1), 35-44.
- Shrout, P., & Bolger, N. (2002). Mediation in experimental and nonexperimental studies: New procedures and recommendations. *Psychological Methods*, 7, 422-445.

- Smylie, M.A., (1988). The enhancement function of staff development: Organizational and psychological antecedents to individual teacher change. *American Educational Research Journal*, 25, 1-30.
- Soodak, L., & Podell, D. (1993). Teacher efficacy and student problem as variables in special education referral. *Journal of Special Education*, 27(1), 66-81.
- Soodak, L., & Podell, D. (1996). Teacher efficacy: toward the understanding of a multifaceted construct. *Teaching and Teacher Education*, 12(4), 401-411.
- Spencer, L., & Spencer, S. (1993). *Competence at work: Models for superior performance*. New York, NY: Wiley.
- Stajkovic, A. & Luthans, F. (1998). Self-efficacy and work-related performance: a meta- Analysis. *Psychological Bulletin*, 124, 240-261.
- Storey, A. (2006). The search for teacher standard: a nationwide experiment in the Netherlands. *Journal of Education Policy*, 21(2), 215-234.
- Struyven, K., & De Meyst, M. (2010). Competence-based teacher education: Illusion or reality? An assessment of the implementation status in Flanders from teachers' and students' points of view. *Teaching and Teacher education*, 26, 1495-1510.
- Struyven, K., Dochy, F., & Janssens, S. (2005). Students' perceptions about evaluation a assessment in higher education: a review. *Assessment & Evaluation in Higher Education*, 30(4), 325-431.
- Struyven, K., Dochy, F., Janssens, S., & Gielen, S. (2006). On the dynamics of students' approaches to learning: The effects of the teaching/learning environment. *Learning and Instruction*, 16, 279-294.
- Tigelaar, D., Dolmans, D., Wolfhagen, I., & Van der Vleuten, C. (2004). The development and validation of a framework for teaching competencies in higher education. *Higher Education*, 48, 253-268.
- Tschannen-Moran, M., & Woolfolk Hoy, A. (2001). Teacher efficacy: capturing an elusive construct. *Teaching and Teacher education*, 17, 783-805.
- Van Dinther, M., Dochy, F., & Segers, M. (2011). Factors affecting students' self-efficacy in higher education. *Educational Research Review*, 6(2), 95-108.
- Woolfolk, A.E., & Hoy, W.K. (1990). Prospective teachers' sense of efficacy and beliefs about control. *Journal of Educational Psychology*, 82, 81-91.
- Woolfolk Hoy, A., & Burke-Spero, R. (2005). Changes in teacher efficacy during the early years of teaching: A comparison of four measures. *Teaching and Teacher Education*, 21, 343-356.
- Woolfolk Hoy, A., & Davis, H.A (2006). Teacher self-efficacy and its influence on the achievement of adolescents. In F. Pajares, & T. Urdan, *Self-Efficacy Beliefs of Adolescents* (pp. 117-137). Greenwich, Connecticut: Information Age.
- Woolfolk, A.E., Rosoff, B., & Hoy, W.K. (1990). Teachers' sense of efficacy and their beliefs about managing students. *Teaching and Teacher Education*, 6, 137-148.
- Zgaga, P. (Ed.). (2006). *The prospects of teacher education in South-East Europe*. Ljubljana, Slovenia: University of Ljubljana.

- Zimmerman, B.J., Bandura, A. & Martinez-Pons, M. (1992). Self-motivation for academic attainment: The role of self-efficacy beliefs and personal goal setting. *American Educational Journal*, 29, 663-676.
- Zimmerman, B.J., & Kitsantas, A. (1999). Acquiring writing revision skill: Shifting from process to outcome self-regulatory goals. *Journal of Educational Psychology*, 91(2), 241-250.
- Zimmerman, B.J., & Ringle, J. (1981). Effects of model persistence and statements of confidence on children's self-efficacy and problem solving. *Journal of Educational Psychology*, 73(4), 485-493.

CHAPTER 2

FACTORS AFFECTING STUDENTS' SELF-EFFICACY IN HIGHER EDUCATION

Van Dinther, M. (2009, November 18 – 20). *Factors affecting students' self-efficacy in education*. Paper presented at the 4th European Practice-Based and Practitioner Research Conference of the European Association for Practitioner Research on Improving Learning, Trier, Germany.

Van Dinther, M., Dochy, F., & Segers, M. (2011). Factors affecting students' self-efficacy in higher education. *Educational Research Review*, 6(2), 95-108.

According to Science Direct: This article is number one in the TOP 25 of most downloaded Educational Research Articles over the years 2011 and 2012.

Abstract

Researchers working in educational settings are increasingly paying attention to the role students' thoughts and beliefs play in the learning process. Self-efficacy, a key element of social cognitive theory, appears to be an important variable because it affects students' motivation and learning. This article investigates empirical literature about the role of students' self-efficacy in education by focusing on the following research question: which are the factors shown to affect the self-efficacy of students within higher educational settings? The results of a review reveal that educational programmes have the possibility to enhance students' self-efficacy, and that educational programmes based on social cognitive theory proved to be particularly successful on this score. Several factors appeared to influence students' self-efficacy and provided evidence of the potency of the main sources of self-efficacy. Directions for future research are indicated.

Keywords: self-efficacy, higher education, student beliefs, social-cognitive theory

Introduction

Educational institutions that focus on outcome-based education put a lot of effort into supporting their students' acquisition of the necessary knowledge, skills, attitudes and competencies. Though competent behaviour is largely understood in terms of developing relevant knowledge, skills and attitudes, researchers in educational settings are increasingly drawing attention to the role students' thoughts and beliefs play in the learning process (Pajares, 2006; Schunk, 2003). Theories of human behaviour which investigate the influence of these thoughts and beliefs are known as cognitive theories.

In this article we focus on one specific type of personal belief: self-efficacy. Self-efficacy refers to "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3). Self-efficacy, as a key element of social cognitive theory, appears to be a significant variable in student learning, because it affects students' motivation and learning. (Pajares, 1996, 2006; Schunk, 1995, 2003). Social cognitive theory views human functioning in a transactional way, depending on reciprocal interactions between an individual's behaviours, their internal personal factors (e.g., thoughts and beliefs), and environmental events (Bandura, 1986, 1997). With reference to the connection between internal personal factors and behaviour, a large amount of research demonstrates that self-efficacy affects students' performance and learning behaviour in such aspects as the tasks they choose, their exertion, perseverance, and performances (Schunk, 1995, 2003).

This study intends to investigate the construct self-efficacy, understood as the self-belief a person holds or his personal judgment about his competencies, within an educational context. With regard to the role self-efficacy plays within student learning, we investigate empirical literature by focusing on the following research question: which are the factors shown to affect the self-efficacy of students within higher educational settings? As review method we used the so-called narrative review. In the following section we will define the crucial concepts used in this study, after that we explain our methodology. In the fourth section we present and discuss the results of our review and finally we draw some conclusions and indicate directions for further research in this area.

Self-efficacy in educational contexts

The construct of self-efficacy

The introduction of the psychological construct of self-efficacy is generally recognised as an important contribution to current educational psychology. These days, it is just not possible to elucidate aspects of human functioning such as motivation, learning, self-regulation and achievement without bringing the role played by self-efficacy beliefs into the discussion (Pajares & Urdan, 2006). Bandura introduced the construct of self-efficacy in 1977. In later years (1986, 1997), he situated it within a social cognitive theory and an agentic perspective (Pajares, 1997). In social cognitive theory human functioning is viewed in a transactional way. Internal personal factors in cognitive, affective and biological embodiment; behaviour; and environmental events all act as interacting determinants that affect one another in a reciprocal manner. Human agency refers to an individual's capacities to generate and direct actions for specific purposes, emphasizing the important role of intentionality in purposive behavior (Bandura, 1997). Within social cognitive theory great value is attached to self-reflection as a human capability (Bandura, 1986, 1997). Self-reflection is a form of self-referent thinking with which people evaluate and modify their own thoughts and behaviour. These self-referent thoughts include perceptions of self-efficacy, that is, "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3).

Self-efficacy as a belief of personal competence acts upon human behaviour in different ways. Bandura assumed that self-efficacy affects the choices people make, their ways of acting, the effort they spend, their perseverance and elasticity (Bandura, 1977). People are apt to choose activities for which they feel themselves capable and avoid those for which they do not. Self-efficacy helps individuals to decide how much effort they will spend on a task, how long they will persist when experiencing difficulties, and how resilient they will appear in detrimental situations. The stronger their notion of self-efficacy, the greater their effort, perseverance and elasticity (Bandura, 1986). Apart from affecting human behaviour, self-efficacy beliefs also influence people's thoughts and feelings. Individuals with a weak notion of self-efficacy are inclined to think that tasks seem more difficult than they actually are. These thoughts are a breeding ground for feelings of failure and depression, tension and helplessness. A strong notion of self-efficacy, on the other hand, creates feelings of tranquility and challenge in the face of difficult tasks. Bandura (1997) used these arguments to state that self-efficacy plays a key role within human agency.

However, self-efficacy is not the only type of self-belief. Cognitive theorists who investigate the influence of thoughts and beliefs on human functioning use several wordings such as self-esteem, self-concept, outcome expectations and locus of control. These constructs are often confounded with self-efficacy, though they represent rather differing constructs. Self-esteem is a type of belief that involves judgments of self-worth. It differs from self-efficacy because it is an affective reaction indicating how a person feels about him- of herself; whereas self-efficacy involves cognitive judgments of personal capacity (Zimmerman & Cleary, 2006). The locus of control construct is developed within the framework of Rotter's (1966) social learning theory. It refers to an individual's beliefs about the main underlying causes of events in his or her life, and about whether the outcomes of his or her actions are contingent on what he or she does, or on events outside his or her personal control. However, beliefs referring to the production of specific actions (self-efficacy) differ from beliefs relative to actions which produce certain outcomes (Bandura, 1997). Within social cognitive theory outcome expectancy and self-efficacy are distinguished in the following way: "Perceived self-efficacy is a judgment of one's capability to organize and execute given types of performances, whereas an outcome expectation is a judgment of the likely consequence such performances will produce" (Bandura, 1997, p. 21). Bandura (1986) stated that the conceptual discrimination between self-efficacy and self-concept seems to be marginal, but the two constructs express different phenomena. Self-concept refers to a generalized self-judgment enclosing a diversity of affects and beliefs such as feelings of self-worth and general beliefs of competence. On the contrary, self-efficacy refers to more specific tasks and activities in which people feel efficacious rather than a more global self-judgment. Subsequently several researchers such as Bong and Clark (1999) and Bong and Skaalvik (2003) compared these two constructs. Bong and Clark (1999) described differences between self-concept and self-efficacy from a conceptual and methodological perspective. Bong and Skaalvik (2003) mention the differences between integration as opposed to separation of cognition and affect, heavily normative as opposed to goal-referenced evaluation of competence, context-specific as opposed to aggregated judgment, hierarchical as opposed to loosely hierarchical structure, future as opposed to past orientation and relative temporal stability as opposed to pliability. Besides these differences Bong and Skaalvik (2003) discuss similarities between self-concept and self-efficacy such as the central role of perceived competence, the use of informational sources and the nature of the constructs both referring to domain-specificity and multidimensionality. On the basis of their comparison they argue that self-efficacy can be seen as providing a basis for the development of self-concept.

Effects of self-efficacy within educational contexts

At the time Bandura (1977) introduced this construct, self-efficacy beliefs became the focus of studies on clinical problems as phobias (Bandura, Adams, Hardy, & Howels, 1980; Bandura, 1983), depression (Davis & Yates, 1982), and assertiveness (Lee, 1984). This early self-efficacy research highlighted self-efficacy as a predictor of behavioural modification (Schunk, 1989b). This so-called 'coping behaviour research' was mainly conducted in controlled laboratory-type situations and therefore, the generality of these findings to other domains of human behaviour remained under-exposed (Kazdin & Rogers, 1978). Since then the thesis of self-efficacy has been attempted in other domains and situations such as smoking behaviour, pain control, health and athletic performance (Pajares, 1996), and work-related performance (Stajlovic & Luthans, 1998). This research supported the thesis that efficacy predicts the performance of earlier learned behaviours as well as the capacity of learning new skills.

During recent decades, the construct self-efficacy has been receiving growing attention in educational research. Several researchers examined the influence of students' self-efficacy on motivation and learning (Bouffard-Bouchard, 1990; Bouffard-Bouchard, Parent, and Larivé, 1991; Lent, Brown & Hackett, 2002; Linnenbrink & Pintrich, 2003; Pintrich & De Groot, 1990; Schunk, 2003; Zimmerman, Bandura & Martinez-Pons, 1992). These findings suggest that self-efficacy influences motivation and cognition by means of affecting students' task interest, task persistence, the goals they set, the choices they make and their use of cognitive, meta-cognitive and self-regulatory strategies. With regard to the relation between self-efficacy and achievement, research has been performed at various levels of education (e.g. primary, secondary, tertiary), several areas (reading, writing, mathematics, computing science) and different ability levels (average, talented, below average). These studies (Bouffard-Bouchard, 1990; Carmichael & Taylor, 2005; Lane, Lane & Kyprianou, 2004; Pajares, 1996, 2003; Pajares & Miller, 1994; Relich, Debus & Walker, 1986; Schunk, 2003) show the direct and indirect effects of students' self-efficacy on their achievements, relating to several grades and ability levels. This considerable amount of research findings points out that self-efficacy plays a predicting and mediating role in relation to students' achievements, motivation and learning. Student's self-efficacy, as a key factor of human agency, mediates between the several determinants of competence (e.g. skill, knowledge, ability, or former achievements) and their subsequent performances (Bandura, 2006, Schunk & Pajares, 2001). Given this substantial role, it is relevant to gain insight in the development of students' self-efficacy and the ways in which education can support this development.

The development of student self-efficacy

According to social cognitive theory, there are four main sources of information that create students' self-efficacy: enactive mastery experiences, vicarious (observational) experiences, social persuasions and physiological and psychological states. Enactive mastery experiences are authentic successes in dealing with a particular situation (Bandura, 1997). These mastery experiences are the most powerful source of creating a strong sense of efficacy because they provide students authentic evidence that they have the capability to succeed at the task (Palmer, 2006). Students interpret the results of their activities and use these interpretations to develop beliefs about their capability to perform in subsequent tasks or activities. These interpreted results of one's own performances create a sense of self-efficacy. In general, successes built a strong sense of self-efficacy and failures lower it, especially when failures occur before a robust sense of efficacy is developed (Bandura, 1997). This robust sense of self-efficacy is not created by easy success; it requires experience in overcoming obstacles and difficult situations through maintained effort and persistence. (Bandura, 1997).

The second source of creating self-efficacy is through observational experiences provided by social models (Bandura, 1997), the so-called vicarious experiences. Students obtain information about their own capabilities by observing others, especially peers who offer suitable possibilities for comparison (Schunk, 1987). An increase of self-efficacy through observational experiences can easily be enfeebled by following failures (Schunk, 1989a). Though this vicarious source of information has a weaker effect than does performance-based information, people with little mastery experience or those who are uncertain about their capacities, are more sensitive to it (Bandura, 1997).

Students often receive information that affirms and persuades them that they are able to perform a task (Schunk, 1989a). It is easier to create and persist a sense of efficacy, especially under difficult circumstances, if significant others communicate their confidence in someone's capacities than if they express doubts (Bandura, 1997). This social persuasion is the third source that helps students developing beliefs of self-efficacy. Persuasive communication and evaluative feedback is most effective when people who provide this information are viewed by students as knowledgeable and reliable, and the information is realistic (Bong & Skaalvik, 2003). Positive persuasory feedback heightens self-efficacy, but verbal persuasion alone is limited in its power to create a strong and abiding sense of self-efficacy (Schunk, 1991).

There is a fourth source of efficacy information that people draw from their physiological, emotional and mood states. Symptoms and feelings such as anxiety, stress reactions, tension and excitement can be interpreted as signals

of failure and debility. A positive mood state strengthens someone's self-efficacy, a dejected mood state enfeebles it. People rely in part on these states in assessing their capacities by perceiving and interpreting this information (Pajares, 1997). As people have the capacity to modify their own thinking and feeling, students with a high sense of self-efficacy can view a state of tension as energising in the face of a performance; whereas those who have self-doubts interpret their tension as weakness. Self-efficacy information that arises from these four sources does not influence self-efficacy directly, for it is cognitively appraised (Bandura, 1977, 1986). During this cognitive efficacy appraisal people weigh and combine the contributions of personal and situational factors such as the difficulty of task, the effort they spend, the support received, the outcome of the task, their failures and successes, perceived similarity to models (Schunk, 1989b, 1991). The basis for these interpretations is constituted by the information people select, and the rules they employ for weighting and combining them. The interpretations people make as a result of their activities and performances, provide information on which self-efficacy is based (Pajares, 1997). Where people look for self-efficacy information and how this might be related to individuals' cultural backgrounds has been studied by researchers such as Earley (1994). Where culture refers to shared values and meaning systems (Triandis, 1996), Earley (1994) states that theories such as social cognitive theory have cultural limits and that in the case of self-efficacy the influence of different sources of information is greater or lesser depending on differing personal cultural values, adhering to cultures that value individualism or collectivism.

In the nineteen-eighties, researchers started to examine the potency of these sources investigating the possible situational and instructional factors within educational contexts affecting students' self-efficacy. These studies, conducted within primary and secondary educational levels, demonstrated that factors as rewards (Schunk, 1983c, 1984); goal setting (Bandura & Schunk, 1981; Schunk, 1983a, 1985, 1995, 1996; Schunk & Rice, 1991; Schunk & Schwartz, 1993), modelling (Relich, Debus & Walker, 1986; Schunk & Hanson, 1985, 1989; Schunk, Hanson & Cox, 1987; Zimmerman & Ringle, 1981), feedback (Schunk, 1982, 1983a, 1983b, 1989a, 1995; Schunk & Cox, 1986), task strategies (Pintrich & De Groot, 1990; Schunk and Gunn, 1986; Graham & Harris, 1989a, 1989b; Schunk, 1989b; Schunk and Cox, 1986), self-monitoring/self-evaluation (Schunk, 1983d, 1989c, 1996; Zimmerman & Kitsantas, 1999), and assessment (Brookhart & DeVoge, 1999; Pajares & Miller, 1997), can enhance students' self-efficacy in several ways. During the nineties of the last century the first studies regarding this subject emerged within the higher educational level.

The next part of this study concerns a review conducted within the higher educational sector. With regard to the above-mentioned research findings which

point out the predicting and mediating role of self-efficacy in relation to students' achievements, motivation and learning, it seems important for higher education institutions, to focus not only on students' development of competencies but also on their self-efficacy development. In the following we examine the potency of the four sources of self-efficacy information posited by social cognitive theory and give an answer to our research question: which are the factors shown to affect the self-efficacy of students within higher educational settings?

Method

In conducting this review we searched the following databases listed in EBSCO HOST: Academic Search Elite, ERIC and PsycINFO. Using combinations of the following keywords: "education", "students" and "self-efficacy", we searched online and selected empirical studies from 1990 up to the present. This search resulted in the retrieval of over five hundred hits. In our second selection phase we went through the abstracts and introductory paragraphs of the found studies and selected those that met the following criteria for inclusion: 1) the level of the study had to be higher education; 2) the variable 'self-efficacy' had to be an operationalisation of the original Bandura construct; and 3) research on factors influencing self-efficacy had to be described. In the third selection phase we went through the articles and selected those studies that conducted their research within the initial higher educational level and that focused on educational programmes or situational and instructional factors, affecting students' self-efficacy. Finally we selected thirty-two studies that met our criteria. Using the snowball method, we went through the reference sections of the selected articles for additional research and found seven additional studies that met our criteria. To analyse the selected studies we defined the characteristic features relative to this study and coded each selected study. Since only a small number of empirical studies that has used a control group was found, we decided to perform a narrative review. A narrative review is a review method in which the researchers summarize different primary studies from which conclusions may be drawn in a systematic way and from a holistic point of view, contributed by researchers' own experience and existing theories. Results of a narrative review are of a qualitative rather than a quantitative nature, providing the opportunity for in-depth information (Dochy, Segers, Bossche & Gijbels, 2003). With the intention to critically evaluate our topic of research we took the following steps. Firstly, with the intention of taking into account the characteristic features of the type of empirical study, we divided the selected studies into survey studies and intervention studies, with and without control group. Subsequently we separated

the selected intervention studies into two groups: studies in which researchers investigated the effects of an interventional treatment with underlying theories different from social cognitive theory, and studies in which researchers investigated the effects of interventional treatments which were explicitly based on or related to social cognitive theory. The last distinction provided us with the opportunity to examine the effectiveness of interventions based on social cognitive theory compared with interventions based theories other than social cognitive theory. The following step was the analysis of intervention studies on the effectiveness of the programmes. After that we analyzed all studies on factors influencing student's self-efficacy. Conducting this last step we analyzed if identified factors were measured, if measured factors were significant and if researchers connected their identified factors with the sources for self-efficacy according to social cognitive theory (Bandura, 1986, 1997).

Results and discussion

On the basis of our criteria, we selected for inclusion a total of thirty-nine empirical studies. After describing some characteristic features of the selected studies, the results of these studies will be presented, using the distinctions given above, and discussed in relation to social cognitive theory.

Characteristic features of the selected studies

Publication year and domain in which the study was carried out

The selected studies encompass research conducted between 1993 and 2010: 5% between 1994 and 1995, 23% between 1995 and 2000, 41% between 2001 and 2005 and 31% between 2006 and the present. The selected research was carried out in the following higher educational domains: medical domain (three studies), psychology/counselling domain (seven studies), educational/educational psychology domain (two studies), teacher education domain (fourteen studies), business/business administration/business policy domain (three studies), health and computing domain (one study), social work/social sciences domain (two studies), physical education/sport sciences domain (two studies), postgraduate research students (several disciplines, one study), students recruited from all or a number of universities (several disciplines, four studies).

Types of study

Following the distinction in type of studies we found within the selection five survey studies, in which researchers were searching for factors affecting

self-efficacy, measuring students' self-efficacy at one moment: Tresolini and Stritter (1994), Cassidy and Eachus (2002), Cantrell, Young and Moore (2003), Tang, Addison, Lasure-Bryant, Norman, O'Connell and Stewart-Sicking (2004), Miller and Byers (2008). Besides these we found within our selection twelve intervention studies in which researchers investigated the effects of an interventional treatment with underlying theories different from social cognitive theory. The following nine intervention studies were carried out without control group: Settlage (1999), Chu (2003), Chen, Donahue and Klimosky (2004), Parker (2005), Hendry, Heinrich, Lyon, Barratt, Simpson, Hyde, Gonsalkorale, Hyde and Mgaieth (2005), Palmer (2006), Torkzadeh, Chang and Demirhan (2006), Abbitt and Klett (2007), Milman and Molebash (2008). The three intervention studies with control group were: Griffin and Griffin (1998), Rittschof and Griffin (2001), Franko, Cousineau, Trant, Green, Rancourt, Thompson, Ainscough, Mintz and Ciccazzo (2008). At the site of these intervention studies we found within our selection twenty-two studies intervention studies in which researchers investigated the effects of interventional treatments which were explicitly based on or related to social cognitive theory. The following nine intervention studies were carried out without control group: Schunk and Ertmer (1999), Larson, Clark, Wesely, Koraleski, Daniels and Smith (1999), Ren (2000), Daniels and Larson (2001), Adams (2004), Gurvitch and Menzler (2009), Dempsey, PytlikZillig & Bruning (2009), Koh and Frick (2009) and Papastergiou (2010). The thirteen social cognitive theory intervention studies with control group were: Ertmer, Evenbeck, Cennamo and Lehman (1994), Newman and Tuckman (1997), Johnson and Marakas (2000), Anderson (2000), Tompson and Dass (2000), Kitsantas and Baylor (2001), Urbani, Smith, Maddux, Smaby, Torres-Rivera and Crews (2002), Carson, Gilham, Kirk, Reddy and Battles (2002), Barbee, Scherer and Combs (2003), Al-Darmaki (2004), Wang, Ertmer and Newby (2004), Lancaster and Bain (2007), and Mathisen and Bronnick (2009).

Identified factors

Identified factors within survey studies

In table 1 we set out the results of the 5 survey studies. In the identified factors column we mention the factors as named by the researchers, in the following columns we show if identified factors are measured, if measured factors are significant and if researchers connect their identified factors with the sources for self-efficacy according to social cognitive theory (Bandura, 1986, 1997).

In all 5 survey studies one or more factors were identified which influenced students' self-efficacy. All identified factors were measured and did show a significant relation with students' self-efficacy, except the factor past science

experiences (Cantrell et al., 2003). Three studies (Cassidy & Eachus, 2002; Cantrell et al., 2003; Tang et al., 2004) reveal factors indicating that the amount of experiences is related to students' self-efficacy. Two studies (Tresolini & Stritter, 1993; Miller & Byers, 2008) reveal factors referencing the type of experience. Regarding the self-efficacy sources, four studies describe students' experiences in terms of sources of self-efficacy information. Cassidy and Eachus (2002), Cantrell et al. (2003), and Tang et al. (2004) connect found factors with Bandura's mastery experiences. Tresolini and Stritter (1993) linked the found patterns of experience with all 4 sources of efficacy information. Although all survey studies suggest there is a relationship between identified factors and student self-efficacy, several researchers (Cantrell et al., 2003; Tang et al., 2004; Miller & Byers, 2008) point at the limitations of their studies mentioning sample size and used correlational methods.

Table 1. Identified factors within survey studies.

Studies	Identified factors	Influence on self-efficacy		Linked with sources SE
		Measured	Significant	
Tresolini & Stritter (1993)	Patterns of experience	x	x	x
Cassidy & Eachus (2002)	Computer experiences	x	x	x
	Familiarity with computers	x	x	x
Cantrell et al. (2003)	Time spent teaching	x	x	x
	Past science experiences	x		
Tang et al. (2004)	Length internship	x	x	x
	Prior related work experience	x	x	x
Miller & Byers (2008)	Sexuality-specific training experiences	x	x	

Identified factors within intervention studies without control group

In table 2 we make visible the results of nine studies that investigated the effects of an interventional treatment with underlying theories different from social cognitive theory, in a pretest-posttest design without control group. In the intervention column we mention the intervention as named by the researchers, in the influence on SE column we note if the intervention showed a significant effect on students' self-efficacy, in the following columns we make visible if identified factors are argued or measured, if measured factors are significant and if researchers connect their identified factors with the sources for self-efficacy according to social cognitive theory (Bandura, 1986, 1997).

Seven intervention studies showed a significant interventional treatment effect on students' self-efficacy. Only the teamwork training (Chen et al., 2004) and the learning styles workshop (Hendry et al., 2005) did not significantly improve student' self-efficacy.

Only three studies identified factors within the treatment, possibly responsible for students' raised self-efficacy. Settlage (2000) argued that it seemed likely that a combination of methods, components of courses (micro teaching, classroom videos, lectures, discussion, classroom visits) was responsible for the efficacy improvement and can be linked to the four sources of efficacy information. Parker (2006) also linked practice learning to the four sources but did not mention possible factors within practice learning. Abbitt and Klett (2007) argued that although it was not clear which specific course characteristics enhanced students' self-efficacy, results suggested that a course design that focused more broadly on topics relating the integration of technology into teaching practice was more likely to impact self-efficacy to a larger degree than a course that focuses primarily on developing specific computer technology skills. Making a connection with Bandura's vicarious experiences they mention the possibility of another factor including the observation of others. Palmer (2006) investigated the relative importance of the various sources of self-efficacy measured by surveyed students' statements. He provided evidence for three self-efficacy sources except verbal persuasion. Furthermore, Palmer (2006) argued on basis of students' statements the existence of additional sources, namely cognitive content mastery (successes in understanding science content), cognitive pedagogical mastery (successes in how to teach science) and simulated modelling (in which teaching is role-played). In this study Palmer (2006) found cognitive pedagogical mastery to be the most relevant source of self-efficacy information.

Table 2. Identified factors within intervention studies without control group.

Studies	Intervention	Influence on SE	Identified factors			Linked with sources SE
			Argued	Measured	Significant	
Settlage (2000)	Methods course	x	x			x
Chu (2003)	Web pages	x				
	design Instruction					
	Computer and	x				
	software use rates					
Chen et al. (2004)	Teamwork training					
Hendry et al. (2005)	Workshop learning styles					
Parker (2006)	Practice learning	x				x
Palmer (2006)	Methods course	x		x		x
Torkzadeh et al. (2006)	Introductory computer course	x				
Abbitt & Klett (2007)	Technology integration courses	x	x			
Milman & Molebash (2008)	Educational technology course	x				

Identified factors within intervention studies with control group

In table 3 we make visible the results of the three studies that investigated the effects of an interventional treatment with underlying theories different from social cognitive theory, using a pretest-posttest design with control group.

Table 3. Identified factors within intervention studies with control group.

Studies	Intervention	Influence on SE	Identified factors			Linked with sources SE
			Argued	Measured	Significant	
Griffin & Griffin (1998)	Reciprocal peer tutoring	if				
Ritschoff & Griffin (2001)	Reciprocal peer tutoring					
Franko et al. (2008)	Internet-based education programme	x	x			

if=inconsistent statistically significant findings.

Within these three studies, one intervention study (Franko et al., 2008) demonstrated significant differences between intervention and control groups on measures of students' self-efficacy although they did not find long-term maintenance of the intervention effects on self-efficacy. Griffin and Griffin (1998) found inconsistent statistically significant effects of a cooperative learning strategy, called reciprocal peer tutoring (RPT) on students' self-efficacy. They describe cooperative learning as an active learning strategy in which students work together to create their knowledge interdependently to enhance their own and each other's learning. Reciprocal peer tutoring enables each student to play the role of tutor and tutee. Rittschof and Griffin (2001) re-examined the value of cooperative learning and found no significant results. Only the Franko et al. (2008) study identified possible factors influencing students' self-efficacy. The methodology used in this study, i.e., students making multiple visits to the website, could have been responsible for the increase of self-efficacy because students had a tryout period for new behaviour combined with the possibility of setting and updating personal goals. Researchers did not link this methodology to the self-efficacy sources.

Identified factors within social cognitive intervention studies without control group

Nine studies within the selected group investigated the effects of an interventional treatment based on or related to social cognitive theory, using a pretest-posttest design without control group. In all studies in which the treatment was based on social cognitive theory students' self-efficacy was affected significantly.

Table 4. Identified factors within social cognitive theory intervention studies without control group.

Studies	Intervention	Influence on SE	Identified factors			Linked with sources SE
			Argued	Measured	Significant	
Schunk & Ertmer (1999)	Introduction computer course	x		x	x	x
Larson et al. (1999)	Counsellor training	x		x	x	x
Ren (2000)	Library instruction	x	x			x
Daniels & Larson (2001)	Laboratory counselling session	x		x	x	x
Adams (2004)	Observing models	x		x	x	x
Gurvitch & Metzler (2009)	Practicum	x	x			x
Dempsey et al. (2009)	Web-based environment	x	x			x
Koh & Frick (2009)	Educational technology course	x	x			x
Papastergiou (2010)	Computer literacy course	x	x			x

Identified factors

In five studies, factors within the treatment possibly responsible for students' raised self-efficacy, were identified and linked to the self-efficacy sources. Ren (2000) identified the combined library instruction components lecture, demonstration, hands-on practice and assignment and linked these to all the efficacy sources, emphasizing mastery experiences and less negative experiences emotions. Gurvitch and Metzler (2009) attributed the significant differences between the two treatment groups to the different levels of authentic teaching practice between groups. In this study authentic teaching experiences

includes most or all of the contextual characteristics found in P-12 schools. Linking these to Bandura's mastery experiences and verbal persuasion, Dempsey et al. (2009) infer from qualitative data and student scores in relation to experts' ratings on the website, that students could have experiences of acquiring writing assessment skills by practicing with student papers in the site on the basis of scaffolded practice, and experiences of frequent feedback on their performances. Koh and Frick (2009) mentioned that according to student perceptions software mastery was the most useful opportunity for raising self-efficacy, they also mentioned instructor demonstrations, a stress-free learning environment, clear learning goals and having appropriate learning resources as useful for raising self-efficacy. Koh and Frick (2009) also derived four patterns of instructor and student interactions, emerged from qualitative analysis of video clips, that appear to promote student computer self-efficacy and linked these to the four self-efficacy sources. Pattern one in which the teacher uses show and tell (providing content information) interactions with prompt and hint (asking questions to stimulate recall), appears to support students' mental forms of enactive mastery. In pattern two the teacher uses progress checking (monitoring students task performance) which stimulates student interactions initiating all kinds of questions. This in turn provides teachers with opportunities for frustration control (pointing out potential errors) and sharing new perspectives (suggestions of alternative approaches). Pattern two appears to support students' enactive mastery. In pattern three teachers invite suggestions from students that facilitate conversations and allow students to share content (responding to questions) and share projects (sharing ideas or progress). Within the same pattern teachers use direction maintenance (motivating student to focus and persist) which appears to support positive emotional arousal. Pattern four demonstrates that when students are able to clarify task and validate task performance they are able to clarify the learning goals. And establishing clear learning goals appears to be associated with students' computer self-efficacy (Koh & Frick, 2009). Connecting this with the enactive mastery experience source, Papastergiou (2010) deduced from students' views on and satisfaction with the course, that the hands-on activities developing ICT skills, valued by students as indispensable for their studies and careers, influenced students' ICT self-efficacy.

Identified and measured factors

In four studies identified factors within the intervention were measured. Schunk and Ertmer (1999) found that the opportunity for frequent self-evaluation, as an integral component of the self-reflection phase of self-regulation (Zimmerman, 2000), significantly affected students' self-efficacy.

Linking this outcome to social cognitive theory, demonstrates that not the self-evaluation opportunity itself but students' perception of progress is responsible for the improvement in self-efficacy. Larson et al. (1999) investigated the differential effects of the two pre-practical training techniques, videotapes on counselling sessions and role plays with mock clients, on counselling efficacy. Watching a videotape in which a model conducts a counselling session, provided a modest but uniformly beneficial effect across all novice students. The effect of the role-play intervention in which students acted in role plays with mock clients, was more volatile depending on novice students' success ratings. Linking this to social cognitive theory (Bandura, 1986), researchers mention that modelling may be particularly helpful when the skill is complex and the students are lacking the skills. Within the same counsellor education domain, Daniels and Larson (2001) demonstrated that positive bogus performance feedback after a 10-minute mock counselling session, significantly enhanced novice students' counselling self-efficacy. Researchers argue that novice counselling students seemed to translate the bogus positive feedback into a mastery experience more than they did the bogus negative feedback.

Adams (2004) investigated the differential influence of observing a seminar performance of a peer to that of a senior academic, on postgraduate students' self-efficacy for seminar presentations. Students observing the non-expert peer student showed significantly greater efficacy gains than students observing the expert performance, these students experienced no statistically significant gain in self-efficacy for the task. However based on social cognitive theory, it was expected that both groups would experience an enhancement of self-efficacy. Referring to the speech and content subscales in which expert model students experienced the greatest loss in self-efficacy researchers argue that observing a model native English speaker with an expert standard of content tends to create doubts in students about their own capabilities in these areas. Although in these last four studies identified factors appeared to be significant regarding their influence on students' self-efficacy, these interesting results should be interpreted with caution due to the lack of control groups and in most studies the absence of a random selection.

Identified factors within social cognitive intervention studies with control group

Thirteen studies within the selected group investigated the effects of an interventional treatment based on or related to social cognitive theory, using a pretest-posttest design with control group.

Identified factors

In five studies the effect of an intervention programme was measured and factors identified. Urbani et al. (2002) found that, master degree students, enrolled in a counsellor training founded on the four social cognitive sources for self-efficacy, exhibited greater gains in skills acquisition and counselling self-efficacy than did the control group students. Carson et al. (2002) found that among medical students, who enrolled in a cardiovascular nutrition module based on social cognitive theory principles, the increase in self-efficacy was twice that of the increase in the control group. Researchers argue that the gain in self-efficacy for experimental students was likely due partially to increased knowledge, also role modelling by faculty in class and expert views in computer cases may be responsible. Afterwards students themselves attributed their increased self-efficacy to the class sessions, the use of computer cases and the opportunity to apply knowledge in patient care. Barbee et al. (2003) found that pre-practical service learning had a positive significant relation with the counselor self-efficacy of novice counselor education students. Researchers describe pre-practical service learning as placing novice students in school or community agency settings using activities that are more structured and supervised than in an internship or practicals. However the level of counsellor training/development and experience with counselling-related work had a stronger influence than did pre-practical service-learning. Researchers suggest that pre-practical service learning is more appropriate for less experienced novice students. Al-Darmaki (2004) found that experimental group undergraduate students who received a first counsellor training showed greater gains in counsellor self-efficacy and less anxiety than did the control group students. The researcher suggests that the authentic experience of counselling training provides students with the opportunity to gain knowledge about their ability to help others and with a feeling of self-efficacy as professional helper and suggests that more investigation should be conducted to identify other variables such as supervisor feedback. Mathisen and Bronnick (2009) examined among students, municipality employees and special education teachers the effects of creativity training, on creative self-efficacy. The creativity course was based on social cognitive theory principles and conducted in a five-day format and a condensed one-day format. Creative self-efficacy improved significantly for participants in the five-day format as well as the one-day format, control group participants showed no changes in creative self-efficacy. A follow-up assessment two months after completing the course showed no decline in creative self-efficacy. These five studies clearly indicate that interventions based on social cognitive theory affect students' self-efficacy significantly. Furthermore several studies identify factors influencing students' self-efficacy on the basis of theoretical arguments.

Table 5. Identified factors within social cognitive theory intervention studies with control group.

Studies	Intervention	Influence on SE	Identified factors			Linked with sources SE
			Argued	Measured	Significant	
Ertmer et al. (1994)	Computer application course	x		x		x
Newman & Tuckman (1997)	Participant modelling			x		x
Johnson & Marakas (2000)	Information systems application course	x		x		x
Anderson (2000)	Symbolic modelling	x		x	x	x
	Persuasive information	x		x	x	x
Tompson & Dass (2000)	Strategic management course	x		x	x	x
Kitsantas & Baylor (2001)	Educational technology course			x		
Urbani et al. (2002)	Counsellor training	x	x			x
Carson et al. (2002)	Cardio-vascular nutrition module	x	x			x
Barbee et al. (2003)	Prepracticum service-learning	x	x			x
Al-Darmaki (2004)	Counsellor training	x	x			x
Wang et al. (2004)	Educational technology course	x		x	x	x
Lancaster & Bain (2007)	Inclusive education course	x		x		x
Mathisen & Bronnick (2009)	Creativity training	x	x			x

Identified and measured factors

In eight studies factors relative to self-efficacy, isolated or integrated within a programme, were measured. In the studies that examined the effects of some kind of modelling on students' self-efficacy, Anderson (2000) examined the effects of symbolic modelling compared with persuasive influences on self-efficacy. In the case of symbolic modelling students observe models not live but on videotapes. Anderson (2000) found that symbolic modelling caused greater efficacy and behavioural intentions than did persuasive efficacy information, which in turn surpassed the control condition. Johnson and Marakas (2000) investigated the role of behavioural modeling in computer skills acquisition. They define behavioural modelling as the observation of another person performing desired behaviour, because they used a videotaped model this type of model is comparable with Anderson's (2000) symbolic modelling. Gains in computer self-efficacy could not be attributed directly to modelling manipulation. Self-efficacy increased among all training participants and it was not possible to isolate the true effect of the training manipulation on the dependent variable.

Newman and Tuckman (1997) studied the effects of another type of modelling, participant modelling. Participant modelling refers to a trainer who demonstrates and guides the student through the learning process so that a successful outcome can be attained (Newman & Tuckman, 1997). Participant modelling influenced task performance significantly but had less effect on self-efficacy. Researchers state that the time between treatment sessions was short and suppose that self-efficacy requires multiple and successive experiences to be affected in a positive and measurable way. Wang et al. (2004) investigated among preservice teachers the effects of vicarious learning experiences and goal setting on students' self-efficacy for integrating technology into the classroom, using three experimental and one control situation. Vicarious learning is described in this respect as observing positive role models (in this study supervising teachers) successfully accomplish a task, goal setting is described as addressing a specific goal while resolving a particular teaching issue. Results from the Wang et al. study (2004) demonstrated significant treatment effects for vicarious experiences and goal setting. The most powerful effect was found when vicarious experiences were combined with goal setting.

Within two treatment and a control situation, students' self-efficacy in computer capability significantly increased across all situations. Ertmer et al. (1994) did not find a direct relationship between time-on-task and levels of self-efficacy. The researchers suggest that the pervasive effects of qualitative positive classroom experiences and personal interactions with the instructor, may have overshadowed the quantitative time-on-task computer experience.

Tompson and Dass (2000) investigated the relative contribution of simulations and case studies for enhancing students' self-efficacy in a strategic management course, with the intention of determining which teaching method provides a more authentic enactive mastery experience. The traditional course mainly based on written case studies, requiring students to offer a solution or recommendation for strategic problems, served as control group. The experimental students enrolled in a course based on a total enterprise simulation, required students to generate multiple, successive decisions for an ongoing company. The use of simulations resulted in significantly higher improvements in self-efficacy than the use of case studies. Researchers mention that they did not control for the instructor's style, which may have affected students' beliefs.

Kitsantas and Baylor (2001) studied the impact of an instructional planning self-reflective tool on the self-efficacy pre-service teachers enrolled in an educational technology course. The tool was designed to promote students' self-regulation (Zimmermann, 2000) containing the two core elements self-monitoring and self-evaluation. Self-monitoring refers to tracking one's activities through self-observation whereas self-evaluation refers to assessing and comparing one's accomplishments to a standard or goal. Students in the control group condition were taught how to develop an instructional plan as part of the course. In the experimental group students were provided with instruction on how to use a self-regulatory tool while engaging in instructional planning. The results revealed that experimental group students demonstrated higher level in proficiency in skills mastery, more positive disposition and reported higher perceived instrumentality of instructional planning, than did control group students. The results regarding instructional planning self-efficacy, showed no significant differences between the two groups. Nevertheless, further analyses revealed that students who initially felt highly efficacious reported significantly lower self-efficacy after the self-regulatory tool instruction; in contrast, students who initially felt low in self-efficacy mentioned significantly higher self-efficacy after the tool intervention. The researchers argue that the used instrument may be too less sensitive and that the tool may have facilitated the low self-efficacy students to feel more confident whereas it may have facilitated the high efficacious students to realise the depth and complexity of instructional planning.

Lancaster and Bain (2007) investigated the differential effects of types of field-based experience included in a thirteen-week inclusive education course on students' self-efficacy. Student teachers participated in one of the three levels: mentoring, inclusive classroom support and subject-only (comparison group). Scores on self-efficacy increased for all groups from pre-test to post-test, however the inclusion of applied experience did not necessarily show covariance with greater enhancement of students' self-efficacy. The researchers suggest that

the provision of a direct experience is, in itself, not sufficient to build student teachers self-efficacy and that more detailed understanding of the nature and effects of applied experiences is necessary.

Except the studies of Newman and Tuckman (1997) and Kitsantas and Baylor (2001) all of these eight studies indicate that an intervention based on social cognitive theory affects students' self-efficacy significantly. In addition to this in three of these studies factors, isolated or integrated within a programme appeared to influence self-efficacy significantly.

Conclusions

Student self-efficacy has emerged as an important construct in educational research over the last thirty years. Since the early nineties of the last century researchers within the higher educational sector have tried to clarify situational and instructional factors that influence students' self-efficacy. Based on the findings of our literature review we can draw the following conclusions.

Firstly, it is possible to influence students' self-efficacy within higher educational programmes, eighty percent of the intervention studies across several types of study and across several domains demonstrated a significant relation between an intervention programme and students' self-efficacy.

Secondly, not surprisingly intervention programmes that were based on social cognitive theory were more effective in influencing students' self-efficacy than interventional treatments with underlying theories other than social cognitive theory. Ninety one percent of the total number of social cognitive theory intervention studies was effective against sixty seven percent of the total number of other invention studies, eighty five percent of the social cognitive theory intervention studies with control group was effective against thirty-three percent of the other intervention studies with control group.

In the third place, thirty-one out of the thirty-nine studies identified one of more factors influencing students' self-efficacy. In thirteen studies arguments were used to identify factors, and in eighteen studies factors were measured. Within the studies that measured factors twelve found a significant relation, nine studies found a causal significant relation. Within these nine studies that found a causal significant relation, three studies used a control group.

Fourthly, enactive mastery experiences are stated as the most powerful source of creating a strong sense of efficacy. With regard to this source almost every study stresses the relevance of providing students with practical experiences, i.e. students performing a task while applying knowledge and skills within demanding situations. Indeed, the translation into educational

programmes varies, some studies found mixed evidence for the amount of practical experience, and found in effect time-on-task or length of internship to be responsible for the enhancement of students' self-efficacy. Although a lot of researchers emphasize the type of experience, namely the specificity of the educational experiences in relation to the task as being responsible for enhancing students' self-efficacy, most of the evidence was argued retrospectively. Furthermore it is argued that a direct experience in itself is not automatically a mastery experience, it seems relevant to tune the authenticity level of the experience, the structure of the situation and the supervision of the students to the complexity of the task or skill and to the students' skill developmental level. For example, even the use of simulations such as role-plays in which students exercise their skills is not necessarily a well-tuned intervention for novice students, regarding the authenticity level. In some studies the possible influence of goal setting on students' self-efficacy is argued or measured, and although not mentioned in these studies goal setting can be seen as a component of student self-regulation (Zimmerman, 2000). Goal setting combined with self-reflection, another self-regulation component, can provide students the opportunity of perceptions of learning progress, which can lead to a mastery experience.

Fifthly, although vicarious experiences as second source of efficacy information are often mentioned and argued, we found mixed evidence for the effectiveness. Researchers used different types of observational learning, such as live models, videotaped models and participant modelling. Regarding the translation of this efficacy source into instructional factors, several questions arise such as under which conditions it is preferable to use expert models or peer models, and in the case of participant modelling, in which demonstration as well as guiding are included, questions concerning the effective parts of this type of modelling arise.

Sixthly, verbal persuasion as the third efficacy source is also often mentioned and argued as relevant for students' efficacy. Only a few studies examined this source by translating it into feedback on students' performance and found some evidence. In line with Gielen, Peeters, Dochy, Onghena and Struyven (2010) who state that not all feedback leads to performance improvement and emphasize the need for investigators to describe the type of examined feedback and circumstances in which feedback is provided, several questions remain regarding the differing effects of different types of feedback on students' self-efficacy.

Seventh, a lot of studies mention the combined self-efficacy sources as high potential for enhancing students' self-efficacy. Several studies argue this relevance or base their educational programme design on combined sources. The only study (Wang, et al. 2004) that measured the effect of combined sources found promising results.

Finally, almost all studies identified factors at the level of the course or instructional strategy. The Koh and Frick (2009) study is the only one that examined factors at the level of teacher and student classroom interaction. They found four types of instructional transactions connected with the self-efficacy sources that probably influenced students' self-efficacy.

The results of this review study indicate several suggestions for further research. Due to the limitations of most studies, it seems necessary to measure instructional factors that are clearly derived from the self-efficacy sources within randomized trial studies. For further study it seems relevant to examine how combinations of instructional factors interplay and which combinations are effective regarding students' skill level and the complexity of the skills. Because almost all studies examined short-term effects, it seems necessary to conduct studies in which the maintenance of self-efficacy is examined. Other relevant lines of further research are the further investigation and validation of patterns of teacher and student interactions that enhance students' self-efficacy, and the examining of additional sources of self-efficacy such as cognitive forms of enactive mastery.

Higher educational institutions put effort into helping their students develop the required knowledge, skills and competencies. Although competent behaviour largely depends on acquiring knowledge and skills, it is obvious that students' self-efficacy plays a predicting and mediating role in relation to students' achievements, motivation and learning. Therefore it seems crucial that institutions of higher education pay attention to students' developing self-efficacy. Knowing the factors that affect the development of students' self-efficacy can help higher educational institutions in developing and planning educational programmes that enhance students' self-efficacy.

In the light of furthering our understanding in this field we certainly are convinced after reading all the studies and the presented evidence that self-efficacy is vital to academic performance and that self-efficacy of students can be affected positively. Certainly, a strong source for lowering students' self-efficacy will be their mastery experiences in elementary and secondary education: repeated strong negative mastery experiences will probably lead to decreasing levels of self-efficacy. The fact that this phenomenon appears frequently is not that surprising since many school systems are built on the adagio of failure, non-mastery or mistakes. Teachers focus on what students have not mastered yet, what they do not know, and so on. A general change in attitude and focus in the school system on 'what students can or master', on their 'talent' or on focussing on competencies mastered, would probably have influence on this phenomenon. A focus on 'talent' or 'strengths' of students would then certainly require a change in learning methods and assessment modes.

Besides this, educational institutions could also actively stimulate self-efficacy of students by providing a programme that provides students with authentic tasks, requiring them to apply more frequently knowledge and skills within diverse situations. In these, the authenticity level of the experience, the structure of the situation and the supervision of the students should be well tuned to the complexity of the task and to the student's 'skill developmental level'. Such an approach could then raise the time-on-task and consequently the self-efficacy. Moreover, the classroom climate should be a 'safe' environment for students in order to learn. Of course, a rigorous approach and application of frequent self reflection and self- and peer-assessment could add to it (Van Gennip, Segers, & Tillema, 2009). In addition, performing tasks that entail constructive conflicts or controversy within teams of students would seem to be a promising path to follow (Decuyper, Dochy & Van den Bossche, 2010).

References

- Adams K. (2004). Modelling success: enhancing international postgraduate research students' self-efficacy for research seminar presentations. *Higher Education Research & Development*, 23(2), 115-130.
- Abbitt, J.T., & Klett, M.D. (2007). Identifying influences on attitudes and self-efficacy beliefs towards technology integration among pre-service teachers. *Electronic Journal for the Integration of Technology in Education*, 6, 28-42.
- Al-Darmaki, F.R. (2004). Counselor training, anxiety, and counseling self-efficacy: Implications for training psychology students from the United Arab Emirates University. *Social Behavior and Personality*, 32(5), 429-440.
- Anderson R.B. (2000). Vicarious and persuasive influences on efficacy expectations and intentions to perform breast self-examination. *Public Relations Review*, 26(1), 97-114.
- Bandura, A (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84, 191-215.
- Bandura, A. (1983). Self-efficacy determinants of anticipated fears and calamities. *Journal of Personality and Social Psychology*, 45, 464-469.
- Bandura, A (1986). Social foundations of thought and action: *A social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W.H. Freeman and Company.
- Bandura, A. (2006). Adolescent development from an agentic perspective. In F. Pajares & T. Urdan (Eds.), *Self-efficacy beliefs of adolescents* (pp.1-43). Greenwich, CT: Information Age Publishing.
- Bandura, A., Adams, N.E., Hardy, A.B., & Howells, G.N. (1980). Tests of the generality of self-efficacy theory. *Cognitive Therapy and Research*, 4(1), 39-66.
- Bandura, A. & Schunk, D.H. (1981). Cultivating competence, self-efficacy and intrinsic interest through proximal self-motivation. *Journal of Personality and Social Psychology*, 41(3), 586-598.
- Barbee, P.W., Scherer, D., & Combs, D.C. (2003). Prepracticum service-learning: Examining the relationship with counselor self-efficacy and anxiety. *Counselor Education & Supervision*, 43, 108-119.
- Bong, M., & Clark, R.E. (1999). Comparison between self-concept and self-efficacy in academic motivation research. *Educational Psychologist*, 34(3), 139-153.
- Bong, M., & Skaalvik, E.M. (2003). Academic self-concept and self-efficacy: How different are they really? *Educational Psychology Review*, 15(1), 1-40.
- Bouffard-Bouchard, T. (1990). Influence of self-efficacy on performance in a cognitive task. *The Journal of Cognitive Psychology*, 130(3), 353-363.
- Bouffard-Bouchard, T., Parent, S., & Larivée, S. (1991). Influence of self-efficacy on self-regulation and performance among junior and senior high-school age students. *International Journal of Behavioral Development*, 14(2), 153-164.

- Brookhart, S.M., & DeVoge, J.G. (1999). Testing a theory about the role of classroom assessment in student motivation and achievement. *Applied Measurement in Education*, 12(3), 409-426.
- Cantrell, P., Young, S., & Moore, A. (2003). Factors affecting science teaching efficacy of preservice elementary teachers. *Journal of Science Teacher Education*, 14(3), 177-192.
- Carmichael, C., & Taylor, J.A. (2005). Analysis of student beliefs in a tertiary preparatory mathematics course. *International Journal of Mathematical Education in Science and Technology*, 36(7), 713-719.
- Carson, J.A., Gilham, M.B., Kirk, L.M., Reddy, S.T., & Battles, J.B. (2002). Enhancing self-efficacy and patient care with cardiovascular nutrition education. *American Journal of Preventive Medicine*, 23(4), 296-302.
- Cassidy, S., & Eachus, P. (2002). Developing the computer user self-efficacy (cuse) scale: investigating the relationship between computer self-efficacy, gender and experience with computers. *Journal of Educational Computing Research*, 26(2), 133-153.
- Chen, G., Donahue, .M., & Klimosky, R.J. (2004). Training undergraduates to work in organizational teams. *Academy of Management Learning and Education*, 3(1), 27-40.
- Chu, L. (2003). The effects of web page design instruction on computer self-efficacy of preservice teachers and correlates. *Journal of Educational Computing Research*, 28(2), 127-142.
- Daniels J.A., & Larson L.M. (2001). The impact of performance feedback on counseling self-efficacy and counselor anxiety. *Counselor Education & Supervision*, 41(2), 120-130.
- Davis, F. W., & Yates, B.T. (1982). Self-efficacy expectancies versus outcome expectancies as determinants of performance deficits and depressive affect. *Cognitive Therapy and Research*, 6(1), 23-35.
- Decuyper, S., Dochy, F., & Van den Bossche, P. (2010). Grasping the dynamic complexity of team learning. An integrative systemic model for effective team learning. *Educational Research Review*, 5(2), 111-133.
- Dempsey, M.S., PytlikZillig, L.M., Bruning, R.H. (2009). Helping preservice teachers learn to assess writing: Practice and feedback in a web-based environment. *Assessing Writing*, 14, 38-61.
- Dietze, A., Jansma, F., & Riezebosch, A. (2000). *Een kijkkader voor competenties voor de tweedegraads lerarenopleidingen* [A framework of competencies for secondary grade teacher education]. Utrecht: Programma Management Educatief Partnerschap.
- Dochy, F. (2001). A new area assessment era: different needs, new challenges. *Research Dialogue in Learning and Instruction*, 10, 11-20.
- Dochy, F., Segers, M., Bossche P. Van den, & Gijbels, D. (2003). Effects of problem-based learning: a meta-analysis. *Learning and Instruction*, 13(5), 533-568.
- Earley, P.C. (1994) Self or group? Cultural effects of training on self-efficacy and performance. *Administrative Science Quarterly*, 38, 89-117.
- Ertmer, P.A., Evenbeck, E., Cennamo, K.S., & Lehman, J.D. (1994). Enhancing self-efficacy for computer technologies through the use of positive classroom experiences. *Educational Technology Research and Development*, 42(3), 45-62.

- Franko, D.L., Cousineau, T.M., Trant, M., Green, T.C., Rancourt, D., Thompson, D., Ainscough, J., Mintz, L.B., & Ciccazzo, M. (2008). Motivation, self-efficacy, physical activity and nutrition in college students: Randomized controlled trial of an internet-based education program. *Preventive Medicine*, 47, 369-377.
- Gielen, S., Peeters, E., Dochy, F., Onghena, P., & Struyven, K. (2010). Improving the effectiveness of peer feedback for learning. *Learning and Instruction*, 20(4), 304-315 .
- Graham, S. & Harris, K.R. (1989a). Improving learning disabled students' skills at composing essays: Self-instructional strategy training. *Exceptional Children*, 56(3), 201-214.
- Graham, S. & Harris, K.R. (1989b). Components analysis of cognitive strategy instruction: Effects on learning disabled students' compositions and self-efficacy. *Journal of Educational Psychology*, 81(3), 353-361.
- Griffin, M.M. & Griffin, B.W. (1998). An investigation of the effects of reciprocal peer tutoring on achievement, self-efficacy and test anxiety. *Contemporary educational psychology*, 23(3), 298-311.
- Gurvitch, R., & Metzler, M.W. (2009). The effects of laboratory-based and field-based practicum experience on pre-service teachers' self-efficacy. *Training and Teacher Education*, 25, 437-443.
- Hendry, G.D., Heinrich, P., Lyon, P.M., Barratt, A.L., Simpson, J.M., Hyde, S.J., Gonsalkorale, S., Hyde, M., & Mgaith, S. (2005). Helping students understand their learning styles: Effects on study self-efficacy, preference for group work and group climate. *Educational Psychology*, 25(4), 395-407.
- Johnson, R.D., & Marakas, G.M. (2000). Research report: The role of behavioral modeling in computer skills acquisition: Toward refinement of the model. *Information Systems Research*, 11(4), 402-417.
- Kazdin, A.E., & Rogers, T. (1978). On paradigms and recycled ideologies: Analogue research revisited. *Cognitive therapy and research*, 2(1), 105-117.
- Kitsantas, A., & Baylor, A. (2001). The impact of the instructional planning self-reflective tool on preservice teacher performance, disposition and self-efficacy beliefs regarding systematic instructional planning. *Educational Technology Research and Development*, 49(4), 97-106.
- Koh, J.H.L., Frick, T.W. (2009). Instructor and student classroom interactions during technology skills instruction for facilitating preservice teachers' computer self-efficacy. *Journal for Educational Computing Research*, 40(2), 211-228.
- Lancaster, J., & Bain, A. (2007). The design of inclusive education courses and the self-efficacy of preservice teacher education students. *International Journal of Disability, Development and Education*, 54(2), 245-256.
- Lane, J., Lane, A. & Kyprianou, A. (2004). Self-efficacy, self-esteem and their impact on academic performance. *Social Behaviour and Personality*, 32, 247-256.
- Larson, L.M., Clark, M.P., Wesely, L.H., Koraleski, S.F., Daniels, J.A., & Smith, P.L. (1999). Videos versus role plays to increase counseling self-efficacy in prepractica trainees. *Counselor Education & Supervision*, 38(4), 237-248.

- Lee, C. (1984). Accuracy of efficacy and outcome expectations in predicting performance in a simulated assertiveness task. *Cognitive Therapy and Research*, 8(1), 37-48.
- Lent, R.W., Brown, S.D., & Hackett, G. (2002). Social cognitive career theory. In: D. Brown (Ed.), *Career choice and development* (pp. 255-311). San Francisco: Jossey-Bass.
- Linnenbrink, E.A., & Pintrich, P.R. (2003). The role of self-efficacy beliefs in student engagement and learning in the classroom. *Reading and writing quarterly: overcoming learning difficulties*, 19(2), 119-137.
- Mathisen, G.E., & Bronnick, K.S. (2009). Creative self-efficacy: An intervention study. *International Journal of Educational Research*, 48, 21-29.
- Miller, S.A., & Byers, E.S. (2008). An exploratory examination of the sexual intervention self-efficacy of clinical psychology graduate students. *Training and Education in Professional Psychology*, 2(3), 137-144.
- Milman, N.B., & Molebash, P.E. (2008). A longitudinal assessment of teacher education students' confidence toward using technology. *Journal of Educational Computing Research*, 38(2), 183-200.
- Newman, E.J. & Tuckman, B.W. (1997). The effects of participant modeling on self-efficacy, incentive, productivity and performance. *Journal of Research and Development in Education*, 31(1), 38-45.
- Pajares, F. (1996). Self-efficacy Beliefs in Academic Settings. *Review of Educational Research*, 66(4), 543-578.
- Pajares, F. (1997). Current Directions in Self-efficacy Research. In M. Maehr & P.R. Pintrich (Eds.), *Advances in motivation and achievement: Vol. 10* (pp. 1-49). Greenwich, CT: JAI Press.
- Pajares, F. (2003). Self-efficacy beliefs, motivation and achievement in writing. *Reading & Writing Quarterly*, 19(2), 139-158.
- Pajares, F. (2006). Self-efficacy during childhood and adolescence: Implications for teachers and parents. In F. Pajares & T. Urdan (Eds.), *Self-efficacy Beliefs of Adolescents* (pp. 339-367). Greenwich, CT: Information Age Publishing.
- Pajares, F., & Miller, M.D. (1994). Role of self-efficacy and self-concept beliefs in mathematical problem solving: a path analysis. *Journal of Educational Psychology*, 86(2), 193-203.
- Pajares, F., & Miller, M.D. (1997). Mathematics self-efficacy and mathematical problem solving: Implications of using different forms of assessment. *Journal of Experimental Education*, 65(3), 313-229.
- Pajares, F., & Urdan, T. (2006). Foreword. In F. Pajares & T. Urdan (Eds.), *Self-efficacy beliefs of adolescents* (pp. ix-xii). Greenwich, CT: Information Age Publishing.
- Palmer, D.H. (2006). Sources of self-efficacy in a science methods course for primary teacher education students. *Research in Science Education*, 36, 337-353.
- Papastergiou, M. (2010). Enhancing physical education and sport science students' self-efficacy and attitudes regarding information and communication technologies through a computer literacy course. *Computers & Education*, 54, 298-308.

- Parker, J. (2006). Developing perceptions of competence during practice learning. *British Journal of Social Work*, 36, 1017-1036.
- Pintrich, P. & De Groot, E. (1990). Motivational and self-regulated learning, components of classroom academic performance. *Journal of Educational Psychology*, 82, 33-40.
- Relich, J.D., Debus, L., & Walker, R. (1986). The mediating role of attribution and self-efficacy variables for treatment effects on achievement outcomes. *Contemporary Educational Psychology*, 11, 195-216.
- Ren, W.H. (2000). Library instruction and college student self-efficacy in electronic information searching. *The Journal of Academic Librarianship*, 26(5), 323-328.
- Rittschof, K.A., & Griffin, B.W. (2001). Reciprocal peer tutoring: re-examining the value of a cooperative learning technique to college students and instructors. *Educational Psychology*, 21(3), 313-331.
- Rotter, B.J. (1966). Generalized expectancies for internal versus external control reinforcement. *Psychological Monographs*, 33(1), 300-303.
- Ryan, M.R. & Deci, E.L. (2000). Self-Determination Theory and the facilitation of intrinsic motivation, social development and well-being. *American Psychologist*, 55(1), 68-78.
- Schunk, D.H. (1982). Effects of effort attributional feedback on children's perceived self-efficacy and achievement. *Journal of Educational Psychology*, 74(4), 548-556.
- Schunk, D.H. (1983a). Developing children's self-efficacy and skills: The roles of social comparative information and goal setting. *Contemporary Educational Psychology*, 8, 76-86.
- Schunk, D.H. (1983b). Ability versus effort attributional feedback: Differential effects on self-efficacy and achievement. *Journal of Educational Psychology*, 75(6), 848-856.
- Schunk, D.H. (1983c). Reward contingencies and the development of children's skills and self-efficacy. *Journal of Educational Psychology*, 75, 511-518.
- Schunk, D.H. (1983d). Progress self-monitoring: Effects on children's self-efficacy and achievement. *Journal of Experimental Education*, 51, 89-93.
- Schunk, D.H. (1984). Enhancing self-efficacy and achievement through rewards and goals: Motivational and informational effects. *Journal of Educational Research*, 78, 29-34.
- Schunk, D.H. (1985). Participation in goal setting: effects on self-efficacy and skills of learning-disabled children. *The journal of Special Education*, 19(3), 307-317.
- Schunk, D.H. (1987). Peer models and children's behavioral change. *Review of Educational Research*, 57, 149-174.
- Schunk, D.H. (1989a). Self-efficacy and achievement behaviors. *Educational Psychology Review*, 1, 173-208.
- Schunk, D.H. (1989b). Self-efficacy and cognitive skill learning. In C. Ames & R. Ames (Eds.), *Research on motivation in education: Vol. 3, Goals and cognitions* (pp.13-44). San Diego: Academic.
- Schunk, D.H. (1989c). Social Cognitive Theory and Self-regulated learning. In B.J. Zimmerman & D.H. Schunk (Eds.), *Self-Regulated Learning and Academic Achievement. Theory, Research and Practice* (pp.83-110). New York: Springer-Verlag.

- Schunk D.H. (1991). Self-efficacy and academic motivation. *Educational Psychologist*, 26, 207-231.
- Schunk, D.H (1995) Self-efficacy and education and instruction. In J.E. Maddux (Ed.), *Self-efficacy, adaptation and adjustment: Theory, research and application* (pp. 281-303). New York: Plenum Press.
- Schunk, D.H (1996). Goal and Self-evaluative influences during children's cognitive skill learning. *American Educational Research Journal*, 33(2), 359-382.
- Schunk D.H. (2003). Self-efficacy for reading and writing: influence of modeling, goal setting and self-evaluation. *Reading and writing quarterly: overcoming learning difficulties*, 19(2), 159-172.
- Schunk, D.H. & Cox, P.D. (1986). Strategy training and attributional feedback with learning disabled students. *Journal of Educational Psychology*, 78(3), 201-209.
- Schunk, D.H, & Ertmer P.A. (1999). Self-regulatory processes during computer skill acquisition: Goal and Self-evaluative influences. *Journal of Educational Psychology*, 91(2), 251-260.
- Schunk, D. & Gunn, T.P. (1986) Self-efficacy and skill development: Influence of task strategies and attributions. *Journal of Educational Research*, 79, 238-244.
- Schunk, D.H. & Hanson A.R (1985). Peer models: Influence of children's self-efficacy and achievement. *Journal of Educational Psychology*, 77, 313-322.
- Schunk, D.H. & Hanson A.R. (1989). Self-modeling and children's cognitive skill learning. *Journal of Educational Psychology*, 81(2), 155-163.
- Schunk, D.H, Hanson A.R. & Cox P.D. (1987). Peer model attributes and children's achievement behaviors. *Journal of Educational Psychology*, 79, 54-61.
- Schunk D.H. & Pajares F. (2001) The Development of academic self-efficacy. In A. Wigfield & J.S. Eccles (Eds.), *Development of Achievement Motivation* (pp.15-32). San Diego, CA: Academic Press.
- Schunk, D.H & Rice J.M (1991). Learning goals and progress feedback during reading comprehension instruction. *Journal of Reading Behavior*, 23(3), 351-364.
- Schunk, D.H & Schwartz C.W. (1993). Goals and progress feedback: Effects on self-efficacy and writing achievement. *Contemporary Educational Psychology*, 18, 337-354.
- Segers, M., Dochy, F. & Cascallar, E. (2003). *Optimising new modes of assessment: In search of qualities and standards*. Dordrecht: Kluwer Academic Publishers.
- Settlage, J. (2000). Understanding the learning cycle: Influences on abilities to embrace the approach by preservice elementary school teachers. *Science Education*, 84(1), 43-50.
- Stajkovic, A. & Luthans, F. (1998). Self-efficacy and work-related performance: a meta- Analysis. *Psychological Bulletin*, 124, 240-261.
- Tang, M., Addison, K.D., Lasure-Bryant, D., Norman, R., O'Connell, W., & Stewart-Sicking, J.A. (2004). Factors that influence self-efficacy of counseling students: An exploratory study. *Counselor Education & Supervision*, 44, 70-80.
- Tompson, G.H. & Dass, P. (2000). Improving students' self-efficacy in strategic management: The relative impact of cases and simulations. *Simulation & Gaming*, 31(1), 22-41.

- Tresolini, C.P., & Stritter, F.T. (1994). An analysis of learning experiences contributing to medical students' self-efficacy in conducting patient education for health promotion. *Teaching and Learning in Medicine*, 6(4), 247-254.
- Triandis, H.C. (1996). The psychological measurement of cultural syndromes. *American Psychologist*, 51, 407-415.
- Torkzadeh, G., Chang, J.C., & Dedirhan, D. (2006). A contingency model of computer and internet self-efficacy. *Information & Management*, 43, 541-550.
- Urbani, S., Smith, M.R., Maddux, C.D., Smaby, M.H., Torres-Rivera, E., & Crews, J. (2002). Counselor preparation: Skills-based training and counseling self-efficacy. *Counselor Education & Supervision*, 42, 92-106.
- Van Gennip, N.A.E., Segers, M., & Tillema, H.H. (2009). Peer assessment for learning from a social perspective: The influence of interpersonal and structural features. *Learning and Instruction*, 4(1), 41-54.
- Wang, L., Ertmer, P.A., & Newby, T.J. (2004). Increasing preservice teachers' self-efficacy beliefs for technology integration. *Journal of Research on Technology in Education*, 36(3), 231-250.
- Weiner, B. (1992). *Human motivation: Metaphors, theories and research*. Newbury Park, CA: SAGE Publications.
- Zimmerman, B.J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P.R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp.13-35). San Diego, CA: Academic Press.
- Zimmerman, B.J., Bandura, A. & Martinez-Pons, M. (1992). Self-motivation for academic attainment: The role of self-efficacy beliefs and personal goal setting. *American Educational Journal*, 29, 663-676.
- Zimmerman B.J., & Cleary T.J. (2006). Adolescents' Development of Personal Agency. In F. Pajares & T. Urdan (Eds), *Self-Efficacy Beliefs of Adolescents* (pp. 45-69). Greenwich, Connecticut: Information Age Publishing.
- Zimmerman, B.J., & Kitsantas, A. (1999). Acquiring writing revision skill: Shifting from process to outcome self-regulatory goals. *Journal of Educational Psychology*, 91(2), 241-250.
- Zimmerman, B.J., & Ringle, J. (1981). Effects of model persistence and statements of confidence on children's self-efficacy and problem solving. *Journal of Educational Psychology*, 73(4), 485-493.

CHAPTER 3

THE CONSTRUCT VALIDITY AND PREDICTIVE VALIDITY OF A SELF-EFFICACY MEASURE FOR STUDENT TEACHERS IN COMPETENCE-BASED EDUCATION

Van Dinther, M., & Braeken, J. (2011, May 19 - 20). *Perceived competence for higher education: Underlying structure and utility*. Paper presented at the ASA Spring Methodology Conference, of the American Sociological Association, organised in Europe by the Department of Methodology and Statistics at Tilburg University, Tilburg, The Netherlands.

Van Dinther, M. (2012, November 28 – 30). *Self-efficacy of student teachers in competence-based education*. Paper presented at the EAPRIL 2012 Conference of the European Association for Practitioner Research on Improving Learning, Jyväskylä, Finland.

Van Dinther, M., Dochy, F., Segers, M., & Braeken, J. (2013). The constructive validity and predictive validity of a self-efficacy measure for student teachers in competence-based education. *Studies in Educational Evaluation*, 39, 169-179.

Abstract

This study intends to investigate the validity of a self-efficacy measure which is developed for predictive and diagnostic purposes concerning student teachers in competence-based education. CFA results delivered converging evidence for the multidimensionality of the student teacher self-efficacy construct and the bi-factor model as underlying structure, reflecting a teacher competence framework. Factor loadings of the bifactor model evidenced the theoretical assumption that incipient student teachers enter the programme with a global undifferentiated sense of teacher self-efficacy, having teaching experiences a further differentiation takes place to a partly differentiated sense of teacher self-efficacy. Logistic regression analysis revealed that the measure succeeds in predicting students' first-year outcomes and delivered evidence for the diagnostic value of the scale.

Keywords: student evaluation, student teacher self-efficacy measure, competence-based education, evaluation methods

Introduction

At present, institutes for teacher education put effort in supporting their student teachers in developing the knowledge, skills and competences required of them. In the development of these competences, researchers in educational settings are increasingly drawing attention to the role student perceptions and beliefs play in the learning process. In particular self-efficacy, as a key element of social cognitive theory, appears to be a significant variable in student learning and development (see e.g., Pajares, 2006; or for a review, see Van Dinther, Dochy & Segers, 2011, Chapter 2 of this dissertation). Concerning the educational field, considerable research has been conducted with regard to the relevance of teacher self-efficacy and the development of teacher self-efficacy measures (Tschannen-Moran & Woolfolk Hoy, 2001; Woolfolk Hoy & Davis, 2006). However, existing teacher self-efficacy measures are mostly concerned with graduated teachers working in the educational field, lacking the optimal level of task and context specificity because they do not take into account student teacher competence development and student teacher self-efficacy development.

According to Bandura (1997) and Woolfolk Hoy and Burk -Spero (2005), teacher self-efficacy may be most malleable during teacher preparation and the first years of teaching. However, teacher educational institutes pay scarce attention to student teacher self-efficacy and research to explore the development of student teacher self-efficacy is limited.

Taking into account students' incipient developmental stage of teacher competences and teacher self-efficacy, this study intends to investigate the construct validity and predictive validity of a self-efficacy measure which is developed for predictive and diagnostic purposes for first year student teachers in competence-based education.

Teachers' sense of efficacy

As a key element of social cognitive theory, self-efficacy appears to be a significant variable in diverse domains of human functioning (Pajares, 1996; Schunk, 1995, 2003). Self-efficacy refers to "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p.3). Within the educational field, the meaning and measure of teachers' sense of efficacy has been the focus of many research studies. Teacher self-efficacy is usually defined as "the extent to which the teacher believes he or she has the capacity to affect student performance" (Berman, McLaughlin, Bass, Pauly, & Zellman, 1977, p. 137) or as "their belief in their ability to have a positive effect on student learning" (Ashton, 1985, p. 142).

The notion that teachers' beliefs about their capabilities as teachers are of consequence, dates from Rotter's social learning theory (1966). According to this conceptual base, teachers' sense of efficacy was viewed as the extent to which teachers believe whether the reinforcement of their teaching activities lies within their own control (internal) or outside their control and within the influence of the environment (external).

The second conceptual base originated from Bandura's work (1977) and identified teacher self-efficacy as a type of self-efficacy among several other types. The meaning of teacher self-efficacy as a type of self-efficacy regarding student achievement and motivation has been investigated in several studies (Woolfolk Hoy & Davis, 2006). Several researchers found significant relations between teacher sense of efficacy and student achievement. We mention some examples. Ashton and Webb (1986) demonstrated that students generally learn more from teachers with a high sense of efficacy than from teachers with a low sense of efficacy. Other researchers showed that students guided by high self-efficacious teachers achieved higher in subjects such as mathematics (Muijs & Reynolds, 2001; Ross, 1992, 1998) and reading (Ross, 1992, 1998) than did students guided by low self-efficacious teachers. Others connected teacher self-efficacy with student motivation (Midgley, Feldlaufer & Eccles, 1989) and students' interest in and attitude towards school (Woolfolk, Rosoff & Hoy, 1990). Referencing teacher behaviour, research has pointed out that teachers with a high sense of self-efficacy differ from those with low sense of self-efficacy in their teaching behaviour regarding issues such as classroom management, instruction, teacher feedback. Researchers as Chacon (2005), Woolfolk & Hoy (1990) and Woolfolk, Rosoff & Hoy (1990) suggest that teacher efficacy is related to teacher classroom management. High efficacy teachers incline to less controlling and more humanistic behaviour in handling their students. High efficacious teachers apt to divide the class for small group instruction and direct teaching (Gibson & Dembo, 1984; Muijs & Reynolds, 2001), spend more time in interactive instruction (Smyie, 1988), demonstrate higher levels of planning and organisation (Allinder, 1994), and demonstrate more enthusiasm in their teaching (Allinder, 1994; Guskey, 1984) than do their low efficacious colleagues. Ashton, Webb and Doda (1983) found significant relations between teacher self-efficacy and interactions between teacher and students, and student accomplishments. High efficacy teachers focused more on high standards, instruction, student task behaviour and a supportive climate, than do low efficacy teachers. Gibson and Dembo (1984) and Dembo and Gibson (1985) investigated the influence of teacher efficacy on academic focus and teacher feedback. Their results revealed that high efficacy teachers were more effective in leading students to correct responses by means of questioning than were low efficacy teachers.

High efficacious teachers are less critical to and spent more time in working with and monitoring students who exhibited learning difficulties (Ashton & Webb, 1986; Gibson & Dembo, 1984), those teachers perceive all students as teachable (Soodak & Podell, 1993, 1996).

Considering this substantial amount of research findings, pointing to the central role of teacher self-efficacy plays in teaching competence and teacher effectiveness, it seems relevant for teacher educational institutes to pay attention to students' developing self-efficacy within the learning process.

Measuring teachers' sense of efficacy

During the last three decades several researchers have attempted to measure teacher self-efficacy, resulting in short, general measures as well as long, detailed ones. Although the study of teacher self-efficacy started with RAND researchers' notion, dating from Rotter's social learning theory; in particular the conceptual base originating from Bandura's social cognitive theory (1977, 1997) gave rise to the development of several teacher self-efficacy measures.

According to this Bandura tradition, the Gibson and Dembo (1984) Teacher Efficacy Scale (TES) is the most used instrument. They developed a two-factor instrument, to measure two constructs of social cognitive theory, self-efficacy and outcome expectancy. One factor, conceptualized as Personal Teaching Efficacy, refers to self-efficacy. The second factor, conceptualized as General Teaching Efficacy, refers to outcome expectancy, which is the individual's appraisal of the likely consequences of executed actions. However, continued research on this two-factor instrument revealed inconsistencies and factor loadings appeared to be not always consistent across studies (see e.g., Anderson, Greene & Loewen, 1988; Hoy & Woolfolk, 1993; Soodak & Podell, 1993). At first, factor analyses confirmed the two-factor instrument. Later on, in continued research building on Gibson and Dembo's two-factor solution, researchers introduced other factor solutions. Woolfolk and Hoy (1990) maintained Gibson and Dembo's General Teaching Efficacy dimension but broke the Personal Teaching Efficacy dimension into two factors, namely teacher's sense of personal accountability concerning positive and negative student learning outcomes. Soodak and Podell (1996) also argued for a three-factorial solution but proposed an alternative interpretation of the two factors that, according to Woolfolk and Hoy (1990), comprise Personal Teaching Efficacy. Results of their principal components analysis revealed that these two factors were not differentiated by positive and negative student learning outcomes but by Bandura's self-efficacy and outcome expectations. In addition to this Emmer and Hickman (1991) argued that the Personal Teaching

Efficacy dimension reflects two different efficacy beliefs, teaching and classroom management. Results of their principal component analysis confirmed this three-factor solution. Lin and Gorrell (1998) mentioned a four-factor solution and labelled the factors as: professional knowledge, effective teaching, guiding difficult children and home environment. However, they gave no a priori theoretical arguments that make this four-factor solution plausible. Brouwer and Tomic (2003) noticed that most researchers who studied the factorial validity of the TES only used the statistical technique principal components analysis, which provides no information about the overall fit of the factorial models. They tested different factorial models as proposed by several above-mentioned researchers on theoretical grounds. The results of their confirmatory factor analyses delivered evidence for a four-factor model that significantly fitted the data better than the other model, although its fit did not reach the recommended criterion of adequately fitted models. They mentioned the following reasons why the TES did not demonstrate an adequate factorial model fit. Firstly, the item content in both subscales reflects two different constructs, namely knowing how to teach and being confident about teaching. Secondly, the General Teaching Efficacy subscale reflects different reference points, some items refer to teachers in general and other items refer to the individual teacher. Deemer and Minke (1999) extensively examined the TES and found that the items of the Personal Teacher Efficacy Scale were valid indicators of teaching efficacy, however they questioned the validity of the General Teaching Efficacy Scale. Removing item wording confounds, they argued for a one-factor solution, indicating a global Personal Teacher Efficacy dimension.

Considering the above-mentioned teacher self-efficacy measurement research, the underlying structure of teacher efficacy measures resulted in different factor solutions. Some researchers argued for the one-factor solution (Deemer & Minke, 1999). In a one-factor model the covariance among items is explained by one common factor (Reise, Morizot & Hays, 2007). The one-factor model suggests that in the perception of teachers a global self-efficacy belief counts and each item is considered to be an indicator of that common factor. According to this model a further differentiation in more specific self-efficacy aspects would not be worthwhile (denoted by model A in figure 1). Other researchers found evidence for a multi-factor solution (Brouwers & Tomic, 2003; Gibson & Dembo, 1984; Tschannen-Moran, Woolfolk Hoy & Hoy, 1998). In a multi-factor model (denoted as model B in figure 1) the covariance among items is explained by several factors, and these factors are correlated (Reise, Morizot & Hays, 2007). This multi-factor model suggests that in teacher perception there exists a differentiation between several (two or more) teacher self-efficacy aspects, such as instructional self-efficacy and disciplinary self-efficacy, in which each item is considered to be an indicator of one specific teacher self-efficacy aspect.

More recently, advances in instrumentation make it possible to investigate more complex structures such as so-called higher or second order factor models (Henson, 2001). In a second-order model (denoted as model C in figure 1) items load on first-order factors and first-order factors load on second-order factors (Rindskopf & Rose, 1988). Due to the persistent measurement problems, Tschannen-Moran and Woolfolk-Hoy developed a new measure of teacher self-efficacy, the Teachers' Sense of Efficacy Scale (TSES), and labeled three factors: efficacy for student engagement, efficacy for instructional strategies and efficacy for classroom management. The TSES goes beyond previous measures because it captures a wider range of teaching tasks. Testing the TSES, Tschannen-Moran and Woolfolk Hoy (2001) conducted a second-order analysis as the three subscales showed moderate correlations. The results demonstrated that the earlier found three factors collapsed into one strong factor with factor loadings ranging from .74 to .84. According to Tschannen-Moran and Woolfolk Hoy (2001), the appearance of this second-order factor and the moderate correlations between the subscales suggest that TSES' total score as well as the three subscale scores can be calculated. A second-order structure suggests that in teacher's perception the three mentioned specific teacher efficacy beliefs contribute to and cluster together in one factor, which refers to a more global self-efficacy belief.

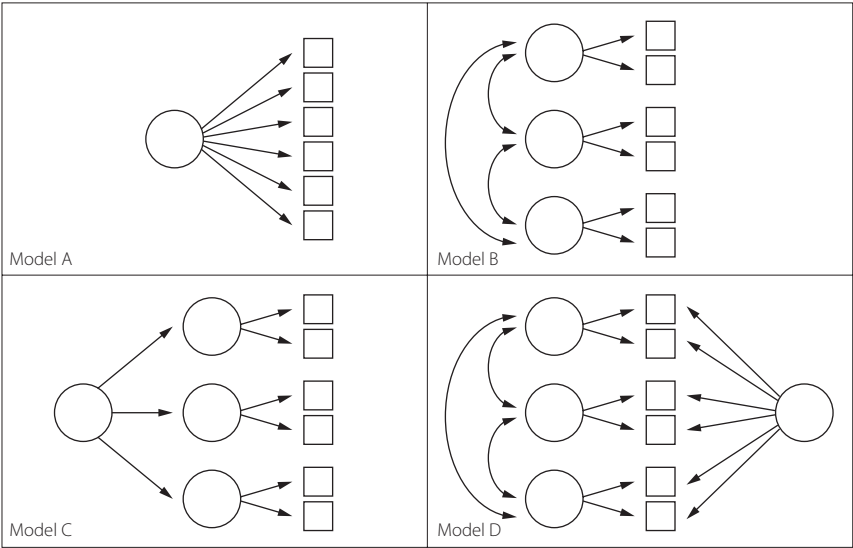


Figure 1. Path diagrammes of four possible teacher self-efficacy models.

Note: Circles represent latent factors; squares represent manifest observed variables; single-headed arrows represent factor loadings; double-headed arrows represent correlations. Error terms have been omitted for clarity of presentation.

Summarizing the history of teacher self-efficacy measurement research, several teacher self-efficacy measures have been developed with mixed psychometric results and different factor solutions. The discussion centered on two connected issues. The first issue is related to the theoretical nature of the self-efficacy construct (Bandura, 1977, 1997). According to social cognitive theory (Bandura, 1997) self-efficacy beliefs can vary along domain-specific activities and tasks and this implies the challenge of finding the optimal level of specificity for measurement. The second issue refers to the different factor solutions from the primary instruments aiming to measure teacher self-efficacy. A possible reason for an inadequate fit of these primary instruments may have been due to the employment of a global measure of teacher self-efficacy rather than a context and task specific measure. The STES (Tschannen-Moran & Woolfolk Hoy, 2001) is characterised by a higher level of task specificity as previous measures and demonstrates adequate validity and reliability. However, this measure is concerned with graduate teachers working in the educational field. Therefore, the STES is not suitable for educational purposes because its level of context specificity does not take into account student teachers competence development.

According to Bandura (1997) and Woolfolk Hoy and Burk -Spero (2005), teacher self-efficacy may be most malleable during teacher preparation and the first years of teaching. However, limited research has explored the development of student teacher self-efficacy and little is known about the way in which incipient student teachers' self-efficacy develops in relation to experienced teachers' sense of efficacy. According to Eccles, Wigfield and Schiefele (1998) students' school experiences help shape their self-efficacy beliefs and with cognitive development students create a more differentiated view of self-efficacy. With reference to the target group of this study, first-year student teachers in competence-based education, it is plausible that this group enters the first-year programme with a more global undifferentiated sense of teacher efficacy. As students have more diverse teaching experiences, a differentiation takes place from a broad understanding to a more fine-grained sense of teacher efficacy (Schunk & Meece, 2006). In conclusion, there is a need for a teacher self-efficacy measure, that takes into account student teacher competence development and student's incipient developmental stage of teacher self-efficacy.

Teacher education nowadays: the use of teacher competences

The context for this study is an institute for competence-based teacher education. Although competence-based approaches within teacher education are not new, this approach has emerged since the late nineties of the last century, more and more as a leading paradigm for innovation within higher (teacher) education (Dochy & Nickmans, 2005). A competence can be viewed as an integrated set of related knowledge, skills and attitudes, which enables the student to perform professional tasks (in accordance with e.g. Parry, 1996 and Lizzio & Wilson, 2004). Hence, competence-based teacher education emphasises the development of competences in relation to authentic professional situations, instead of merely the acquisition of isolated knowledge, skills and attitudes.

In the late nineties of the last century researchers and teacher educational institutes in several European countries developed, in collaboration with the work field and other educational institutes in the same occupational domain, teaching competences student teachers need to acquire for qualification (Struyven & De Meyst, 2010). We mention some examples. Tigelaar, Dolmans, Wolfhagen and Van der Vleuten (2004) developed and validated a framework of teaching competences in higher education, containing the domains: person as teacher, expert on content knowledge, facilitator of learning processes, organizer and scholar/lifelong learner. Kovacs-Cerovic (2006) mention in their report: skills and knowledge regarding pedagogy and psychology, subject knowledge and subject didactics. The Scottish Office (1998) and Zgaga (2006) refer to four areas of competence: subject matter and content of teaching; classroom competences; school and the education system; and values and attributes related to professionalism. Fives and Buehl (2008) proposed a framework consisting of teaching knowledge (e.g. children knowledge and content knowledge), teaching abilities (e.g. classroom management), skills (e.g. cognitive and communication skills) and qualities (e.g. enthusiasm and dedication). Pantic and Wubbels (2010) investigated perceptions of teachers and teacher educators in order to identify areas of expertise that make up a competent teacher and identified the four components: values and child rearing; understanding of and contribution to the educational system; subject knowledge, pedagogy and curriculum; self-evaluation and professional development.

Next to this, changes in European Union policy together with an increased interest in teachers and teacher education, resulted in consensus about the competences teachers need to acquire to meet the challenges of their role within education nowadays (Fredriksson, 2003). To support policy makers at a national

or regional level, the European Commission set out common European principles for teaching competences and qualifications, and recommendations concerning the key competences of teachers (European Commission, 2004, 2005).

Dutch schools and teachers use teacher competences, which are developed by the Dutch 'Association for the professional qualities of teachers' (2009). Dutch institutes for competence-based teacher education apply these teacher-derived competences (Storey, 2006) in teacher education. This Dutch Association (2009) developed and validated a framework for elementary teacher competences in close collaboration with a large representation of the professional group of teachers in the field (Dietze, Jansma & Riezenbosch, 2000). For developing this teacher competence framework, four different roles were distinguished which are characteristic of the teaching profession. These roles are: the interpersonal role, the pedagogical role, the role of expert in subject matter and teaching methods and the organisational role (figure 2, first column). A teacher performs these roles within four different situations, also characteristic of the teaching profession. These situations are: working with students, working with colleagues, working with the school environment and working with him/herself (figure 2, first row). A cross-tabulation of these four professional roles and professional situations generates a framework for the description of seven teaching competence aspects which are essential for the teaching profession.

Contexts Roles	With students	With colleagues	With the school's environment	With him/herself
Interpersonal	INT	COL	ENV	REF
Pedagogical	PED			
Subject knowledge and methodological	SKM			
Organisational	ORG			

Figure 2. Teacher competence framework. Adapted from *A framework of competencies for secondary grade teacher education* (p. 8), by A. Dietze, F. Jansma, and A. Riezenbosch, 2000.

The seven competence aspects can be described as follows: a interpersonally competent teacher (figure 2: INT) demonstrates leadership and creates a friendly and cooperative atmosphere, stimulating an open communication and encouraging students' autonomy. A teacher who is pedagogically competent (figure 2: PED) offers students a safe learning environment, within which they can make choices, and he/she stimulates their social-emotional and moral development. A teacher who is competent in subject knowledge and methodology (figure 2: SKM), has thorough knowledge of subject matter and the ability to use

teaching methods effectively. A teacher is organisationally competent (figure 2: ORG) when he is able to create a well-organised and task-oriented learning environment within which students can learn. A teacher who is competent in collaborating with his colleagues (figure 2: COL), contributes to the school climate, to collaboration with colleagues, to the school organisation and to the improvement of the school. A teacher who is competent in collaborating with the school's environment (figure 2: ENV), communicates carefully and responsibly, with students' parents and with colleagues of institutions his school collaborates with. A teacher who is competent in terms of reflection and development (figure 2: REF) reflects regularly on his/her professional views and competence development, keeps his/her professional ability up to date and improves it.

The resulting framework, serving as a teaching standard, closely resembles the teacher competencies from the above-mentioned international studies in the field of teacher education. Dutch institutes for competence-based teacher education apply the elementary aspects of teacher competence (figure 2) by defining levels of proficiency for each competence aspect, in terms of competence criteria that a teacher-student has to achieve given his/her specific phase in the study programme. Determining appropriate competence criteria to assess student competence development, Dutch teacher institutes use level variables such as: extent of independence, extent of responsibility, extent of task and situation complexity and extent of transfer (see e.g., Spencer & Spencer, 1993). Considering the purpose of this study, the mentioned competence criteria are of great importance for the content validity of the student teacher self-efficacy measure.

In addition to the use of competence profiles in the curriculum which serve as a standard that has to be achieved at the end of the educational process, competence-based teacher education is characterised by the following features: realistic teaching tasks connected with the vocational practice, the centrality within teacher education of students' competence development, the increasing responsibility of students for their own learning, the assessments that are aimed at levels of teaching competences, the addressing of students as starting teachers, the systematic involvement of vocational practice, and the functioning of school as a learning organisation (Ritzen and Kösters, 2002). This paradigm change from traditional into competence-based education is connected with a shift from a testing culture to an assessment culture (Dochy, Segers & De Rijdt, 2002) including new modes of assessment of student learning. These new modes of assessment strongly emphasise the integration of assessment and instruction and focus on assessment of the learning process in addition to that of its products. This new view on assessment is represented by the notion of assessment as a tool for learning (Black & William, 1998; Gielen, Dochy & Dierick, 2003) and

stresses the diagnostic or formative use of evaluation methods with which students competence development can be monitored and guided. Self-evaluation and self-reflection leading to planned competence development form part of the assessment for learning view (Pollard, Collins, Simco, Swaffiels, Warin & Warwick, 2005; Schön, 1987). According to social cognitive theory (Bandura, 1986, 1997; Pajares, 2006), self-efficacy plays a predicting role in relation to students' achievements and student teachers' sense of efficacy can be seen as an indicator for competence development. Incorporating the social-cognitive tradition, with respect to self-efficacy, in up-to-date competence-based teacher education with its emphasis on the diagnostic use of evaluation methods with which students' competence development can be monitored and guided, there is a need for a self-efficacy instrument that is suitable for educational purposes concerning student teachers in competence-based education.

Method

In this section we first outline the conceptual framework and report on the construction and pretesting of the item pool. After that we describe participants and procedures for the validation process, where we consider both construct and predictive validity.

Conceptual framework

Self-efficacy is specific in relation to domains, contexts and tasks. As a consequence, self-efficacy measures should be tailored to the specific domain which is the object of assessment (Zimmerman & Cleary, 2006). The context for this study is an primary teacher educational programme and the broad construct domain intended to be measured is self-efficacy with respect to teacher competences. The target population in this study are student-teachers in the first year of the bachelor programme.

Bandura (1997) states that to use the power of the self-efficacy construct to explain and predict human functioning, the to-be-assessed beliefs have to match the target of prediction. Hence, self-efficacy items have to be related to the performance outcomes that are meant to be predicted (Bong, 2006). The targets of prediction are the student teacher results on a competence-based (pass/fail) assessment at the end of the first year. In particular, the conceptual framework of the 'Association for the professional qualities of teachers' (2009) introduced earlier is used as a teaching standard. Hence, the focus is on the required competence level for the initial phase in the first year of the bachelor programme.

This includes six competences (see Figure 2), but excludes the competence for collaboration with the school's environment, as the latter is not yet relevant for first-year students. Note that in the Dutch setting this conceptual framework is in fact legally established in the 'Professions in Education Act' (Wet BIO). This conceptual competence framework will be exported to a corresponding conceptual teacher-efficacy framework and used as blueprint for the item construction.

Construction of the item pool

A self-efficacy measure should accurately reflect the construct involved. The construct in question is self-efficacy which refers to perceived capability to perform a task, rather than to psychological traits. Hence, the different competence criteria in the conceptual framework were reformulated into self-efficacy items according to the standard guidelines of Bandura (2006a, 2006b). For example, one of the criteria for the pedagogical competence is as follows: 'I demonstrate my interest in every child', which was reformulated as 'How much confidence do you have regarding the following: I demonstrate my interest in every child?' Students were instructed to rate the strength of their confidence in executing the required activities by using a 0-100 point scale ('cannot do at all' to 'highly certain can do').

In line with the conceptual teacher competence framework, this procedure resulted in the construction of 44 items divided across six aspects of teacher self-efficacy. The general instrument design follows Bandura's perspective that multi-faceted measures are favoured over too general self-efficacy measures, because particularized domain-related measures surpass global measures in explanatory and predictive power.

Pretesting of the initial item pool

We pretested and evaluated the initial item pool in two ways, in depth and in general. For more detailed feedback on item wording and content, all items were screened on readability, familiarity, and content validity by means of a think-aloud procedure by individuals of the target population (i.e., teacher students, $n=5$) and by content-matter experts (i.e., experienced teachers, $n=3$). Furthermore, data on the 44 items were collected from 108 first year student teachers, enrolled in a Dutch elementary teacher education programme. Besides filling in the questionnaire, all participants were also asked to put a cross against the items they did not recognize and/or understand. To make sure that all items measured at least to some extent the same broad self-efficacy construct, using

exploratory factor analysis (EFA) individual items were screened based upon their communality within a one-factor model.

As a result of this initial pretesting step, three items were reworded and 13 items with loadings less than the cut-off score of .40 (i.e. barely 16% common variance within one item) were removed. Table 1 visualizes the initial item pool and the resulting refined item pool of 31 items. The item pool blue print is structured according to the underlying teacher competence framework. Further validation steps will focus on how well the items conform to this theoretical structure.

Table 1. Initial and refined item pool.

Competence aspect	Initial item pool	Refined item pool
	N items	N items
Interpersonal competence	5	3
Pedagogical competence	6	4
Subject knowledge and methodological competence	11	7
Organizational competence	8	7
Competence for collaboration with colleagues	6	4
Competence for reflection and development	8	6
Total	44	31

Note that the model with one common factor already explained 49% of the total variance in the item pool. However, inspection of the residual correlations between the items showed 48% non-redundant residuals with absolute values greater than 0.05. According to Preacher and MacCallum (2003) in factor analysis, a factor's success is not determined by how much variance it explains because the model is not intended to explain optimal amounts of variance. A factor's success is gauged by how well it helps the researcher understand the sources of common variance underlying the observed data. The results of the EFA demonstrate that the one-factor model is not sufficient given the amount of residual correlations and we suspect a more complex underlying factor structure (cf. literature review).

Due to the small subject to item ratio (see e.g., Kass & Tinsley, 1979; Comrey & Lee, 1992), no further exploration of the factor structure was conducted on the small pretest sample to safeguard against possible artifacts in analyses that attempt to reveal a more detailed factor structure with more common factors. The information provided by the limited sample is not sufficient to guarantee unbiased results for these more complex multi-factor models.

Construct validity

Given the mixed psychometric results and questioned factor solutions of previous teacher self-efficacy measures and also the function of our instrument regarding student teachers in competence-based education, we wanted to shed some more light on the possible complex multi-factorial underlying structure of our student teacher efficacy measure. According to Reise, Morizot and Hays (2007) the so-called bi-factor or general-specific model is a valuable alternative for exploring factor solution questions relating to broad constructs with heterogeneous indicators. A bi-factor model (denoted as model D in Figure 1) consists of one general factor as in model A (see figure 1), plus a group of specific factors as in model B (see Figure 1). It is one variety of hierarchy model in which some factors are more general than others (Rindskopf & Rose, 1988). The difference between a second-order model (denoted as model C in Figure 1) and a bi-factor model is that the general factor is not a super-ordinate factor, but lies on the same conceptual level as the more specific factors. A bi-factor model makes it possible to measure how much of the item variance is due to the general factor and how much to the specific factors (Chen, West & Sousa, 2006; Reise, Morizot & Hays, 2007). In the perception of incipient student teachers the general factor is a global not differentiated sense of teacher efficacy, the specific factors represent already existing more specific teacher self-efficacy aspects. To further examine construct validity from the perspective of this differentiation hypothesis, we conducted confirmatory factor analysis (CFA). Data were collected from a new and larger sample of 301 first year student teachers, enrolled in a Dutch primary school teacher education programme. At the end of the first year programme, but preceding the first year assessment, these students were asked by their teacher- coach to fill in the questionnaire.

Predictive validity

According to Sinharay, Puhan and Haberman (2010), the use of diagnostic scores have to meet psychometric quality in terms of high reliability and validity to minimize incorrect instructional and remediation decisions. For that reason

we conducted reliability analyses for the teacher-efficacy measure as a whole as well as for the subscales correspond to each of the six aspects. We managed to acquire at the end of the first year programme, the results of the first year evaluation for 138 out of 301 students that earlier participated in the validation phase. This first year evaluation is a competence-based assessment in accordance with the conceptual framework. Students obtained a pass or fail score on each of the six primary teacher competences. To evaluate whether the teacher efficacy measure had predictive value towards the end-of-year competence assessments we conducted logistic regression analyses predicting the pass/fail outcome on each of the six competences based upon the student's scores on the teacher efficacy measure. For practical reasons for 163 out of the 301 students, the results of the first year evaluation were not available. Scores on teacher efficacy subscales, correlations, and standard deviations were largely comparable between the two groups. Note that for all samples considered in this study, approximately 90% of the participants were female students and 10% were male students.

Results

Construct validity: In search for the underlying structure of the student teacher self-efficacy measure

Confirmatory factor analysis was used to fit the four discussed teacher self-efficacy models (the one-factor, the multi-factor, the second-order factor, and the bi-factor model) (see Figure 1) to the data. Factor analysis assumes that a small set of latent unobservable variables function as common causes of the manifest observable items. As such, the items function as indicators of these common causes and the latent variables or factors explain the correlations between the item scores and reflect the construct of interest, in this case the teacher self-efficacy construct. The models differ in the specification of these common causes and their corresponding theoretical basis.

To put these four competing factor models to the test, a model comparison approach was followed based upon four commonly-accepted goodness-of-fit statistics used in structural equation modeling: the model's chi-square χ^2 as absolute measure of fit, the root mean square error of approximation (RMSEA), the Bayesian information criterion (BIC) that penalizes model fit in terms of model complexity, and the comparative fit index (CFI) that offsets a model to the null model (i.e., no correlation between all items).

Table 2. Summary of Goodness-of-Fit Indexes for the four teacher self-efficacy models.

Model	Parameters	CFI	RMSEA	BIC	χ^2
OM	62	0.784	0.093	1863.548	1512.877
MM	77	0.877	0.072	1470.217	1034.706
M2	68	0.867	0.074	1474.586	1089.979
MB	108	0.918	0.061	1410.712	799.865

Notes: OM = one-factor model, MM = multi-factor model, M2 = second-order model, MB = bi-factor model.

The goodness-of-fit indices for all models are shown in Table 2. The multi-factor model, the second-order and the bi-factor model all show a better fit than the one-factor model. This result supports the multidimensionality of the teacher self-efficacy construct. The best fitting model in an absolute sense (i.e., lowest chi-square χ^2) is the bi-factor model, which is logical given that it is the most complex model of the four. Yet when balancing model fit and complexity using the other fit statistics, all still converge towards the bi-factor model. Therefore, we reject the three alternative models and theories, in favour of the bi-factor model.

The bi-factor model

The factor loadings of the bi-factor model can provide additional insight in the structure of the student teacher self-efficacy scale and can point to potential implications for its use in practice. In Figure 3 we provide an overview of the thirty-one items and their factor loadings on the general factor and their specific factor, within the bi-factor model. Items systematically differed in their loadings on the general factor and the specific factor. Three distinct item types can be recognized: items that have a substantive higher loading on the specific factor than on the general factor (a difference of 0.20 or more), items that have a substantive higher loading on the general factor than on the specific factor (a difference of 0.20 or more), and items having no substantial difference in loadings on the general and the specific factor (a difference less than 0.20). 1) Items with a substantive higher loading on the specific factor are generally items concerning concrete behaviour within specific situations, for example ‘I remain calm in unexpected situations’; 2) Items that load substantively higher on the general factor are items referencing cognitive activities such as ‘I list the characteristics of children’s social behaviour’; 3) Items with no substantially different loadings on the general and the specific factor, are often a combination of practical and cognitive activities or tasks, for example ‘I’m aware of differences in cultural backgrounds between my colleagues.’

The potential implication of this is that a student teacher's sense of efficacy is partly differentiated, consisting of a general part and specific parts. The general part refers to a broad common cognitive belief largely determined by indicators concerning cognitive activities. The specific parts refer to more practical beliefs largely determined by indicators referencing performing concrete behaviour within specific situations. To provide further insight into this potential two-folded interpretation, we determined the variance explained by the bi-factor model and split it up into variance explained by the general factor and a part that is explained by the specific factors together. The bi-factor model explained 54,2% of the total variance, with the general factor explaining 22% and the six specific factors together explaining 32,2%. These specific factors themselves cannot be split up because they are correlated.

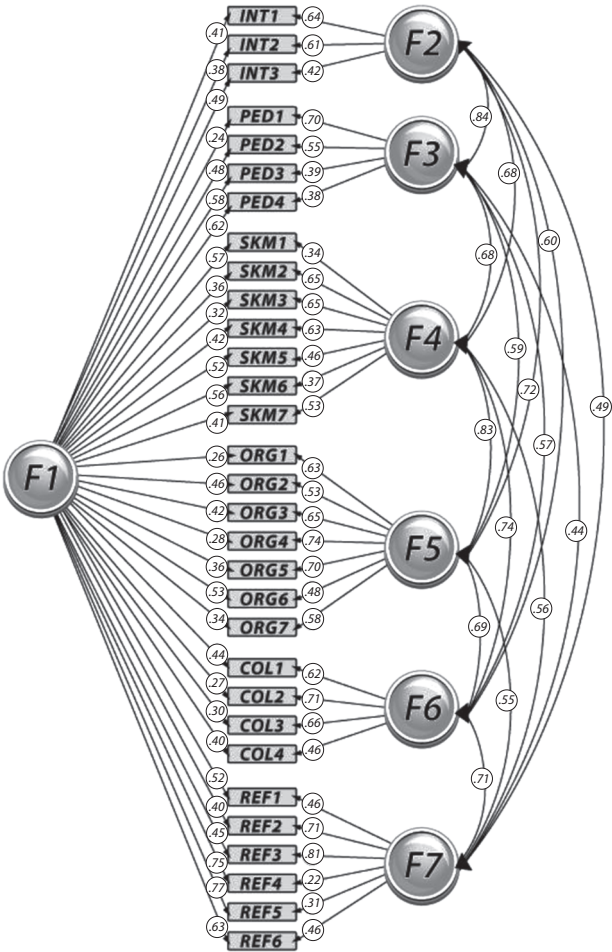


Figure 3. Results of the confirmatory factor analysis for the bi-factor model.

Note: Standardized coefficients are reported. Errors are omitted for reasons of clarity.

Scale and subscale reliability

In order to check if the student teacher self-efficacy scale leads to consistent measurement results of the construct of interest, we conducted a reliability analysis for the scale as a whole and for each of its 6 sub-scales (see Table 3). The internal consistency of the scale as a whole is high (Cronbach $\alpha = .957$). Taking into account the small number of items in some sub-scales, all 6 sub-scales also demonstrated high internal consistency (i.e., alpha coefficients ranging from .736 for a 3-item sub-scale up to .887 for a 6-item sub-scale). The resulting student teacher self-efficacy scale can be seen in the appendix.

Table 3. The Cronbach alpha coefficients for the student teacher self-efficacy scale and its 6 subscales.

Subscale	Example item	n items	Cronbach α
	<i>How much confidence do you have regarding the following:</i>	31	.957
Interpersonal	I stimulate positive behaviour	3	.736
Pedagogical	I demonstrate my interest in every child	4	.784
Subject knowledge	I use varied learning activities	7	.856
Organisational	I remain calm in unexpected situations	7	.882
Collaboration	I am open to advice from colleagues	4	.804
Reflection/development	I critically reflect on my learning process	6	.887

Predictive validity and diagnostic implications

To examine the predictive validity of the student teacher self-efficacy measure, we looked at how good student teachers' efficacy during the first year programme can explain outcomes on the competence-based evaluation at the end of the year. There are six binary (i.e., pass/fail) outcomes, one for each competence aspect, and also the student teacher self-efficacy measure was constructed with these six aspects in mind. When considering the prediction of a specific competence, say SKM, we can consider four options on how to use the information provided by the teacher efficacy measure.

Baseline. Firstly, we can choose to not use it, and rely only on baseline information on the average passing rate for the subject knowledge and methodological (SKM) aspect regardless of the student teacher efficacy. The aspect SKM is, with a passing percentage of only 54% (see baseline column in tables 4 and 5),

in fact the competence that is the toughest to obtain, followed by the reflection and development (REF) aspect and pedagogical (PED) aspect with 67% and 70% (see baseline columns in tables 4 and 5), whereas the percentage of students that passes the other three competence aspects is high (i.e., 86% each).

Specific. Secondly, we can use the one-to-one mapping between competence and student teacher efficacy, and predict the SKM competence using information provided by the SKM efficacy subscale. Hence, we fitted a logistic regression in which each competence was predicted by the student teacher efficacy score on the corresponding aspect-specific subscale. This approach stresses mostly the specific element (and partially the general element) of the teacher efficacy measure as a predictor. Each specific subscale was able to significantly improve upon the baseline prediction of its corresponding competence (see Table 4). As expected, effects are always positive, indicating that higher teacher efficacy goes along with higher chances to pass each of the 6 competences. Effect sizes vary between odds ratio effects of OR = 1.07 for INT to OR = 1.36 for SKM. These results are re-assuring for the predictive value of the student teacher efficacy subscales for assessing competence development. Even in the presence of near ceiling-effects for 3 out of 6 competences (baseline probabilities of 86%), student teacher efficacy still provides added value in competence prediction.

Table 4. Logistic regression assessing the predictive validity of the specific subscale scores of the student teacher self-efficacy measure for their corresponding competence.

Student Teacher Efficacy			Specific subscale		OR	Competence	Passing %			
X	M	SD	b0 (se)	b1 (se)		Y	baseline	M-SD	M	M+SD
INT	79	12	2.03 (.29)	.07 (.02)***	1.07	INT	86	76	88	95
PED	76	11	1.05 (.21)	.10 (.02)***	1.11	PED	70	48	74	90
SKM	79	10	.33 (.26)	.31 (.05)***	1.36	SKM	54	7	58	96
ORG	82	10	2.34 (.35)	.13 (.03)***	1.14	ORG	86	75	91	97
COL	82	11	2.34 (.35)	.13 (.03)***	1.14	CO	86	73	91	98
REF	76	13	.94 (.22)	.11 (.02)***	1.12	REF	67	39	72	91

Notes: Predicted passing % based upon logistic regression: $\Pr(Y = \text{pass}) = 1/1 + \exp(-[b_0 + b_1(X - M)])$
with Odds ratio effect size $OR = \exp(b_1)$

Full. Thirdly, we can make use of the broader context and use information provided by the full efficacy scale to predict the SKM competence. Hence, we fitted a logistic regression in which each competence was predicted by the student teacher efficacy score on the full scale (i.e., comprising all six subscales). This combines both the general as well the specific element of the teacher efficacy measure into one predictor score. For each competence, the full-scale score significantly improved upon the baseline prediction (see Table 5). As expected, effects are always positive, indicating that higher teacher efficacy goes along with higher chances to pass each of the six competences. Effect sizes are of similar magnitude as for the specific subscales and vary between odds ratio effects of OR = 1.13 for PED to OR = 1.32 for SKM. These results are re-assuring for the predictive value of the student teacher efficacy scale as a whole for assessing competence development.

Table 5. Logistic regression assessing the predictive validity of the full-scale score of the student teacher self-efficacy measure for the six competences.

	Student Teacher Efficacy		Full subscale		Competence		Passing %			
	M	SD	b0 (se)	b1 (se)	OR	Y	baseline	M-SD	M	M+SD
STE	79	9	2.41 (.37)	.16 (.04)***	1.17	INT	86	72	92	98
STE	79	9	1.07 (.22)	.13 (.03)***	1.13	PED	70	47	74	90
STE	79	9	.18 (.24)	.28 (.05)***	1.32	SKM	54	8	54	94
STE	79	9	2.38 (.36)	.14 (.03)***	1.15	ORG	86	74	92	98
STE	79	9	2.32 (.35)	.14 (.03)***	1.15	COL	86	73	91	97
STE	79	9	.92 (.22)	.13 (.03)***	1.14	REF	67	42	71	90

Notes: STE = average (INT,PED,SKM,ORG,COL,REF)

Predicted passing % based upon logistic regression: $\Pr(Y = \text{pass}) = 1/(1+\exp(-[b_0+b_1(\text{STE}-M)]))$

with Odds ratio effect size OR = $\exp(b_1)$

A specific. A last alternative only makes use of non-aspect specific information and can only borrow information from the general element of the teacher efficacy measure, while mostly ignoring the specific part. Hence, we fitted a logistic regression in which each competence was predicted by the scores on all teacher efficacy subscales except for the one corresponding to the competence.

Table 6 summarizes the model fit results of these four logistic regressions by providing posterior model weights based upon the bayesian information criterion (BIC) (Hastie, Tibshirani & Friedman, 2009). The higher the weight,

the more relative evidence there is in the data in favour of this model. Notice that model weights can be interpreted as proportions because they sum up to 1 across models for the same competence. Reassuring for the predictive validity of the teacher self-efficacy measure is that the baseline model that ignores its information is ruled out completely. Furthermore, the non-aspect-specific model also does not receive any support, which implies that general efficacy information alone will not provide an accurate competence prediction. We find two aspects, INT and PED for which the full scale context is preferred when making competence predictions, three aspects SKM, COL and REF for which specific information is sufficient, and mixed support for the ORG aspect. Hence, also in the predictive validity results, the bi-factor structure of the student teacher efficacy measure surfaces.

Table 6. Posterior model weights of the four competing logistic regressions predicting each of the six competences.

	INT	PED	SKM	ORG	COL	REF
1. Baseline	.00	.00	.00	.00	.00	.00
2. Specific subscale	.00	.17	.98	.36	.81	.91
3. Full scale	1.00	.82	.02	.64	.19	.08
4. Non-aspect-specific subscales	.00	.01	.00	.00	.00	.00

Note: Higher weights correspond to more relative evidence in favour of the model's use for prediction.

The practical relevance of these results can best be illustrated in terms of probabilities (see passing % in Table3 and 4). A student who gives a score that is equal to the average score on subject knowledge teacher self-efficacy (SKM=79) has a 58% chance in obtaining this competence. A student who writes down a score that is one standard deviation above the average score in this sample (SKM =88), has a 96% chance and we can almost be certain that s/he passes this competence. For a student who takes down a score that is one standard deviation below the average score in this sample (SKM=69), with a 7% chance we can almost be sure that he or she fails this competence. Teacher educators can use the results of the subscales for diagnostic purposes, although for INT and PED teacher self-efficacy it is advisable to rely on the full-scale information (cf. model weights in Table 6). With regard to students who demonstrate subscale scores that are clearly below the average score, a diagnostic interview and/or consultation can be useful. Tracing the items that lower the score can help student's competence development by focusing on the proper learning activities.

Conclusions and discussion

Reviewing teacher self-efficacy measurement research revealed that during the last three decades several teacher self-efficacy measures have been developed with mixed psychometric results and different factor solutions. It is hard to pinpoint the main reason for these mixed psychometric results, but a likely candidate might be differences in heterogeneity of the settings and experience of the teachers in the different samples. This study focuses on first-year student teachers in competence-based education and takes into account students' incipient developmental stage of teacher competences and teacher self-efficacy. The purpose of this study was to investigate the construct validity and predictive validity of a self-efficacy measure which is developed for predictive and diagnostic purposes for this target group.

To investigate the construct validity of the self-efficacy measure we conducted confirmatory factor analysis to provide further insight in the underlying structure of the measure. The four distinct factor models were compared based upon 4 commonly-accepted goodness-of-fit statistics used in structural equation modeling. These analyses delivered evidence for the multidimensionality of the student teacher self-efficacy construct, reflecting the underlying competence criteria for student teachers. Our results also revealed that the three multifactorial models (multi-factor-, second-order and bi-factor model) demonstrate a better fit than one-factor models. These results confirm, with regard to previous teacher self-efficacy measurement research (see e.g. Gibson & Dembo, 1984; Tschannen-Moran & Woolfolk Hoy, 2001), the multidimensionality of the teacher self-efficacy construct in general. Within these results the multi-factor model demonstrates a slightly better fit than the second-order model. Although the STES (Tschannen-Moran & Woolfolk Hoy, 2001) meets the Bandura criterion (1997) of task specificity, our results do not confirm Tschannen-Moran and Woolfolk Hoy's (2001) findings pointing at the second-order model as best fitting model.

Furthermore the confirmatory factor analyses delivered converging evidence for our differentiation hypothesis regarding the bi-factor model. The bifactor model explained 54,2% of the total variance, within which a general factor explained 22% and six specific factors together explained 32,2%, proved to be the best fitting model for our purpose. The factor loadings of the bi-factor model provided additional insight in the structure of the student teacher self-efficacy scale, a potential implication that a students incipient developmental stage of teacher self-efficacy is partly differentiated, consisting of a general part and specific parts. The general part refers to a general common cognitive belief largely determined by indicators concerning cognitive activities.

The specific parts refer to specific practical beliefs largely determined by indicators referencing performing concrete behaviour within specific situations. For a further interpretation of these results, it is necessary to involve the context for this study which is the first year of a competence-based teacher education programme. Students who enter this first year have an early idea of teaching and teaching competences, which tends to be more global or general in nature. This early global concept is based on prior knowledge, teaching experiences drawn from their student role and in general no or very limited teaching experiences as a teacher. Competence-based teacher education nowadays provides student teachers with realistic teaching experiences from the first year of the programme. Incipient student teachers, encountering new teaching experiences, interpret these experiences and create a new and better understanding of the teaching practice and required teaching competences. In line with Schunk and Meece (2006) who state that students' school experiences help shape their self-efficacy beliefs, we argue that the development of teacher competences matches the development of first year student teachers self-efficacy. This implies, according to the theoretical assumption of Eccles, Wigfield and Schiefele (1998), that first-year student teachers enter the first-year programme with a more global undifferentiated sense of teacher efficacy. As students have more teaching experiences a differentiation takes place from a broad understanding to a partly differentiated sense of efficacy, finally leading to a more fine-grained sense of teacher efficacy.

The results of the reliability analysis revealed a high internal consistency for the scale as a whole and taking into account the small number of items in some sub-scales, all six sub-scales also demonstrated high internal consistency. Furthermore, the results of the logistic regression analyses revealed that the student teacher self-efficacy subscales as well as the student teacher self-efficacy as a whole succeeds in making an accurate prediction of the student's first-year outcome on all of the six aspects. These results are in line with and confirm other empirical and theoretical research findings that point at the predicting role of the self-efficacy construct in relation to students' achievements, as stated by social cognitive theory (Bandura, 1997). Logistic regression results also reveal that general efficacy information alone does not provide a accurate competence prediction. These results are in line with social cognitive theory (Bandura, 1977, 1997) as well as earlier teacher self-efficacy measurement research (see e.g. Brouwers & Tomic, 2003), pointing at the inappropriateness of global measures with one-factor solutions.

The summarized construct and predictive validity results reveal that we succeeded in developing a student teacher self-efficacy measure (see appendix) that meets psychometric requirements in terms of reliability and validity. In concrete terms, the student teacher self-efficacy measure, reflects the

underlying competence criteria, and consequently takes into account student teachers' stage of competence development. With regard to our literature review, results show that our student teacher self-efficacy measure outperforms existing teacher self-efficacy measures such as the STES (Tschannen-Moran & Woolfolk Hoy, 2001), because it meets the optimal level of task as well as context specificity.

The practical result of this study, a method for measuring student teachers' developing self-efficacy, can be used as a monitoring system for tracking student teachers' competence development during the educational programme in a non-threatening way. The implication of this is that teacher educators use filled-in questionnaires to analyze students' answers at three levels: the scale level, the subscale level and the item level. Referencing the scale level, students with a low overall sense of efficacy can be detected in an early stage of the programme. Using the subscale level the supervision of students can be targeted at the specific competence aspects on which they feel less efficacious. According to the item level, inspection of the factor loadings, as a result of the factor analysis, revealed three distinct groups of items. At the item level, the supervision of students can be targeted at the type of items on which they feel less efficacious such as concrete behaviour within specific teaching situations or cognitive activities as part of the teacher educational programme.

According to Bandura (1997) self-efficacy is most pliable at an early stage of the learning process, but once self-efficacy beliefs have been solidly set, it would take a certain shock to cause a recalibration. Woodfolk Hoy and Burke-Spero (2005) mentioned the so-called reality shock as a possible explanation for the decline in sense of efficacy when novice teachers enter the field and face all the role demands and the complexity of the teaching task. As competence-based teacher education nowadays addresses students as starting teachers and provides them with realistic teaching experiences from the beginning, there is the opportunity to prevent a future reality shock. However a teaching experience in itself is not automatically a mastery experience, which is in turn the main source for the establishment of a firm sense of teacher efficacy. This implicates that, to provide incipient student teachers with mastery teaching experiences, teacher educators have to tune the authenticity level of the teaching experience, the structure of the situation and the supervision of the student teachers to the complexity of the teaching task and to the students' competence developmental level.

Referencing the risk of overconfidence, the measure has to be used with some caution during the first months of the educational programme. Although modest overconfidence is posited to promote achievement, some student teachers can be overconfident, that is a significant incongruence between student teacher self-efficacy and subsequent accomplishments, which can obscure students weaknesses (Klassen, 2006). However when student teachers enter the vocational

practice and gain teaching experiences, their overly optimistic self-efficacy beliefs tend to recalibrate.

However, due to the limited response rate, the results of the logistic regression analyses -concerning predictive validity and diagnostic implications - must be interpreted with caution. In order to confirm our results and to gain more insight into the diagnostic implications of the student teacher efficacy subscales, further research is needed on a larger scale. Next to this further investigation it is necessary to gain insight in the diagnostic use of the student teacher efficacy subscales within the practice of competence-based teacher education. Finally, in this article we focused on first-year student teachers concerning students with an incipient developmental stage of teacher efficacy. As a consequence, new research is needed to investigate if and how a further differentiation of student teacher efficacy takes place during their further competence development.

Appendix
Student teacher self-efficacy measure

Rate your degree of confidence by recording a number from 0 to 100 using the scale given below

0	10	20	30	40	50	60	70	80	90	100
Cannot					Moderately				Highly certain	
Do at all					can do					can do

How confident are you that you can do the following: **Confidence**
(0-100)

Interpersonal competence

- I see what happens in the classroom
- I stimulate positive behaviour
- I make aspects of group processes explicit in the classroom

Pedagogical competence

- I demonstrate my interest in every child
- I have knowledge of children's view of their world
- I act on the basis of the 3 psychological basic needs
- I list the characteristics of children's social behaviour

Subject knowledge and methodological competence

- I observe purposefully
- I am acquainted with the learning domains within primary education
- I have a thorough knowledge of the learning content of my class
- I spot differences of level in my classroom
- I instruct my class clearly
- I use varied learning activities
- I motivate children

Organisational competence

- I adjust my activities to fit in with the group planning
- I monitor time during learning activities
- I oversee the children during learning activities
- I accommodate the learning environment to learning activities
- I provide learning material on time
- I keep records of students
- I remain calm in unexpected situations

Competence for collaboration with colleagues

- I keep to my agreements
- I am aware of differences in cultural backgrounds of my colleagues
- I am open to advice from colleagues
- I handle private information about children and colleagues with care

Competence for reflection and development

- I give my opinion on education
- I ask feedback from others to enable my development
- I critically reflect on my learning process
- I use theory to analyze my practical experiences
- I word learning goals
- I consult theory while solving problems

References

- Allinder, R.M. (1994). The relations between efficacy and the instructional practices of special education teachers and consultants. *Teacher Education and Special Education*, 17, 86-95.
- Anderson, R., Greene, M., & Loewen, P. (1988). Relationships among teachers' and students' thinking skills, sense of efficacy, and student achievement. *Alberta Journal of Educational Research*, 34(2), 148-165.
- Ashton, P. T. (1985). Motivation and teachers' sense of efficacy. In: C. Ames & R. Ames (Eds.), *Research on motivation in education: Vol. 2. The classroom milieu* (pp. 141-174). Orlando, FL: Academic Press.
- Ashton, P.T., & Webb, R.B. (1986). *Making a difference: Teachers' sense of efficacy and student achievement*. New York: Longman.
- Ashton, P.T., Webb, R., & Doda, N. (1983). *A study of teachers' sense of efficacy. Final report* (Research Report): National Institute of Education, Washington, DC. (ERIC, Document Reproduction Service No. ED 231833).
- Association for Professional Qualities of Teachers (2009). *Professions in Education Act*. Consulted online on <http://www.lerarenweb.nl>.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84, 191-215.
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W.H. Freeman and Company.
- Bandura, A. (2006a). Adolescent development from an agentic perspective. In F. Pajares & T. Urdan (Eds.), *Self-efficacy beliefs of adolescents* (pp. 1-43). Greenwich, CT: Information Age Publishing.
- Bandura, A. (2006b). Guide for creating self-efficacy scales. In: F. Pajares, & T. Urdan, *Self-Efficacy Beliefs of Adolescents* (pp. 307-337). Greenwich, Connecticut: Information Age Publishing.
- Berman, P., McLaughlin, M., Bass, G., Pauly, E., & Zellman, G. (1977). *Federal programs supporting educational change: Vol. VII. Factors affecting implementation and continuation* (Rep. No. R-1589/7-HEW). Santa Monica, CA: RAND (ERIC Document Reproduction Service No. 140432).
- Black, P., & William, D. (1998). Assessment and classroom learning. *Assessment in Education*, 5(1), 7-74.
- Bong, M. (1997). Generality of academic self-efficacy judgments. Evidence of hierarchical relations. *Journal of Educational Psychology*, 89, 696-709.
- Bong, M. (2006). Asking the right question. In F. Pajares & T. Urdan (Eds.), *Self-Efficacy Beliefs of Adolescents* (pp. 287-305). Greenwich, Connecticut: Information Age Publishing.
- Brouwers, A., & Tomic, W. (2003). A test of the factorial validity of the teacher efficacy scale. *Research in Education*, 69, 67-79.

- Chacon, C.T. (2005). Teachers' perceived efficacy among English as a foreign language teachers in middle schools in Venezuela. *Teaching and Teacher Education*, 21, 257-272.
- Chen, F.F., West, S.G., & Sousa, K.H. (2006). A comparison of bifactor and second-order models of quality of life. *Multivariate Behavioral Research*, 41, 189-225.
- Comrey, A.L., & Lee, H.B. (1992). *A First Course in Factor Analysis*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Deemer, S.A., & Minke, K.M. (1999). An investigation of the factor structure of the Teacher Efficacy Scale. *Journal of Educational Research*, 93, 3-10.
- Dembo, M., & Gibson, S. (1985). Teachers' sense of efficacy: An important factor in school improvement. *Elementary School Journal*, 86(2), 173-184.
- Dietze, A., Jansma, F., & Riezebosch, A. (2000). *Een kijkkader voor competenties voor de tweedegraads lerarenopleidingen* [A framework of competencies for secondary grade teacher education]. Utrecht: Programma Management Educatief Partnerschap.
- Dochy, F., & Nickmans, G. (2005). *Competentiegericht opleiden en toetsen. Theorie en praktijk van flexibel leren*. [Competence-based instruction and assessment. Theories and practice of flexible learning]. Utrecht: Lemma.
- Dochy, F., Segers, M. & De Rijdt, C. (2002). Nieuwe ontwikkelingen: De assessmentcultuur. [New developments: The assessmentculture]. In F. Dochy, L. Heylen, & H. Van de Mosselaer (Eds.), *Assessment in onderwijs. Nieuwe toetsvormen en examinering in studentgericht en competentiegericht onderwijs* (pp. 11-26). Utrecht: Lemma.
- Eccles, J.S., Wigfield, A., & Schiefele, U. (1998). Motivation to succeed. In N. Eisenberg (Ed.), *Handbook of child psychology: Vol. 3. Social, emotional, and personality development* (5th ed., pp. 1017-1095). New York: Wiley.
- Emmer, E.T., & Hickman, J. (1991). Teacher efficacy in classroom management and discipline. *Educational and Psychological Measurement*, 51, 755-765.
- European Commission (2004). *Commission staff working paper: Progress towards the common objectives in education and training. Indicators and benchmarks*. Brussels: European Commission.
- European Commission (2005). *Testing Conference on the Common European principles for Teacher Competences and Qualifications 20th – 21st June 2005*. Brussels: European Commission.
- Fives, H., & Buehl, M.M. (2008). What do teachers believe? Developing a framework for examining beliefs about teachers' knowledge and ability. *Contemporary Educational Psychology*, 33(2), 134-176.
- Fredriksson, U. (2003). Changes of Education Policies within the European Union in the Light of Globalisation. *European Educational Research Journal*, 2(4), 522-546.
- Gibson, S., & Dembo, M. (1984). Teacher efficacy: A construct validation. *Journal of Educational Psychology*, 76(4), 569-582.

- Gielen, S., Dochy, F., & Dierick, S. (2003). Evaluating the consequential validity of new modes of assessment: The influence of assessment on learning, including pre-, post-, and true assessment effects. In: M. Segers, F. Dochy, & E. Cascallar (2003). *Optimising new modes of assessment: In search of qualities and standards* (pp. 37-54). Dordrecht: Kluwer Academic Publishers.
- Guskey, T. R. (1984). The influence of change in instructional effectiveness upon the affective characteristics of teachers. *American Educational Research Journal*, 21, 245-259.
- Hastie, T., Tibshirani, R., & Friedman, J. (2009). *The elements of statistical learning: Data mining, inference and prediction*. New York: Springer.
- Henson, R.K. (2001). The effects of participation in teacher research on teacher efficacy. *Teaching and teacher education*, 17, 819-836.
- Hoy, W.K., & Woodfolk, A.E. (1993). Teachers' sense of efficacy and the organizational health of schools. *The Elementary School Journal*, 93, 356-372.
- Kass, R.A., & Tinsley, H.E.A. (1979). Factor Analysis. *Journal of Leisure research*, 11, 120-138.
- Klassen, R.M. (2006). Too Much Confidence? The Self-efficacy of Adolescents with Learning Disabilities. In F. Pajares & T. Urdan (Eds.), *Self-efficacy beliefs of adolescents* (pp. 181-200). Greenwich, CT: Information Age Publishing.
- Kovács-Cerović, T. (2006). National Report – Serbia. In P. Zgaga (Ed.), *The prospects of teacher education in South-East Europe* (pp. 487-526). Ljubljana: University of Ljubljana.
- Lizzio, A., & Wilson, K. (2004). Action learning in higher education; an investigation of its potential to develop professional capability. *Studies in higher education*, 29, 469-488.
- Midgley, C., Feldlaufer, H., & Eccles, J.S. (1989). Change in teachers' efficacy and student self and task related beliefs in mathematics during the transition to junior high school. *Journal of Educational Psychology*, 81, 247-258.
- Muijs, D., & Reynolds, D. (2001). Teachers' beliefs and behaviours: What really matters. *Journal of classroom interaction*, 37, 3-15.
- Pajares, F. (1996). Self-efficacy Beliefs in Academic Settings. *Review of Educational Research*, 66(4), 543-578.
- Pajares, F. (2006). Self-efficacy during childhood and adolescence: Implications for teachers and parents. In F. Pajares & T. Urdan (Eds.), *Self-efficacy Beliefs of Adolescents* (pp. 339-367). Greenwich, CT: Information Age Publishing.
- Pantic, N., & Wubbels, T. (2010). Teacher competencies as a basis for teacher education – Views of Serbian teachers and teacher educators. *Teaching and Teacher Education*, 26, 694-703.
- Parry, S.R. (1996). The quest for competence. *Training Magazine*, 8, 48-56.
- Pollard, A., Collins, J., Simco, N., Swaffield, S., Warin, J., & Warwick, P. (2005). *Reflective Teaching*. London: Continuum.
- Preacher, K.J., & MacCallum, R.C. (2003). Repairing Tom Swift's Electric Factor Analysis Machine. *Understanding Statistics*, 2, 13-43.
- Reise, S.P., Morizot, J., & Hays, R.D. (2007). The role of the bifactor model in resolving dimensionality issues in health outcomes measures. *Quality of Life research*, 16, 19-31.

- Rindskopf, D., & Rose T. (1988). Some theory and applications of confirmatory second-order models of quality of life. *Multivariate Behavioral Research*, 23, 51-67.
- Ritzen, M. & Kösters, J. (2002). Mogelijke functies van een portfolio binnen een competentiegestuurd curriculum [Possible functions of a portfolio within a competence-based curriculum]. *Tijdschrift Onderzoek van Onderwijs*, 31(1), 3-7.
- Ross, J.A. (1992). Teacher efficacy and the effect of coaching on student achievement. *Canadian Journal of Education*, 17(1), 51-65.
- Ross, J.A. (1998). The antecedents and consequences of teacher efficacy. In: J. Brophy (Ed.), *Advances in research on teaching* (Vol. 7, pp. 49-73). Greenwich, CT: JAI Press.
- Rotter, B.J. (1966). Generalized expectancies for internal versus external control reinforcement. *Psychological Monographs*, 80 (whole no. 609).
- Schön, D. (1987). *Educating the Reflective Practitioner*. San Francisco: Jossey Bass.
- Schunk, D.H (1995). Self-efficacy and education and instruction. In J.E. Maddux (Ed.), *Self-efficacy, adaptation and adjustment: Theory, research and application* (pp. 281-303). New York: Plenum Press.
- Schunk D.H. (2003). Self-efficacy for reading and writing: influence of modeling, goal setting and self-evaluation. *Reading and writing quarterly: overcoming learning difficulties*, 19(2), 159-172.
- Schunk, D. & Meece, J.L. (2006). Self-efficacy development in adolescence. In F. Pajares & T. Urdan (Eds.), *Self-Efficacy Beliefs of Adolescents* (pp. 71-96). Greenwich, Connecticut: Information Age Publishing.
- Schunk D.H. & Pajares F. (2001). The Development of academic self-efficacy. In A. Wigfield & J.S. Eccles (Eds.), *Development of Achievement Motivation* (pp.15-32). San Diego, CA: Academic Press.
- Sinharay, S., Puhon, G., & Haberman, J. (2010). Reporting diagnostic scores in educational testing: Temptations, pitfalls, and some solutions. *Multivariate Behavioral Research*, 45, 553-573.
- Smylie, M.A., (1988). The enhancement function of staff development: Organizational and psychological antecedents to individual teacher change. *American Educational Research Journal*, 25, 1-30.
- Soodak, L., & Podell, D. (1993). Teacher efficacy and student problem as factors in special education referral. *The Journal of Special Education*, 27(1), 66-81.
- Soodak, L., & Podell, D. (1996). Teacher efficacy: toward the understanding of a multifaceted construct. *Teaching and Teacher Education*, 12(4), 401-411.
- Spencer, L., & Spencer, S. (1993). *Competence at work: Models for superior performance*. New York: Wiley.
- Storey, A. (2006). The search for teacher standard: a nationwide experiment in the Netherlands. *Journal of Education Policy*, 21(2), 215-234.
- Struyven, K., & De Meyst, M. (2010). Competence-based teacher education: Illusion or reality? An assessment of the implementation status in Flanders from teachers' and students' points of view. *Teaching and Teacher education*, 26, 1495-1510.

- The Scottish Office (1998). *Guidelines for initial teacher education courses in Scotland*. Retrieved from <http://www.scotland.gov.uk/library/documents-w3/git-00.gtm>.
- Tschannen-Moran, M., Woolfolk Hoy, A., & Hoy, W. (1998). Teacher efficacy: Its meaning and measure. *Review of Education Research*, 68(2), 202-248.
- Tschannen-Moran, M., & Woolfolk Hoy, A. (2001). Teacher efficacy: capturing an elusive construct. *Teaching and Teacher education*, 17, 783-805.
- Tigelaar, D., Dolmans, D., Wolfhagen, I., & Van der Vleuten, C. (2004). The development and validation of a framework for teaching competencies in higher education. *Higher Education*, 48, 253-268.
- Van Dinther, M., Dochy, F., & Segers, M. (2011). Factors affecting students' self-efficacy in higher education. *Educational Research Review*, 6(2), 95-108.
- Woolfolk, A.E., & Hoy, W.K. (1990). Prospective teachers' sense of efficacy and beliefs about control. *Journal of Educational Psychology*, 82, 81-91.
- Woolfolk Hoy, A., & Burke-Spero, R. (2005). Changes in teacher efficacy during the early years of teaching: A comparison of four measures. *Teaching and Teacher Education*, 21, 343-356.
- Woolfolk Hoy, A., & Davis, H.A (2006). Teacher self-efficacy and its influence on the achievement of adolescents. In: F. Pajares, & T. Urdan, *Self-Efficacy Beliefs of Adolescents* (pp. 117-137). Greenwich, Connecticut: Information Age Publishing.
- Woolfolk, A.E., Rosoff, B., & Hoy, W.K. (1990). Teachers' sense of efficacy and their beliefs about managing students. *Teaching and Teacher Education*, 6, 137-148.
- Zgaga, P. (2006). *The prospects of teacher education in South-East Europe*. Ljubljana: University of Ljubljana.
- Zimmerman B.J., & Cleary T.J. (2006). Adolescents' Development of Personal Agency. In F. Pajares & T. Urdan (Eds.), *Self-Efficacy Beliefs of Adolescents* (pp. 45-69). Greenwich, Connecticut: Information Age Publishing.

CHAPTER 4

STUDENT PERCEPTIONS OF ASSESSMENT AND STUDENT SELF-EFFICACY IN COMPETENCE-BASED EDUCATION

Van Dinther, M., Dochy, F., Segers, M., & Braeken, J. (2014). Student perceptions of assessment and student self-efficacy in competence-based education. *Educational Studies*, 40(3), 330-351.

Abstract

The purpose of this study was to provide insight into the interplay between student perceptions of competence-based assessment and student self-efficacy, and how this influences student learning outcomes. Results reveal that student perceptions of the form authenticity aspect and the quality feedback aspect of assessment do predict student self-efficacy, confirming the role of mastery experiences and social persuasions in enhancing student self-efficacy as stated by social cognitive theory. Findings do not confirm mastery experiences as being a stronger source of self-efficacy information than social persuasions. Study results confirm the predictive role of students' self-efficacy on their competence outcomes. Mediation analysis results indicate that student's perceptions of assessment have an indirect effect on student's competence evaluation outcomes through student's self-efficacy. Study findings highlight which assessment characteristics, positively influencing students' learning, contribute to the effectiveness of competence-based education. Limitations of the study and directions for future research are indicated.

Keywords: self-efficacy, assessment characteristics, perceptions of assessment, competence-based assessment, student perceptions.

Introduction

As a response to a society that has a growing need for creative and flexible professionals, higher educational institutes are modifying their educational programmes to become so-called new learning environments, in which students are confronted with complex real-life problems and situations for developing relevant competences (De Corte, Verschaffel, Entwistle, & Merriënboer, 2003). Though competent behaviour largely depends on acquiring relevant knowledge, skills and competences, researchers in educational settings are increasingly also drawing attention to the role of student self-efficacy and student perceptions during learning (Baartman & Ruijs, 2011; Dochy, Segers, Van den Bossche, & Struyven, 2005; Schunk, 2003).

In particular self-efficacy, as a key construct of social cognitive theory, appears to be a significant variable because it affects student learning and performance (see e.g., Pajares, 2006). Educational programmes based on the main sources of self-efficacy, namely enactive mastery experiences, vicarious experiences and social persuasions, have the potency of enhancing student self-efficacy (Van Dinther, Dochy, & Segers, 2011 in Chapter 2 of this dissertation). According to social cognitive theory (Bandura, 1997) enactive mastery experiences are authentic successes in dealing with particular situations, vicarious experiences are observational experiences provided by social models and social persuasions refer to encouragement and evaluative feedback communicated by important others.

Competence-based education and other new learning environments, often use assessment as a tool for learning (Black & William, 1998; Gielen, Dochy, & Dierick, 2003). This is in accordance with a line of research which points to the influential role of assessment as perceived by students. In particular student perceptions of the specific assessment characteristics: authenticity of assessment (Janssens, Boes & Wante, 2002; Sambell, McDowell & Brown, 1997; Gulikers, 2006) and feedback (Gibbs & Simpson, 2004a; Higgins & Hartley, 2002; Segers, Gijbels & Thurlings, 2008), appear to play a positive role in student learning. Considering the connection that can be made between these assessment characteristics and the above-mentioned sources of self-efficacy, respectively mastery experiences and verbal persuasions, we argue that student perceptions of these assessment characteristics can positively influence student self-efficacy.

The context for this study is a competence-based teacher educational programme in which formative competence assessment is used, preceding the first year final competence evaluation. Formative competence assessment, as a part of the instructional process, enables students to improve their competences, by providing them with feedback on their competence development. The focus

of this article is the impact of student perceptions of formative assessment on student development of self-efficacy, which in its turn has an impact on the outcome of the final competence evaluation. Student self-efficacy can be considered to play a key role, both intermediate and direct, in predicting competence evaluation outcomes. The purpose of this study is to provide more insight into the interplay between student perceptions of competence-based assessment, student self-efficacy, and how this influences student learning outcomes. The findings of our study can highlight which processes are essential in establishing the effectiveness of the competence-based approach within higher education.

Self-efficacy and perceptions of assessment

As a key construct of social cognitive theory, self-efficacy appears to be a significant variable because it affects student motivation and learning (Bandura, 1997; Schunk & Pajares, 1996). Self-efficacy refers to 'beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments' (Bandura, 1997, p.3). According to social cognitive theory, there are four main sources of information that are responsible for the development of students' self-efficacy: enactive mastery experiences, vicarious (observational) experiences, social persuasions and physiological and psychological states. In this study we focus on mastery experiences and social persuasions, because these sources can be connected with the main characteristics of competence-based assessment.

Mastery experiences, in other words authentic successes in performing tasks within demanding situations, are stated as the most powerful source of self-efficacy and research shows that mastery experiences are significant predictors of creating a strong sense of self-efficacy (Bandura, 1997; Britner & Pajares, 2006). Research on factors affecting student self-efficacy in higher education (Lancaster & Bain, 2007; Palmer, 2006; Papastergiou, 2010; Van Dinther, Dochy, & Segers, 2011 in Chapter 2 of this dissertation) confirms the role of mastery experiences within education and stresses the relevance of providing students with practice-oriented learning experiences as a necessary condition for acquiring mastery experiences.

Feedback or information about the outcome of an action is considered a second (persuasive) source for creating self-efficacy information. Feedback, encouragement and support, especially from important others such as parents and teachers, enhance student self-efficacy (Bandura, 1997, Bong & Skaalvik, 2003; Schunk & Pajares, 2001; Van Dinther et al., 2011, in Chapter 2 of this dissertation).

Both sources of self-efficacy, mastery experiences and feedback, are clearly related to assessment practices. In this respect, during the last decades, many scholars have been arguing for the alignment of assessment with how learning and instruction is taking place. They have put forward the importance of student perceptions of two characteristics of assessment, authenticity (Janssens, Boes, & Wante, 2002; Sambell, McDowell, & Brown, 1997; Gulikers, 2006) and feedback (Gibbs & Simpson, 2004a; Higgins & Hartley, 2002; Segers, Gijbels, & Thurlings, 2008). Authenticity refers to the relatedness of assessment tasks to real-life situations and meaningful problems as part of the professional practice. Authenticity is a multidimensional construct. Gulikers, Bastiaens and Kirschner (2006) confirmed four dimensions of assessment authenticity: task, form, physical context, social context and criteria as the fifth dimension clearly related to the former four dimensions. Their validation study (Gulikers, Bastiaens & Kirschner, 2006) indicates that the task (i.e. professionally relevant activities requiring the use of integrated knowledge, skills and attitudes) and form (demonstration of competence by professionally relevant results) dimensions, are preferred by teachers and students as pivotal dimensions. Student perceptions of authenticity of assessment refer to how practice-oriented assessment is perceived by students (Gulikers, 2006). Since practice-oriented learning experiences can be seen as a necessary condition for gaining mastery experiences (Palmer, 2006; Van Dinther et al., 2011 in Chapter 2 of this dissertation), the assessment characteristic authenticity can be connected with this source of creating self-efficacy. Perceptions of feedback, refer to how students perceive information about the outcome of assessment (Gibbs & Simpson, 2004a). Because feedback from important others such as teachers influences students' self-efficacy, this assessment characteristic can easily be connected with social persuasions as another source of creating self-efficacy.

Based on the above we test the following hypothesis in this study:

Hypothesis 1.

Student perceptions of the authenticity of competence-based assessment and feedback given have a positive effect on student self-efficacy.

Bandura (1997) states that mastery experiences are the most powerful source of self-efficacy information, research on factors affecting student self-efficacy in higher education confirms this assertion (Lancaster & Bain, 2007; Palmer, 2006; Papastergiou, 2010; Van Dinther et al., 2011 in Chapter 2 of this dissertation). Following Bandura (1997) we presume that authenticity of assessment has a stronger influence on student self-efficacy than feedback given. We test this with the following hypothesis of this study:

Hypothesis 2.

Student perceptions of the authenticity of competence-based assessment have a more powerful effect on student self-efficacy than perceptions of feedback given.

Self-efficacy and competence

Developing a social cognitive theory, Bandura (1986, 1997) assumed that a strong self-efficacy belief affects the choices people make, their ways of acting, the effort they spend, their perseverance and elasticity (Bandura, 1977). Research findings support these assumptions among several domains of human functioning such as health, sports and work-related performance (Luszczynska & Schwarzer, 2005; Schwarzer, Richert, Kreasukon, Remme, Wiedemann, & Reuter, 2010; Stajkovic & Luthans, 1998). Concerning the educational domain the relation between self-efficacy and achievement has been investigated at various levels of education (e.g. primary, secondary, tertiary), several areas (reading, writing, mathematics, computing science) and different ability levels (average, talented, below average). These studies (Bouffard-Bouchard, 1990; Carmichael & Taylor, 2005; Lane, Lane, & Kyprianou, 2004; Pajares, 1996, 2006; Pajares & Miller, 1994; Relich, Debus, & Walker, 1986; Schunk, 2003) show, among other things, direct effects of student self-efficacy on achievements with respect to several grades and ability levels. Within the context of this study, students are examined within a final competence evaluation that takes place at the end of the first year programme. Following social cognitive theory and given the strong empirical results on the general role of self-efficacy in competence development, we test the following hypothesis in this study:

Hypothesis 3.

Student self-efficacy positively predicts student competence evaluation outcomes

In the foregoing we argued the following: student perceptions of the authenticity of assessment and feedback given play a positive role in student learning and learning outcome, student perceptions of the authenticity of and feedback given have a positive effect on student self-efficacy, and student's self-efficacy positively predicts student competence evaluation outcomes. Considering the substantial role self-efficacy plays in student learning and achievement (Bandura, 1997, 2006; Schunk & Pajares, 2001) we assume self-efficacy plays an intermediate role between student perceptions of a formative competence-based

assessment and their competence outcomes as a result of the final evaluation. We test this with the following hypothesis:

Hypothesis 4.

Student perceptions of assessment have an indirect effect on student competence evaluation outcomes mediated through student self-efficacy.

In Figure 1, we summarize the research model for this study.

Method

Participants and setting

The data in this study were collected from a sample of 138 first year student teachers, enrolled in a Dutch 4-year bachelor programme for elementary teacher education (response rate 42%). The group of participants was homogenous in relation to age (mean age 18,8), prior educational level, teaching experience and gender (95% were female students and 5% male, which is typical for elementary teacher education). The context of this study is a competence-based teacher educational curriculum in which a teacher competence profile is used that serves as a standard required to be achieved at the end of the educational process. Next to this, formative assessment is used to monitor student competence development. At the end of a first year module including formative assessment but preceding the first year evaluation, these students were asked by their teacher-coach to fill in a perceptions of authenticity questionnaire (Gulikers, Bastiaens & Kirschner (2004, 2006), a perceptions of feedback questionnaire (Gibbs & Simpson, 2004b), and a student teacher efficacy questionnaire. Afterwards at the very end of the first year programme, the results of the first year final competence evaluation were collected.

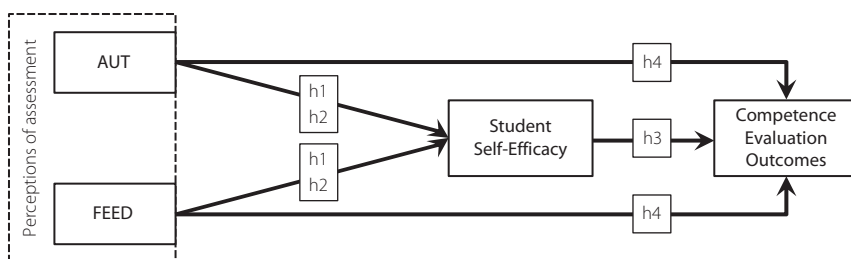


Figure 1. Research model.

Notes: h = hypothesis; AUT = authenticity; FEED = feedback.

Measures

Student Competence Evaluations

The results of the final first year evaluation were used to evaluate student competences. To reach the optimal level of inter-rater agreement, each student was evaluated by two skilled assessors within a standardized portfolio assessment procedure. Students are evaluated on competences that are developed by the Dutch Association for the Professional Quality of Teachers (2006). This Dutch association (2006) developed and validated a framework for elementary teacher competences in close collaboration with a large representation of the professional group of teachers in the field (Dietze, Jansma & Riezenbosch, 2000). The resulting framework, serving as a teaching standard, resembles highly the teacher competencies from other international studies in the field of teacher education (see e.g. Fives & Buehl, 2008; Gonzales & Wagenaar, 2005; Kovacs-Cerovic, 2006; Pantic & Wubbels, 2010; Storey, 2006; Tigelaar, Dolmans, Wolhagen & Van der Vleuten, 2004; Zgaga, 2006). For a starting student teacher, this framework consists of six elementary aspects of teacher competence (Figure 2). As a result of this final first year evaluation, students received, within this specific learning environment, a pass score (coded as: 1) or fail score (coded as: 0) on each of six competences. Hence the outcome variable of this study is a categorical variable based on a natural underlying binary phenomenon (O’Connell & Rivet Amrico, 2010).

Interpersonal Competence	Pedagogical Competence	Subject knowledge and methodological Competence	Organizational Competence	Competence for collaboration with colleagues	Competence for reflection and development
INT	PED	SKM	ORG	COL	REF

Figure 2. Teacher competence with inside the six competence aspects.

Student teacher self-efficacy

To measure self-efficacy in direct correspondence with the competence evaluations, a teacher efficacy questionnaire was constructed, following Bandura’s standardized guidelines for self-efficacy measures (2006), such that each of the six subscales reflects one of the six evaluated competences (Van Dinther, Dochy, Segers & Braeken, 2013 in Chapter 3 of this dissertation). This comes down to 22 100-point scale items in total, with 3 to 4 items in each subscale (Cronbach α ranging from .74 to .89). Factor analysis results delivered evidence

for an underlying multidimensional structure of the questionnaire, reflecting the teacher competence framework (Van Dinther, Dochy, Segers & Braeken, 2013 in Chapter 3 of this dissertation). Since student teacher self-efficacy is a multi-factor construct (Bandura, 1997), the hypotheses will be tested for six self-efficacy variables reflecting six aspects of teacher competence.

Student perceptions of authenticity

For the purpose of this study the two subscales about authenticity of the Task (5 items, Cronbach $\alpha = .79$) and Form (4 items, Cronbach $\alpha = .71$) of the authenticity perception questionnaire (APQ: Gulikers, Bastiaens, & Kirschner, 2004, 2006) were used to measure the extent to which the assessment is perceived by students as reflecting real-life situations and meaningful problems. Student perceptions of authenticity were measured using a 5-point Likert scale (coding: 1 = low/strongly disagree, 5 = high/strongly agree).

Student perceptions of feedback

For the purpose of this study the three subscales about feedback Quantity (6 items, Cronbach $\alpha = .87$), Quality (6 items, Cronbach $\alpha = .77$), and feedback Use (6 items, Cronbach $\alpha = .74$) of the Assessment Experience Questionnaire (AEQ: Gibbs & Simpson, 2004b) were used to measure the extent to which assessment is perceived by students as meeting the conditions under which assessment supports student learning. Student perceptions of feedback were measured using a 5-point Likert scale (coding: 1 = low/strongly disagree, 5 = high/strongly agree).

Thus in total, we consider a set of six competence evaluation outcomes, a set of six corresponding self-efficacy subscales, and a set of five perceptions of assessment subscales (two for authenticity and three for feedback).

Data analysis

All statistical analyses were performed in the open-source statistical software R (R Core Team, 2013) and used maximum likelihood for model estimation. We used multiple regression to test whether perceptions of assessment predict student teacher self-efficacy (Hypothesis 1). More specifically we tested if each of the perceptions of assessment variables (i.e. 5 predictors) predicted the 6 self-efficacy variables. Hypothesis 2 involves a comparison between the contribution of two sets of predictors: a predictor block consisting of the two authenticity variables and a predictor block of the three feedback variables.

The effect of a predictor block can be summarized in a so-called sheaf coefficient or block effect which is a linear composite based upon the regression coefficients of the predictors in that block (see e.g., Whitt, 1986; Heise, 1972). Because there is no standard asymptotic method available to test such block effect, we used bootstrap, a resampling technique (see e.g., Efron & Tibshirani, 1993), to test Hypothesis 2. Bias-corrected bootstrap confidence intervals were constructed around the difference between the two block effects ($\Delta = \beta[\text{Authenticity}] - \beta[\text{Feedback}]$). The null hypothesis is that the two blocks have an equal effect on self-efficacy, and would be rejected when a zero value is outside the corresponding confidence interval for their difference.

We used a logistic regression to test if student teacher self-efficacy predicts the competence evaluation outcome (Hypothesis 3). More specifically we tested if the 6 self-efficacy variables predicted their corresponding 6 competence aspects. For comparability with linear regression and ease of interpretation we opted to report a generalized R² statistic (Zheng & Agresti, 2000). Additionally, we also accounted for the assessment predictors by adding assessment as an extra single predictor and as predictor in combination with self-efficacy.

To test Hypothesis 4 we used mediation analysis involving the computation of indirect effects through a combination of linear regression coefficients (perceptions of assessment \rightarrow self-efficacy) and logistic regression coefficients ([perceptions of assessment +] self-efficacy \rightarrow competence evaluation outcome). Since there is no standard method available for this type of computation, we used as recommended the bootstrap technique to conduct a mediation analysis (see e.g., Shrout & Bolger, 2002; Kelley & Maxwell, 2010). The latter logistic coefficients were first standardised according to the underlying response variable (see e.g., MacKinnon & Dwyer, 1993), after which the resulting standardised indirect effects were tested using bias-corrected bootstrap confidence intervals. For each competence aspect, the whole set of standardized mediation analysis results is summarized in a figure (Figures 3 – 8).

Results

Descriptives

In Table 1 the descriptives and correlation matrix concerning the assessment characteristics authenticity and feedback and the student teacher self-efficacy aspects are depicted. Inspection of the means and standard deviations of the assessment characteristics (columns 1 and 2, rows 1 to 5) shows that students perceive the assessment as rather authentic i.e. professionally relevant, the same counts for

students perception of feedback given. Students teacher self-efficacy (columns 1 and 2, rows 6 to 11) demonstrates a range from 75.62 to 82.03, indicating that students feel quite efficacious on all self-efficacy aspects.

Scrutiny of correlations between the authenticity aspects Task and Form and the feedback aspects Quantity, Quality and Use (columns 3 to 7, rows 1 to 5) reveals that these predictor variables do not correlate too highly. Finally, the correlations between the student teacher self-efficacy aspects (columns 8 to 12, rows 6 to 11) show high but not too high correlations, which is not surprisingly given the underlying factor structure.

Perceptions of assessment and self-efficacy

Referencing Hypothesis 1, the results of multiple regression reveal that both the authenticity block as the feedback block predict each of the six self-efficacy variables, indicating that this hypothesis can be confirmed (see R-squares Table II). Student perceptions of the authenticity of competence-based assessment and feedback given, do predict student self-efficacy, resulting in a percentage of explained variance ranging from 18% (SE-INT) to 43% (SE-REF).

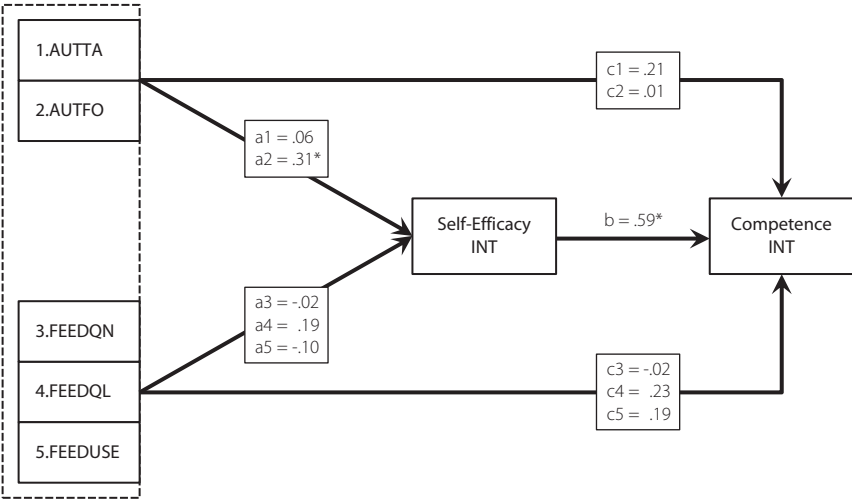


Figure 3. Standardized results of the mediation analyses: Perceptions of Assessment through Self-Efficacy to the Competence evaluation outcome INT.

Notes: The correlations between the perceptions of assessment measures are omitted for reasons of clarity. Indirect effects from perceptions of assessment over self-efficacy to competence evaluation outcome consist of the $a \times b$ product. AUTTA = Authenticity of Task; AUTFO = Authenticity of Form; FEEDQN = Feedback Quantity; FEEDQL = Feedback Quality; FEEDUSE = Use of Feedback; INT = Interpersonal Competence with corresponding Self-Efficacy variable.

To take a closer look at the single predictors within the authenticity and feedback blocks, we depicted the effects of authenticity of the Task (a1) and Form (a2), feedback Quantity (a3), feedback Quality (a4) and feedback Use (a5), on each of the self-efficacy variables (see Figure 3 – 8, left side). Inspection of the resulting regression coefficients a1 – a5 reveals that, with a few exceptions, the authenticity aspect Form (a2-INT = .31*; a2-PED = .29*; a2-SKM = .46*; a2-ORG = .38*; a2-COL = .23*; a2-REF = .43*) and the feedback aspect Quality (a4-PED = .31*; a4-SKM = .25*; a4-COL = .35*; a4-REF = .41*) are the most prominent predictors.

Hypothesis 2 states that authenticity is a stronger predictor of self-efficacy than feedback. The test for the difference in block effects (Difference Δ , Table II) did not support a significant difference between the effects of the authenticity block and the feedback block. Although there was not enough evidence to statistically support this hypothesis, inspection of the Δ differences across the self-efficacy variables revealed that for 3 of the 6 self-efficacy aspects (SKM: difference Δ .21; ORG: difference Δ .18; INT: difference Δ .16), authenticity tended to have a stronger effect than feedback. In first-year students perceptions these 3 self-efficacy aspects possibly demonstrate the strongest resemblance with the professional teaching practice. On the other 3 self-efficacy aspects (PED, COL, REF) the block effects of the two perceptions were rather similar.

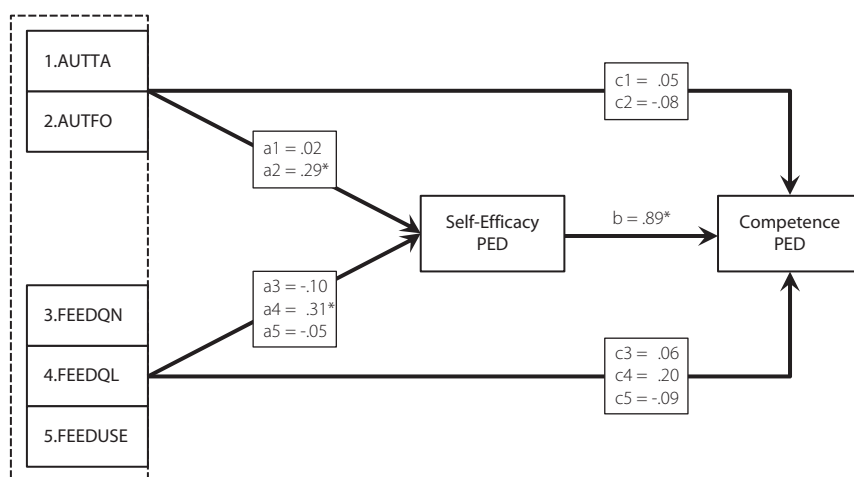


Figure 4. Standardized results of the mediation analyses: Perceptions of Assessment through Self-Efficacy to the Competence evaluation outcome PED.

Notes: The correlations between the perceptions of assessment measures are omitted for reasons of clarity.

Indirect effects from perceptions of assessment over self-efficacy to competence evaluation outcome consist of the $a \times b$ product. AUTTA = Authenticity of Task; AUTFO = Authenticity of Form; FEEDQN = Feedback Quantity; FEEDQL = Feedback Quality; FEEDUSE = Use of Feedback; PED = Pedagogical Competence with corresponding Self-Efficacy variable.

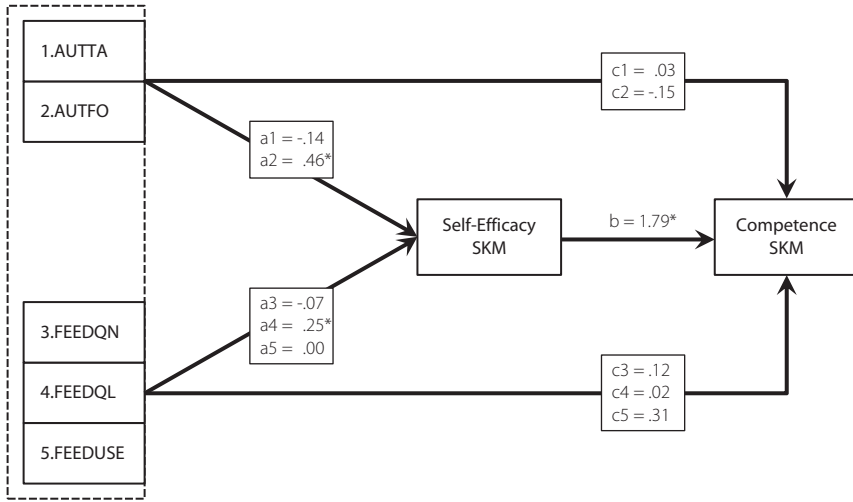


Figure 5. Standardized results of the mediation analyses: Perceptions of Assessment through Self-Efficacy to the Competence evaluation outcome SKM.

Notes: The correlations between the perceptions of assessment measures are omitted for reasons of clarity.

Indirect effects from perceptions of assessment over self-efficacy to competence evaluation outcome consist of the $a \times b$ product. AUTTA = Authenticity of Task; AUTFO = Authenticity of Form; FEEDQN = Feedback Quantity; FEEDQL = Feedback Quality; FEEDUSE = Use of Feedback; SKM = Subject Knowledge and Methodological Competence with corresponding Self-Efficacy variable.

Self-efficacy and competence

The results of the logistic regression, testing if student teacher self-efficacy predicts the competence evaluation outcome, reveal the following generalized R² (see generalized R², row: only SE, Table III): SE-INT on Competence-INT: .11; SE-PED on Competence-PED: .20; SE-SKM on Competence-SKM: .56; SE-ORG on Competence-ORG: .18; SE-COL on Competence=COL: .18; SE-REF on Competence-REF: .28, these results are all significant.

Even after accounting for the assessment predictors (i.e., adding assessment as extra predictors; row PA and SE, Table III), student teacher self-efficacy still has an unique significant contribution to the prediction of the competence evaluation outcome, see the corresponding b-values in Figures 3-8 (right side), respectively: .59, .89, 1.79, 1.12, .94 and .96; all significant. These results demonstrate that Hypothesis 3 can be confirmed. Student teacher self-efficacy succeeds in making a reasonable prediction of student competence evaluation outcomes on all of the 6 competence aspects.

For Hypothesis 4, we used mediation analysis to test if student's perceptions of assessment have an indirect effect on student's competence evaluation outcomes

through student self-efficacy. The *c* – values (*c*1 to *c*5, Figure 3 – 8) reveal a general absence of direct effects of perceptions of assessment on competence evaluation outcomes.

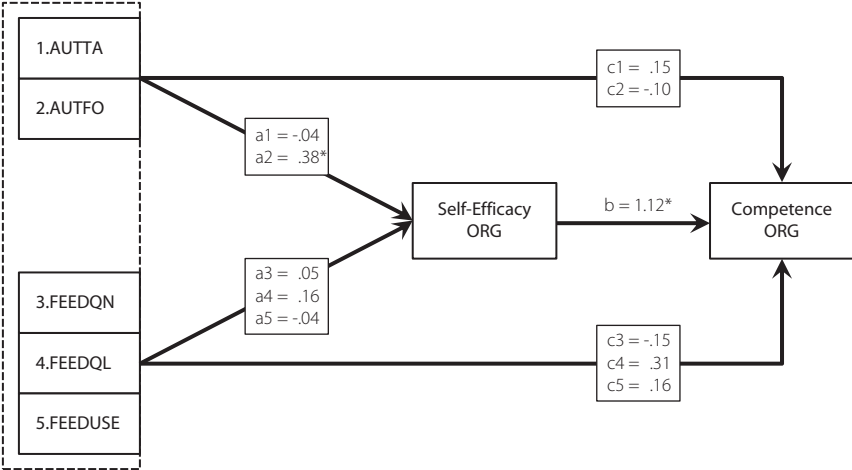


Figure 6. Standardized results of the mediation analyses: Perceptions of Assessment through Self-Efficacy to the Competence evaluation outcome ORG.

Notes: The correlations between the perceptions of assessment measures are omitted for reasons of clarity.

Indirect effects from perceptions of assessment over self-efficacy to competence evaluation outcome consist of the *a x b* product. AUTTA = Authenticity of Task; AUTFO = Authenticity of Form; FEEDQN = Feedback Quantity; FEEDQL = Feedback Quality; FEEDUSE = Use of Feedback; ORG = Organizational Competence with corresponding Self-Efficacy variable.

These results in combination with bias-corrected bootstrap confidence intervals for indirect effects of perceptions of assessment on competence evaluation outcomes in Table IV, provide clear support for Hypothesis 4.

A closer look at the indirect effects of the assessment aspects (see Table IV) reveal that the authenticity aspect form [$\beta = .18$, 95%CIs (.02, .39); $\beta = .26$, 95%CIs (.10, .49); $\beta = .82$, 95%CIs (.49, 1.19); $\beta = .42$, 95%CIs (.19, .70); $\beta = .22$, 95%CIs (.05, .43); $\beta = .42$, 95%CIs (.24, .62)] and the feedback aspect quality [$\beta = .28$, 95%CIs (.08, .55); $\beta = .45$, 95%CIs (.10, .83); $\beta = .33$, 95%CIs (.14, .64); $\beta = .39$, 95%CIs (.22, .60)] with a few exceptions, exhibit through self-efficacy the strongest indirect effects compared with the other assessment aspects.

Comparison of the individual and joint contributions of perceptions of assessment and self-efficacy to competence evaluation outcomes (R2 in Table III, row Only SE) reveals that self-efficacy is often the strongest predictor. The differences between Perceptions of Assessment and Self-efficacy (see: Table III, third row: PA and SE) and Only Self-efficacy (see Table III, second row: Only SE)

are respectively: .05, .02, .02, .06, .14 and .03. These results demonstrate that when self-efficacy is already included, perceptions of assessment often make only a slight extra contribution to the prediction of competence evaluation outcomes.

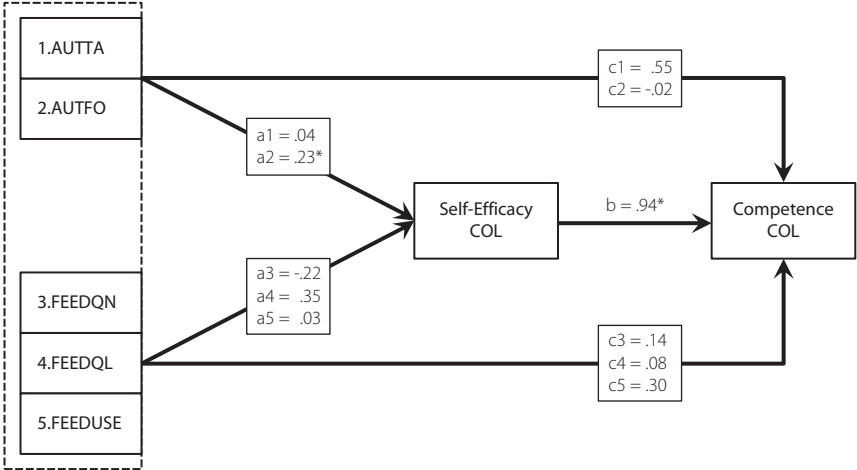


Figure 7. Standardized results of the mediation analyses: Perceptions of Assessment through Self-Efficacy to the Competence evaluation outcome COL.

Notes: The correlations between the perceptions of assessment measures are omitted for reasons of clarity.

Indirect effects from perceptions of assessment over self-efficacy to competence evaluation outcome consist of the $a \times b$ product. AUTTA = Authenticity of Task; AUTFO = Authenticity of Form; FEEDQN = Feedback Quantity; FEEDQL = Feedback Quality; FEEDUSE = Use of Feedback; COL = Competence for Collaboration with Colleagues with corresponding Self-Efficacy variable.

Discussion

The purpose of this study was to provide more insight into the interplay between student perceptions of competence-based assessment and student self-efficacy, and how this influences student learning outcomes.

A first result includes that student perceptions of (formative) assessment do predict student self-efficacy, and particularly student perceptions of the form authenticity aspect and the quality feedback aspect showed to be the best predictors. The influence of this type of perceptions confirms the role that the two main sources of self-efficacy information play, as stated by social cognitive theory. The results indicate that formative competence assessment, 1) requiring students to create a quality product or observable performance in a real-life situation and 2) characterised by understandable and learning focused feedback that is linked to the task and criteria, enhances students self-efficacy.

Table I. Descriptive statistics and correlation matrix for assessment and self-efficacy.

	M	SD	1	2	3	4	5	6	7	8	9	10	11
1 AUTTA	3.69	0.59	1	0.34	0.30	0.25	0.26	0.18	0.15	0.06	0.13	0.15	0.14
2 AUTVO	3.43	0.93		1.00	0.33	0.47	0.23	0.39	0.40	0.51	0.44	0.35	0.57
3 FEEDKT	3.58	0.74			1.00	0.57	0.31	0.18	0.16	0.18	0.24	0.08	0.25
4 FEEDKW	3.61	0.78				1.00	0.36	0.31	0.38	0.40	0.34	0.36	0.54
5 FEEDUSE	3.81	0.47					1.00	0.05	0.10	0.14	0.11	0.16	0.23
6 SEINT	79.44	12.23						1.00	0.73	0.63	0.67	0.59	0.64
7 SEPED	76.18	11.17							1.00	0.74	0.57	0.58	0.65
8 SESKM	78.64	9.57								1.00	0.74	0.67	0.74
9 SEORG	82.03	9.57									1.00	0.64	0.69
10 SECOL	82.01	10.53										1.00	0.70
11 SEREF	75.62	12.88											1.00

Note: Correlations in absolute value above .17 are significant at the 5% level, above .22 at the 1% level, and above .28 at the .1% level.

Table 2. Multiple regression: Perceptions of assessment predicting student self-efficacy.

Self-efficacy													
Predictors	INT	β	PED	β	SKM	β	ORG	β	COL	β	REF	β	
Block	Authenticity	.33*	Authenticity	.30*	Authenticity	.43*	Authenticity	.36*	Authenticity	.25*	Authenticity	.41*	
	Feedback	.17*	Feedback	.26*	Feedback	.22*	Feedback	.18*	Feedback	.30*	Feedback	.37*	
	Δ β	.16	Δ β	.04	Δ β	.21	Δ β	.18	Δ β	-.05	Δ β	.04	
F(5,132)	5.81	R ² .18*	7.18	R ² .21*	11.93	R ² .31*	7.58	R ² .22*	6.71	R ² .20*	20.29	R ² .43*	

Notes: A * indicates a p-value below significance level alpha of .05; Bias-corrected bootstrap confidence intervals using 2500 resamples are used to test the effect of a block of predictors.

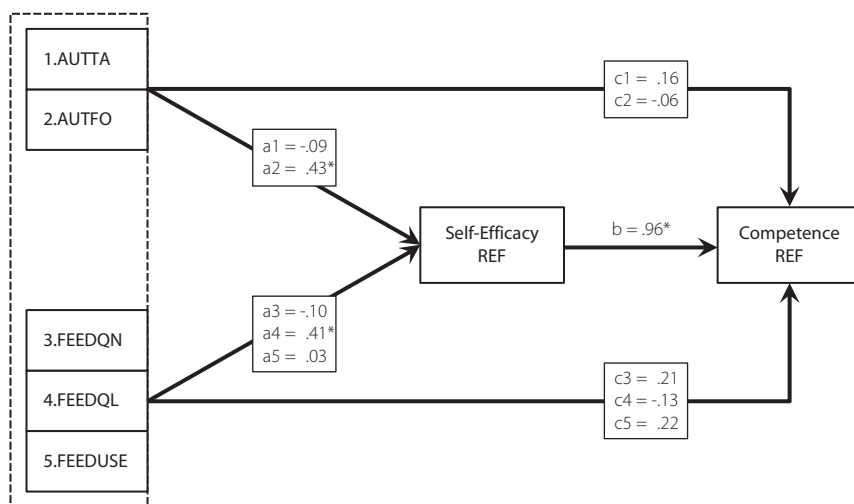


Figure 8. Standardized results of the mediation analyses: Perceptions of Assessment through Self-Efficacy to the Competence evaluation outcome REF.

Notes: The correlations between the perceptions of assessment measures are omitted for reasons of clarity.

Indirect effects from perceptions of assessment over self-efficacy to competence evaluation outcome consist of the $a \times b$ product. AUTTA = Authenticity of Task; AUTFO = Authenticity of Form; FEEDQN = Feedback Quantity; FEEDQL = Feedback Quality; FEEDUSE = Use of Feedback; REF = Competence for Reflection and Development with corresponding Self-Efficacy variable.

The results do not confirm mastery experiences as being a stronger source of self-efficacy information than social persuasions. As argued earlier, providing students with practice-oriented learning experiences is a necessary condition for acquiring mastery experiences, which is in turn the main source for the establishment of a firm sense of self-efficacy. However, not every practice-oriented learning experience itself leads automatically to a mastery experience. To provide students with mastery teaching experiences, educators have to tune the authenticity level of the learning experience, the structure of the situation and the supervision of the students to the complexity of the task and to the students' competence developmental level (Van Dinther et al., 2011 in Chapter 2 of this dissertation). A possible explanation for the non-confirmation of Hypothesis 2 can be that the authenticity level of the formative competence assessment did not precisely match first year student competence developmental level.

Another result of this study is the confirmation of Hypothesis 3. Logistic regression results revealed that student self-efficacy succeeds in making a reasonable prediction of student competence outcomes of the final end-of-year evaluation, on all of the 6 competence aspects. These results confirm the predictive role of self-efficacy as postulated by Bandura (1997). The practical relevance

of these results can be illustrated by using the odds ratio. Taking the student efficacy SE-SKM subscale as an example, each extra point a student writes down on this self-efficacy subscale corresponds to a 1.36 times increase in the odds of passing on this competence. In terms of probability, a student who rates a degree of self-efficacy that is equal to the average degree in this sample (SE-SKM = 79) has a 58% chance in obtaining this competence. A student who rates a degree

Table 3. Logistic regression predicting the competence evaluation outcomes.

	COMPINT								COMPED							
	G	Df	p	R ²	ΔG	ΔDf	p		G	Df	p	R ²	ΔG	ΔDf	p	
0 Model	114.21	137		0.00					167.92	137		0.00				
Only PA	103.14	132	0.050*	0.09	8.24	1	0.000**		158.31	132	0.090	0.06	20.29	1	0.000**	
Only SE	99.89	136	0.000**	0.11	4.99	5	0.420		140.43	136	0.000**	0.20	2.41	5	0.790	
PA and SE	94.90	131	0.000**	0.16					138.02	131	0.000**	0.22				

	COMPSKM								COMPORG							
	G	Df	p	R ²	ΔG	ΔDf	p		G	Df	p	R ²	ΔG	ΔDf	p	
0 Model	190.26	137		0.00					110.60	137		0.00				
Only PA	168.03	132	0.000**	0.14	74.13	1	0.000**		102.20	132	0.140	0.07	17.86	1	0.000**	
Only SE	99.28	136	0.000**	0.56	5.38	5	0.370		88.14	136	0.000**	0.18	3.8	5	0.58	
PA and SE	93.90	131	0.000**	0.58					84.34	131	0.000**	0.24				

	COMPCOL								COMPREF							
	G	Df	p	R ²	ΔG	ΔDf	p		G	Df	p	R ²	ΔG	ΔDf	p	
0 Model	114.21	137		0.00					174.26	137		0.00				
Only PA	91.21	132	0.000**	0.16	19.09	1	0.000**		157.29	132	0.000**	0.11	26.99	1	0.000**	
Only SE	86.49	136	0.000**	0.18	14.37	5	0.010**		135.08	136	0.000**	0.28	4.78	5	0.440	
PA and SE	72.12	131	0.000**	0.32					130.30	131	0.000**	0.31				

Notes: COMP = Evaluation outcome of the Interpersonal Competence (INT), Pedagogical Competence (PED), Subject Knowledge and Methodological Competence (SKM), Organizational Competence (ORG), Competence for Collaboration with Colleagues (COL), Competence for Reflection and Development (REF); G = Deviance; Df = Degrees of Freedom; Δ = likelihoodratio test results of the model compared with model PA and SE; * indicates a p-value below significance level of .05, ** indicates a p-value below significance level of .01; Generalized R² are reported to indicate the individual and joint contributions of Perceptions of Assessment (PA) and Self-efficacy (SE).

Table 4. Indirect effects of perceptions of assessment through self-efficacy on competence evaluation outcomes.

Competence	INT		PED		SKM		ORG		COL		REF	
	Indirect Effects											
Predictor	β	95%CI	β	95%CI	β	95%CI	β	95%CI	β	95%CI	β	95%CI
Task	.04	[-.06, -.02]	.02	[-.17, -.21]	-.25	[-.59, -.07]	-.05	[-.27, -.16]	.04	[-.15, -.25]	-.08	[-.25, -.05]
Form	.18	[-.02, -.39]*	.26	[-.10, -.49]*	.82	[-.49, 1.19]*	.42	[-.19, -.70]*	.22	[-.05, -.43]*	.42	[-.24, -.62]*
Quantity	-.01	[-.13, -.11]	-.09	[-.28, -.04]	-.13	[-.41, -.15]	.05	[-.16, -.23]	-.21	[-.43, -.04]*	-.10	[-.28, -.04]
Quality	.11	[-.01, -.34]	.28	[-.08, -.55]*	.45	[-.10, -.83]*	.18	[-.01, -.44]	.33	[-.14, -.64]*	.39	[-.22, -.60]*
Use	-.06	[-.19, -.03]	-.04	[-.18, -.10]	.01	[-.25, -.25]	-.04	[-.24, -.12]	.03	[-.12, -.18]	.03	[-.10, -.19]

Notes: A * indicates a p-value below significance level alpha of .05; Bias-corrected bootstrap confidence intervals are based upon 2500 resamples.

of self-efficacy (SE-SKM = 88) that is one standard deviation above the average degree in this sample, has a 96% chance, and hence we can almost be certain that he passes this competence. For a student who rates degree of self-efficacy (SE-SKM = 69) that is one standard deviation below the average self-efficacy degree in this sample, with a 7% chance to pass we can almost be sure that he fails for this competence. As a consequence of this result higher educational institutes should, in addition to supporting student competence development, pay attention to the monitoring and enhancement of students' developing self-efficacy because it predicts their future accomplishments.

In general, research regarding the role of student perceptions in education demonstrates moderate strength of relations between student perceptions and student learning and learning outcomes (Nijhuis, Segers & Gijsselaers, 2005; Struyven, Dochy, Janssens & Gielen, 2006; Segers, Nijhuis & Gijsselaers, 2006; Segers, Gijbels & Thurlings, 2008). The last result of this study, concerning Hypothesis 4, is in line with these research findings and demonstrates that student perceptions of assessment have an indirect effect on student's competence evaluation outcomes through student self-efficacy: revealing that perceptions of assessment make a slight contribution on top of the influence of self-efficacy on competence evaluation outcomes. This implies that perceptions influence competence outcomes for the greater part on account of their impact on self-efficacy. The results of testing Hypothesis 1 revealed a pattern, including student perceptions of the form authenticity aspect and the quality feedback aspect as being the best predictors of student teacher self-efficacy. Testing the indirect

effects of student perceptions of assessment on student competence evaluation outcomes through student self-efficacy, the same pattern applied, confirming the Hypothesis 1 result.

With respect to the research design, the measurement of the assessment characteristics and student teacher self-efficacy in the first part of the study was conducted simultaneously. The data of the competence evaluation outcome were collected in the second part of the study on another later time. The time difference in the study's second part supports our results regarding the predictive role of student teacher self-efficacy. Due to the correlational nature of the study's first half, the causality and direction of relationship between perceptions of assessment and self-efficacy must be interpreted with some caution. Nevertheless, the direction and size of the effects are in line with the pliability of self-efficacy of incipient students and the role of sources of self-efficacy according to social-cognitive theory (Bandura, 1997). Although we expect that study results apply to other student teachers, the homogeneity and size of the sample requires further affirming investigation among other and more heterogeneous samples of (upper year) student teachers.

The findings of this study further our understanding in the processes and characteristics which are essential for the effectiveness of new learning environments such as competence-based education. However, the results of this study indicate some suggestions for further research. Firstly, due to the limitation of this study, a more elaborate longitudinal study design could confirm the direction of the proposed relationship between student assessment perceptions and self-efficacy. Secondly, regarding the result of Hypothesis 1 and according to Hattie and Timperly (2007), the type of feedback and the way it is given can be differentially effective. Further research is needed to investigate which type of feedback given within formative assessment is most influential for enhancing student self-efficacy. Finally, regarding the role of mastery experiences as main source of creating self-efficacy and the result of Hypothesis 2, in-depth research is needed to investigate how students' perceptions of the assessment form authenticity aspect impact their self-efficacy.

References

- Association for Professional Quality of Teachers (2006). Bekwaamheidseisen. [Required Professional qualities of teachers]. Retrieved from <http://www.onderwijscooperatie.nl/?nl/onderwijscooperatie/bekwaamheid/&art=45>.
- Baartman, L., & Ruijs, L. (2011). Comparing students' perceived and actual competence in higher vocational education. *Assessment & Evaluation in Higher Education*, 36(4), 385-398.
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: Freeman. Bandura, A. (2006). Guide for creating self-efficacy scales. In: F. Pajares, & T. Urdan, *Self-Efficacy Beliefs of Adolescents* (pp. 307-337). Greenwich, Connecticut: Information Age.
- Black, P., & William, D. (1998). Assessment and Classroom learning. *Assessment in Education*, 5(1), 7-74.
- Bong, M., & Skaalvik, E.M. (2003). Academic self-concept and self-efficacy: How different are they really? *Educational Psychology Review*, 15(1), 1-40.
- Bouffard-Bouchard, T. (1990). Influence of self-efficacy on performance in a cognitive task. *The Journal of Cognitive Psychology*, 130(3), 353-363.
- Britner, S.L., & Pajares, F. (2006). Sources of science self-efficacy beliefs of middle school students. *Journal of Research in Science Teaching*, 43, 485-499.
- Carmichael, C., & Taylor, J.A. (2005). *Analysis of student beliefs in a tertiary preparatory mathematics course*. *International Journal of Mathematical Education in Science and Technology*, 36(7), 713-719.
- De Corte, E., Verschaffel, L., Entwistle, N., & van Merriënboer, J. (2003). Introduction. In E. De Corte, L. Verschaffel, N. Entwistle, & J. van Merriënboer (Eds.), *Powerful learning environments: Unraveling basis components and dimensions* (pp. XI-XIII). Oxford, England: Elsevier Science.
- Dietze, A., Jansma, F., & Riezebosch, A. (2000). Een kijkkader voor competenties voor de tweedegraads lerarenopleidingen [A framework of competencies for secondary grade teacher education]. Retrieved from <http://www.leroweb.nl>.
- Dochy, F., Segers, M., Van den Bossche, P., & Struyven, K. (2005). Students' perceptions of a problem-based learning environment. *Learning Environments Research*, 8, 41-66.
- Efron, B., & Tibshirani, R. (1993). *An introduction to the bootstrap*. Boca Raton, FL, USA: Chapman & Hall/CRC.
- Fives, H., & Buehl, M.M. (2008). What do teachers believe? Developing a framework for examining beliefs about teachers' knowledge and ability. *Contemporary Educational Psychology*, 33(2), 134-176.
- Gibbs, G., & Simpson, C. (2004a). Conditions under which assessment supports student's learning. *Learning and Teaching in Higher Education*, 1(1), 3-31.

- Gibbs, G., & Simpson, C. (2004b). Measuring the response of students to assessment: Assessment Experience Questionnaire. In C. Rust (Ed.), *Improving Student Learning: Theory, Research and Scholarship* (pp. 171-185). Oxford, England: The Oxford Centre for Staff & Learning Development.
- Gielen, S., Dochy, F., & Dierick, S. (2003). Evaluating the consequential validity of new modes of assessment: The influence of assessment on learning, including pre-, post-, and true assessment effects. In M. Segers, F. Dochy, & E. Cascallar (2003), *Optimising new modes of assessment: In search of qualities and standards* (pp. 37-54). Dordrecht, The Netherlands: Kluwer.
- Gonzales, J., & Wagenaar, R. (2005). *Tuning educational structures in Europe II: Universities contribution to the Bologna process*. Bilbao, Spain: University of Duesto & Groningen, The Netherlands: University of Groningen.
- Gulikers, J.T. (2006). *Authenticity is in the eye of the beholder: Beliefs and perceptions of authentic assessment and the influence on student learning*. PhD dissertation. Heerlen, Netherlands: Open University.
- Gulikers, J.T., Bastiaens, ThJ., & Kirschner, P.A. (2004). A five-dimensional framework for authentic assessment. *Educational Technology Research & development*, 52, 67-85.
- Gulikers, J.T., Bastiaens, ThJ., & Kirschner, P.A. (2006). Authentic assessment, student and teacher perceptions: the practical value of the five-dimensional framework. *Journal of Vocational Education and Training*, 58, 337-357.
- Hattie, J., & Timperly, H. (2007). The power of feedback. *Review of Educational Research*, 77(1), 81-112.
- Heise, D. (1972). Employing nominal variables, induced variables, and block variables in path analysis. *Sociological Methods and Research*, 1, 147-173.
- Higgins, R., & Hartley, P. (2002). The conscientious consumer: Reconsidering the role of assessment feedback in student learning. *Studies in Higher Education*, 27(1), 53-64.
- Janssens, S., Boes, W., & Wante, D. (2002). Portfolios: een instrument voor toetsing en begeleiding. [Portfolios: an instrument for assessment and teaching]. In F. Dochy, L. Heylen, & H. Van de Mosselaer (Eds.), *Assessment in onderwijs*. [Assessment in Education]. (pp. 203-224). Utrecht, The Netherlands: Lemma.
- Kelley, K., & Maxwell, S.E. (2010). Multiple Regression. In G.R. Hancock & O. Mueller (Eds.), *The Reviewer's Guide to Quantitative Methods in the Social Sciences* (pp. 281-297). New York, NY: Routledge.
- Kovács-Cerović, T. (2006). National Report – Serbia. In P. Zgaga (Ed.), *The prospects of teacher education in South-East Europe* (pp. 487-526). Ljubljana, Slovenia: University of Ljubljana.
- Lancaster, J., & Bain, A. (2007). The design of inclusive education courses and the self-efficacy of preservice teacher education students. *International Journal of Disability, Development and Education*, 54(2), 245-256.
- Lane, J., Lane, A. & Kyprianou, A. (2004). Self-efficacy, self-esteem and their impact on academic performance. *Social Behaviour and Personality*, 32, 247-256.

- Luszczynska, A., & Schwarzer, R. (2005). The role of self-efficacy in health self-regulation. In W. Greve, K. Rothermund, & D. Wentura (Eds.), *The adaptive self: Personal continuity and intentional self-development* (pp. 137-152). Göttingen, Germany: Hogrefe/Huber.
- MacKinnon, D. P., & Dwyer, J. H. (1993). Estimating mediated effects in prevention studies. *Evaluation Review*, 17, 144-158.
- Nijhuis, J., Segers, M. & Gijsselaers, W. (2005). Influence of redesigning a learning environment on student perceptions and learning strategies. *Learning Environment Research*, 8, 67-93.
- O'Connell, A.A., & Amico, K.R. (2010). Logistic Regression. In G.R. Hancock & O. Mueller (Eds.), *The Reviewer's Guide to Quantitative Methods in the Social Sciences* (pp. 221-239). New York, NY: Routledge.
- Pajares, F. (1996). Self-efficacy Beliefs in Academic Settings. *Review of Educational Research*, 66(4), 543-578.
- Pajares, F. (2006). Self-efficacy during childhood and adolescence: Implications for teachers and parents. In F. Pajares & T. Urdan (Eds.), *Self-efficacy Beliefs of Adolescents* (pp. 339-367). Greenwich, CT: Information Age.
- Pajares, F., & Miller, M.D. (1994). Role of self-efficacy and self-concept beliefs in mathematical problem solving: a path analysis. *Journal of Educational Psychology*, 86(2), 193-203.
- Palmer, D.H. (2006). Sources of self-efficacy in a science methods course for primary teacher education students. *Research in Science Education*, 36, 337-353.
- Pantic, N., Wubbels, T. (2010). Teacher competencies as a basis for teacher education – Views of Serbian teachers and teacher educators. *Teaching and Teacher Education*, 26, 694-703.
- Papastergiou, M. (2010). Enhancing physical education and sport science students' self-efficacy and attitudes regarding information and communication technologies through a computer literacy course. *Computers & Education*, 54, 298-308.
- R Core Team (2013). R: A Language and Environment for Statistical Computing. Vienna, Austria: R Foundation for Statistical Computing. Retrieved from <http://www.R-project.org>.
- Relich, J.D., Debus, L., & Walker, R. (1986). The mediating role of attribution and self-efficacy variables for treatment effects on achievement outcomes. *Contemporary Educational Psychology*, 11, 195-216.
- Sambell, K., McDowell, L., & Brown, S. (1997). But is it fair?: An exploratory study of student perceptions of the consequential validity of assessment. *Studies in Educational Evaluation*, 23, pp. 349-371.
- Schunk D.H. (2003). Self-efficacy for reading and writing: influence of modelling, goal setting and self-evaluation. *Reading and writing quarterly: overcoming learning difficulties*, 19(2), 159-172.
- Schunk D.H. & Pajares F. (2001) The Development of academic self-efficacy. In A. Wigfield & J.S. Eccles (Eds.). *Development of Achievement Motivation* (pp. 15-32). San Diego, CA: Academic Press.
- Schwarzer, R., Richert, J., Kreausukon, P., Remme, L., Wiedemann, A.U., & Reuter, T. (2010). Translating intentions into nutrition behaviors via planning requires self-efficacy: Evidence from Thailand and Germany. *International Journal of Psychology*, 54, 260-268.

- Segers, M., Gijbels, D., & Thurlings, M. (2008). The relationship between students' perceptions of portfolio assessment practice- and their approaches to learning. *Educational Studies*, 34(1), 35-44.
- Segers, M., Nijhuis, J., & Gijselaers, W. (2006). Redesigning a learning and assessment environment: The influence on students' perceptions of assessment demands and their learning strategies. *Studies in Educational Evaluation*, 32, 223-242.
- Shrout, P., & Bolger, N. (2002). Mediation in experimental and nonexperimental studies: New procedures and recommendations. *Psychological Methods*, 7, 422-445.
- Stajkovic, A. & Luthans, F. (1998). Self-efficacy and work-related performance: a Meta- analysis. *Psychological Bulletin*, 124, 240-261.
- Storey, A. (2006). The search for teacher standard: a nationwide experiment in the Netherlands. *Journal of Education Policy*, 21(2), 215-234.
- Struyven, K., Dochy, F., Janssens, S., & Gielen, S. (2006). On the dynamics of students' approaches to learning: The effects of the teaching/learning environment. *Learning and Instruction*, 16, 279-294.
- Tigelaar, D., Dolmans, D., Wolhagen, I., & Van der Vleuten, C. (2004). The development and validation of a framework for teaching competencies in higher education. *Higher Education*, 48, 253-268.
- Van Dinther, M., Dochy, F., & Segers, M. (2011). Factors affecting students' self-efficacy in higher education. *Educational Research Review*, 6(2), 95-108.
- Van Dinther, M., Dochy, F., Segers, M., & Braeken, J. (2013). The construct validity and predictive validity of a self-efficacy measure for student teachers in competence-based education. *Studies in Educational Evaluation* (published online 14 June 2013).
- Whitt, H. (1986). The sheaf coefficient: a simplified and expanded approach. *Social Science Research*, 15, 174-189.
- Zgaga, P. (Ed.). (2006). *The prospects of teacher education in South-East Europe*. Ljubljana, Slovenia: University of Ljubljana.
- Zheng, B., & Agresti, A. (2000). Summarizing the predictive power of a generalized linear model. *Statistics in Medicine*, 19, 1771-1781.

CHAPTER 5

THE CONTRIBUTION OF ASSESSMENT EXPERIENCES TO STUDENT TEACHERS' SELF-EFFICACY IN COMPETENCE-BASED EDUCATION

Van Dinther, M. (2013, September, 18 - 20). Student perceptions of assessment and student self-efficacy in competence-based education. Paper presented at the Research Days of Katholieke Universiteit Leuven and Maastricht University, organised by Centre for Research on Professional Learning & Development, Corporate Training and Lifelong Learning at Katholieke Universiteit Leuven, Wange, Belgium.

Van Dinther, M., Dochy, F., & Segers, M. (2014). The contribution of assessment experiences to student teachers' self-efficacy in competence based education. Submitted to Teaching and Teacher Education.

Abstract

Earlier research argues that educational programmes based on social cognitive theory are successful in improving students' self-efficacy. In this study we focus on the formative assessment characteristics 'authenticity' and 'feedback', and student teachers' self-efficacy. The purpose of this qualitative research is to study in depth how student teachers' assessment experiences contribute to their self-efficacy. We interviewed 15 second year student teachers enrolled in a competence based teacher educational programme, using a standardised open-ended interview structure. Thematic content analysis results reveal that the assessment characteristics 'authenticity' and 'feedback' exert a positive influence on student teachers self-efficacy during all phases of the portfolio competence assessment. The results provide a fine-grained view of several types of self-efficacy information connected with the phases of portfolio competence assessment. Research findings expose the role that mastery experiences, social persuasions and physiological and affective states play in developing student self-efficacy as stated by social cognitive theory.

Key words: self-efficacy, formative assessment, assessment characteristics, assessment experiences, teacher education, types of self-efficacy information

Introduction

Cross-national research findings (Jensen, Sandoval-Hernández, Knoll & Gonzalez, 2012) have demonstrated that on average, nearly 10% of teachers in the first 1-3 years of their teaching leave the profession. In addition, the research findings also questioned the effectiveness of new teachers compared to experienced teachers by showing that new teachers provide less actual teaching and learning time in their classes as their experienced colleagues. This finding is related to new teachers' low self-efficacy. Moreover, lower academic results of students are associated with low teacher self-efficacy. (see e.g. Muys & Reynolds, 2001; Ross, 1998; Woolfolk Hoy & Davis, 2006).

A vast amount of research points at the central role of teachers' self-efficacy, usually defined as "their belief in their ability to have a positive effect on student learning" (Ashton, 1985, p. 142), in teaching competence and teaching effectiveness (Tschannen-Moran & Woolfolk Hoy, 2001; Woolfolk Hoy & Davis, 2006). According to Bandura (1997) and Woolfolk Hoy and Burk-Spero (2005), teacher self-efficacy may be most malleable during teacher preparation and the first years of teaching. Paying attention to the development of a strong sense of efficacy among novice teachers and student teachers seems to be worthwhile, because once established the self-efficacy of experienced teachers seems resistant to change (Woolfolk Hoy & Burk-Spero (2005). Social cognitive theory (Bandura, 1997) claims that teachers' self-efficacy can be created by four main sources of information, namely enactive mastery experiences, vicarious experiences, verbal persuasions and physiological and affective states. Research in higher education (see e.g. Palmer, 2006; Van Dinther, Dochy & Segers, 2011 in Chapter 2 of this dissertation) evidenced the relevance of these sources for improving students' self-efficacy. Nevertheless, the way efficacy information derived from these sources is cognitively processed by students is an unexplored area in self-efficacy research.

Formative assessment, which refers to assessment that specifically intends to generate feedback on students' achievements to improve student learning (Nicol & Macfarlane-Dick, 2006; Sadler, 1998), has the potency to provide students with several types of self-efficacy information. Recent research results reveal (Van Dinther, Dochy, Segers & Braeken, 2014 in Chapter 4 of this dissertation) that student perceptions of formative assessment do predict student self-efficacy. Particularly student perceptions of the form authenticity aspect, i.e. the resemblance of assessment to the future teaching profession (Gulikers, Bastiaens & Kirschner, 2006) and the quality of feedback showed to be the best predictors. The influence of this type of perceptions confirm, as stated by social cognitive theory (Bandura, 1997), the essential role that enactive mastery experiences and

verbal persuasions play in building students self-efficacy beliefs. However it is not yet clear how in students experiences these assessment characteristics contribute to their self-efficacy.

Considering the state of the art in self-efficacy research and the relevance of providing student teachers with a strong self-efficacy, the purpose of this paper is to study in depth how student teachers' assessment experiences contribute to their self-efficacy.

Student teachers' self-efficacy

The idea that teachers' beliefs about their capabilities as teachers are of consequence, has been studied for several decades. Teacher efficacy is a special type of self-efficacy which refers to "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3). Within the educational field, the meaning and measure of teachers' self-efficacy has been the focus of many research studies. Teacher self-efficacy is usually defined as "the extent to which the teacher believes he or she has the capacity to affect student performance" (Berman, McLaughlin, Bass, Pauly, & Zellman, 1977, p. 137) or as "their belief in their ability to have a positive effect on student learning" (Ashton, 1985, p. 142). There is a considerable amount of research findings pointing at its central role in teaching competence and teaching effectiveness. For example, regarding classroom management, high efficacious teachers incline to less controlling and more humane behaviour in handling their students than less efficacious teachers (Chacon, 2005; Woolfolk & Hoy, 1990; Woolfolk, Rosoff & Hoy, 1990). Regarding instruction, compared to less efficacious colleagues, highly efficacious teachers apt to divide the class for small group instruction and direct teaching (Gibson & Dembo, 1984; Muys & Reynolds, 2001), spent more time in interactive instruction (Smylie, 1988) and demonstrate higher levels of planning and organisation (Allinder, 1994). Furthermore teachers' self-efficacy is frequently associated with student educational outcomes. For example Caprara, Barbaranelli, Steca and Malone (2006) found, controlling for previous levels of achievement that teachers' self-efficacy affected student academic achievements in a positive way. Concerning subjects as reading (Ross, 1998) and mathematics (Muys & Reynolds, 2001; Ross, 1998), researchers demonstrated that students guided by teachers with high self-efficacy performed better than students guided by less efficacious teachers. Considering this substantial amount of research findings, it seems important for prospective teachers to develop a robust self-efficacy. However, cross-national research (Jensen, Sandoval-Hernández, Knoll & Gonzalez, 2012) revealed that new teachers reported significantly lower levels of self-efficacy than experienced teachers.

Referencing the target group of this study, student teachers, Bandura (1997) states that their self-efficacy is most pliable at an early stage of the learning process. Students who enter the first year of the teacher educational programme have an early global or general idea of teaching and teaching competences. This early global concept is based on prior knowledge, teaching experiences drawn from their student role and in general no or very limited teaching experiences as a teacher. First year student teachers encounter new teaching experiences, they interpret these experiences and that forms a new and better understanding of the teaching practice and required teaching competences. In line with Schunk and Meece (2006) who state that students' school experiences help shape their self-efficacy beliefs, it is plausible that the development of teacher competences runs parallel with the development of first year student teachers self-efficacy. This implies, according to the theoretical assumption of Eccles, Wigfield and Schiefele (1998), that first-year student teachers enter the first-year programme with a more global undifferentiated teacher self-efficacy. As students have more teaching experiences a differentiation takes place from a broad understanding to a partly differentiated self-efficacy (Van Dinther, Dochy, Segers & Braeken, 2013 in Chapter 3 of this dissertation), finally leading to a more fine-grained sense of teacher efficacy.

According to social cognitive theory (Bandura, 1997) students develop their self-efficacy by interpreting information from four sources: enactive mastery experiences, vicarious experiences, verbal persuasion and physiological and emotional states. Enactive mastery experiences are the most powerful source of self-efficacy information and refer to authentic successes in carrying out particular tasks within particular situations. In general, experiences interpreted as successful raise students' self-efficacy and experiences interpreted as unsuccessful lower it. Next to this source, self-efficacy appraisals are partly affected by vicarious experiences, which refers to observational experiences provided by social models. Verbal persuasion and allied types of social influences serve as the third source of strengthening self-efficacy beliefs, by expressing faith in one's capabilities through encouragement and evaluative feedback. In the construction of self-efficacy beliefs, students rely partly on indicators of e.g. excitement, tension and stress transferred by physiological and affective states. This forms the fourth source of efficacy information.

Self-efficacy information that arises from these sources does not affect self-efficacy directly because it is cognitively appraised. This cognitive appraisal involves the selection of the type of information which students use from the different sources, as indicators for self-efficacy. Furthermore it involves the rules students use to weigh, interpret and integrate the self-efficacy information into creating their self-efficacy. This inferential process goes along with personal and

situational factors such as previously created self-efficacy beliefs, perceived task difficulty, spent effort, received support during the task and the outcome of the task (Bandura, 1997; Britner & Pajares, 2006).

In the 1980s researchers started to examine the potency of these sources of self-efficacy information by investigating the situational and instructional factors within educational contexts that could possibly affect students' self-efficacy. The results within the elementary and secondary school settings demonstrated that factors such as goal setting (see e.g. Schunk, 1996), modeling (Relich, Debus & Walker, 1986), feedback (Schunk, 1995), task strategies (Pintrich & DeGroot, 1990) and self-monitoring and self-evaluation (Zimmerman & Kitsantas, 1999), can enhance students' self-efficacy in several ways. Since the 1990s studies referencing the same subject emerged within higher education. Review results (Van Dinther, Dochy & Segers, 2011 in Chapter 2 of this dissertation) revealed that educational programmes based on social cognitive theory are successful in improving students' self-efficacy and several factors influencing students' self-efficacy provided evidence for the potency of the main sources of self-efficacy information. Regarding enactive mastery experiences, stated by Bandura (1997) as the most powerful source of self-efficacy information, a lot of educational programmes emphasise the amount of practical experience, i.e. the time students spent in performing a task while applying knowledge and skills within demanding situations (Van Dinther, Dochy & Segers, 2011 in Chapter 2 of this dissertation). However not every direct practical experience itself leads in students' interpretations to a mastery experience. With respect to vicarious experiences as second source of efficacy information, the results of former studies were inconclusive. Verbal persuasion, as the third source of efficacy information, is mostly captured by providing student with performance feedback. However there are several questions regarding the differing effects of different types of feedback on student self-efficacy, for not every type of feedback does in fact reflect the encouraging message, as theorised by social cognitive theory (Usher & Pajares, 2009).

Although there is evidence that student teachers' self-efficacy increases during teacher training programmes (Wenner, 2001; Woolfolk Hoy & Burke Spero, 2005), it is still largely unclear how student teachers deal with the different self-efficacy sources. For example, which level of authenticity leads to a mastery experience? Is this level different for students in different phases of the programme? Which type of feedback in which situation is interpreted by students as encouraging regarding their capabilities? Additionally, in general, the cognitive processing of self-efficacy information, derived from these sources, is an unexplored area within self-efficacy research (Zeldin & Pajares, 2000). There is a need for a better understanding of the role the sources of self-efficacy play and a deeper insight in the way student teachers select and interpret the information from these sources.

Increasing student teacher self-efficacy through assessment

It is widely accepted that assessment has an influence on how students learn and scholars have put forward the importance of student perceptions of two specific characteristics of assessment in students' learning, namely authenticity (Janssens, Boes, & Wante, 2002; Sambell, McDowell, & Brown, 1997; Gulikers, Bastiaens, & Kirschner, 2006, 2007) and feedback (Gibbs & Simpson, 2004; Higgins & Hartley, 2002; Segers, Gijbels, & Thurlings, 2008). Formative assessment refers to assessment that specifically intends to generate feedback on students' achievements to improve student learning (Nicol & Macfarlane-Dick, 2006; Sadler, 1998). Formative assessment has a positive impact on students' learning outcomes (Black & William, 1998; Hattie & Timperly, 2007), because it concentrates on improving students' learning in terms of learning gains, student motivation and student self-efficacy (Black, Harrison, Lee, Marshall & William, 2003).

Feedback can be considered as a persuasive source of efficacy information and according to Schraw, Crippen and Hartley (2006) feedback can enhance students' self-efficacy if it provides information about whether the task is performed acceptably as well as how to improve subsequent performance. This is in line with research pointing at instructional factors within higher education such as feedback that can enhance students' self-efficacy (Palmer, 2006; Van Dinther, Dochy & Segers, 2011 in Chapter 2 of this dissertation).

Authenticity of assessment, refers to the use of assessment tasks connected with real-life situations and meaningful problems which resemble the authenticity of the professional occupational domain (Ritzen & Kösters, 2002; Segers, Dochy & Cascallar, 2003). Student perceptions of authenticity of assessment refer to how practice-oriented assessment is perceived by students (Gulikers, 2006). Since practice-oriented learning experiences can be seen as a necessary condition for gaining mastery experiences (Palmer, 2006; Van Dinther et al., 2011 in Chapter 2 of this dissertation), the assessment characteristic authenticity can be connected with this source of creating self-efficacy.

Recent research reveals (Van Dinther, Dochy & Segers, 2014 in Chapter 4 of this dissertation) that student perceptions of assessment practices positively influence their self-efficacy, and particularly student perceptions of the 'form authenticity' aspect and 'the quality of feedback' aspect demonstrated the strongest influence. However not every practice-directed assessment result itself leads automatically to a mastery experience and not every type of feedback given leads to enhancement of students' self-efficacy. Therefore this study intends to provide clarity about how students experience these assessment characteristics and how in students' experiences these assessment characteristics contribute to their self-efficacy.

The current study is of an explorative and qualitative nature and aims to investigate in depth how student teachers' assessment experiences contribute to their self-efficacy. According to the aim of this study we try to answer the following research questions:

1. How do students' assessment experiences regarding the authenticity aspect contribute to their self-efficacy?
2. How do students' assessment experiences regarding the feedback given contribute to their self-efficacy?

Method

Participants

A qualitative study was set up to guarantee in depth-information about students assessment experiences. Participants in this study were second year students, enrolled in a 4-year bachelor programme for elementary teacher education. A total of fifteen second year student teachers that were invited to participate in the interviews, all agreed to take part. From the angle of the credibility of the study capturing a wide range of experiences, we invited randomly both female and male students, students with different views on assessment (i.e. positive as well as negative views) and students differing regarding the assessment results with sufficient as well as not sufficient competence development.

Setting and procedure

The setting for this study is a competence-based teacher educational curriculum in which at the end of the first year a formative competence assessment is used to monitor student competence development and to serve as a preparation for the final evaluation. The formative competence assessment consists of an assessment of student's portfolio and a portfolio assessment interview. With regard to the setting of this study, from the students' point of view this portfolio assessment can be divided in three phases, namely the direct preparation phase, the portfolio assessment interview phase and the feedback phase. During the direct preparation phase, students have to compose a reflective portfolio, which in general includes collected evidence and a self-appraisal regarding the competence development, reflective comments on collected feedback provided by important referents and a reflection regarding

prospective learning goals and activities (Smith & Tillema, 2003; Segers, Gijbels, & Thurlings, 2008). In this competence based teacher educational institute setting, next to other evidence, the core content of students' portfolios consists of students' teaching activities and experiences in practice. During the portfolio interview phase, students are interviewed by two assessors. As a consequence of the competence based approach students are assessed on the integration of required knowledge, skills and attitudes referencing the teacher competences. In the feedback phase students receive feedback from the assessors on their teacher competence development.

The students were interviewed at the beginning of their second bachelor year, a couple of months after they had finished the formative competence assessment.

Interview protocol

The interviews were administered individually by a researcher who is an expert on this research subject and is not affiliated to this institute. The familiarity of the interviewer with the topic of research created the possibility for delivering in depth questions if students' answers gave rise to that, whereas the external position created a more open atmosphere in which students were invited to answer as openly and critically as possible. The interviews lasted between 30 and 35 minutes and followed a standardised open-ended structure, i.e. a set of open-ended questions were asked in a specific order and exactly as worded. The standardised open-ended structure gives the researcher the possibility to deepen certain issues dependent on the answers of the participants while comparability of the answers is retained (Johnson & Christensen, 2012). When greater clarity or depth in answers was needed, the interviewer used probes and follow-up questions.

For the design of the interview scheme we took some statements from the questionnaires used in a former study, as a starting position. More specific we used statements, regarding student perceptions of the form authenticity aspect and the quality of feedback aspect, which have demonstrated the strongest influence on student teachers' self-efficacy (Van Dinther, Dochy & Segers, 2014 in Chapter 4 of this dissertation). Students were invited to react openly to these statements with their formative assessment experiences in mind (see the left side of Table 1 for an excerpt of used statements). The interview questions were aimed at eliciting responses regarding how students describe these assessment characteristics and if and how in students experience, these assessment characteristics contribute to their sense of efficacy (see the right side of Table 1 for an excerpt of interview questions).

Table 1. Excerpt from the interview protocol.

Starting point statements	Interview questions
This assessment is clearly aimed at the requirements of the teaching profession	<p>When you think of your experience with the formative assessment:</p> <p>a) Was the assessment, in your experience, clearly aimed at the requirements of the teaching profession?</p> <p>b) If it were, can you explain why?</p> <p>c) If it were not, can you explain why not?</p> <p>d) Did such an assessment influences your self-efficacy as a student teacher?</p> <p>e) If it did, can you describe how?</p> <p>f) If it didn't, can you explain why not?</p>
The feedback given at the end of this assessment helps me to improve my teacher competences	<p>When you think of your experience with the feedback given:</p> <p>a) Did the feedback given, in your experience, helps you to improve your teacher competences?</p> <p>b) If it did, can you explain how?</p> <p>c) If it didn't, can you explain why not?</p> <p>d) Did such feedback influences you're self-efficacy as a student teacher?</p> <p>e) If it did, can you describe how?</p> <p>f) If it didn't, can you explain why not?</p>

Coding and analysis

The audio taped interviews were literally transcribed. The subsequent step was to define the unit of analysis which refers to the basis unit text to be classified during the thematic content analysis (Zhang & Wildemuth, 2009). The unit of analysis in this study was a meaningful text segment, including a partial, single or several sentences, in which the students referred to the assessment characteristics authenticity or feedback, or the contribution of these assessment characteristics to student teachers' self-efficacy.

In order to analyse the data we used thematic content analysis. Thematic content analysis is a commonly used method in qualitative research which is related to grounded theory as well as phenomenology (Braun & Clarke, 2006; Guest, Mitchell & Namery, 2012), and has been defined as 'a method for identifying, analysing and reporting patterns (themes) within data' (Braun & Clarke, 2006, p. 6). During the analysis we relied on an abductive strategy by moving back and forth between the data and prior understanding based on theories in order to obtain the most optimal understanding of the object of our study (Morgan, 2007).

Following the standardised structure of the interview protocol, we conducted a three-step analysis in which an elaborated coding scheme was developed. The development of this coding scheme was supported by the use of written memos during the whole analytical process (Miles & Huberman, 1994; Hsieh & Shannon, 2005). To ensure the consistency of coding we defined the categories and subcategories. Text units were assigned to only one code.

In the first analysis step, all text segments in which students refer to the assessment characteristics of interest, were coded into the categories 'authenticity' or 'feedback'. Subsequently, in this first step we focused on what the participants experienced, i.e. the different qualities of authenticity of assessment and feedback given. Data were further specified into qualities of authenticity and qualities of feedback.

At the beginning of the second analysis step, we selected all statements in which participants referred to the influence of this assessment on their self-efficacy. Subsequently all text segments in which students refer to one of the sources of self-efficacy were selected. These last text segments were coded into the following four categories representing the main sources of self-efficacy, as described by participants by relying on social cognitive theory (Bandura, 1997) as introduced in the literature review:

- a) 'Mastery experiences': including participants' statements about success experiences referencing the development of teacher competences,
- b) 'Vicarious experiences': including participants' statements about observational experiences provided by other students or teachers,
- c) 'Verbal persuasion': including participants' statements referring to information provided by the assessors that affirms and persuades students that they are able to further develop the teacher competences,
- d) 'Physiological and affective states': including participants' statements about experiences regarding their physiological and affective mood states.

We completed this second analysis step by analysing participants' descriptions in which they connected the assessment characteristic 'authenticity' or 'feedback' with one or more sources of self-efficacy.

The third analysis step focused on what the participants experienced: a further specification of the described sources of self-efficacy into types of efficacy information in relation to the outcome of the first analysis phase i.e. the different authenticity and feedback qualities. The purpose of this step was to identify possible patterns of self-efficacy information as elicited by the assessment characteristics ‘authenticity’ and ‘feedback’.

To validate and refine the coding scheme early in the analytical process, we tested the clarity and consistency of the definitions of the categories on a sample of the text, which were 20% of the interviews. Two coders were assigned to code the transcribed interviews. One of the two is an expert on assessment and social cognitive theory, the other coder is expert in teacher education. The two coders read and coded independently the sample and distinct statements pertaining to the categories. To achieve a high consistency among the coders, in a meeting the coding and coding experiences were discussed, which resulted in a collaborative refined and data-driven coding scheme. After that the coding was applied to the whole corpus of the texts. To maintain high consistency in terms of reliability, during this process two meetings were organised to discuss if new codes emerged and the coding categories needed to be modified. Discussion between coders of issues that arise during the analytical process, refers to an iterative process that should be continued until sufficient coding consistency has been achieved (Schilling, 2006; Zhang & Wildemuth, 2009). Regarding the interrater reliability, after the first round in the analytical process a correspondence of 85% was reached. Prior to starting the final round in the analytical process coders negotiated until unanimous agreement was reached about the definite coding scheme (see Appendix).

The reporting of the findings and the drawing of conclusions of the coded data, will be addressed in the next sections. In order to increase the validity of the study, in the text of the result section several authentic participants’ answers are provided (Elo & Kyngas, 2007).

Results

We start this result section with the qualities of ‘authenticity’ and ‘feedback’ as experienced by students. Before we describe which types of self-efficacy information were elicited by these assessment characteristics, we reveal if a formative assessment with these characteristics does influence participants’ self-efficacy. Finally we describe the results of our search, according to thematic content analysis, for relevant patterns, i.e. parts of the experiences that are common across the participants. Regarding the focus of this study this search

was aimed at types of self-efficacy information across participants that had been elicited by the assessment characteristics of interest.

Qualities of 'authenticity' in students' experiences

The results suggest a variation in students' experiences with regard to the experienced degree of 'authenticity' and referencing the different qualities students attribute to 'authenticity'. Most ($n = 12$), but not all, students experienced the assessment as authentic, i.e. professionally relevant. In addition to this, from students' descriptions three qualities regarding assessment 'authenticity' emerged.

Reflection on development

Almost half ($n = 7$) of the students experienced reflection on their competence development during preparation of the portfolio as authentic. This reflection on competence development involves activities such as thinking back on their experiences, analysing their activities, judging their own acting and collecting evidence for their competence development. Students explain in several ways why they view this preparation task as professionally relevant. (a) Several participants ($n = 3$) refer to their internship, as representing the professional practice for them. This is not surprising because for most first year students this internship is their frame of reference. Because the reflection task is about their internship activities these students experience it as professionally relevant. (b) Due to the focus on the professional standards i.e. teacher competences, some students ($n = 2$) perceive the task as being aimed at their future profession and as corresponding with the requirements of the practice. (c) Next to this, some students ($n = 2$) view reflection as an activity that belongs to teachers' profession. For instance, one of the students described:

Yes, it does connect with elementary education. Especially, last year I realised that when I had to type those reflection reports and those standards, all those points that you had to reflect on, this I had already come across during my internship and I did give those lessons. Those things often appeared in my internship so it connects to the practice. (S4, U3)

Addressed as a future teacher

A majority of the students ($n = 10$) experience the portfolio assessment interview as authentic. In their experiences the assessors put questions concerning their personal vision on teaching situations, their teacher competence development, evidencing their development and about putting theory into practice.

Students explain in two ways why they view this portfolio assessment interview as authentic. In part of the descriptions the students mention that the type of questions were questions that could be asked in the real practice, in their perception this kind of questions can be asked in the future when they work as a teacher. In the other descriptions the participants express that due to the attitude of the assessors and the type of questions, they were stimulated to have a large share in the conversation and were given the opportunity to lead a part of the interview. These participants felt themselves addressed as an adequate interlocutor. For instance, one of the students described:

I did a lot of the talking and they put plenty of questions to me about things I hadn't prepared and didn't expect. I think this corresponds with the profession, because in the future when you have to answer questions from parents and from colleagues you don't always know the answers in advance. (S7, U15)

Another student expressed:

Yes, we also talked about my vision, and I could lead the interview in the direction of my interests, so I could talk a lot about my personal vision and experience-directed education when I did my internship. (S13, U21)

Degree of reality

A part of the students ($n = 5$) describe the authenticity of the assessment in general by referring to the degree of reality of the assessment. These students made statements about the degree of reality by comparing the assessment activities with actual internship activities or future professional activities and requirements. Although two of these participants described the assessment as real because it is aimed at the professional requirements, several ($n = 3$) described the assessment as not real enough. The latter experience the assessment as verbalising what they do in practice. The assessment itself does not take place in the practice itself and it does not include an observation of their activities during their internship, in their view they were assessed with so-called second hand information. These participants questioned the degree of reality of the assessment and they favour a hands-on assessment in the practice itself. One of them described the degree of reality with the following statement:

You work things out and you show it to them, so it becomes clear what you did but if really... if you really can show what you did in your internship, I doubt that. You have to demonstrate a three minute video and of course you can explain things but I don't think I can really show it this way. (S11, U27)

Qualities of 'feedback' in students' experiences

The results suggest a variation in students' experiences regarding the 'feedback given' and referencing the different qualities students attribute to the feedback. Almost all students ($n = 13$) experienced the 'feedback given' as supporting the further development of their teacher competences. Furthermore three qualities regarding feedback given emerged from student's expressions.

Balanced feedback

A lot of students ($n = 10$) expressed that feedback supports their competence development when it balances between clarifying the things that go well and the things that need improvement. For these students it seems relevant that assessors not only focus on their failures but also pay positive attention to their strengths and progression. In students experiences this 'balanced feedback' consists of positive feedback i.e. affirming comments about what goes well combined with feed forward which identifies weak aspects of students performance and providing suggestions for improvement. One participant expressed 'balanced feedback' as follows:

... but it has to do with the positive and the negative feedback ... it was not quite right, but they gave me a compliment and suggested you could improve this or that but in general it all looks quite good; instead of this and that isn't right and you have to improve all this. (S14, U37)

In addition to this, some students ($n = 2$) describe two types of unbalanced feedback, negative feedback only and positive feedback only. In their view only positive or negative feedback is not helpful and not complete. This 'unbalanced feedback' provides them with nothing to go on to improve and does not encourage taking a next step. These students expressions reveal a lack of something to go on in terms of improvement which forms an essential part of what other students experience as balanced feedback. One of these participants expressed this as follows:

... but the feedback they gave me then, was ... it is not good enough and you have to do it (authors: reflection reports) again, but how? How do I start? (S15, U39)

Recognisable feedback

In several cases students ($n = 5$) expressed that feedback supports their competence development when it is 'recognisable feedback'. For these students feedback needs to connect with their own expectations, feedback is useful when

it is as expected and when it affirms their self-view or the self-judgments they have about their own development. One participant expressed 'recognisable feedback' as follows:

Yes, and when you get feedback from which you thought yourself in advance, I have to improve this and I've already planned that to improve so this is covered. You get feedback of which you think, oh yes that's my own point of view. (S5, U40)

The influence of formative competence assessment on students' self-efficacy

Preceding the answer to the question how 'authenticity' and 'feedback' can influence students' self-efficacy, it is relevant to determine for which students this assessment did influence their self-efficacy. Students varied in their answers to this question. The majority of the students ($n = 10$) stated that the formative assessment did positively influence their self-efficacy. From these descriptions, a new theme, namely 'meeting the standard', emerged. A lot of students ($n = 12$) mention that in relation to their self-efficacy the outcome of the formative assessment is of interest. They express that achieving a positive result i.e. a sufficient development of their competences positively influences their self-efficacy by providing an experience of success, of mastery. Although the intention of this formative competence assessment is to improve students' learning by emphasizing the next step, it appears that students attach great importance to a positive result in terms of 'meeting the competence standard' in relation to their self-efficacy. One participant expresses:

What they wrote on that competence form, it was all positive and I had made good progress, it felt as a success. That gives you self-confidence. (S1, U45)

Furthermore, some students ($n = 2$) answered that the formative assessment did not influence their self-efficacy. One of these students experienced the assessment as not 'authentic' by questioning the degree of reality. The other student did not 'meet the standard' i.e. of achieving a sufficient competence development and expressed that it did not influence her self-efficacy because it affirmed her own expectation. Some other students ($n = 2$) stated that the formative assessment did not raise or lower their self-efficacy, it affirmed their actual level of self-efficacy. One of these students also experienced the assessment as not 'authentic' by questioning the degree of reality, the other expressed that she entered the assessment with an already

robust sense of efficacy. Another student not ‘meeting the competence standard’, mentioned that the formative assessment felt as a failure which negatively influenced her self-efficacy. Explaining the negative impact in self-efficacy this student included also the unexpectedness of the result and the associated feedback as negative only.

Answering the question how ‘authenticity’ and ‘feedback’ can influence students’ self-efficacy, we analysed all students descriptions regarding the sources of self-efficacy. The first analysis result pointed out that students mentioned three of the four sources of self-efficacy namely: mastery experiences, persuading experiences and physiological and emotional experiences. Vicarious experiences as fourth type of efficacy information was not described by students.

In a further examination we searched for a connection between ‘authenticity’, ‘meeting the standard’ and ‘feedback’ with one or more of these three sources of self-efficacy. A connection would mean that when students expressed that an assessment characteristic elicited a type of experience that belongs to one or more of the sources of elf-efficacy. We made it visual in Table 2 by depicting an ‘X’ on the crossing of an assessment characteristic and a source of self-efficacy.

Table 2. Overview of the connections between assessment characteristics and sources of self-efficacy.

Sources of self-efficacy	Assessment characteristics		
	Authenticity of assessment	Meeting the standard	Feedback given
Mastery experiences	X	X	
Vicarious experiences			
Persuading experiences			X
Physiological/affective experiences	X	X	X

Almost all students (n = 14) mention mastery experiences or verbal persuasions as main experiences elicited by these assessment characteristics, a lot of students (n = 7) describe both of these experiences as elicited. The main experiences that are elicited by ‘authenticity of assessment’ and ‘meeting the standard’ are mastery experiences. The main experiences that are elicited by ‘feedback’ are persuading experiences. Many students (n = 10) express that these mastery experiences and verbal persuasions are accompanied by physiological and affective experiences. In the next section we further examine these sources of self-efficacy information and we will provide several examples.

Patterns of efficacy information in formative competence assessment

The portfolio assessment procedure in this setting consists of three phases: the direct preparation phase, the interview phase and the feedback phase. The outcome of the first phase of analysis i.e. most of the 'authenticity' and 'feedback' qualities as experienced by students, can easily be placed within these assessment phases. The authenticity quality 'reflection on development' is part of the direct preparation phase and the other authenticity quality 'addressed as a future teacher' refers to the portfolio assessment interview phase. The theme 'meeting the standard' and the feedback qualities 'balanced feedback' and 'recognisable feedback', all belong to the feedback phase.

In this section the results of a further specification of students descriptions of the sources of self-efficacy, related to the phase in the portfolio assessment procedure, will be presented. These results include several new subcategories belonging to mastery and persuading experiences. In Table 3 we depict which types of efficacy information can be connected with the mentioned three portfolio assessment phases. A connection means that according to students expressions a portfolio assessment phase elicits an experience that belongs to one of more types of efficacy information. In Table 3 we make this visual by depicting an 'X' on the crossing of a portfolio assessment phase and a type of efficacy information. The new subcategories related to mastery and persuading experiences that are visualized in the column 'Types of efficacy information, will be explained in the following, furthermore a characteristic expression for every new type of efficacy information will be provided in Table 4.

Table 3. Overview of the connections between assessment phases and types of efficacy information.

Types of efficacy information	Phases of portfolio assessment		
	Direct preparation phase	Interview phase	Feedback phase
Mastery experiences			
- mastery-after-action experiences	X		
- mastery-in-action experiences		X	
- Obama-mastery experiences			X
Persuading experiences			
- affirming experiences			X
- clarifying experiences			X
Physiological/affective experiences			
- affective states	X	X	X

Direct preparation phase

Several students (n = 6) describe that the assessment preparation task including a self-judgment of their competence development, created an awareness of the activities they had undertaken and the tasks they performed during their internship. Because they had to judge themselves against the requirements of the first year programme, they became conscious of the reason why things went well, namely that their performance met the standard i.e. the teacher competences. These self-judgments elicit during the assessment preparation a consciousness about results in the past, leading to a sense of mastery some time after the teaching experiences during the internship. These descriptions relating to awareness and consciousness can be seen as a belonging to mastery experiences, and are here labelled as ‘mastery-after-action experiences’ as type of self-efficacy information. One student expressed this ‘mastery-after-action experience’ as follows:

I discovered that I, without knowing, had learned more than I had thought. When you look from the beginning until the end and then you tell about it, you see that there is fortunately an upward trend: an improvement in what you did. And that feels really as some kind of success. (P10, U83)

Another student expressed it as follows:

But when you finally finish these (authors: competence reports), you have sorted out for yourself what you did and that things went well. And yes, as I already said, that is rather positive and you are proud about it. (P14, U85, U114)

The student in the second example expresses next to the ‘mastery-after-action experience’ a feeling of pride, which we labelled ‘positive affective experiences’ as a type of efficacy information belonging to the source physiological and affective experiences.

Some of the students mentioning ‘mastery-after-action’ experiences also expressed that they were well prepared through this reflection task. The consciousness about what they had learned and achieved, provided them with self-confidence to enter the next phase of the portfolio assessment, the interview phase.

Table 4. Characteristic expressions of new types of efficacy information.

New types of efficacy information	Characteristic expressions
Mastery experiences	
- mastery-after-action	I discovered that, without knowing, I learned more than I had thought. When you look from the beginning until the end and tell about it, you see that there is fortunately an upward trend: an improvement. And that feels really as some kind of success.
- mastery-in-action	Yes, that interview went rather well, I could answer those questions and I could explain my vision, for me it was more like a conversation.
- Obama-mastery	For me it was a milestone when I sensed I have it in me, I really can and I can move on.
Persuading experiences	
- clarifying experiences	I really did get a clearer view of myself. If you have a clear view about how you have to improve through that feedback, it becomes clear to you what you have to work on, after that feedback I felt more certain.
- affirming experiences	Of course, I know my own strong and weak points but when you also get this affirmation from these assessors then you know I do this and it is really true that I am good in this and not so good in that.

Portfolio assessment interview phase

More than half of the students ($n = 8$) describe that being 'addressed as a future teacher' during the portfolio assessment interview elicited experiences of success while they were interviewed. Students describe these type of successes as small and concrete performances at the time of the interview itself. More concretely, students refer to being a conversation partner to the assessor, being able to answer questions of the assessors which affirmed being successful in dealing with the assessment interview. These 'I could ...' statements can be seen as belonging to mastery experiences and are here labelled as 'mastery-in-action experiences' as a type of self-efficacy information. Three participants expressed these experiences as follows:

Yes, that interview went rather well, I could answer those questions and I could explain my vision, for me it was more like a conversation. (S5, U89)

Yes, I knew where I was talking about, and then you continue and you think, okay, let the next question come ... (S13, U92)

I could answer these questions using my experience and yes for me it did not feel as pressure ... (S2, U86, U105)

As can be seen in the third example this student experiences, next to a 'mastery-in-action experience', a no pressure feeling, belonging to the self-efficacy source physiological and affective experiences, which we labelled as 'affective experiences'.

Feedback phase

The feedback phase elicited among almost all students ($n = 13$) mastery experiences or persuading experiences and for some students ($n = 3$) this phase elicited mastery experiences as well as persuading experiences.

Students often ($n = 8$) describe that meeting the standard elicited mastery experiences expressed as 'Yes I can and I can move on' experiences. These thoughts can indicate several things, for some students this experience leads to the conclusion that this profession suits them, for others it means that they are on the right track, including that their learning activities are appropriate and that they can continue. For these students this experience serves as an indicator of their capability to become a teacher, it serves as a milestone for their future learning activities. This 'Yes I can and I can move on' thoughts belonging to the mastery experiences, are here labelled as 'Obama-mastery experiences' as a type of self-efficacy information. Participants described this as follows:

For me it was a milestone when I sensed I have it in me, I really can and I can move on. (P2, U75)

Another student expressed:

Yes, that was really a success experience because it gave me a positive feeling, I just can move on or yes, it goes well so I can just move on, or yes, a step higher to the next year, that gave me a success experience. (P1, U72)

More than half of the students ($n = 9$) experienced 'balanced feedback' and 'recognisable feedback' as a type of social persuasion, more concretely as 'affirming' or as 'clarifying'. Students ($n = 4$) who reported feedback as a 'clarifying' experience entered the assessment with no clear view on their development and a growing understanding of the teaching practice and requirements. The received feedback provides them with a more clear self-image and a better view on their development, it clarifies their strong and weak points. It gives them a better understanding of the teaching practice and the requirements. For these students clarifying feedback serves as a handhold. Two students expressed this in the following ways:

I really did get a clearer view of myself. If you have a clear view about how you have to improve through that feedback, it gets clear to you where you have to work on, after that feedback I felt more certain. (S8, U101)

When it goes well but you haven't got wind of what you have to improve, through their comments you get clear which are your weak points. (S11, U102, U112)

As can be seen in the first example this student experiences in addition to a clearer view also a feeling of certainty, belonging to the self-efficacy source physiological and affective experiences, which we labelled as 'affective experiences'.

For several other students ($n = 5$) this feedback affirms their own thoughts and it confirms the self-judgments they made preceding the assessment, in other words it corroborates their self-view. Such an experience is typically reported by students who entered the assessment interview with a clear view on their development. These students are more or less aware of their capabilities and the points that need improvement and they have a developed understanding of the teaching practice and the requirements. These students express the need to confirm that their self-image is realistic in relation to the requirements of the teaching profession. One student expressed this as follows:

Of course, I know my own strong and weak points but when you also get this affirmation from these assessors then you know I do this and it is really true that I am good in this and not so good in that. (S1, U94)

'Clarifying' experiences' as well as 'affirming experiences' persuade students that they have the capabilities to become a teacher and that they are able to further develop their teacher competences. For the students who experience this feedback as 'clarifying' it simultaneously provides them a mirror through which they can develop a clearer self-image. For the students who experience this feedback as 'affirming' this feedback provides them with the confidence to rely on their self-knowledge in the future. These encouraging experiences belonging to verbal persuasion experiences, are here labelled as 'affirming experiences' and 'clarifying experiences' as type of efficacy information.

Conclusions and discussion

For teacher educational institutes, creating possibilities for students to build a robust sense of teacher efficacy, is of utmost importance. In this respect, programmes should offer opportunities for mastery, persuading and physiological and affective experiences. The assessment practice is powerful tool for reaching this goal. However, to date it is not clear how student teachers' assessment experiences contribute to their self-efficacy. For that reason the purpose of this research was to obtain an in-depth view on how student teachers' assessment experiences contribute to their self-efficacy.

Regarding the 'authenticity' of assessment, most students experienced the assessment as professionally relevant and described 'authenticity' of assessment with qualities as 'reflection on development', being 'addressed as a future teacher' and 'the degree of reality'. Regarding the other assessment characteristic of interest, 'feedback given', most students experienced feedback as supporting their competence development if it was 'balanced' or 'recognisable'. These two feedback qualities are in line with Hattie and Timperly (2007), who stated that feedback must provide answers to reduce discrepancies between current and desired performances. Moreover, the feedback quality 'balanced feedback' matches Ferguson's (2011) findings regarding the balance between supportive and critical feedback comments.

In response to our first research question students describe that 'authenticity' of assessment exerts influence on their self-efficacy through the authenticity qualities in the direct preparation phase and the interview assessment phase. More specific, 'reflection on development' raises students'

self-efficacy during the direct preparation phase by eliciting ‘mastery-after-action experiences’ and being ‘addressed as a future teacher’ during the assessment interview, positively affects students’ self-efficacy by eliciting ‘mastery-in action experiences’. These findings illustrate the results of a former study (Van Dinther, Dochy, Segers & Braeken, 2014 in Chapter 4 of this dissertation). Furthermore, ‘addressing student as future teachers’ and ‘reflection on development’ are in line with the characteristics of the competence based approach (Ritzen & Kösters, 2002; Struyven & De Meyst, 2010). The latter can also be connected with the agentic perspective of social cognitive theory (Bandura, 1997) which includes among other things self-reflection, referring to self-referent thinking processes in which students monitor, evaluate and modify their actions and thoughts. In this respect, some students questioned the ‘authenticity’ of assessment. These students favor being assessed while performing in practice instead of being assessed on verbalizing what they had done in practice, in their opinion the latter does not provides real enough successes, in other words no full enactive mastery experiences. At the end of this section we pay attention to possible consequences of these students’ views for competence based education.

With reference to our second research question, students mention that ‘feedback given’ exerts its influence on student self-efficacy in the feedback phase of assessment. More specific, when assessors provide students with ‘balanced feedback’ or ‘recognisable feedback’ students’ self-efficacy is positively influenced by eliciting ‘affirming’ and ‘clarifying’ experiences. These findings are in line with the results of a former study (Van Dinther, Dochy, Segers & Braeken, 2014 in Chapter 4 of this dissertation). Furthermore, it illustrates Bandura’s (1997) statement that evaluative feedback given in the early stages of students’ skill development and underlining their capabilities has a notable influence on the development of students’ self-efficacy. The thematic content analysis results regarding feedback revealed a new theme namely ‘meeting the standard’. It appeared that, although formative assessment focuses on improving students’ learning by emphasizing the next step, students attach great importance to a positive result in terms of meeting the competence standard in relation to their self-efficacy. Students expressed that meeting the competence standard enhances their self-efficacy through ‘Obama-mastery experiences’.

Our research reveals that students can experience a sense of mastery in different manners, a) reflecting on tasks performed in the past, b) while performing a task and c) at the outcome of a task. We labelled these types of self-efficacy information as ‘mastery-after-action’, ‘mastery-in action’ and ‘Obama mastery’ experiences. In addition it appeared that formative portfolio assessment procedure has the capacity of influencing students’ self-efficacy by eliciting this different types of mastery experiences during the three phases of the assessment.

Our research also revealed that students referencing verbal persuasions can feel encouraged in two ways, a) by acquiring a clearer self-image and a better view of their development (clarifying experiences) or b) by being affirmed in their self-judgment (affirming experiences). Mentioning 'clarifying' or 'affirming' experiences seems to depend on differences between students in self-view and understanding of the teaching practice, which refers to differences in competence development between first year students. This types of self-efficacy information refer to the feedback phase of assessment. Several students describe that the above mentioned types of self-efficacy information are accompanied by affective experiences. Most of them, with one exception, described positive affective experiences. Students mentioned no physiological experiences, which is in line with social cognitive theory (Bandura, 1997) which states that physiological indicators of efficacy mostly are reported in self-efficacy research regarding the health functioning domain and in activities requiring physical strength and stamina. Vicarious experiences were also not reported by students, the reason for this can be that this study focused on assessment, which is an individual activity requiring no collaboration with other students. These results altogether illustrate the potency of three of the four sources of self-efficacy as theorised by Bandura (1997).

Furthermore, we can conclude that for most of the students this formative competence assessment positively influences their self-efficacy. This illustrates previous research findings regarding the influence of assessment on student self-efficacy (Van Dinther, Dochy & Segers, 2014, in Chapter 4 of this dissertation) and is in line with assessment research results regarding the value of formative assessment for student learning (see e.g. Black & William, 1998; Gielen, Dochy & Dierick, 2003; Sadler, 1998). This may seem not surprisingly, since a lot of the students met the competence standard and mentioned this as relevant for their self-efficacy. Nevertheless, it appeared that students' self-efficacy is not only influenced by the assessment outcome but it is affected in all three phases of the formative portfolio assessment. In this respect, one student mentioned that the assessment did negatively influence her self-efficacy by not meeting the competence standard and by indicating the unexpectedness of the outcome. The other student not meeting the competence standard expressed that it did not influence her self-efficacy because it affirmed her own expectation. This connects with 'recognisable feedback' mentioned by some students as a feedback quality. However, when feedback given in assessment is according students expectations, it does not refer to a quality of feedback given in assessment but it refers to other factors such as the clarity and amount of feedback given during the preceding educational programme and to student characteristics including their attention to and acceptance of feedback (William, 2011).

In summary, the results of this study highlight that the assessment characteristics ‘authenticity’ and ‘feedback given’ exert mainly a positive influence on student teachers’ self-efficacy during different phases of the portfolio assessment in competence based teacher education. It is also exposed that students’ self-efficacy can be affected by several types of self-efficacy information connected with these portfolio assessment phases. The use of thematic content analysis provided a fine-grained view on the types of self-efficacy information. This revealed a possible differentiation of mastery experiences and verbal persuasion into respectively several kinds of success experiences and distinct kinds of verbal persuasion experiences. In addition, in this study the role of affective experiences belonging to the fourth self-efficacy source, came to the surface. In general, our results correspond with earlier research regarding the potency of the main sources of self-efficacy and it provided more clarity of how identified factors influence students’ self-efficacy. With regard to the relevance of self-efficacy for prospective teachers, it seems possible to pay attention to the development of self-efficacy as part of the overall process for preparing students, with the use of characteristics of the competence based approach as authenticity and feedback.

Based on our research results we can formulate some implications for the design of assessment in teacher training programmes. Firstly, the capacity of formative competence assessment to positively influence students’ self-efficacy, depends among other things, on designing authentic assessment tasks and on assessors provided with necessary skills and attitudes.

Secondly, considering the gains for student teacher efficacy and competence development, teacher educators must encourage their students to reflect on their competence development, more frequently at several moments during the programme than just as direct assessment preparation.

Furthermore, the cyclical nature of feedback implies that within competence based teacher training programmes several feedback loops should be provided to monitor student teachers’ competence development and to provide opportunities for building a robust sense of teacher efficacy. In general, a constructive alignment in teacher education between curriculum, assessment and student learning, not only supports student teachers competence development but also their development of teacher efficacy.

This research has a few limitations. Because this study focused on two assessment characteristics, other possibly influencing assessment characteristics were not included. Further research can shed light on e.g. the extent to which assessment tasks are integrated in the learning environment (Gijbels, Van de Watering & Dochy, 2005; Segers, Gijbels & Thurlings, 2008) and how this possibly influences students’ self-efficacy. Furthermore, possible differences in

existing levels of self-efficacy among participants that could be of influence on how students experience the assessment characteristics, have not been taken into consideration. A follow-up investigation among the same target group applying a person oriented analysis strategy can take into account existing levels of self-efficacy in advance of the assessment, and can shed light on the processing of students' self-efficacy during the three assessment stages. Regarding the transferability of the results, we suggest replications of the study in other teacher training programmes as well as other programmes in higher education. Lastly, the results of this qualitative study can provide content for the construction of questionnaires regarding sources of self-efficacy to be used in quantitative research.

Appendix

Coding scheme

Category	Subcategory	Number of units
Authenticity of assessment	Reflection on development	7
	Addressed as a future teacher	15
	Degree of reality	5
Meeting the Standard		12
Feedback given	Balanced feedback	10
	Unbalanced feedback	2
	Recognisable feedback	5
Self-efficacy	Positive influence	10
	No influence	2
	Affirming	2
	Negative influence	1
Mastery experiences	Mastery-after-action	6
	Mastery-in-action	8
	Obama-mastery	8
Vicarious experiences		0
Persuading experiences	Clarifying experiences	4
	Affirming experiences	5
Physiological and affective experiences	Physiological experiences	0
	Affective experiences	14
Total number of units		116

References

- Allinder, R.M. (1994). The relations between efficacy and the instructional practices of special education teachers and consultants. *Teacher Education and Special Education*, 17, 86-95.
- Ashton, P. T. (1985). Motivation and teachers' sense of efficacy. In: C. Ames & R. Ames (Eds.), *Research on motivation in education: Vol. 2. The classroom milieu* (pp. 141-174). Orlando, FL: Academic Press.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W.H. Freeman and Company.
- Berman, P., McLaughlin, M., Bass, G., Pauly, E., & Zellman, G. (1977). *Federal programs supporting educational change: Vol. VII. Factors affecting implementation and continuation* (Rep. No. R-1589/7-HEW). Santa Monica, CA: RAND (ERIC Document Reproduction Service No. 140432).
- Black, P., Harrison, C., Lee, C., Marshall, B., & William, D. (2003). *Assessment for learning: Putting it into practice*. Berkshire, England: McGraw-Hill Education.
- Black, P., & William, D. (1998). Assessment and Classroom learning. *Assessment in Education*, 5(1), 7-74.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77-101.
- Britner, S.L., & Pajares, F. (2006). Sources of science self-efficacy beliefs of middle school students. *Journal of Research in Science Teaching*, 43, 485-499.
- Caprara, G.V., Barbaranelli, C., Steca, P., & Malone, P.C. (2006). Teachers self-efficacy beliefs as determinants of job satisfaction and students' academic achievement: A study at the school level. *Journal of School Psychology*, 44(6), 473-490.
- Chacon, C.T. (2005). Teachers' perceived efficacy among English as a foreign language teachers in middle schools in Venezuela. *Teaching and Teacher Education*, 21, 257-272.
- Eccles, J.S., Wigfield, A., & Schiefele, U. (1998). Motivation to succeed. In N. Eisenberg (Ed.), *Handbook of child psychology: Vol. 3. Social, emotional, and personality development* (5th ed., pp. 1017-1095). New York: Wiley.
- Elo, S., & Kyngäs, H. (2007). The qualitative content analysis process. *Journal of Advanced Nursing*, 62(1), 107-115.
- Ferguson, P. (2011). Student perceptions of quality feedback in teacher education. *Assessment & Evaluation in Higher Education*, 36(1), 51-62.
- Gibbs, G., & Simpson, C. (2004). Conditions under which assessment supports student's learning. *Learning and Teaching in Higher Education*, 1(1), 3-31.
- Gibson, S., & Dembo, M. (1984). Teacher efficacy: A construct validation. *Journal of Educational Psychology*, 76(4), 569-582.
- Gielen, S., Dochy, F., & Dierick, S. (2003). Evaluating the consequential validity of new modes of assessment: the influence of assessment on learning, including pre-, post- and true assessment effects. In Segers, M., Dochy, F., Cascallar, E. (Eds.), *Optimising new modes of assessment: in search of qualities and standards* (pp. 37-54). Dordrecht, Netherlands: Kluwer Academic.

- Gijbels, D., Van de Watering, G., & Dochy, F. (2005). Integrating assessment tasks in a problem-based learning environment. *Assessment and Evaluation in Higher Education*, 30, 73-86.
- Guest, G.S.; Mitchell, M.C., & Namery, E.E. (2012). *Collecting qualitative data: A field manual for applied research*. London, UK: Sage.
- Gulikers, J.T., Bastiaens, ThJ., & Kirschner, P.A. (2006). Authentic assessment, student and teacher perceptions: the practical value of the five-dimensional framework. *Journal of Vocational Education and Training*, 58, 337-357.
- Gulikers, J.T., Bastiaens, ThJ., & Kirschner, P.A. (2007). Defining authentic assessment: five dimensions of authenticity. In A. Havnes & L. McDowell (Eds.). *Balancing dilemmas in assessment and learning in contemporary education* (pp. 73-86). New York, NY: Routledge.
- Hattie, J., & Timperly, H. (2007). The power of feedback. *Review of Educational Research*, 77(1), 81-112.
- Higgins, R., & Hartley, P. (2002). The conscientious consumer: Reconsidering the role of assessment feedback in student learning. *Studies in Higher Education*, 27(1), 53-64.
- Hsieh, H.-F., & Shannon, S.E. (2005). Three approaches to qualitative content analysis. *Qualitative Health research*, 15(9), 1277-1288.
- Janssens, S., Boes, W., & Wante, D. (2002). Portfolio's: een instrument voor toetsing en begeleiding. [Portfolios: an instrument for assessment and teaching]. In F. Dochy, L. Heylen, & H. Van de Mosselaer (Eds.), *Assessment in onderwijs*. [Assessment in Education]. (pp. 203-224). Utrecht, The Netherlands: Lemma.
- Jensen, B., Sandoval-Hernández, A., Knoll, S., & Gonzalez, E.J. (2012). *The experience of new teachers: Results from TALIS, 2008*. Paris, France: OECD.
- Johnson, B., & Christensen, L. (2012). *Educational Research: Quantitative, qualitative and mixed approaches*. London, UK: Sage.
- Miles, M.B., & Huberman, A.M. (1994). *Qualitative Data Analysis: An expanded sourcebook*. Thousand Oaks, CA: Sage.
- Morgan, D.L. (2007). Paradigms lost and paradigms regained: Methodological implications of combining qualitative and quantitative methods. *Journal of mixed methods research*, 1(1), 48-76.
- Muijs, D., & Reynolds, D. (2001). Teachers' beliefs and behaviours: What really matters. *Journal of classroom interaction*, 37, 3-15.
- Nicol, D.J., & Macfarlane-Dick, D. (2006). Formative assessment and self-regulated learning: a model and seven principles of good feedback practice. *Studies in Higher Education*, 31(2), 199-218.
- Palmer, D.H. (2006). Sources of self-efficacy in a science methods course for primary teacher education students. *Research in Science Education*, 36, 337-353.
- Pintrich, P. & De Groot, E. (1990). Motivational and self-regulated learning, components of classroom academic performance. *Journal of Educational Psychology*, 82, 33-40.
- Relich, J.D., Debus, L., & Walker, R. (1986). The mediating role of attribution and self-efficacy variables for treatment effects on achievement outcomes. *Contemporary Educational Psychology*, 11, 195-216.

- Ritzen, M. & Kösters, J. (2002). Mogelijke functies van een portfolio binnen een competentiegestuurd curriculum [Possible functions of a portfolio within a competence-based curriculum]. *Tijdschrift Onderzoek van Onderwijs*, 31(1), 3-7.
- Ross, J.A. (1998). The antecedents and consequences of teacher efficacy. In: J. Brophy (Ed.), *Advances in research on teaching* (Vol. 7, pp. 49-73). Greenwich, CT: JAI Press.
- Sadler, D.R. (1998). Formative assessment: revisiting the territory. *Assessment in Education*, 5(1), 77-84.
- Sambell, K., McDowell, L., & Brown, S. (1997). But is it fair?: An exploratory study of student perceptions of the consequential validity of assessment. *Studies in Educational Evaluation*, 23, pp. 349-371.
- Schilling, J. (2006). On the pragmatics of qualitative assessment: Designing the process for content analysis. *European Journal of Psychological Assessment*, 22(1), 28-37.
- Schraw, G., Crippen, K.J., & Hartley, K. (2006). Promoting self-regulation in science education: Metacognition as part of a broader perspective on learning. *Research in Science education*, 36, 111-139.
- Schunk, D.H (1995) Self-efficacy and education and instruction. In J.E. Maddux (Ed.), *Self-efficacy, adaptation and adjustment: Theory, research and application* (pp. 281-303). New York: Plenum Press.
- Schunk, D.H (1996). Goal and Self-evaluative influences during children's cognitive skill learning. *American Educational Research Journal*, 33(2), 359-382.
- Schunk, D. & Meece, J.L. (2006). Self-efficacy development in adolescence. In F. Pajares & T. Urdan (Eds.), *Self-Efficacy Beliefs of Adolescents* (pp. 71-96). Greenwich, Connecticut: Information Age Publishing.
- Segers, M., Dochy, F. & Cascallar, E. (2003). *Optimising new modes of assessment: In search of qualities and standards*. Dordrecht: Kluwer Academic Publishers.
- Segers, M., Gijbels, D., & Thurlings, M. (2008). The relationship between students' perceptions of portfolio assessment practice and their approaches to learning. *Educational Studies*, 34(1), 35-44.
- Smith, K., & Tillema, H.H. (2003). Clarifying different types of portfolio use. *Assessment and Evaluation in Higher Education*, 28(6), 625-648.
- Smylie, M.A., (1988). The enhancement function of staff development: Organizational and psychological antecedents to individual teacher change. *American Educational Research Journal*, 25, 1-30.
- Struyven, K., & De Meyst, M. (2010). Competence-based teacher education: Illusion or reality? An assessment of the implementation status in Flanders from teachers' and students' points of view. *Teaching and Teacher education*, 26, 1495-1510.
- Tschannen-Moran, M., & Woolfolk Hoy, A. (2001). Teacher efficacy: capturing an elusive construct. *Teaching and Teacher education*, 17, 783-805.
- Usher, E. L., & pajares, F. (2009). Sources of self-efficacy in mathematics: A validation study. *Contemporary Educational Psychology*, 34, 89-101.

- Van Dinther, M., Dochy, F., & Segers, M. (2011). Factors affecting students' self-efficacy in higher education. *Educational Research Review*, 6(2), 95-108.
- Van Dinther, M., Dochy, F., Segers, M. & Braeken, J. (2013). The construct validity and predictive validity of a self-efficacy measure for student teachers in competence-based education. *Studies in Educational Evaluation*, 39, 169-179.
- Van Dinther, M., Dochy, F., Segers, M. & Braeken, J. (published online 24 March, 2014). Student perceptions of assessment and student self-efficacy in competence based education. *Educational Studies*, 40(3), 330-351.
- Wenner, G. (2001). Science and mathematics efficacy beliefs held by practicing and prospective teachers: a five-year perspective. *Journal of Science Education and Technology*, 10, 181-187.
- William, D. (2011). What is assessment for learning? *Studies in Educational Evaluation*, 37, 3-14.
- Woolfolk, A.E., & Hoy, W.K. (1990). Prospective teachers' sense of efficacy and beliefs about control. *Journal of Educational Psychology*, 82, 81-91.
- Woolfolk, A.E., Rosoff, B., & Hoy, W.K. (1990). Teachers' sense of efficacy and their beliefs about managing students. *Teaching and Teacher Education*, 6, 137-148.
- Woolfolk Hoy, A., & Burke-Spero, R. (2005). Changes in teacher efficacy during the early years of teaching: A comparison of four measures. *Teaching and Teacher Education*, 21, 343-356.
- Woolfolk Hoy, A., & Davis, H.A (2006). Teacher self-efficacy and its influence on the achievement of adolescents. In: F. Pajares, & T. Urdan, *Self-Efficacy Beliefs of Adolescents* (pp. 117-137). Greenwich, Connecticut: Information Age Publishing.
- Zeldin, A.L., & Pajares, F. (2000). Against the odds: Self-efficacy beliefs of women in mathematical, scientific, and technological careers. *American Educational Research Journal*, 37(1), 215-246.
- Zhang, Y. & Wildemuth, B.M. (2009). Qualitative analysis of content. In B.M. Wildemuth, (Ed.), *Applications of social research methods to questions in information and library science*, (pp. 308-319). Westport, CT: Libraries Unlimited.
- Zimmerman, B.J., & Kitsantas, A. (1999). Acquiring writing revision skill: Shifting from process to outcome self-regulatory goals. *Journal of Educational Psychology*, 91(2), 241-250.

CHAPTER 6

CONCLUSIONS AND DISCUSSION

Conclusions and discussion

A substantial amount of research findings point to the central role teacher self-efficacy plays in teaching competence and teacher effectiveness. Considering the relevance for teacher educational institutes to pay attention to students' developing self-efficacy within the learning process, the aim of this doctoral research project was to provide insight into the interplay between student teacher self-efficacy, student perceptions of characteristics of a competence-based assessment and student learning outcomes. In this final chapter we highlight the main findings of each of the studies in relation to the research questions. Furthermore we provide practical implications for the educational practice and finally we describe, taking into account the limitations of this research project, some suggestions for further research.

Main findings

Factors influencing students' self-efficacy

The main concept of this study is student self-efficacy, a key concept in social cognitive theory (Bandura, 1997). Self-efficacy refers to "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3). According to social cognitive theory, there are four main sources of information that create students' self-efficacy: enactive mastery experiences, vicarious (observational) experiences, social persuasions and physiological and affective states. Enactive mastery experiences, as the most powerful source of self-efficacy information, refer to authentic successes in carrying out particular tasks within particular situations. The second source is vicarious experiences, which refer to observational experiences provided by social models. Verbal persuasion as third source refers to encouragement and evaluative feedback, provide by important others. In the construction of self-efficacy beliefs, students rely partly on indicators of e.g. excitement, tension and stress transferred by physiological and affective states. This forms the fourth source of efficacy information.

As this doctoral research project takes place within the higher educational domain, we conducted a literature review, to gain more insight in factors which are shown to influence student self-efficacy within the higher educational context. Chapter 2 (Van Dinther, Dochy & Segers, 2011) presented the review results which were drawn from the 39 empirical studies that met our criteria for inclusion. The results revealed that educational programmes based on social cognitive theory have the possibility to enhance students' self-efficacy. Considering enactive mastery experiences, argued as the most powerful source of developing a strong sense of efficacy, we found arguments as well as evidence for the potency of this source. Providing students with practical experiences, i.e. challenging students to perform tasks, for which they have to apply knowledge and skills within demanding situations proved to be of relevance. The amount of practical experience and the specificity of the experiences in relation to the task have been shown to be responsible for enhancing students' self-efficacy. More specifically, it is relevant to tune the authenticity level of the experience, the structure of the situation and the supervision of the students to the complexity of the task or skill and to the students' competence developmental level. Regarding vicarious experiences as source of efficacy information, the results of former studies were inconclusive. Offering students vicarious experiences through different types of observational learning, seemed not effective in all situations, and it is still unclear if it is preferable to use expert models, peer models of participant modeling. Regarding the potency of verbal persuasion as source of self-efficacy, we found evidence for using this source by providing feedback to students on their performances. However several questions arose regarding the differing effects of different types of feedback on students' sense of efficacy. Referencing the fourth source of efficacy information, named physiological and emotional mood states, we found no research results. Finally our review results showed, on the basis of arguments and some evidence, that the combination of the different sources of self-efficacy within educational programmes can lead to promising results regarding students' self-efficacy. The findings of the literature review provided a foundation for the next studies of this dissertation.

Developing and validating a student teacher self-efficacy measure

We focused in the second study (see Chapter 3) on teacher efficacy as a specific form of self-efficacy. Within the educational field, considerable research has been conducted with regard to the relevance of teacher efficacy and the development of teacher efficacy measures (Tschannen-Moran & Woolfolk Hoy, 2001; Woolfolk Hoy & Davis, 2006). Results point to the central role that teacher self-efficacy plays in teaching competence and teaching effectiveness.

However, existing teacher efficacy measures are mostly concerned with graduated teachers working in the educational field, lacking the optimal level of task and context specificity because they do not take into account student teachers' competence development and student teacher efficacy development during teacher education. Also considering the fact that research to explore the development of student teacher efficacy is limited, in this study we intended to develop a student teacher efficacy measure for predictive and diagnostic purposes for first year student teachers. In the development of this measure we took into account student teacher competence development and students' incipient developmental stage of teacher self-efficacy. With reference to social cognitive theory stating that a self-efficacy measure should be tailored to the specific domain which is the object of assessment, we focused during the developmental phase on the required competence level for the initial phase in the first year of the teacher bachelor programme, by relying on the conceptual competence framework as established in the 'Professions in Education Act' (Wet BIO). Following Bandura's guidelines (2006) we constructed the items, after that we pretested the item pool and investigated the constructive and predictive validity of the measure.

The construct and predictive validity results of this study (Van Dinther, Dochy, Segers & Braeken, 2013 in Chapter 3) revealed that we succeeded in developing a student teacher efficacy measure that meets psychometric requirements in terms of reliability and validity. Our measure meets the optimal level of task as well as context specificity as recommended by social cognitive theory, more concrete it reflects the underlying competence criteria and consequently takes into account student teachers' competence development.

The construct validity results of the study support in general the multidimensionality of the teacher self-efficacy construct and provide evidence for the bi-factor model or general-specific model as underlying structure of our student teacher self-efficacy measure (Van Dinther, Dochy, Segers & Braeken, 2013 in Chapter 3). The bi-factor model consists of one general teacher efficacy factor plus a group of specific teacher efficacy factors reflecting the teacher competence framework. This last finding supports our differentiation hypothesis regarding the development of student teacher efficacy. This theoretical hypothesis implies that the differentiation of student teacher efficacy runs parallel with the development of their teacher competences. First year students enter the programme with a global, undifferentiated sense of teacher efficacy, which is congruent to their early global idea of teaching and teacher competences. As students gain teaching experiences they create a better understanding of the teaching practice and the required teaching competences. In parallel with this, a differentiation takes place from a global undifferentiated sense of teacher self-efficacy to a more differentiated sense of teacher self-efficacy.

Finally, this study delivered as a practical result a method for measuring student teachers' self-efficacy. Referencing the predictive validity results, teacher educators can use the measure as part of a monitoring system for tracking student teachers' competence development in a non-threatening manner. Student answers can be analysed at three levels. Using the scale level, students with a low overall sense of efficacy can be detected in an early stage of the programme. The subscale level, provides the possibility to draw attention to the specific competence aspects on which students feel less efficacious. Using the item level, the coaching of the student can be targeted at the type of activities they feel less efficacious, such as acting within specific teaching activities in the field or cognitive activities as part of the teacher educational programme.

Students perceptions of assessment and students self-efficacy

In this study (see Chapter 4) we investigated the main question of this doctoral thesis, which refers to the interplay between student teacher efficacy, student perceptions of the authenticity of formative competence-based assessment and feedback given, and student learning outcomes. Student perceptions of authenticity of assessment refer to how practice-oriented assessment is perceived by students (Gulikers, Bastiaens, & Kirschner, 2006, 2007). Since practice-oriented learning experiences can be seen as a necessary condition for gaining mastery experiences (Palmer, 2006; Van Dinther et al., 2011 in Chapter 2), the assessment characteristic authenticity can be connected with this source of creating self-efficacy. Perceptions of feedback, refer to how students perceive information about the outcome of assessment (Gibbs & Simpson, 2004). Because feedback from important others such as teachers influences students' self-efficacy, this assessment characteristic can easily be connected with social persuasions as another source of creating self-efficacy. More specifically referencing authenticity we investigated student perceptions of the authenticity of the assessment task and the assessment form/result. More specifically regarding feedback we investigated student perceptions of the quantity, quality of feedback and feedback use. Based on the instrument validation study (Van Dinther, Dochy, Segers & Braeken, 2013 in Chapter 3) we tested the role of authenticity and feedback for six self-efficacy variables and for six aspects of teacher competence.

Referencing the first hypothesis our findings partly confirm that student perceptions of two main characteristics of formative competence based assessment positively influence student self-efficacy (Van Dinther, Dochy, Segers & Braeken, 2014 in Chapter 4). More specifically, student perceptions of the form authenticity aspect and the quality feedback aspect proved to have the greatest impact. These results indicate that if formative competence based assessment practices require

students to demonstrate their competences by professionally relevant results and feedback given is understandable, learning focused and it is linked to the task and criteria, students' self-efficacy is enhanced. These results stress the role of mastery experiences and social persuasions as two relevant sources of self-efficacy, as posed by social cognitive theory (Bandura, 1997). However, in contradiction with social cognitive theory stating enactive mastery experiences as being the most powerful source of self-efficacy information, our results (hypothesis 2) did not confirm this (Van Dinther, Dochy, Segers & Braeken, 2014 in Chapter 4). Formative competence assessment enables students to improve their competences, by providing them with feedback on their competence development. It is obvious that students differ in their development regarding the six teacher competences. A possible explanation for the non-confirmation of this second hypothesis is that although the assessment provides students with practice-oriented learning experiences, which is in our line of thought a necessary condition for acquiring mastery experiences, students probably differed in experiencing the assessment as a success. As a result, the students who experienced no or less enactive mastery experiences, rely on feedback given as self-efficacy source that impacts their self-efficacy.

In addition, our findings showed (Van Dinther, Dochy, Segers & Braeken, 2014 in Chapter 4) that student self-efficacy succeeds in predicting student competence outcomes of the final end-of-year evaluation, on all of the six competence aspects (hypothesis 3). These results are in line with former self-efficacy research results pointing at the predictive role of student self-efficacy in relation to students' achievements.

Finally, we found (hypothesis 4) that student perceptions of assessment mainly influence student's competence evaluation outcomes through their impact on student self-efficacy (Van Dinther, Dochy, Segers & Braeken, 2014 in Chapter 4). This means that self-efficacy plays a mediating role in the relation between students' competence evaluation outcomes and student perceptions regarding authenticity of form of assessment and quality of feedback given.

This last result is in line with other research results regarding the role of student perceptions in education which point at the moderate strength of relations found between student perceptions of the learning environment and student learning and learning outcomes.

The contribution of assessment experiences to student teachers' sense of efficacy

The fourth study (see Chapter 5) of this doctoral research project was of a qualitative and explorative nature. In this study we wanted to investigate in depth some results of study three (Van Dinther, Dochy, Segers & Braeken, 2014,

see Chapter 4). More specifically we aimed to explain and understand how in students experiences the authenticity aspect and the feedback aspect contribute to their sense of self-efficacy. For that purpose we conducted standardized open-ended interviews among fifteen second year teacher students who had participated in the portfolio assessment.

Regarding 'authenticity' of assessment, most students experienced the assessment as professionally relevant and described 'authenticity' of assessment with qualities as 'reflection on development', being 'addressed as a future teacher' and 'the degree of reality'. Regarding the other assessment characteristic of interest, 'feedback given', most students experienced feedback as supporting their competence development if it was 'balanced' or 'recognisable'.

In response to the research question 'How students' assessment experiences regarding the authenticity aspect do contribute to their self-efficacy?', students describe that 'authenticity' of assessment exerts influence on their self-efficacy during the assessment preparation phase as well as the portfolio interview phase. More specific, 'reflection on development' raises students' self-efficacy during the direct preparation phase by eliciting 'mastery-after-action experiences'. Additionally, when during the portfolio assessment interview, students experience that they are 'addressed as future teachers', their self-efficacy is positively affected by eliciting 'mastery-in-action experiences'.

With reference to the research question 'How students' assessment experiences regarding the feedback given do contribute to their self-efficacy?', students mention that 'feedback given' exerts its influence on student self-efficacy in the feedback phase of assessment. More specifically, when assessors provide students with 'balanced feedback' or 'recognisable feedback' students' self-efficacy is positively influenced by eliciting 'affirming' and 'clarifying' experiences. The thematic content analysis results regarding feedback revealed a new theme namely 'meeting the standard'. It appeared that, although formative assessment focuses on improving students' learning by emphasizing the next step, students attach great importance to being confirmed that they meet the competence standard. Students expressed that meeting the competence standard enhances their self-efficacy through 'Obama-mastery experiences'.

Overlooking students' expressions our research reveals that with regard to the source mastery experiences students can experience a sense of mastery in different manners, a) reflecting on tasks performed in the past, b) while performing a task and c) at the outcome of a task. We labelled these types of self-efficacy information respectively as 'mastery-after-action', 'mastery-in action' and 'Obama mastery' experiences. In addition it appeared that formative competence assessment has the capacity of influencing students' self-efficacy by eliciting these different types of mastery experiences during the three phases of the assessment.

Our research also reveals that students referencing the source verbal persuasions can feel encouraged in two ways, a) by acquiring a clearer self-image and a better view on their development or b) by being affirmed in their self-judgment. Mentioning ‘clarifying’ or ‘affirming’ experiences seems to depend on differences between students in self-view and understanding of the teaching practice, which refers to differences in competence development between first year students. Labelling these types of self-efficacy information as ‘clarifying’ and ‘affirming’ experiences, it became clear that the feedback phase of assessment has the capacity to elicit these types of efficacy information.

In sum, the results of this study highlight that the assessment characteristics ‘authenticity’ and ‘feedback given’ exert a positive influence on student teachers self-efficacy during all phases of the portfolio assessment in competence based teacher education. It is also exposed that students’ self-efficacy can be affected by several types of self-efficacy information connected with these portfolio assessment phases. The use of thematic content analysis provided a fine-grained view on the types of self-efficacy information. This revealed a possible differentiation of mastery experiences and verbal persuasion into respectively several kinds of success experiences and distinct kinds of verbal persuasion experiences.

Implications for educational practice

This doctoral thesis is conducted within a competence-based teacher educational programme. The competence-based approach emerged since the late nineties of the last century, more and more as a leading paradigm for innovation within higher education (Dochy & Nickmans, 2005). Contrary to the emphasis on ‘the ability to demonstrate knowledge’ within traditional education, the competence-based approach emphasizes the ‘ability to do’ (Struyven & De Meyst, 2010). Adherents of the competence based approach use the term ‘competence’ instead of ‘ability’. The notion of competences as an integrated set of related knowledge, skills and attitudes is very popular, however Van Merriënboer, Van der Klink & Hendriks (2002) demonstrated that there are many definitions of the concept. Despite this conceptual diffusion several characteristics are attributed to a competence-based curriculum, such as: realistic tasks are connected with the vocational practice, the education centres on students’ competence development, students are increasingly responsible for their own learning, assessments are aimed at levels of competence, students are addressed as starting employees, vocational practice is systematically involved, and school functions as a learning organisation. With respect to assessment in competence-based programmes, the changing view on assessment which is

represented by the notion of assessment as a tool for learning (Gielen, Dochy & Dierick, 2003) emphasises the diagnostic or formative use of evaluation methods with which students competence development can be monitored and guided. This setting was optimal to study the influence of student teachers' self-efficacy on their teacher competence proficiency and how assessment perceptions play a role in enhancing student teacher' self-efficacy. The results of our study indicate the relevance of some conditions for teacher educational programmes to be effective in enhancing student teachers' self-efficacy.

First, because self-efficacy predicts student teachers' competence proficiency, the use of a monitoring system for tracking students' self-efficacy development is advisable.

Second, our research revealed that the use of formative competence assessment can be effective if student perceive the assessment as authentic and the feedback of high quality. Although teacher educational institutes differ in the pace and ways teacher competences are implemented in the programmes (Struyven & De Meyst, 2010), it is conditional for meeting authenticity of assessment that teacher competences serve as standards to be achieved instead of goals to aim for. Furthermore, institutes should tune the authenticity level of the assessment to students' competence developmental level. Therefore it is necessary that institutes apply teacher competences by defining levels of proficiency for each competence aspect, in terms of competence criteria that a teacher-student has to achieve given the specific phase in the study programme. In continuation of this, it is advisable to use new modes of assessment, such as portfolio assessment to evaluate teacher competences. Furthermore, assessment tasks should require students to demonstrate their teacher competence proficiency level by professionally relevant results. The assessment preparation task in particular, should involve reflection on competence development, consisting of student activities such as thinking back on experiences, analysing activities, judging own acting and collecting evidence for competence development.

Authenticity as well as high quality feedback demands certain requirements of the assessors. Regarding the assessment interview assessors should create an atmosphere in which students feel addressed as future teachers. This requires assessors to operate with an attitude which invites students to take part in a professional conversation. It also requires assessors to put interview questions aimed at student's personal vision on teaching situations, their teacher competence development, evidencing their development and about putting theory into practice.

Feedback is of high quality when it supports students' competence development which means that it balances between clarifying the things that are going well and the things that need improvement. Through their attitude,

assessors must not only focus on students' failures but also pay positive attention to students' strengths and progression. Assessors should be able to formulate balanced feedback, which consists of positive feedback i.e. affirming comments about what is going well combined with feed forward which identifies weak aspects of students performance and providing suggestions for improvement. If assessors do not possess the above-mentioned attitudes and skills, it is advisable to train them in this regard.

Finally, a last condition refers to the constructive alignment between curriculum, assessment and student learning. It is advisable that teacher educational institutes encourage their students to reflect on their competence development, more systematically at several moments during the programme rather than just as direct assessment preparation. Furthermore, students must be clearly informed about their development and achievements, by high quality feedback provided proceeding, during and after an assessment takes place.

Suggestions for future research

Because, teacher self-efficacy plays a central role in teaching competence and teacher effectiveness, addressing student teachers' self-efficacy is of utmost importance. Although, self-efficacy is a well-studied construct, a comprehensive overview of factors enhancing students' self-efficacy in higher education, was still missing. Our review study addressed this gap and provided the basis for this doctoral thesis. Moreover, although different measures for teacher self-efficacy have been formerly developed and validated, no self-efficacy instrument for measuring teacher competence efficacy of student teachers is available. Therefore we developed and validated a task and context specific teacher efficacy instrument. Finally, in our dissertation, we used a multi-method approach by combining quantitative (study 3 in chapter 4) and qualitative (study 4 in chapter 5) research methods. In addition, to overcome common-method bias, we used an objective performance measure in addition to self-reports of student teacher self-efficacy and student perceptions of authenticity of assessment and provided feedback.

This dissertation does not only indicate answers to questions important for teacher education, but also offers different suggestions for future research. The study-specific limitations were already discussed in the previous chapters. In the following suggestions for future research we also take into account some more central limitations of the study already presented and associated with the choices made during this doctoral research project.

Regarding the student teacher efficacy instrument, we discern two research options. Firstly, this research was conducted within a specific setting for teacher

education referencing end first year student teachers. In order to confirm our constructive validity results, further research is needed within other settings for teacher education and among different year students. Secondly, based on the findings in this validation study we worded the so-called differentiation hypothesis, i.e. student teachers enter the programme with a global, undifferentiated, sense of teacher-efficacy, having teaching experiences a further differentiation takes place to a partly differentiated sense of teacher self-efficacy. We presume that the development of teacher competences matches the development of student teachers self-efficacy leading to a further differentiation of student teacher self-efficacy during their further competence development. To capture this research option we suggest further longitudinal research within other settings for teacher education referencing the same target group. More concretely, we suggest the collection of data among students at three different time points during their educational programme, namely: 1) at the beginning of the first year (the students having had no teaching experiences), 2) at the end of the first year (the students having had limited teaching experiences) and 3) at the end of second year (when they have had a moderate amount of teaching experiences). The comparison of the results of the three different time points can provide an answer to our differentiation hypothesis. Next to this, further investigation is advisable to gain insight in the diagnostic use of the student teacher efficacy subscales within the practice of competence-based teacher education.

One of the limitations of the results of this doctoral thesis has to do with the correlational nature of the research design of the third study. We have already discussed the causality and direction of relationship between perceptions of assessment and self-efficacy. Earlier we argued that although the measurement of the assessment characteristics and student teacher self-efficacy in the first part of the study was conducted simultaneously, there was a time difference in the study's second part because the data of the competence evaluation outcome were collected at a later point in time, which supports our results. In addition to this, the combined results of studies three and four can speak in our advantage. As mentioned above, we combined in study three and four quantitative with qualitative methods, to provide an answer on the main question of this research project. The results of this qualitative study not only lead to a fine-grained view on students' assessment experiences but these findings also corroborated the findings of study three which provided stronger evidence for the found relationships. Nevertheless, the causality and direction of relationship between perceptions of assessment and self-efficacy must be interpreted with some caution and future research within teacher education, based on a more elaborate longitudinal study design, could confirm the proposed relationships between assessment perceptions and self-efficacy.

Additionally, in study 4, in which we investigated how in students' experiences the authenticity aspect and the feedback aspect contribute to their sense of self-efficacy, delivered a fine-grained view of several types of self-efficacy information connected with the phases of portfolio competence assessment. Due to the limitations of this qualitative study, the transferability of the results has to be further investigated. In order to enhance the transferability of these results we suggest replications of this qualitative study in other teacher training programmes. The results of these future studies can provide content for the construction of questionnaires regarding sources of self-efficacy to be used in quantitative research.

Finally, based on the results of our review study, we focused in this research project on two instructional factors relating to assessment. From the angle of assessment as well social cognitive theory, further research regarding the possible influence of other factors relating to assessment, on student self-efficacy could be worthwhile. Another result of our review study is, for example, goal setting, more concretely the learning goal property clarity appears to influence student self-efficacy. According to this finding it seems relevant to investigate goal setting as possible assessment factor influencing student self-efficacy. With reference to social-cognitive theory this research can also contribute to the knowledge of sources of self-efficacy, because it can provide additional insight into which instructional factors elicit which types of self-efficacy information. As the results of our review study relate to higher educational institutes in general, it seems logical that this last research suggestion brings forth fruitful yields as it takes place in several other domains of higher education next to teacher education.

References

- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.
- Bandura, A. (1997). Self-efficacy: *The exercise of control*. New York: W.H. Freeman and Company.
- Bandura, A. (2006). Guide for creating self-efficacy scales. In: F. Pajares, & T. Urdan, *Self-Efficacy Beliefs of Adolescents* (pp. 307-337). Greenwich, Connecticut: Information Age Publishing.
- Dochy, F., & Nickmans, G. (2005). *Competentiegericht opleiden en toetsen. Theorie en praktijk van flexibel leren*. [Competence-based instruction and assessment. Theories and practice of flexible learning]. Utrecht: Lemma.
- Eccles, J.S., Wigfield, A., & Schiefele, U. (1998). Motivation to succeed. In N. Eisenberg (Ed.), *Handbook of child psychology: Vol. 3. Social, emotional, and personality development* (5th ed., pp. 1017-1095). New York: Wiley.
- Gibbs, G., & Simpson, C. (2004). Conditions under which assessment supports student's learning. *Learning and Teaching in Higher Education*, 1(1), 3-31.
- Gielen, S., Dochy, F., & Dierick, S. (2003). Evaluating the consequential validity of new modes of assessment: the influence of assessment on learning, including pre-, post- and true assessment effects. In Segers, M., Dochy, F., Cascallar, E. (Eds.), *Optimising new modes of assessment: in search of qualities and standards* (pp. 37-54). Dordrecht, Netherlands: Kluwer Academic.
- Gulikers, J.T., Bastiaens, ThJ., & Kirschner, P.A. (2006). Authentic assessment, student and teacher perceptions: the practical value of the five-dimensional framework. *Journal of Vocational Education and Training*, 58, 337-357.
- Gulikers, J.T., Bastiaens, ThJ., & Kirschner, P.A. (2007). Defining authentic assessment: five dimensions of authenticity. In A. Havnes & L. McDowell (Eds.), *Balancing dilemmas in assessment and learning in contemporary education* (pp. 73-86). New York, NY: Routledge.
- Nijhuis, J., Segers, M. & Gijselaers, W. (2005). Influence of redesigning a learning environment on student perceptions and learning strategies. *Learning Environment Research*, 8, 67-93.
- Palmer, D.H. (2006). Sources of self-efficacy in a science methods course for primary teacher education students. *Research in Science Education*, 36, 337-353.
- Struyven, K., Dochy, F., Janssens, S., & Gielen, S. (2006). On the dynamics of students' approaches to learning: The effects of the teaching/learning environment. *Learning and Instruction*, 16, 279-294.
- Struyven, K., & De Meyst, M. (2010). Competence-based teacher education: Illusion or reality? An assessment of the implementation status in Flanders from teachers' and students' points of view. *Teaching and Teacher education*, 26, 1495-1510.
- Van Dinther, M., Dochy, F., & Segers, M. (2011). Factors affecting students' self-efficacy in higher education. *Educational Research Review*, 6(2), 95-108.

- Van Dinther, M., Dochy, F., Segers, M., & Braeken, J. (2013). The constructive validity and predictive validity of a self-efficacy measure for student teachers in competence-based education. *Studies in Educational Evaluation*, 39, 169-179.
- Van Dinther, M., Dochy, F., Segers, M., & Braeken, J. (2014). Student perceptions of assessment and student self-efficacy in competence-based education. *Educational Studies*, 40(3), 330-351.
- Van Merriënboer, J., Van der Klink, M., & Hendriks, M. (2002). *Competenties: van complicaties tot compromis. Over schuifjes en begrenzers. Een studie in opdracht van de Onderwijsraad. [Competencies: from complications to compromise]*. Den Haag, the Netherlands: Onderwijsraad.
- William, D. (2011). What is assessment for learning? *Studies in Educational Evaluation*, 37, 3-14.

List of publications and conferences

Scientific publications

- Van Dinther, M., Dochy, F., & Segers, M. (2011). Factors affecting students' self-efficacy in higher education. *Educational Research Review*, 6(2), 95-108.
- Van Dinther, M., Dochy, F., Segers, M., & Braeken, J. (2013). The constructive validity and predictive validity of a self-efficacy measure for student teachers in competence-based education. *Studies in Educational Evaluation*, 39, 169-179.
- Van Dinther, M., Dochy, F., Segers, M., & Braeken, J. (2014). Student perceptions of assessment and student self-efficacy in competence-based education. *Educational Studies*, 40(3), 330-351.

International conferences

- Van Dinther, M. (2009, November 18 – 20). *Factors affecting students' self-efficacy in education*. Paper presented at the 4th European Practice-Based and Practitioner Research Conference of the European Association for Practitioner Research on Improving Learning, Trier, Germany.
- Van Dinther, M., & Braeken, J. (2011, May 19 - 20). *Perceived competence for higher education: Underlying structure and utility*. Paper presented at the ASA Spring Methodology Conference, of the American Sociological Association, organised in Europe by the Department of Methodology and Statistics at Tilburg University, Tilburg, The Netherlands.
- Van Dinther, M. (2012, November 28 – 30). *Self-efficacy of student teachers in competence-based education*. Paper presented at the EAPRIL 2012 Conference of the European Association for Practitioner Research on Improving Learning, Jyväskylä, Finland.
- Van Dinther, M. (2013, September, 18 - 20). *Student perceptions of assessment and student self-efficacy in competence-based education*. Paper presented at the Research Days of Katholieke Universiteit Leuven and Maastricht University, organised by Centre for Research on Professional Learning & Development, Corporate Training and Lifelong Learning at Katholieke Universiteit Leuven, Wange, Belgium.
