

**A design-based approach to  
introducing student teachers in  
conducting and using research**

**Wietse van der Linden**



This doctoral thesis was financially supported by Fontys University of Applied Sciences and facilitated by Eindhoven School of Education (Eindhoven University of Technology). The research was carried out in the context of the Dutch Interuniversity Center for Educational Research (ICO).

**A catalogue record is available from the Eindhoven University of Technology Library**

**ISBN: 978-90-386-3311-4**

**NUR: 841**

**Printed by: Printservice TU/e**

**Cover: Arjan Lammerts**

# **A design-based approach to introducing student teachers in conducting and using research**

## **PROEFSCHRIFT**

ter verkrijging van de graad van doctor aan de  
Technische Universiteit Eindhoven, op gezag van de  
rector magnificus, prof.dr.ir. C.J. van Duijn, voor een  
commissie aangewezen door het College voor  
Promoties in het openbaar te verdedigen  
op donderdag 20 december 2012 om 14.00 uur

door

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geboren te Steenbergen

Dit proefschrift is goedgekeurd door de promotor:

prof.dr. D. Beijaard

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dr. A. Ros

## **Dankwoord**

In juni 2008 stond ik voor de keuze: een vaste baan in het basisonderwijs of een contract als promovendus bij de pabo in Tilburg. Ik heb, zoals uit dit proefschrift blijkt, gekozen voor het laatste. Niet omdat ik zo graag een 'extra titel' wilde of omdat ik het basisonderwijs de rug toe wilde keren, maar omdat het onderwerp van het onderzoek me erg interesseerde. Het verbeteren van de kwaliteit van leraren begint bij die leraren zelf. In mijn ogen moeten leraren constant bezig zijn met zich af te vragen wat ze op welk moment het beste kunnen doen en waarom dat zo is. Leraren zouden de constante behoefte tot het onderbouwen en kunnen verantwoorden van hun keuzes moeten hebben. Het ontwikkelen van de capaciteiten om dit te kunnen doen, is mijn brandstof om na te blijven denken over de functie van onderzoek in een lerarenopleiding voor basisonderwijs, en zo dus ook voor dit promotieonderzoek.

In de afgelopen jaren zijn er heel wat mensen geweest die op één of andere manier hebben bijgedragen aan voorliggend proefschrift. Douwe, allereerst wil ik jou bedanken dat je me als promotor in het gehele traject hebt bijgestaan. In het eerste deel van het traject is het onderzoek allemaal 'wat stroefjes' verlopen, maar ik heb altijd vanuit het idee kunnen werken dat wanneer jij het eenmaal goed zou vinden, het daadwerkelijk ook goed is. Dank ook voor je geduld en flexibele tijdsplanning (vooral in de laatste fase). Eric Verbiest en Marc Vermeulen, dank voor jullie steun en ideeën in de eerste periode van het onderzoek. Anouke en Anje, aan jullie heb ik naar mijn idee te danken dat het ook daadwerkelijk allemaal gelukt is. Vanaf het moment dat jullie bij het project betrokken raakten, is het allemaal wat duidelijker geworden en daarmee ook productiever. Zowel voor de procesbewaking en inhoudelijke inbreng als voor jullie enthousiasme en positieve interesse in mij als persoon dank ik jullie.

Fontys PABO Tilburg en de Eindhoven School of Education wil ik bedanken voor het bieden van de faciliteiten die het mogelijk maakten om dit promotieonderzoek uit te voeren. Pabostudenten, dank voor de deelname aan mijn onderzoek! Collega's van de pabo, bedankt dat ik me

zo snel een ‘echte’ collega kon voelen: ik ben erg blij dat ik na mijn promotietraject ook jullie collega kan blijven. Ard, Arjan, Astrid, Ingrid, maar ook Edith en Chantal; dank voor jullie (in)directe bijdrage aan dit proefschrift! Collega’s -en nu bijna ex-collega’s- van ESoE, het was mooi dat we elkaar in Eindhoven even ‘buiten de onderwijspraktijk’ konden steunen in onze verschillende onderzoeksmoeilijkheden. Dank voor de wijsheid en gezelligheid: Anna, Ellen, Evelien, Fons, Irene, Jannet, Maaïke, Marjan, Migchiël, Niek, Perry, Ton en Zeger-Jan (en buiten ESoE: Iris en Didi). Speciale dank voor de mede-promovendi die tijdens mijn traject meer zijn gaan betekenen dan collega’s: Linda, Marieke, Nele en Rens, we gaan elkaar hopelijk nog regelmatig spreken; veel succes met de afronding van jullie onderzoek!

Vervolgens wil ik vrienden, bekenden en collega’s van Café de Boekanier bedanken voor alle steun, begrip en interesse, maar vooral ook voor de gezelligheid en de ‘andere wereld’ waarin ik me met jullie regelmatig mag begeven. Hierdoor kon ik het in moeilijke momenten allemaal een stuk beter relativeren. Dank daarvoor: Bram, Dave, Petra, Bob, Lex, Hélène, Hester, Nardus, Nathalie, Felix, Sandra, Jasper en alle anderen die ik nog vergeet.

Pa, ma, Sven en Femke; als het nest waar je uit komt een weerspiegeling is van hoe gelukkig je kunt worden als mens, dan is het in mijn geval een heel goed nest geweest! Dank ook voor jullie steun en interesse tijdens mijn promotietraject.

Lieve Marga, dank je wel dat je voor alle bovenstaande ‘bedankjes’ de basis vormt door er altijd voor mij te zijn en op alle momenten aan lijkt te voelen wat ik nodig heb om een gelukkig mens te zijn.

Wietse van der Linden (november, 2012)

## Contents

<b>Chapter 1: General introduction</b>	<b>1</b>
1.1 Context of this study	2
1.2 Conceptual framework	3
1.3 General problem statement and research questions	7
1.4 Relevance of the study	8
1.5 Overview of the dissertation	9
 <b>Chapter 2: Student teachers' development of a positive attitude towards research and research knowledge and skills</b>	 <b>13</b>
2.1 Introduction	14
2.2 Theoretical background	
2.2.1 <i>Teacher research and the knowledge and skills to be developed</i>	16
2.2.2 <i>Developing a positive attitude towards research</i>	18
2.2.3 <i>Research questions</i>	19
2.3 Method	
2.3.1 <i>Context</i>	20
2.3.2 <i>Instruments</i>	22
2.3.3 <i>Participants</i>	23
2.3.4 <i>Analysis</i>	24
2.4 Results	
2.4.1 <i>Student teachers' attitude towards research</i>	25
2.4.2 <i>Development of research knowledge and skills</i>	27
2.4.3 <i>The contribution of the elements of the introductory course to the perceived development of the student teachers' attitude, research knowledge and skills</i>	27
2.4.4 <i>Clustering student teachers in terms of their attitude towards research and the development of research knowledge and skills</i>	28
2.5 Conclusions	29
2.6 Discussion	31
 <b>Chapter 3: Student teachers' attitude towards research</b>	 <b>35</b>
3.1 Introduction	36
3.2 Theoretical background	
3.2.1 <i>Research in teacher education curricula</i>	37
3.2.2 <i>Student teachers' attitude towards research</i>	38
3.2.3 <i>Attitude change and the contributing elements of an introductory course</i>	39
3.2.4 <i>Research questions</i>	40

3.3 Method	
3.3.1 <i>Context</i>	41
3.3.2 <i>Participants</i>	42
3.3.3 <i>Data collection</i>	42
3.3.4 <i>Analysis</i>	43
3.4 Results	
3.4.1 <i>The cognitive aspect and the contributing elements of the introductory course</i>	45
3.4.2 <i>The affective aspect and the contributing elements of the introductory course</i>	47
3.4.3 <i>The self-efficacy aspect and the contributing elements of the introductory course</i>	49
3.4.4 <i>The behavioural aspect and the contributing elements of the introductory course</i>	51
3.5 Conclusions	52
3.6 Discussion	53
 <b>Chapter 4: The development of student teachers' research knowledge, beliefs and attitude</b>	 <b>57</b>
4.1 Introduction	58
4.2 Theoretical background	59
4.2.1 <i>Student teachers' research knowledge</i>	60
4.2.2 <i>Student teachers' beliefs about research</i>	60
4.2.3 <i>Student teachers' attitude towards research</i>	61
4.2.4 <i>Research questions</i>	62
4.3 Method	
4.3.1 <i>Context</i>	63
4.3.2 <i>Design and participants</i>	68
4.3.3 <i>Data collection</i>	68
4.3.4 <i>Analysis</i>	71
4.4 Results	
4.4.1 <i>Student teachers' development of research knowledge</i>	74
4.4.2 <i>Student teachers' beliefs about research</i>	77
4.4.3 <i>Student teachers' attitude towards research</i>	77
4.5 Conclusions	79
4.6 Discussion	80



<b>Chapter 5: An introductory course in research: What works according to student teachers?</b>	<b>85</b>
5.1 Introduction	86
5.2 Theoretical background	
5.2.1 <i>Design principles of an introductory course in research</i>	87
5.2.2 <i>Research questions</i>	91
5.3 Method	
5.3.1 <i>The introductory course in research</i>	91
5.3.2 <i>Data collection</i>	96
5.3.3 <i>Participants</i>	97
5.3.4 <i>Analysis</i>	97
5.4 Results	
5.4.1 <i>Student teachers perceived contributions for each design principle</i>	98
5.4.2 <i>Intended effects from the literature compared to the perceived contributions from the student teachers</i>	109
5.5 Conclusions and discussion	111
 <b>Chapter 6: The relationship between student teachers' knowledge, beliefs and attitude after having participated in an introductory course in research</b>	 <b>117</b>
6.1 Introduction	118
6.2 Theoretical background and methods used for data collection	118
6.3 Hypothetical work model	121
6.4 Method	123
6.5 Results	125
6.6 Conclusions and discussion	127
 <b>Chapter 7: Conclusions and discussion</b>	 <b>133</b>
7.1 Brief overview	133
7.2 Main findings and conclusions	
7.2.1 <i>Main findings and conclusions from the pilot study</i>	133
7.2.2 <i>Main findings and conclusions from the second study</i>	135
7.2.3 <i>General conclusions</i>	138
7.3 Discussion	
7.3.1 <i>Educational design research as a means to develop an introductory course in research</i>	139
7.3.2 <i>Student teachers' beliefs and attitudes regarding research</i>	141
7.3.3 <i>Teachers as researchers or teachers with research knowledge, skills and a positive attitude towards research?</i>	142

7.4 Strengths, limitations and directions for future research	143
7.5 Implications for practice	145
<b>References</b>	149
<b>Appendix</b>	159
<b>Summary</b>	171
<b>Samenvatting</b>	181
<b>List of publications</b>	191
<b>Curriculum Vitae</b>	193
<b>ESoE dissertation series</b>	195

# CHAPTER 1



## Chapter 1: General introduction

In the year 2000, the EU countries announced their ambition to grow into the ‘most dynamic knowledge society in the world’. The amount of attention being paid to the contribution of Higher Education in terms of the development, transfer, expansion and circulation of knowledge increased since then. Optimizing the quality of research activities in Higher Education was considered to be a great opportunity to contribute to the pursuit of becoming the world’s leading knowledge economy. Translated to the educational practice, and expressed for example in the so-called Dublin Descriptors (international qualifications for bachelor’s and master’s degrees developed by the Joint Quality Initiative, 2004), it became compulsory in the curricula of the EU institutes of Higher Education to provide all students with applicable research knowledge and skills so that they can become valuable partners in the creation of the knowledge economy.

The higher education system in the Netherlands is divided into research universities on the one hand and universities of applied sciences on the other. Formerly, in the Dutch context, attention to research was mostly paid in the curricula of the research universities, and less in the curricula of universities of applied sciences (which primarily offer students a bachelor’s degree). The context of the study presented in this dissertation is a Dutch institute for primary teacher education embedded in a university of applied sciences (as is the majority of these institutes in the Netherlands).

Research activities in the curricula of these institutes are rather new. In other countries, the value of teachers conducting and using results of research to improve their teaching practice has long been acknowledged (e.g., Harris & Van Tassel, 2005; Darling-Hammond, 2005). However, evidence on how student teachers can be taught and motivated to conduct and use results of research in their teaching practice is rather scarce, especially in the context of education for primary school teachers. It is relevant to investigate in what way research activities can be integrated in the curricula of this type of teacher education.

In this chapter, the context of this study and its conceptual framework will be described, followed by the general problem statement, the main research questions and the theoretical and practical relevance of

the study. The chapter ends with an overview of the empirical studies of this dissertation.

## 1.1 Context of this study

As mentioned above, the context of this study is an institute for primary teacher education embedded in a university of applied sciences. Student teachers receive their bachelor degree after successfully completing four full-time years of primary teacher education. This degree is a licence to teach all grades of primary education, thus pupils from 4 to 12 years old. The institute for primary teacher education that was investigated has a socio-constructivist perspective on learning. Student teachers are encouraged to construct their own knowledge in realistic situations together with others (Simons, van der Linden, & Duffy, 2000). These realistic situations and opportunities to practise knowledge and skills are provided by a traineeship of one or more days a week in every year of their teacher education.

The results of recent research show that teachers in Dutch primary schools find it difficult to conduct research (e.g., Lunenberg, Ponte, & Van de Ven, 2007), have a negative opinion about research (e.g., Labaree, 2003), and hardly use the results of (scientific) research to improve their own teaching practice (e.g., Broekkamp & Van Hout-Wolters, 2006). The study described in this dissertation is not aiming at directly changing the practicing teachers' negative views on research or lack of capabilities to use research, but attempts to gain insight in the way research can be introduced to student teachers in curricula of institutes for primary teacher education in order to positively contribute to their perceptions of research as an important means for improving educational practice.

This study focuses on the introduction of research in the second year of primary teacher education. This year was chosen instead of the first year because it can be assumed that some experience with and knowledge about the teaching practice may help student teachers to understand the contribution of research by teachers better. In addition, learning how to conduct and use research is an iterative process where student teachers need to have the opportunity to practise their research skills and develop research knowledge at an early stage, and need to go through cycles of conducting and using research throughout their entire study (Hall, 2009; Ponte, 2002). An introduction in research in the

second year of the curriculum provides a starting point for further education and practise in the next two years.

## 1.2 Conceptual framework

Internationally, especially in Canada, Australia, England and the USA, teacher research is often taught and conducted within professional development schools (Harris & Van Tassel, 2005). In these schools, student teachers, experienced teachers and teacher educators work collaboratively on research projects to support their learning, professional development and development of research knowledge and skills (Darling-Hammond, 2005). Particularly from international experiences and studies, different possible effects can be distinguished with respect to the goals of research in teacher education.

Firstly, learning how to conduct and use research is expected to contribute to an increasing awareness of teaching and learning processes and enables teachers to realize a critical, reflective attitude towards their own practice (Cochran-Smith & Lytle, 1999 and 2009; Hall, 2009; Hargreaves, 1998; Van der Rijst, Visser-Wijnveen, Kijne, Verloop, & Van Driel, 2008; Zeichner & Noffke, 2001). Secondly, teachers who conduct research activities construct practical knowledge (Ponte, Ax, Beijaard, & Wubbels, 2004), gain new insights into own or shared educational practice (Lunenberg, et al., 2007) and can provide their own 'evidence' of what works in practice and why it works (e.g., Cordingley, 2003). Thirdly, when teachers have been educated in conducting and using research, they should be able to translate the results from (scientific) research into improvements of their own practice (Elliot, 2008; Gore & Gitlin, 2004; Verloop, 2003). Finally, the expectation is that as a result of conducting and using results of research in their teaching practice, teachers become more able to continuously revitalize and renew their teaching practice (Elliott, 2008), and can better adapt to changing/innovative educational contexts, pupil behaviours and expectations of other teachers and policy makers (Day, 1999; Kincheloe, 2003). Reviewing these effects, research can be described as an important means to foster teachers' professional growth (Burton & Bartlett, 2005; Roberts, Crawford, & Hickman, 2010). This in turn, might help increase the chances that students' learning and learning results improve (Teitel, 2001 and 2003).

In the Netherlands, as in other countries, attempts are made to establish professional development schools (Ministry of Education, Culture & Science, 2005 and 2011), but teaching student teachers how to conduct and use research results is still mostly the responsibility of institutes for teacher education. In many of these institutes several difficulties emerged regarding the development and implementation of research activities, caused simply by the lack of a 'research tradition and culture' in these venues (Anderson & Herr, 1999; Alcorn, 2006; Gemmell, Griffiths, & Kibble, 2010). This is seen in primary schools as well (Windmuller, 2012). Unfortunately, the majority of (student) teachers have misconceptions and a negative opinion about the usability and usefulness of research in education (e.g., Labaree, 2003). Changing student teachers' negative beliefs and attitudes towards research must first be achieved, because these strongly influence their intention to conduct and use results of research in practice (Bransford & Johnson, 1972; Merrill, 2002; Pajares, 1992; Vosniadou, Ioannides, Dimitrakopoulou, & Papademetriou, 2001). Especially the introduction of research, early in the curriculum, could be of crucial importance for the student teachers' development of positive beliefs and a positive attitude towards research. That is why this study focusses on *the introduction of research in the curriculum of an institute for primary teacher education* in such a way that second-year student teachers develop:

- positive beliefs about research, so that they learn to appreciate the value and applicability of conducting and using results of research for improving the teaching practice;
- a positive attitude towards research, through which they learn to perceive research as important and attractive and by which they intend to conduct and use research as a teacher;
- research knowledge and skills that enable them to conduct and use the results of research as a teacher.

#### *Student teachers' beliefs about research*

Human beliefs consist of a mix of generalizations, rules of thumb, expectations, values and opinions grouped in a more or less structured way (Lowyck, 1994; Rokeach, 1976). Beliefs can be seen as a filter through which new knowledge and experiences are screened for meaning (Campbell, Kyriakides, Muijs, & Robinson, 2004; Pajares, 1992; Smith & Croom, 2000). Therefore, beliefs are probably even more influential than knowledge in discerning how individuals frame and organize problems and tasks, and thus they are strong predictors of behaviour (Nespor, 1987). Although teacher beliefs are established by



earlier experiences as pupils and influenced by experiences in the professional context as (student) teachers (Pajares, 1992), student teachers' beliefs are considered to be amenable to change as a result of instruction and experience (Richardson, 1996). It is assumed that an ideal time to pay attention to and change student teachers' beliefs is during teacher education (Bryan, 2003). In this study, thus, pertaining to student teachers' beliefs about research as a part of the teaching job.

### *Student teachers' attitude towards research*

It is generally assumed that attitudes are influenced by a person's cognition as well as affect concerning a behaviour (Eagly & Chaiken, 1993; Ajzen & Fishbein, 2000). In this dissertation three different aspects of attitude are distinguished: (1) a cognitive aspect, (2) an affective aspect, and (3) a person's perceived behavioural control. The cognitive aspect pertains to a person's thoughts/knowledge of an object or behaviour and is based on the overall evaluation of that person's beliefs (Ajzen, 2001; Ajzen & Fishbein, 2000). The affective aspect of attitude is an emotional response that expresses the individual's degree of preference for an object or behaviour (in other words, a person's feelings towards an object or behaviour, in this study towards research). Another aspect of attitude that influences behaviour is a person's perceived behavioural control (Ajzen, 2001). This is described as whether or not a person believes that he or she has control over performing a certain behaviour. The concept of perceived behavioural control is closely related to the concept of self-efficacy. Self-efficacy is the degree of anticipated difficulty and one's judgement of ability to perform a behaviour (Bandura, 1995 and 1997; Pajares & Urdan, 2006; Schunk & Pajares, 2002). A person's beliefs and the cognitive, affective and self-efficacious aspects of their attitude influence their *intention* to perform certain behaviour ('intended behaviour'; Ajzen, 2001). A person's intended behaviour is assumed to be a mediator between beliefs and attitude on the one hand and the actual behaviour on the other.

The student teachers' positive attitude towards research is operationalized in this study by four attitudinal aspects described as follows: (1) *the cognitive aspect*, referring to the fact that student teachers need to understand and perceive the possibilities of conducting and using research as important for them as prospective teachers; (2) *the affective aspect*, concerning the need for student teachers to enjoy and be attracted to conducting and using research as prospective teachers; (3) *the self-efficacious aspect*, indicating student teachers' positive judgement about

being able to conduct and use research as teachers in practice; and (4) *the intended behaviour*, thus when a student teacher plans to conduct or use the results of research or wishes to learn more about it.

### *Student teachers' required research knowledge and skills*

When student teachers need to conduct and use the results of research, they need to develop specific knowledge (and the skills to be able to put this knowledge into practice). Based on the literature and handbooks on teacher research (e.g., Berger, Boles, & Troen, 2005; Cochran-Smith & Lytle, 1999 and 2004; Kincheloe, 2003; Lankshear & Knobel, 2004; Lunenberg, et al., 2007; Reis-Jorge, 2005; Van der Rijst, et al., 2008; Verschuren, 2009) these specific knowledge and skills refer to:

- the goals and benefits of research for their functioning as a teacher;
- the kind of research topics that are suitable for teachers;
- the research process for conducting research and the different phases of research, consisting of the translation of relevant topics via proper problem analyses into research questions, the choice of an appropriate research design and methods for the collection and analysis of data;
- the criteria for research quality and the consequences of these criteria for their own research;
- reporting research results in such a way that colleagues in education get a clear view of the process, the results and the practical implications of the research.

Similar to the fact that there is no consensus about the relationships between beliefs, attitudes and knowledge and skills in the literature, there is hardly any evidence on the relationships between student teachers' change in beliefs, attitudes and development of knowledge and skills regarding research, and the way they influence each other. Insight in these relations could enhance the contribution of research activities in teacher education.

A design-based research approach was used in order to gain insight in how these knowledge, skills, beliefs and attitudes towards research could be taught effectively (Van den Akker, Gravemeijer, McKenney, & Nieveen, 2006). A literature study was done aiming at formulating design principles (described as 'elements of the course' in Chapter 2 and 3) that in theory positively influence student teachers' learning about research. In our search, we first focused on literature from educational psychology and instructional design theories. For the

specific content parts of the course we used literature on educational and teacher research, next to reviews and handbooks on teacher education and teacher learning/development. The design principles were deduced by combining the different perspectives from the literature. This was followed by an operationalization of these principles into concrete starting points for an introductory course in research for second-year students in an institute for primary teacher education. This course was executed and investigated twice: in a pilot study and in a second study one year later. Based on the results of the pilot study, the design principles and our understanding of student teachers' attitude towards research evolved and improvements were made to the introductory course (see Chapter 4).

### 1.3 General problem statement and research questions

The literature indicates that teachers who conduct and use results of research in their teaching practice avail themselves of opportunities to constantly develop as professionals, can contribute to better education and, in that way, to learning gains for students. Attempts have been made to gain insight into such contributions of research activities in teacher education (e.g., Diezman, 2005; Dunn, Harrison, & Coombe, 2008; Hall, 2009; Reis-Jorge, 2007; Schulz & Mandzuk, 2005), but in what way research can be introduced to student teachers in an institute for primary teacher education within a university of applied sciences so that they develop research knowledge and skills together with positive beliefs and attitudes regarding research still remained unclear.

As stated above, the study in this dissertation focuses on the introduction of research to student teachers in primary teacher education. The aim was to generate a set of theoretically and empirically grounded design principles that underpin an introductory course that contributes to student teachers' development of research knowledge and skills, as well as positive beliefs and attitudes regarding research. The main research question of this dissertation was:

*What design principles of an introductory course in research in an institute for primary teacher education contribute to the development of student teachers' knowledge, skills, positive beliefs and attitude regarding research and how do they contribute?*

As mentioned before, the introductory course was executed twice, first as a pilot version, followed by an adapted version. Both times the design

principles and the developments of the student teachers were investigated extensively in two different studies. The main research question was divided into the following five more specific research questions:

Research questions of the pilot study:

1. (a) How do student teachers perceive their development of research knowledge and skills, and change in attitude towards research during the pilot of the introductory course, and (b) what elements of the introductory course do they perceive as contributing to this development and change?
2. (a) What are student teachers' perceptions of research and how are these related to the cognitive, affective, self-efficacious and intended behaviour aspect of their attitude towards research, and (b) what elements of the introductory course do they perceive as contributing to the positive change of their attitude towards research?

Research questions of the second study:

3. Do student teachers develop research knowledge, positive beliefs and a positive attitude towards research during the (improved) introductory course in research?
4. How do student teachers perceive the importance of each design principle of the introductory course in terms of their learning about conducting and using research?
5. What and how are the relations between student teachers' beliefs about research, their cognitive, affective and self-efficacy aspect of their attitude towards research, their level of research knowledge and their intention to conduct and use research?

## 1.4 Relevance of the study

The research presented in this dissertation has both theoretical and practical relevance. Many descriptions of what (educational) design-based research is or what it is aiming at refer to the practical relevance in research-based interventions/solutions for complex problems in educational practice, and the theoretical relevance in advancing knowledge about the characteristics of these interventions and the

processes of designing and developing them (e.g., Barab & Squire, 2004; Van den Akker, et al., 2006).

From the theoretical point of view, this dissertation provides insight in how the design principles contribute to student teachers' development of research knowledge, skills, beliefs and attitude, what student teachers' attitude towards research is, and in what way student teachers' research knowledge and beliefs and attitude regarding research influence each other. Up till now evidence regarding these topics is scarce, although the importance of properly preparing student teachers for conducting and using research in their later teaching job has already been long acknowledged.

From the practical point of view, the study described in this dissertation provides a research-based introductory course in research for institutes for primary teacher education that contributes to the development of student teachers who are able and motivated to conduct and use results of research. All institutes for primary teacher education are required to achieve these goals and can benefit from the results of this study.

## **1.5 Overview of the dissertation**

The five chapters presented next concern the five research questions in the same order as mentioned above. Chapter 2 presents results of the pilot study that was done on the first time the introductory course was executed (research question 1a and 1b). A questionnaire was used to gain insight in student teachers' ( $N = 81$ ) attitude towards research after having participated in the course, and their perceptions of the development of their attitude, knowledge and skills during the course. For gaining more insight in how the course elements contributed to student teachers' developments, questionnaire items were used about which elements student teachers perceived to be the most and the least contributing.

From the results of the pilot study, questions arose about student teachers' attitude towards research, i.e., what this attitude comprised and how student teachers could develop a positive attitude towards research. Chapter 3 reports on results of six group interviews with (a total of 29) student teachers that show what student teachers' views are on the cognitive, affective and self-efficacious aspects of their attitude and their

intended behaviour towards research, and what elements of the course contributed positively to these aspects (research question 2a and b).

The results of the pilot study (presented in chapter 2 and 3) were used to improve the introductory course. In chapter 4 the results of the study that was conducted the second time the introductory course was executed are presented (research question 3). Results of concept map measurements ( $N = 75$ ) of student teachers' development of their research knowledge during the course are presented, next to student teachers' change in beliefs and attitude regarding research that were measured by a questionnaire ( $N = 79$ ).

Chapter 5 describes results of four group interviews (with a total of 20 student teachers that participated in the second execution of the introductory course) particularly aiming at which design principles were perceived as important in terms of contributing to student teachers' learning about research, including student teachers' perceptions of how these design principles contributed to their learning (research question 4).

In chapter 6, relations between student teachers' research knowledge, beliefs and aspects of their attitude towards research after having participated in an introductory course are explored (research question 5). By conducting Structural Equation Modelling on the results of the questionnaire and concept maps (reported in Chapter 5), (in)direct influences of student teachers' beliefs and attitudinal aspects on their intended behaviour are explored and presented.

In chapter 7 the main findings and conclusions that could be formulated from the studies are presented and discussed. Furthermore, limitations of the studies and directions for future research are provided, followed by implications for practice.

# CHAPTER 2





## Chapter 2:

### Student teachers' development of a positive attitude towards research and research knowledge and skills<sup>1</sup>

---

#### Abstract

The aim of this study was to investigate the experiences of student teachers participating in an introductory course, designed to stimulate the development of a positive attitude towards research and to stimulate the development of research knowledge and skills by second-year student teachers of an institute of primary teacher education. A questionnaire (N = 81) was used to measure student teachers' attitude and perceptions of the development of their attitude towards research, their perceived development of research knowledge and skills and what parts of the introductory course they perceived to be responsible for these developments. According to the student teachers' perceptions, the introductory course contributed to the development of both a positive attitude towards research and research knowledge and skills. The student teachers indicated that examples from practice, authentic learning tasks and working in pairs or groups contributed most to the development of their attitude, knowledge and skills.

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<sup>1</sup> An adapted version of this chapter has been published as: Van der Linden, W., Bakx, A., Ros, A., Beijaard, D., & Vermeulen, M. (2012): Student teachers' development of a positive attitude towards research and research knowledge and skills. *European Journal of Teacher Education*, 35(4), p. 401-419.

## 2.1 Introduction

In the year 2000, the discussion about research activities in Dutch higher education accelerated when the countries of the European Union (EU) signed the Lisbon Declaration. The EU countries announced their ambition to grow into the most dynamic knowledge society of the world in a period of 10 years. The amount of attention being paid to the contribution of Dutch higher education in terms of the development, transfer, expansion and circulation of knowledge has since continued to grow. The inclusion of research activities in the curricula of all institutes for higher education became required.

The Dutch higher education system is divided into research universities on the one hand and universities of applied sciences on the other (also known as higher vocational education institutes). Dutch primary teacher education, which forms the context of this study, is embedded within universities of applied sciences that offer student teachers a bachelor's degree and prepare them for teaching practice.

Although the Dutch universities of applied sciences introduced professorships in 2001 and, since 2005, have allocated specific resources for applied research by lecturers (supported by governmental funds), there is a lack of any 'research culture' in primary teacher education and in primary education (Anderson & Herr, 1999; Alcorn, 2006; Gemmell, Griffiths, & Kibble, 2010). For instance, over 45% of the lecturers in Dutch higher vocational education in general do not have an academic degree, and in teacher education this proportion is even higher. In other words, teachers in primary teacher education often have little or no experience in conducting and using research themselves. Now they are facing the government's demands that research should be integrated into the curricula of their institutes for teacher education. The fact that, until several years ago, research activities in teacher education only appeared in the student teachers' graduation year (and that little attention was paid to actually learning how to conduct and use research), also indicates the subordinate position of research in the curriculum.

There are different perspectives on teacher research that are related to several goals for educational practice. First, research establishes a great opportunity for teachers to foster a critical and reflective attitude towards their own practice, which is important for a competent teacher (Darling-Hammond & MacLaughlin, 1999; Doornekamp, Pakkert, Brandsma, & Mulder, 1997; Hall, 2009; Hargreaves, 1998; Ponte, 2002; Zeichner & Noffke, 2001). Second, by

carrying out research, teachers are able to develop their knowledge (Ponte, Ax, Beijaard, & Wubbels, 2004), and provide their own evidence of what works in practice and why it works (e.g., Cordingley, 2003). Third, if teachers are able to conduct and use research, they can translate the results from their own scientific and educational research into improvements for their own practice (Elliot, 2008; Gore & Gitlin, 2004; Schön, 1983; Verloop, 2003). Taking all of the aforementioned perspectives into account, it is an essential task and a responsibility of institutes for teacher education to provide curricula in which student teachers are taught how to conduct research and to use the results of other research (e.g., Korthagen, Kessels, Koster, Lagerwerf, & Wubbels, 2001).

Recently, many Dutch handbooks on teacher research have appeared. The focus in these books is mainly on improving student teachers' research skills and adjusting their motivation and their attitude towards conducting and using research in practice as areas which develop simultaneously. However, there is no evidence to support this assumption, and the conceptions and opinions of student teachers regarding research have continued to be rather negative (Dunn, Harrison, & Coombe, 2008; Gitlin, Barlow, Burbank, Kauchak, & Stevens, 1999; Labaree, 2003). Evidence of how student teachers in primary teacher education should be motivated and taught how to conduct and use research is scarce. For example, Schulz and Mandzuk (2005) focussed on the development of an understanding of the value and applications of inquiry in the education of student teachers in a pre-service teacher education programme in a Canadian university. Dunn et al. (2008) focussed on a one-semester long research project in Australian early childhood teacher education. Both studies produced promising results in the sense that the courses which were investigated contributed to the student teachers' acceptance that conducting and using research is a part of teaching. Gitlin et al. (1999) stated that the student teachers in their study developed the opinion that research should be a part of teaching after they had participated in a teaching programme. However, the emphasis of this study was on investigating student teachers' opinions about the value of using scientific research in general.

Thus, more research is needed on the development of student teachers' research skills in relation to their motivation to actually conduct research activities in their daily practice. Therefore, the main focus of the study described in this article was on an introductory course in a Dutch institute for primary teacher education, which was aimed at introducing

research in such a way that the student teachers would develop a positive attitude towards research, and that they would also develop research knowledge and skills.

## 2.2 Theoretical background

In this section, the concept of teacher research will be briefly explored, followed by a description of the knowledge and skills student teachers need to develop to be able to conduct and to use research in practice. Next, a description is given of the student teachers' development of a positive attitude towards research.

### 2.2.1. *Teacher research and the knowledge and skills to be developed*

Teacher research is not a new concept. Doornekamp et al. (1997) stated that teachers who use and conduct research are aware of the increasing importance of: 1) critical self-reflection and self-evaluation; 2) the ability to observe, analyse and interpret the behaviour and learning results of student teachers; and 3) teacher accountability. The most recent studies on teacher research have focussed on the role it can play in providing teachers with their own evidence of what works and how it works, resulting in either evidence-based (Cordingley, 2003) or data-driven teaching (Fullan, 2001; Ledoux, Blok, Boogaard, & Krüger, 2009).

Table 2.1 is an attempt to enumerate the characteristics of teacher research. A distinction has been made between more general, methodological and execution-based characteristics, and what knowledge and skills are required to use these characteristics in practice, based on the findings of several authors (e.g., Berger, Boles, & Troen, 2005; Cochran-Smith & Lytle, 1999 and 2004; Lankshear & Knobel, 2004; Lunenberg, Ponte, & Van de Ven, 2007; Reis-Jorge, 2005 and 2007; Van der Rijst, et al, 2008; Verschuren, 2009).

Table 2.1. Characteristics of teacher research and the research knowledge and skills required by teachers

Teacher research....	A teacher needs to....
<ul style="list-style-type: none"> <li>• focuses on context-specific and practice-oriented problems, rooted in teaching practice;</li> <li>• arises from individual or collective (school) interest and the responsibility to provide professional teaching performance;</li> <li>• aims at developing knowledge, insights and products which contribute to problem solving, and/or developments in teaching practice;</li> <li>• requires a critical, reflective and research-oriented attitude from the teacher;</li> </ul>	<ul style="list-style-type: none"> <li>- have a knowledge of what kinds of problems/interests are suitable for teacher research;</li> <li>- be able to notice practical problems and translate them via proper problem analyses into research questions;</li> <li>- be able to constantly seek out improvements and view practice in a professional way;</li> <li>- be able to evaluate, interpret and reflect on the results of (other) research and translate them into practical implications;</li> </ul>
<ul style="list-style-type: none"> <li>• makes use of appropriate methods and meets research criteria such as reliability and validity, without reducing the practical relevance of the research;</li> </ul>	<ul style="list-style-type: none"> <li>- have a knowledge of the different phases in research;</li> <li>- have a knowledge of the different appropriate research designs and methods;</li> <li>- be able to choose (to fit the research questions), develop, execute and analyse appropriate methods of data collection;</li> <li>- have a knowledge of the criteria for research quality and the skills to apply this knowledge in their own research;</li> <li>- be able to report research results in such a way that their colleagues in education get a clear view of the process, the results and the practical implications;</li> </ul>
<ul style="list-style-type: none"> <li>• is conducted by the 'problem-owner/teacher', either in collaboration with colleagues or external researchers.</li> </ul>	<ul style="list-style-type: none"> <li>- be able to research their own practice alone and in collaborative 'research teams'.</li> </ul>

The focus of this study is on the introduction of research to second-year student teachers in primary teacher education. The course in question is executed at the beginning of the curriculum, because learning how to conduct and use research is an iterative process which cannot be learned in a single workshop and needs to be repeated (Hall, 2009; Ponte, 2002). Student teachers need to have the opportunity to practise

their research skills and develop research knowledge at an early stage, and need to go through cycles of conducting and using research throughout their period of study.

### *2.2.2. Developing a positive attitude towards research*

An important reason for putting the introduction to research at the beginning of the second year of the four-year teacher education programme is that prospective teachers need to develop a positive attitude towards research in terms of their professional development. This attitude is important for their acceptance of continuously conducting and using research in the subsequent years of their teacher education, and the role research will play in their future teaching career.

Teachers often have misconceptions and a negative opinion of the usability and usefulness of research in education (e.g., Labaree, 2003). When student teachers are introduced to research, they are likely to have different views on what research is, what the aims of research are and the ways in which research is important for them as prospective primary school teachers. This is caused by the lack of examples of research in practice (Joram, 2007; Schulz & Mandzuk, 2005), the varying nature of research activities that they were confronted with as student teachers in secondary education (Schalk, 2006) and the ways in which society uses the concept of research in other settings, such as medical examinations or marketing research. There is a need to take student teachers' potential preconceptions of research into consideration when they are introduced to research, because these preconceptions might influence the development of their attitude towards research and eventually their behaviour regarding conducting and using research in practice (Wubbels, 1992).

The concept of attitude is often divided into three aspects: affective, cognitive and behavioural (Ajzen, 2001; Ajzen & Fishbein, 2000; Eagly & Chaiken, 1993). The cognitive aspect consists of thoughts and views about an object or construct, the affective aspect consists of feelings and moods towards an object, and the behavioural aspect is the intention to exhibit or avoid certain behaviours. Translated to the development of a positive attitude towards research, the cognitive aspect refers to the fact that student teachers need to know and understand the possibilities of conducting and using research (and to perceive it as important for them as prospective teachers). The affective aspect concerns the fact that student teachers need to feel good about and enjoy conducting and using research (and to perceive it as interesting for

them as prospective teachers). Finally, the behavioural aspect occurs when a student attempts to conduct or to use research, or plans to learn more about it.

In addition to paying attention to the influence of student teachers' cognitive, affective and behavioural aspects of their attitude, there is also a need to address the development of the student teachers' confidence in conducting and using research (e.g., Jarvis & Rennie, 1998; Mulholland & Wallace, 2001). The concept of self-efficacy has been added to the operationalisation of attitude. Self-efficacy is a construct which indicates an individual's belief in their own capacities (Bandura, 1986), which, in this study, refers to their being able to conduct and use research (Dyson, 1997). There is a need to include self-efficacy as an aspect of student teachers' attitude towards research, because it influences their behaviour in a positive or negative sense. When self-efficacy with regard to conducting and using research increases, it becomes more likely that student teachers will not only develop a positive attitude towards research, but that they will also conduct and use research in practice (Dyson, 1997). Combining the four aspects of attitude, we assume that student teachers will develop a positive attitude towards research when they:

- 1) know why and how research is done in practice and are convinced of the importance and the feasibility of conducting and using research;
- 2) enjoy conducting and using research;
- 3) take action to become teacher researchers and plan to conduct and use research;
- 4) have confidence in their own ability to conduct and use research.

It is assumed that the cognitive, affective and self-efficacious aspects of a person's attitude influence one's intention to perform behaviour (Ajzen, 2001). In this study, we used the four aspects related to attitude as equal aspects, because we aimed at gaining specific insight in these four aspects from the student teachers' point of view.

### *2.2.3. Research questions*

The aim of this study was to investigate the experiences of student teachers participating in an introductory course in research. The introductory course has been developed in order to stimulate the development of student teachers' positive attitude towards conducting and using research and their research knowledge and skills. At the end of

the course, the student teachers' attitude towards research and their perceptions of the development of their attitude, knowledge and skills were investigated. For the improvement or revision of the course, more information was needed about which elements were perceived by the student teachers to be the most contributing, and which elements were less contributing. Therefore, it was also interesting to investigate whether the student teachers could be clustered, in order to learn whether different groups of student teachers differed in their rating of the elements of the course (e.g. to investigate whether there is a need for differentiation in the course). Therefore, the research questions were:

1. What attitude towards research do student teachers have after participating in the introductory course in research?
2. How do student teachers perceive their development of research knowledge and skills during the introductory course in research?
3. Which elements of the introductory course in research contribute to the development of a positive attitude towards research and the teachers' research knowledge and skills, according to the perceptions of student teachers?
4. Is there a difference in how student teachers, who differ in development of a positive attitude towards research, research knowledge and skills, rate the elements of the introductory course?

2.3 Method

2.3.1. Context

The institute of primary teacher education in which the introductory course in research was investigated has a socio-constructivist perspective on learning. Student teachers are encouraged to construct their own knowledge in realistic situations together with others (Simons, van der Linden, & Duffy, 2000). The introductory course for second-year student teachers contained 11 obligatory meetings of two hours each, and was taught by two lecturers over a period of four months. Table 2.2 gives an overview of the elements of the course and some relevant examples of the ways in which the elements were translated into practice.

Table 2.2. Elements and examples of the introductory course

Elements of the introductory course	Examples from the introductory
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<b>course</b>	
The introductory course needs to be an integral part of the overall curriculum of the teacher education institute (Burke & Hutchins, 2007);	<ul style="list-style-type: none"> <li>- Topics from the regular curriculum were used in examples of teacher research. For example, the student teachers were busy with learning how they needed to prepare lessons at the point when ‘design-based research’ was introduced during the course, including the connection between the two;</li> <li>- Research-related tasks from the regular curriculum were used and discussed in meetings. For example, student teachers investigated teaching methods and materials, systematically observing pupils in schools and discussing the way to did this;</li> </ul>
Through the course, lecturers and student teachers need to become aware and attuned to the student teachers’ prior knowledge and preconceptions of research (Bransford & Johnson, 1972; Merrill, 2002; Vosniadou, Ioannides, Dimitrakopoulou, & Papademetriou, 2001);	<ul style="list-style-type: none"> <li>- Every meeting started by asking what the student teachers knew about certain subjects or what they remembered from the past meetings;</li> <li>- The student teachers discussed their opinions and conceptions about research by, for example, discussing the different feasibilities of research topics or methodologies in groups;</li> </ul>
It must become obvious for student teachers why they are confronted with research in this stadium of their teacher education (Ponte, 2002);	<ul style="list-style-type: none"> <li>- At the beginning of the introductory course, it was explained to the student teachers that they were learning about research in this early stage of their teacher education so that they had the opportunity to: 1) practise research in their teacher education; 2) use research as a tool for gaining knowledge in their teacher education, and 3) gain more from other research tasks in the rest of the curriculum;</li> </ul>
The activities in the introductory course need to provide meaningful experiences for the student teachers: the learning activities, tasks and examples must be clearly connected to or derived from primary teaching practice in order to be useful for the student teachers (Van Merriënboer, 1997; Vosniadou, et al., 2001; Diezmann, 2005);	<ul style="list-style-type: none"> <li>- Student teachers got to know and practised research by working with authentic examples and tasks. For example, when they had to read and discuss examples of the research reports of primary school teachers, they needed to perform a task where they had to plan and motivate methodological choices for answering</li> </ul>

	research questions from a fictional research case;
Student teachers need to have the opportunity to choose subjects of authentic tasks which will be connected to their urgent concerns;	- In a task where student teachers practised the planning of research methods, they had the opportunity to choose different task subjects;
During their instruction, performing tasks and in evaluating tasks or meetings, student teachers need to work together in pairs or groups in which they can interact with one another. In classroom interactions, student teachers need to feel free to elaborate on their ideas or new perspectives and to receive different kinds of feedback from different participants (Van Swet, Roosken, Ansems, Siebelink, & Den Hartog, 2009);	- All tasks, performed during meetings or outside of meetings, were performed in collaborative pairs or groups so that student teachers had the opportunity to discuss with one another; - After performing tasks, student teachers needed to provide written feedback on two tasks performed by their fellow student teachers and discuss the feedback they had given and received; - In group meetings, the opinions and conceptions of the student teachers were encouraged and discussed;
For most student teachers, teacher research is a new and complex concept, and so learning activities and tasks are used in an ‘easy-to-difficult’ sequence (Merrill, 2002; Reigeluth, 1999).	- The authentic examples of research used at the beginning of the course were less complicated in terms of the methods or design used than those which were used at the end of the course.

2.3.2. Instruments

A student questionnaire was developed in order to measure the student teachers’ attitude, how they perceived the development of their attitude, knowledge and skills, their perceptions of the elements of the course and background variables (gender, age, previous education and previous experiences with conducting and using research). It consisted of 45 items.

Table 2.3 shows the items concerning the student teachers’ attitude. In the first part, the student teachers’ attitude towards research was measured. The statements pertained to the cognitive, affective, behavioural and self-efficacy-related aspects of attitude (Ajzen & Fishbein, 2000; Bandura, 1986). Each aspect was divided into two items, one pertaining to ‘conducting research’ and the other pertaining to ‘using the results of research’. A five-point Likert scale was constructed (1 = ‘totally disagree’; 5 = ‘totally agree’). The second part of the

questionnaire measured the student teachers' perceptions of the development of their attitude. For the same eight items as in the first part, the student teachers indicated whether their opinion had changed in a negative way (1), whether it had been stable over time (2), or whether it had changed in a positive way (3).

Student teachers' perceptions of the contribution that the introductory course had made towards their development of research knowledge and skills were measured in the third part of the questionnaire. In total, 21 different aspects of research knowledge and skills were rated on a five-point Likert scale (1 = 'very little'; 5 = 'very much'). Examples of the items from this section include: 'During the course I learned...about design-based research', and 'During the course I learned...about conducting an interview'.

Finally, student teachers' perceptions were measured regarding what elements of the introductory course (from Table 2.2) had been the most valuable to their development. The same five-point Likert scale was used (1 = 'very little'; 5 = 'very much') for eight items. Examples of the items from the fourth section included: 'In this course I learned...from working with examples from practice', and 'In this course I experienced ...connection to the overall curriculum'.

### *2.3.3. Participants*

All of the second-year student teachers at the primary teacher education institute participated in the introductory course ( $N = 105$ ), and 81 of them completed the questionnaire (77%). The average age of the student teachers was approximately 20 years old; 14 male (17.3%) and 67 female (82.7%) student teachers participated. This male-female ratio is representative of Dutch institutes of primary teacher education.

Table 2.3. Items of the ‘attitude’ scale and the ‘development of attitude’ scale

Aspects of the student teachers’ attitude towards research	Items ‘Attitude towards research’	Items ‘Development of attitude towards research’
‘Cognitive’ and ‘conducting research’	I think it is important that primary school teachers conduct research	My opinion about the importance of conducting research as a primary school teacher...
‘Cognitive’ and ‘using the results of research’	I think it is important that primary school teachers use results from other research	My opinion about the importance of using the results of other research as a primary school teacher...
‘Affective’ and ‘conducting research’	I think that I enjoy conducting research as a primary school teacher	My opinion about enjoying conducting research as a primary school teacher...
‘Affective’ and ‘using the results of research’	I think that I enjoy using the results of other research	My opinion about enjoying using the results of other research as a primary school teacher...
‘Behavioural’ and ‘conducting research’	I am planning to conduct research as a primary school teacher	My opinion about planning to conduct research as a primary school teacher...
‘Behavioural’ and ‘using the results of research’	I am planning to use the results of other research as a primary school teacher	My opinion about planning to use the results of other research as a primary school teacher...
‘Self-efficacy’ and ‘conducting research’	I think that I will be able to conduct research as a primary school teacher	My opinion about being able to conduct research as a primary school teacher...
‘Self-efficacy’ and ‘using the results of research’	I think that I will be able to use the results of other research as a primary school teacher	My opinion about being able to use the results of other research as a primary school teacher...

2.3.4. Analysis

In order to determine the attitude of student teachers following their participation in the introductory course (research question 1), descriptive statistics (means and standard deviations) were calculated for part one of the questionnaire (using SPSS 15.0). Then, by using paired t-tests, it was determined whether or not the student teachers differed in their attitude towards ‘conducting’ and ‘using (the results of)’ research.

The differences between the aspects of attitude (cognitive, affective, behavioural and self-efficacy) were also calculated using paired t-tests. The development of the student teachers' attitude towards research was determined by comparing frequencies and descriptive statistics from the categories of part two of the questionnaire.

Factor analysis (with direct Oblimin rotation; the correlations between the components ranged from .22 to .42.) was used to determine whether separate components regarding the development of research knowledge and skills (research question 2). In order to determine whether there were differences between the mean scale scores, paired t-tests were conducted.

Regarding research question 3, the means and standard deviations of the ratings of the elements of the introductory course were calculated and, using paired t-tests, differences in the mean ratings of the elements were tested on significance. In order to determine whether there were any groups of student teachers with similar characteristics in terms of the development of their attitude, knowledge and skills (research question 4), cluster analysis was used (Ward's method with squared Euclidian distances) on parts 1, 2 and 3 of the questionnaire. The outcomes of the cluster analyses were verified through an analysis of variance (ANOVA) in order to check whether a sufficient amount of variance could be explained by the cluster outcomes. By doing so, the first indication of how many clusters were relevant was established. Next, using a one-way ANOVA with a post-hoc Scheffé test, significant differences between the clusters' mean values were calculated. Further analyses were done in order to investigate whether the groups of student teachers differed in their perceived ratings of elements of the introductory course (using one-way ANOVA with a post-hoc Scheffé test). For all of the scales, reliability rates were estimated using Cronbach's alpha.

## 2.4 Results

### 2.4.1. *Student teachers' attitude towards research*

With all of the aspects of attitude taken together, the student teachers' average value for 'attitude towards conducting and using research' was 3.57 (on a scale of 1-5,  $\alpha = .83$ ; see Table 2.4). The results of the paired t-tests regarding the differences between the aspects of attitude showed that the student teachers found conducting and using

research to be significantly more important (cognitive aspect) than enjoyable (affective aspect) ( $t(80) = 9.49, p = .00$ ), and that they were more likely to consider it to be important than plan to conduct it (behavioural aspect) ( $t(79) = 6.16, p = .00$ ). The results also show that student teachers think that they are more capable of conducting and using research (self-efficacy) than enjoying doing or using it ( $t(80) = 4.89, p = .00$ ), and they are more capable than they are likely to plan to conduct research and use it in their teaching practice later in life ( $t(79) = 3.60, p = .00$ ).

Table 2.4. Means and standard deviations of (aspects of) student teachers’ attitude towards research

Attitude total		Cognitive		Affective		Behavioural		Self-efficacy	
M	SD	M	SD	M	SD	M	SD	M	SD
3.57	0.55	3.89	0.67	3.24	0.83	3.39	0.70	3.74	0.79

Regarding the student teachers’ perceptions of the development of their attitude towards research, the total mean was 2.49 ( $SD = 0.28$  on a scale of 3,  $\alpha = .64$ ). Table 2.5 shows that a rather large group of student teachers perceived that their cognitive aspect regarding conducting research had ‘developed positively’ ( $57 = 70\%$ ), in comparison to their affective ( $22 = 27\%$ ) or behavioural ( $39 = 48\%$ ) aspects. Moreover, a large group of student teachers indicated that during the introductory course, their opinions had remained stable over time, or perceived negative development of their affective aspect (in both ‘conducting’:  $59 = 73\%$  and ‘using’:  $67 = 83\%$ ). A rather large group of student teachers also indicated that they developed in a positive direction in their belief that they would be capable of conducting and using research as a primary school teacher (‘conducting’:  $59 = 73\%$  and ‘using’:  $53 = 65\%$ ).

Table 2.5. Frequencies of aspects of attitude development, divided into attitude towards conducting and using the results of research ( $N = 81$ )

	Negative development		Stayed stable over time		Positive development	
	‘Conducting’	‘Using’	‘Conducting’	‘Using’	‘Conducting’	‘Using’
<i>Cognitive</i>	0	0	24	43	57	37
<i>Affective</i>	8	5	51	62	22	14
<i>Behavioural</i>	6	1	36	48	39	32
<i>Self-efficacy</i>	2	0	20	28	59	53

### 2.4.2. Development of research knowledge and skills

The principal factor analysis with Oblimin rotation revealed three scales with high reliability rates (cumulative proportion of explained variance: 58.8%): 1) ‘science-oriented scale’ (9 items,  $\alpha = .86$ ), 2) ‘method-scale’ (10 items,  $\alpha = .91$ ), and 3) ‘research design-scale’ (2 items,  $\alpha = .76$ ); see Table 2.6.

Paired t-tests of the scale means showed that, according to the student teachers’ perceptions, they had learned the most about ‘science-oriented’ knowledge and skills, then about ‘methods’ ( $t(79) = 6.39, p = .01$ ), and the least about ‘research design’-related knowledge and skills ( $t(80) = 9.59, p = .00$ ). The method-scale and the research design-scale also differed significantly from one another ( $t(79) = 2.80, p = .00$ ).

Table 2.6. Research knowledge and skills-scales

Scale	Description	Examples of items
Science-oriented scale ( $M = 3.85, SD = 0.56$ )	The items in the science-oriented scale cover contemplative and conceptual knowledge and skills	‘I’ve learned...about the validity of research’  ‘I’ve learned...about critically evaluating the research of others’
Method-scale ( $M = 3.32, SD = 0.72$ )	The items in the methodological scale cover the knowledge and skills related to developing, executing and analysing research methods	‘I’ve learned...about developing an interview’  ‘I’ve learned...about conducting observation’
Research design-scale ( $M = 3.02, SD = 0.83$ )	The items in the research design-scale cover the aspects of knowledge and skills concerned with research design	‘I’ve learned...about design-based research’  ‘I’ve learned...about action research’

### 2.4.3. The contribution of the elements of the introductory course to the perceived development of the student teachers’ attitude, research knowledge and skills

The overall mean score for how much the student teachers perceived the elements of the introductory course as having contributed to their development was 3.38 (on a scale of 1-5,  $SD = 0.50$ ;  $\alpha = .78$ ). The paired t-tests between the different elements showed that the three elements with the highest means (‘using examples from practice’, ‘performing realistic tasks’ and ‘working together in pairs or groups’; see Table 2.7) scored significantly higher than the other elements. The element ‘connecting to the overall curriculum’ was, in the student

teachers’ opinions, the element which had contributed least to their learning.

Table 2.7. Means, standard deviations and paired t-test results of the elements of the introductory course

Elements of introductory course	M	SD
Working together in pairs or groups	3.75*	.77
Performing realistic tasks	3.59*	.83
Examples from practice	3.53*	.78
Alternating teaching methods	3.35	.92
Connecting to prior knowledge	3.26	.94
Feedback from fellow student teachers	3.07	.96
Opportunities to choose	3.01	.72
Connection to the overall curriculum	2.36**	.83

\* significantly higher mean than all the other elements with a lower mean ( $p < .01$ )

\*\* significantly lower mean than all the other elements ( $p < .00$ )

2.4.4. *Clustering student teachers in terms of their attitude towards research and the development of research knowledge and skills*

The results of the cluster analyses showed that three clusters explained a sufficient amount of variance and that these three clusters could be labelled according to their content (Table 2.8). The three clusters were termed: 1) ‘most developed in terms of research’, 2) ‘medium developed in terms of research’ and 3) ‘least developed in terms of research’. The ‘most developed’ group of student teachers ( $N = 21$ ) had a significantly higher mean on all of the scales compared to both other groups. The student teachers in this group had a more positive attitude towards research, perceived that their positive attitude developed more during the introductory course and they perceived more development on all three scales of research knowledge and skills. The ‘least developed’ group of student teachers had a significantly less developed positive attitude towards research and had gained less knowledge about research designs than both other groups.

An analysis of the student teachers’ characteristics (gender, age, previous education and previous experiences of carrying out and using research) did not show statistical differences, and thus provided no insights into the composition of the group in terms of these characteristics.



Table 2.8. Clusters for the five questionnaire scales

Clusters and frequencies	Attitude total (ETA SQ*: .29)		Development of attitude <sup>a</sup> (ETA SQ*: .26)		Science-oriented scale (ETA SQ*: .37)		Method-scale (ETA SQ*: .29)		Research design-scale (ETA SQ*: .59)	
	<b>M</b>	<b>SD</b>	<b>M</b>	<b>SD</b>	<b>M</b>	<b>SD</b>	<b>M</b>	<b>SD</b>	<b>M</b>	<b>SD</b>
1. 'Most' (N = 21)	3.96 **	0.46	2.63 **	0.21	4.41 **	0.33	3.95 **	0.58	3.57 **	0.51
2. 'Medium' (N = 48)	3.51 **	0.44	2.43 **	0.26	3.67	0.51	3.11	0.63	3.09 **	0.52
3. 'Least' (N = 9)	2.96 **	0.69	2.13 **	0.23	3.63	0.24	2.93	0.69	1.44 **	0.53

<sup>a</sup> The range of this scale goes from 1 to 3, the other scales from 1 to 5

\* ETA squared: proportion of variance explained by the clusters

\*\*  $p < .05$ : means are significantly different from all of the other clusters

Further analyses (one-way ANOVA with post-hoc Scheffé test) were conducted in order to investigate whether the groups of student teachers differed in how they perceived the contribution of the elements of the introductory course, and showed that there was a significant difference in the means of the three elements; the perceived contributions of 'examples from practice', 'working together in groups or pairs' and 'connecting with the rest of the curriculum' (Table 2.9). The 'most developed' group perceived all three of the aforementioned elements as contributing more to their development than the 'least developed' group.

Table 2.9. Significant differences between the groups of student teachers in terms of elements of the introductory course

Course elements	Compared groups		p
Examples from practice	'Most': M = 3.90, SD = 0.63	'Least': M = 3.0, SD = 1.0	.01
Working in groups/pairs	'Most': M = 4.29, SD = 0.64	'Medium': M = 3.58, SD = 0.71	.00
	'Most': M = 4.29, SD = 0.64	'Least': M = 3.13, SD = 0.87	.00
Connection with the curriculum	'Most': M = 2.67, SD = 0.86	'Least': M = 1.44, SD = 0.73	.00

## 2.5 Conclusions

This study investigated the perceived development of student teachers' attitude towards research and the development of their research

knowledge and skills, after participating in an introductory course in research. Overall, the student teachers perceived a positive development in their attitude towards research, especially in their opinions of the importance of research and their own capability of conducting and using research. These findings are partly in line with the results of previous studies into courses that taught student teachers about research (Dunn, et al., 2008; Gitlin, et al., 1999; Schulz & Mandzuk, 2005). Dunn et al. (2008) found that student teachers, after taking a course, described research as being equally important and planned to do it in the future themselves. Unlike this, our study showed a significant difference, as student teachers described research as more important in comparison to the extent to which they were planning on conducting research or using it in practice. The student teachers in our research also stated that research is important, but that they did not equally enjoy it or use it as a (prospective) teacher. The student teachers who were investigated by Schulz and Mandzuk (2005) had similar doubts; they had concerns about 'inquiry being a messy, risky business [...] and they wondered whether adopting an inquiry stance in the first year of teaching was realistic' (p. 327).

The student teachers also experienced a certain development of their research knowledge and skills. They perceived that they developed their knowledge and skills more in science-oriented topics and less in research methods and research designs. This difference can partly be explained by the aim of the introductory course, which was to combine the simultaneous development of attitude, knowledge and skills. The knowledge and skills of the science-oriented scale are strongly related to aspects of a positive attitude towards research. For example, knowledge and skills concerning 'critically evaluating research by others', 'the validity of research' and 'analysing and interpreting data'.

There also appeared to be differences between the elements of the introductory course in terms of their contribution to the perceived development of the student teachers. 'Working together in pairs and groups' on 'realistic tasks' derived from and supported by 'research examples from primary teaching practice' were rated as the most useful elements in the course for developing a positive attitude towards research and research knowledge and skills. These results are in accordance with previous results (Van Swet, et al., 2009; Merrill, 2002; Van Merriënboer, 1997 and 2007; Van Merriënboer & Kirshner, 2001), and these elements should be included in an introductory course in research in any institute for primary teacher education. The (lack of)

connection to the overall curriculum was the least useful element of the introductory course. If the impact of the introductory course must be increased, this element must be studied and improved upon (Burke & Hutchins, 2007). It is possible that student teachers do not yet have the overview to understand the value of this element. The elements of the course which are perceived to be the most important were rated even more highly by the student teachers who developed most over the course. Besides 'realistic tasks', the 'more developed' group of student teachers gained more from 'working together' with 'examples from practice'. The cluster analysis revealed three meaningful groups. However, the analyses concerning the differences between these groups did not provide any clues for lecturers regarding how to differentiate between these groups. Further research is necessary in order to investigate the differences between the groups in more detail.

## 2.6 Discussion

Although research by student teachers is considered to be an important part of teacher education, there are very few studies available regarding the development of student teachers' research skills, knowledge and attitude. The development of a positive attitude towards conducting and using research is an important prerequisite for student teachers to actually use research results and conduct research activities themselves as teachers (Hall, 2009; Ponte, 2002). In this study, we have presented the characteristics of an introductory course that simultaneously focussed on the development of research knowledge and skills and the development of a positive attitude towards research. The experiences of the student teachers in this course were investigated. The operationalization of the student teachers' attitude into four aspects (Ajzen & Fishbein, 2000; Bandura, 1986) may contribute to the existing body of knowledge about teachers' attitudes. The results of this study may be used to enhance the quality of research in the curriculum of teacher education.

There are some limitations of this study. The first difficulty that we encountered in interpreting the results of the questionnaire is that it was hard to set a standard for the level of development that the student teachers should have accomplished. Student teachers develop during education, but there is a question as to what level of development should be defined as sufficient, especially when it concerns an introductory course in a subject that needs to be developed over time through

iterative activities (Hall, 2009). In our follow-up study, we will conduct prior measurements at the start to be able to better determine what attitude and knowledge development student teachers have. The second problem concerns the use of the results of the cluster analyses. When the results are to be used in order to differentiate between student teachers in the course, there is a need to know what the student teachers' attitude, knowledge and skills were before and not only after the course. Knowing this information beforehand would provide opportunities to better connect with the student teachers' needs during the execution of the course. Another point we encountered regarding the clusters is the impossibility of connecting student teachers' background characteristics to the differences between the clusters. There is a need to 'recognise' the characteristics of the different groups, in order to be able to differentiate between people on the course.

Taking the information above into account, not only the necessity of a pre-test measurement, but also the sole use of a questionnaire might be reconsidered. It might be helpful to gain deeper insights into the student teachers' development in terms of attitude, knowledge and skills by investigating it in a qualitative way, because several questions remain unanswered. Why do student teachers think that research is important for them, but rate the affective and behavioural aspects of their attitude as less important? What makes them doubt about conducting and using research in practice? How do they describe the aspects of attitude towards research and why do they rate several elements of the introductory course as 'more contributing to their developments' than others? In our in-depth study, we will explore the experiences of the student teachers with the introductory course further using group interviews. The results will be used to redesign the course to contribute more to the development of student teachers' positive attitude towards research as well as their research knowledge and skills.



## Chapter 3: Student teachers' attitude towards research<sup>1</sup>

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### Abstract

This study was aimed at gaining deeper insight into student teachers' attitude towards research, and the impact of an introductory course on this attitude. Based on group interviews with student teachers, it became clear how their perceptions of research were related to their cognitive, affective, self-efficacious and behavioural aspect of their attitudes. Insight was also gained into the elements of the introductory course student teachers perceived to be responsible for positive or negative developments of these attitudinal aspects. The student teachers felt that a combination of different course elements positively influenced the development of their attitude towards research. The use of authentic research examples and opportunities for student teachers to practise authentic research tasks in pairs or groups, contributed especially positively to student teachers' attitude towards research.

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<sup>1</sup>This chapter has been submitted for publication as: Van der Linden, W., Bakx, A., Ros, A., & Beijaard, D. *Student teachers' attitude towards research*.

**Om de kansen voor acceptatie van dit hoofdstuk als artikel niet negatief te beïnvloeden is in deze weergave alleen de samenvatting weergegeven.**



## Chapter 4:

### The development of student teachers' research knowledge, beliefs and attitude<sup>1</sup>

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#### Abstract

This study reports on the development of second-year student teachers' knowledge, and changes in their beliefs and attitude regarding research during an introductory course at an institute for primary teacher education. Questionnaires and concept maps were used both before and after the course. The results showed that student teachers' knowledge about research grew during the introductory course and that their positive beliefs about research became more positive, while their negative beliefs about research decreased. A positive change was found concerning the attractiveness of research to student teachers. The results also showed that student teachers' self-efficacy regarding research was related to their beliefs and attitude: the more student teachers were convinced of their abilities to conduct and use the results of research after the course, the more positive their beliefs and their attitude regarding research. This study provides guidelines on how institutes for (primary) teacher education should integrate research activities into their curricula, so that their student teachers develop research knowledge and positive beliefs and attitudes towards research.

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<sup>1</sup> An adapted version of this chapter has been submitted for publication as: Van der Linden, W., Bakx, A., Ros, A., & Beijaard, D. *The development of student teachers' research knowledge, beliefs and attitude*.

**Om de kansen voor acceptatie van dit hoofdstuk als artikel niet negatief te beïnvloeden is in deze weergave alleen de samenvatting weergegeven.**





## Chapter 5:

### An introductory course in research: What works according to student teachers?<sup>1</sup>

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#### Abstract

Based on design principles derived from the literature, an introductory course in research for second-year student teachers at an institute for primary teacher education has been developed and executed. This study reports on student teachers' perceptions of the contribution of the design principles to their learning about conducting and using research. Four group interviews with in total 20 second-year student teachers were conducted who participated in the course. The results showed that all design principles used to underpin the introductory course had a positive influence on student teachers' learning about research, except for the principle 'integration and alignment with the overall curriculum'. The results indicate that an introductory course in research, executed in primary teacher education, should attune to student teachers' prior knowledge, concerns and conceptions, with clarity about goals and an increasing level of complexity. Next to this, worked examples and authentic learning tasks were used and performed in collaborative student groups with the opportunity to choose topics of their own interest, which was motivating for the student. When the course is executed in this way and by lecturers who are role models of 'the teacher as researcher', student teachers are motivated to learn about research, develop research knowledge and skills, and a critical attitude.

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<sup>1</sup>This chapter has been submitted for publication as: Van der Linden, W., Bakx, A., Ros, A., & Beijaard, D. *An introductory course in research: What works according to student teachers?*

**Om de kansen voor acceptatie van dit hoofdstuk als artikel niet negatief te beïnvloeden is in deze weergave alleen de samenvatting weergegeven.**

# CHAPTER 6

## **Chapter 6:**

### **The relationship between student teachers' knowledge, beliefs and attitude after having participated in an introductory course in research**

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#### **Abstract**

The aim of the present study was to explore the relations between second-year student teachers' research knowledge, beliefs and aspects of their attitude towards research after having participated in an introductory course in research executed in an institute of primary teacher education. Structural Equation Modelling was used to gain insight into the relations between these concepts. As expected, the results showed (in)direct relations of student teachers' beliefs and attitudinal aspects with their intended behaviour to conduct and use results of research. However, the model did not show relations between student teachers' beliefs and aspects of their attitude on the one hand and their knowledge about research on the other. Student teachers' cognitive attitudinal aspect, together with the positive affective attitudinal aspect and their negative beliefs about research appeared to directly relate to their intentions to conduct and use research as prospective teachers. Future research is needed to further explore the findings of this study.

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**Om de kansen voor acceptatie van dit hoofdstuk als artikel niet negatief te beïnvloeden is in deze weergave alleen de samenvatting weergegeven.**

# CHAPTER 7



## Chapter 7: Conclusions and discussion

### 7.1 Brief overview

The research object of the study described in this dissertation was an introductory course in research for second-year student teachers in an institute for primary teacher education. This introductory course was based on literature about effective teaching programmes and was adjusted after the pilot. The aim of the introductory course was not only to develop student teachers' research knowledge and skills, but also to develop their positive attitude and beliefs regarding research. In this dissertation the impact of the introductory course on these different goals was investigated, including the contribution of the elements of the course (in the second study of this dissertation mentioned 'design principles') to this. The general research question was: *What design principles of an introductory course in research in an institute for primary teacher education contribute to the development of student teachers' knowledge, skills, positive beliefs and attitude regarding research and how do they contribute?* In the two times that the introductory course was executed, different instruments were used to gain more insight in the contribution of the course to student teachers' development (chapter 2, 3, 4 and 5) and a better understanding of student teachers' attitude towards research (chapter 3). The relations between second-year student teachers' research knowledge, beliefs and aspects of their attitude towards research after having participated in the introductory course were explored by using structural equation modelling (chapter 6). In this final chapter the main findings and conclusions that could be formulated from the studies are presented and discussed. Furthermore, limitations of the studies and directions for future research are provided. The chapter concludes with some implications for practice.

### 7.2 Main findings and conclusions

#### 7.2.1 Main findings and conclusions from the pilot study

The first research question of the pilot study was:

- (a) How do student teachers perceive their development of research knowledge and skills, and change in attitude towards

research during the pilot of the introductory course, and (b) what elements of the introductory course do they perceive as contributing to this development and change?

A questionnaire was used in the pilot study to investigate student teachers' perceptions of their development of their attitude and knowledge and skills after the introductory course. The results showed that the student teachers perceived a positive development of their attitude towards research, especially regarding the importance of research (cognitive attitudinal aspect) and their own capability of conducting and using research (research self-efficacy). In comparison to their cognitive attitudinal aspect and their self-efficacy, student teachers' affective and behavioural attitudinal aspects were rated significantly less positive. Thus, although they perceived research by teachers as important, it was not attractive to them as (prospective) teachers and they did not plan on conducting research or using it in practice.

The student teachers also perceived progress in their research knowledge and skills. They perceived that their knowledge and skills in science-oriented topics were more developed than those in research methods and research designs.

According to the student teachers, the elements of the introductory course in the pilot study differed in terms of their contribution to their development. 'Working together' on 'authentic tasks' derived from and supported by 'worked examples' were rated as the most useful elements in the course for developing a positive attitude towards research and the development of research knowledge and skills.

The second research question of the pilot study was:

- (a) What are student teachers' perceptions of research and how are these related to the cognitive, affective, self-efficacious and intended behaviour aspect of their attitude towards research, and
- (b) what elements of the introductory course do they perceive as contributing to the positive change of their attitude towards research?

Based on group interviews, it could be concluded that after the introductory course in research student teachers perceived conducting and using the results of research as an important professional development strategy to improve their own capabilities as teachers and as an important means to improve lessons (cognitive attitudinal aspect). The student teachers indicated that it is attractive to them that teachers,



by conducting and using results of research, have the opportunity to learn more about specific topics of professional interest (affective attitudinal aspect). However, some student teachers also indicated that their attitude towards research stayed negative or changed in that direction during the course; they considered research to be something big, of large-scale, and hard to do alongside the teaching job, because it is time-consuming and difficult to do.

Student teachers believed in their own capabilities of conducting and using research as a teacher after the introductory course (research self-efficacy). They perceived ‘opportunities to practise more in teacher education’ as a good way to increase their research self-efficacy. Thereby, they intended to conduct and use the results of research in their future profession rather than in their ‘student phase’ (intended behaviour). They found it important to be more involved with the students and the school to be able to come up with interesting research topics.

Regarding what elements were perceived as contributing to the positive change of their attitude towards research, it can be concluded that the student teachers perceived ‘practising in authentic tasks’ as the most important. ‘The use of worked examples’ was specifically mentioned as contributing to student teachers’ cognitive aspect of their attitude. ‘Working together with other student teachers’ in combination with ‘expert feedback’ were most contributing to student teachers’ research self-efficacy. Overall, student teachers stated that these elements contributed to the development of a positive attitude towards research by increasing their insight in and appreciation of the value and applications of research in primary education.

### *7.2.2 Main findings and conclusions from the second study*

The first research question of the second study was:

Do student teachers develop research knowledge, positive beliefs and a positive attitude towards research during the (improved) introductory course in research?

From the results of the concept maps and the questionnaires that were used in a pre- and post-test design to investigate the introductory course the second time it was executed, it could be concluded that student teachers developed research knowledge, developed positive beliefs regarding research and positively changed concerning the attractiveness of research (affective attitudinal aspect) during the

introductory course. More specifically, based on the results of the pre- and post-test concept maps, it could be concluded that the student teachers developed research knowledge, specifically regarding the ‘research process’, the ‘quality of research’ and ‘research methodology’. The number of concepts regarding ‘research topics’, ‘goals and benefits of research’ and ‘participants in research’ by primary school teachers did not increase significantly. The results of the pre- and post-test questionnaire showed that student teachers’ positive beliefs about research increased and their negative beliefs decreased. Thus, it could be concluded that they changed positively in the way they perceived research as a part of the teaching job. The cognitive aspect of the student teachers’ attitude and their intended behaviour did not significantly increase and their negative affective aspect of their attitude did not decrease. However, the positive affective aspect of their attitude towards research did increase (as stated above) during the introductory course.

The second research question of the second study was:

How do student teachers perceive the importance of each design principle of the introductory course in terms of their learning about conducting and using research?

Based on the group interviews considering the specific contribution of the design principles of the introductory course, it could be concluded that all the design principles that were derived from the literature contributed in one or more ways to student teachers’ learning about research, except for the principle that prescribed integration and alignment with the overall curriculum. The student teachers perceived the design principles as contributing to their ‘motivation to learn’, ‘development of research knowledge and skills’, and/or ‘changing their critical attitude’. The way the design principles contributed to student teachers’ learning was the most diverse regarding their motivation to learn. It can be concluded that in this introductory course the following design principles accounted for the increase in student teachers’ motivation:

- they gained insight in their own development by comparing this with the development of others in discussing prior knowledge, conceptions, authentic learning tasks and peer-feedback;
- they developed a realistic view of the value and applicability of research in general and in their practice schools in particular by

getting the clarity on the goals, by discussing worked examples and performing the authentic tasks;

- providing a balance between theory and practise in each course meeting by the use of worked examples and performing the authentic tasks;
- the possibilities to learn about topics the student teachers were interested in;
- the enthusiasm and expert role model of the lecturers.

Regarding student teachers' perceptions of the way the design principles contributed to their knowledge development, it can be concluded that the student teachers needed:

- the instruction and discussion with other student teachers to know what was important;
- the tasks to discover what they had understood from the instruction;
- the cooperation with other student teachers to discover and process new knowledge;
- the evaluation and (peer) feedback as confirmation of their developments.

The student teachers' critical attitude changed mostly when they were (constantly) forced to underpin their opinions with valid arguments.

The third research question of the second study was:

What and how are the relations between student teachers' beliefs about research, their cognitive, affective and self-efficacy aspect of their attitude towards research, their level of research knowledge and their intention to conduct and use research?

Based on the correlation analyses of the questionnaire between student teachers' research self-efficacy and their beliefs and aspects of their attitude towards research, it can be concluded that the more student teachers at the end of the introductory course were convinced of their ability to conduct and use the results of research (research self-efficacy), the more positive their overall beliefs and their attitude were towards research, and the more positive their intention to conduct and use research in practice was. Based on the analysis by structural equation modelling it can be concluded that positive beliefs, the cognitive attitudinal aspect and research self-efficacy were positively related to student teachers affective attitudinal aspect. Thus, the more positive beliefs about research a student teacher had, the more (s)he thought

research to be important (cognitive attitudinal aspect) and the more a student teacher judged him/herself to be capable of conducting and using research, the more attractive (s)he perceived research (positive affective attitudinal aspect). Thereby, the more student teachers were convinced they could conduct and use research after the course (research self-efficacy), the less negative their affective aspect of their attitude was. It could also be concluded that student teachers' cognitive aspect of their attitude had the strongest relation to their intended behaviour. Thus, the more a student teacher thought about research to be important for a teacher and the less (s)he had negative beliefs about research, the more (s)he intended to (learn more about to) conduct and use research.

### 7.2.3 *General conclusions*

The main findings and conclusions of the studies provided specific insight in what and how design principles of the course contributed to student teachers' development of research knowledge, skills, beliefs and attitude regarding research. The design principles that were derived from the theory about effective teaching programmes, were empirically tested in the context of an introductory course in research for second-year student teachers. The theoretical underpinnings and empirical results regarding each design principle are displayed in Appendix 1.

In general it can be concluded that it is possible to develop an introductory course in research for student teachers that succeeds in developing research knowledge and skills, together with positively changing their beliefs and attitude regarding research, even in an institute for primary teacher education with a lack of research culture. Resuming the design principles and their operationalizations in the course meetings, there seem to be two major characteristics such an introductory course needs to have. Firstly, in the introduction of research (and probably in the introduction of all topics that are not generally connected to the teaching job), it is crucial to use practical research examples that are embedded in teachers' daily practice as much as possible. Not only worked examples and authentic learning tasks of research by teachers appeared to be valuable for student teachers' learning about research, but also making clear that research knowledge and skills are valuable in the daily teaching job (in for example analysing students' learning gains, or constructing a valid test). Secondly, student teachers appreciated the 'inquiring' set up of the meetings, which means that they were stimulated to express their prior knowledge and

conceptions, discuss about their opinions and ‘forced’ to underpin their opinions with valid arguments. According to the student teachers, this research culture in the meetings not only contributed to their knowledge and skills development, but also to the development of a critical attitude and their insight in the value and applicability of research for their future teaching practice. Lecturers in institutes for teacher education that are responsible for designing and the execution of courses in research should on the one hand be experts in practitioner research in the educational field and on the other hand be able to translate this expertise to a ‘researching/inquiry’ environment in the course meetings.

### 7.3 Discussion

#### *7.3.1 Educational design research as a means to develop an introductory course in research*

This study can be positioned in the tradition of educational design-research. Educational design-research can be considered as a means to increase the relevance of research for educational practice, and to develop empirically grounded theories by the combined study of both the process of learning involved and the ways that support this process (Van den Akker, et al., 2006). The broad definition of this kind of research by Barab and Squire (2004) encompasses most of the variations of educational design research: ‘a series of approaches, with the intent of producing new theories, artefacts, and practices that account for and potentially impact learning and teaching in naturalistic settings’ (p. 2). Following Barab and Squire (2004), Cobb, Confrey, diSessa, Lehrer, & Schauble (2003), Plomp and Nieveen (2010), The Design-Based Research Collective (2003), and Van den Akker et al. (2006), the following characteristics of educational design research can be mentioned: the research aims at designing (based on theoretical propositions), understanding and improving an intervention in the real world, incorporating a cyclic approach of designing, evaluation (based on multi-method measurements matching to the goals of the intervention) and revision, whereby researchers and actors from practice (mostly teachers) collaborate. Its merits are measured by its practicality for users in real contexts and its contribution to theory building by field testing the design (i.e., the intervention).

Against the background of these characteristics, it can be stated that both the research approach and the design of the study in this

dissertation fit an educational design-based research. The focus was on designing an introductory course (the intervention) in an institute for primary teacher education (the real world). The process of designing was based on elements or design principles derived from the literature (theoretical propositions), the course was executed twice, evaluated and improved based on the analysis of quantitative and qualitative data collected by using different methods to gain insight in student teachers' development as well as in which design principles and how these principles contributed to this development. Finally, the study provided a set of theoretically and empirically grounded design principles (theory building) and an introductory course in research that was theoretically underpinned and proven to be effective in practice.

One specific characteristic of design research that must be discussed here, is that one of the researchers (and author of this dissertation) was also (one of) the designer(s) of the course, as well as one of the lecturers. This procedure has some advantages (for example, being engaged in all the cyclic phases of research and developments makes it possible to connect the relevant theory and the specific practice in teaching and learning situation (s)he is familiar with), but entails also some risks. By taking the measures mentioned below, we anticipated on possible role conflicts that might have occurred (Plomp & Nieveen, 2010). Firstly, all steps in designing and executing the course as well as the collection and analysis of the data were discussed by a research team of four people (the author of this dissertation and three other researchers). Secondly, to increase the quality of the data multiple research methods were used (quantitative and qualitative), as well as checks on the reliability of the data processing (for example, through determining inter-rater reliability) and their validity (for example, through discussing research results and suggestions for improvements with two other lecturers involved next to discussions with the other members of the research team as mentioned above). Thirdly, in different settings, research results and experiences from the introductory course were presented and discussed with other practitioners' and scientific researchers in the field of teacher education.

Overall, it can be stated that design-based research with the above described characteristics was an appropriate approach to investigate the central problem statement of this study. This approach provided the possibility to directly change course elements in the educational practice and determine what the results were of these changes in close cooperation with other researchers and lecturers. These

kind of processes in the ‘real world’ are often hard to accomplish (Van der Akker, et al., 2006), because the educational practice is complex and its ‘practical’ culture is persistent, especially when beliefs and attitudes are at stake.

### *7.3.2 Student teachers’ beliefs and attitudes regarding research*

Not only the introductory course itself evolved throughout the studies of this dissertation, this also pertained to the content, understanding and contribution of the concepts of student teachers’ beliefs and attitude regarding research. Based on the assumption that student teachers’ beliefs and attitudes strongly influence their (intentions to perform a behaviour (Ajzen, 2001; Bransford & Johnson, 1972; Merrill, 2002; Pajares, 1992; Vosniadou, et al., 2001) and the questions that arose from the results of the pilot study (chapter 2), it increasingly became clear how this student teachers’ attitude towards research and beliefs regarding research could be understood, how these concepts influenced their intentions to conduct and use research and how student teachers’ beliefs and attitudes could be positively changed. The operationalization of the student teachers’ attitude into four aspects (inspired by Ajzen, 2001; Ajzen & Fishbein, 2000; Bandura, 1995 and 1997; Eagly & Chaiken, 1993) appeared to be an appropriate distinction to investigate this attitude more specifically. Student teachers were able to describe in detail why they thought research is important for them as prospective teachers (cognitive attitudinal aspect), why conducting and using research is attractive to them (positive affective attitudinal aspect), what it makes less attractive (negative affective attitudinal aspect), what their research self-efficacy is and what their intentions are regarding conducting and using results of research. Furthermore, student teachers appeared to be able to describe in detail what design principles contributed to positive changes in their attitudinal aspect towards research. These results may add to the existing body of knowledge about teachers’ attitudes, specifically their attitudes towards research. Insight in how teachers’ attitudes towards research can be influenced is important because these attitudes, as with student teachers, influence teachers’ intentions to conduct and use research in practice and can be assumed to be a precondition for achieving a research culture in the schools. It could also be valuable to transfer our operationalization of attitude to other settings where teachers’ attitudes are at stake. For example, there is a growing consensus that educational innovations are deemed to fail if teachers’ cognitions, including their beliefs, intentions, and attitudes are

not taken into account (Trigwell, Prosser, & Taylor, 1994; Verloop, Van Driel, & Meijer, 2001). The results of this dissertation indicate that it might indeed be useful to consider teachers' beliefs, their cognitive and affective attitudinal aspect and self-efficacy regarding innovations when investigating educational innovation processes and the ways these can be optimized.

### *7.3.3 Teachers as researchers or teachers with research knowledge, skills and a positive attitude towards research?*

The common opinion is that primary school teachers do not need to be fully trained in conducting scientific research (e.g., Berger, et al., 2005; Cochran-Smith & Lytle, 1999). In work by Dewey (1929), Stenhouse (1975), and Schön (1983), teachers who are involved in research are more seen as practitioners who critically review and systematically try to improve their teaching practice than actually researchers who, for example, aim at generalizable and theory-oriented results. The different ways research by teachers is defined and the many characteristics that are given to approaches as 'teacher research', 'self-study research', 'action research', and 'practitioner research' make the discussion diffuse about what is actually meant by conducting research by teachers or what it aims at.

One of the benefits of teachers conducting research is nowadays described in terms of teachers who are able to provide own evidence of what works in their teaching practice and how it works (e.g., Cordingley, 2003). However, we think conducting research that meets scientific standards is very difficult and therefore not easy for teachers, even if they have followed courses in research. Teacher research can even be risky if teachers are convinced of being able to provide evidence of what works and how it works, but base this on their small sampled, not well-operationalized, and non-generalizable examples of 'research' that are insufficiently grounded in existing research literature. Such research might even be contra-productive. It is good to be aware of the quality criteria that are generally important for conducting research, also by teachers. It is not realistic to think that teachers in schools need to possess the same knowledge and skills as scientific researchers, but they must at least be able to understand, interpret and critically review results of research, apply it to their practice and have a critical attitude towards their own teaching. Nevertheless, teachers should be able to apply several basic research skills pertaining to the collection and analysis of data in practice. The emphasis of research activities in teacher education



institutes needs be on teaching prospective teachers how to conduct and use research from that perspective, and less from the ‘scientific researcher’ perspective.

#### **7.4 Strengths, limitations and directions for future research**

The studies described in this dissertation have their strengths and limitations. One of the strengths is that a multi-method approach has been used to answer the research questions. Quantitative (questionnaires and concept maps) and qualitative (group interviews) research methods were used, not only for directly answering the research questions, but also for optimizing the research methods that were used in the follow-up studies (for example, the results of the first round of group interviews were used to better adapt the beliefs and attitude items to student teachers’ frame of reference in the questionnaire that was used in the second study). Another strength is that gaining insight in the contribution of the introductory course to student teachers’ development was combined with gaining more insight in student teachers’ attitude towards research (and partly student teachers’ beliefs about research).

Besides these strengths the studies have also some limitations. A first limitation pertains to the generalizability of the results. The findings of the studies presented in this dissertation are all based on two cohorts of second-year student teachers from one institute for primary teacher education in the Netherlands. The institute for primary teacher education where the studies were situated, has a problem-based learning approach and, through that, a socio-constructivist perspective on learning (Simons, Van der Linden, & Duffy, 2000). Student teachers are encouraged to construct their own knowledge in realistic situations and in collaboration with each other. Two of the main goals of the problem-based learning pedagogy are to help students to develop problem solving skills and self-directed learning (e.g., Hmelo-Silver, 2004). It can be expected that the second-year student teachers were to a certain level familiar with problem-solving tasks prior to participating in the introductory course. This could have influenced and even strengthened their positive attitude towards research (as a problem solving and knowledge developing method). Although on both times that the course was executed, measurements showed that student teachers’ research knowledge developed (chapter 2 and 4), it can be questioned how student teachers in an institute for teacher education with another pedagogy would have

developed. In line with Nieveen et al. (2006) we suggest to further research the impact of our introductory course in a wider context, thus testing our design principles in other institutes for primary teacher.

A second limitation relates to the fact that the groups of student teachers who participated in the course and the subsequent studies were not very large, especially the number of student teachers who participated in the group interviews. In addition to the suggestion for further research mentioned above, it might be useful to investigate the impact of our course on a larger scale, including comparing subsamples of participants from different contexts. Thereby, only the introductory course for second-year students is involved in the studies. It would be very useful to investigate student teachers' intentions about conducting and using research in the rest of the curriculum provided in the students' third and fourth year and beyond. Insight is needed in how their research knowledge, skills and beliefs and attitudes towards research further develop, and what student teachers do with these capabilities in practice. This could provide extra clues on how to introduce research in the curriculum and it should give insight in how to implement research activities in the other years of the curriculum.

A third limitation pertains to the kind of data collected and the way they were collected. The focus of the measurements in the studies in this dissertation was mostly on student teachers' perceptions of their development (chapter 2) and the way the introductory course contributed to this development (chapter 2, 3 and 5). It is a fact that in educational design-based research learners are seen as the most valuable source of information regarding the effects of the interventions (Van den Akker, et al., 2006). However, it would be interesting to use (also) instruments that are less depending on student teachers' subjective perceptions such as observations of video-taped course meetings and more indirect analyses of student teachers' products or results of assignments. In addition, the student teachers' knowledge development was measured by using concept maps. It might be considered to study this method of knowledge measurement more closely. Like in the study by Koopman et al. (2011), the concept map method for measuring student teacher knowledge development appeared to be useful. In their study, however, it also appeared to be difficult to relate the results of the knowledge measurement to other variables in a structural model, although they had a much larger sample of over 400 participants. The option of measuring research knowledge both with concept maps and another instrument at the same time (for example, a knowledge test)

could provide more specific insight in the value and applicability of the results of concept maps.

The studies in this dissertation focused on the contributions of the introductory course in research on student teachers' research knowledge, skills, beliefs and attitude, but the process during the course meetings is not the only influence on student teachers' learning about research. A last limitation to be mentioned here might be the lack of a control group; consequently the impact of other influences than those intended by the course could not be excluded. It would be interesting to more explicitly investigate the influence of for example experiences in practice schools, different approaches of lecturers in teacher education etcetera on the contributions of an introductory course in conducting and using research.

## 7.5 Implications for practice

The findings of the studies in this dissertation indicate it is important to introduce research in an early stage of a curriculum of an institute for primary teacher education and that besides paying attention to knowledge and skills development, student teachers' beliefs and attitude must be taken into account. Such an introductory course must be embedded in teachers' daily practice as much as possible by using worked examples and authentic learning tasks and have an 'inquiry' set-up of the course meetings (mostly by discussing prior knowledge and conceptions and performing tasks in cooperation with other student teachers; see for more details Appendix 1). Institutes for teacher education should adapt these findings into their research activities that mostly consist of limited courses on research knowledge and skills, not embedded in educational practice. The design principles might also be applicable in other contexts, like other institutes embedded in universities of applied sciences that also have no or little experience with research activities in their curriculum.

Another important implication for practice is that, if we want student teachers to really become competent in conducting and using research, just paying attention to research in an introductory course is not enough (Hall, 2009; Ponte, 2002). On the one hand, attention should be paid to how in the rest of the curriculum valuable research activities can be implemented in a way that student teachers have the opportunity to practise and refine their research knowledge and skills. On the other

hand, attention needs to be paid to the ‘research culture’ in the entire curriculum of the institutes for teacher education and in primary schools as well. It is known that teachers in primary education as well as lecturers in teacher education often fail to be a role model as teacher researchers (Anderson & Herr, 1999; Alcorn, 2006; Gemmell, Griffiths, & Kibble, 2010). This could very well influence student teachers’ beliefs and attitudes regarding research before, but also in the years after the introductory course. When examples of research by lecturers in teacher education institutes and by teachers in primary schools are scarce, and opinions about the value and applicability in these venues continue to be rather negative, student teachers’ positive intentions towards conducting and using research will most likely decrease. Initiatives to gain insight in how paying attention to research activities in teacher education can be optimized, like the study in this dissertation, seem to increase in Dutch universities of applied sciences, and in primary schools as well. The same pertaining to the attention being paid to lecturers’ and teachers’ research skills development. One of the implications for practice from the study in this dissertation could be to redesign the introductory course for practicing primary school teachers and lecturers in teacher education in a way that they develop the same important elements as the student teachers: positive beliefs and a positive attitude towards research and the knowledge and skills to conduct and use research. Another development that could improve the research culture at schools is the professional development school, in which researchers, lecturers from teacher education, primary school teachers and student teachers collaborate in research projects and at the same time develop teachers’ and teacher students’ research knowledge, skills and attitude. Results of studies on the process and outcomes of Dutch professional development schools are promising, but also showed that more effort is needed to achieve all goals of these research projects (Windmuller, 2012; Vrijnsen-de Corte, 2012).

Finally, the results of both studies in this dissertation showed that the second-year student teachers preferred learning in an ‘inquiry’-environment that was focused on strategies to develop own knowledge regarding topics of own interest. They perceived the course meeting set-up as contributing to the development of knowledge and a critical attitude. Lecturers in teacher education must be aware of this preference and adapt their course meetings to these findings. They need to become a role model of a critical, almost provocative teacher, who provides insight to the student teachers in what way (s)he uses (results of) research

in their teaching and stimulates student teachers to always underpin their opinions with valid arguments.



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## Appendix

Table 1.1. Design principles, intended effects, operationalizations from the introductory course and contributions according to the results of the studies

Design principles	Intended effects according to the literature	Operationalizations	Contributions to student teacher learning from results of studies in this dissertation
Student teachers' prior knowledge, concerns and conceptions	Lecturers need to activate and attune to the student teachers' prior knowledge (e.g., Bransford & Johnson, 1972; Merrill, 2002). By doing that, chances increase for new knowledge to be understood and memorized. The possibility to plenary discuss student teachers' concerns and interests and attuning to these, increases student teachers' engagement in their own learning process (Merrill, 2002). This also provides the opportunity to clarify linkages between theory and practice (which stimulates transfer of theoretical concepts towards acting in educational practice). Paying attention to student teachers'	<ul style="list-style-type: none"> <li>- Every meeting started by asking what the student teachers knew about certain subjects and/or what they remembered from the past meetings.</li> <li>- The student teachers discussed their opinions and conceptions about research every time new subjects occurred, tasks needed to be executed and evaluated, or at any time any student teacher felt the need to do this (for example by explaining prior knowledge to each other, by discussing the different feasibilities of research topics or aspects of research they observed in their practice schools).</li> </ul>	<p>Results from chapter 5:</p> <ul style="list-style-type: none"> <li>- Knowledge and skills development</li> <li>- Increases student teachers' motivation</li> <li>- Critical attitude development</li> </ul>

	conceptions is necessary to be able to observe and change misconceptions, as well as using their prior conceptions to integrate new knowledge more easily (Vosniadou et al. 2001; Wubbels, 1992).		
Clarity of goals and values	It must become obvious to the student teachers what the goals and benefits are of research activities in their teacher education (Ponte, 2002) and that these activities are a valuable part of the daily teaching job (Lee & Pucil, 1998). The main goals of the entire course and the goals per course meeting need to be clear (Black & William, 2009; Merrill, 2002) and student teachers need to know what the criteria and standards to achieve these goals (Hattie & Timperley, 2007; Marzano, Pickering, & Pollock, 2001). When student teachers understand and appreciate the value of the goals of a course, perceive ownership on their own learning process and know what they need to achieve, their motivation to learn and the development of knowledge and	<ul style="list-style-type: none"> <li>- At the beginning of the introductory course, the student teachers were informed that they are learning about research in this early phase of their teacher education so that they have the opportunity to: (1) practise research in their teacher education, (2) use research as a tool for gaining knowledge in their teacher education, and (3) gain more from other research tasks in the rest of the curriculum.</li> <li>- Every course meeting started with informing the student teachers about the goals of the meeting and the activities they were about to perform to achieve these goals;</li> <li>- Every meeting ended with an evaluation where student teachers were asked to reflect on the degree</li> </ul>	<p>Results from chapter 5:</p> <ul style="list-style-type: none"> <li>- Knowledge and skills development</li> <li>- Increases student teachers' motivation</li> </ul>

	skills will increase.	of their goal achievement; this was discussed plenary.	
		- During the introductory course, the student teachers experienced the links between teaching activities and research activities by, for example, measuring and analysing pupil learning outcomes and collecting and analysing data in research, but also by examples from teachers and student teachers (in personal or in short digital presentations).	
Worked examples	‘Worked examples’ should be used (Sweller, Van Merriënboer, & Paas, 1998). When worked examples of research by (student) teachers are used in discussions or tasks, student teachers develop a realistic view on what research is and what they have to know and to be able to, for conducting research. In this way, the chances increase that student teachers recognize and appreciate the value and applicability of research and get motivated to learn more about it.	- In the introduction of research, compact research reports of (student) teachers were studied and discussed by the student teachers to get acquainted with the sequence of phases in research and what the different phases contained.  - Worked examples were used as tasks (see: authentic learning tasks) and ways to elicit discussion (by questioning the choices the	Results from chapter 2: - Developing knowledge, skills and a positive attitude towards research  Results from chapter 3: - Positively changing student teachers’ attitude towards research  Results from chapter 5:

		<p>researchers in the examples had made).</p> <ul style="list-style-type: none"> <li>- Worked examples were also used to explain and illustrate the applicability and value of research (see previous principle).</li> </ul>	<ul style="list-style-type: none"> <li>- Knowledge and skills development</li> <li>- Increases student teachers' motivation</li> <li>- Critical attitude development</li> </ul>
Authentic learning tasks	<p>Authentic tasks should be used (Korthagen, Loughran, &amp; Russell, 2006; Van Merriënboer, 1997). Authentic tasks promote transfer of knowledge and skills from theory to practice (Simons, 1990). Student teachers get motivated when they develop knowledge and skills that are directly applicable in their teaching practice (Janssen-Noordman &amp; Van Merriënboer, 2002).</p>	<ul style="list-style-type: none"> <li>- Worked examples were translated to authentic learning tasks to introduce and practise the different phases of the research process. For example, when the student teachers read and discussed some research reports of primary school teachers, they needed to perform a task where they had to plan and motivate methodological choices for answering research questions from a fictional research case (derived from a worked example). Another example (see also the principle about the increasing complexity below) is that the student teachers, after getting to know the</li> </ul>	<p>Results from chapter 2:</p> <ul style="list-style-type: none"> <li>- Developing knowledge, skills and a positive attitude towards research</li> </ul> <p>Results from chapter 3:</p> <ul style="list-style-type: none"> <li>- Positively changing student teachers' attitude towards research</li> </ul> <p>Results from chapter 5:</p> <ul style="list-style-type: none"> <li>- Knowledge and skills development</li> <li>- Increases student teachers' motivation</li> </ul>

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conclusion and discussion section from other examples of research reports, performed a task where they needed to complete a research report in which these sections were left out. In the evaluation, the original conclusions and discussion were compared to the ones of the student teachers and differences were discussed.

- Other authentic tasks needed to be performed in the practice schools of the student teachers to increase their perceptions of the applicability and value of research and the role research activities play in the daily teaching job (for example, by interviewing their mentor or observing the way their mentor collected data on pupils' developments).

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Increasing complexity throughout the	By designing the course in a way that the degree of complexity of instruction and tasks increases over	-	To decrease the level of complexity, the research activities in the course were always closely	Results from chapter 3: - Positively changing student teachers'
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course	<p>time, student teachers have the opportunity to get used to and practise new knowledge and skills without getting frustrated when this is too hard or complicated (Merill, 2002; Reigeluth, 1999). Attuning the difficulty of the course to student teachers' level of development increases the chance that they develop their self-efficacy, which has a positive effect on their motivation to learn and develop more (Bandura, 2001; Ryan &amp; Deci, 2000). It is important that, in case of a complex learning process like learning to conduct research, student teachers have the opportunity to experience the whole process several times. By using "backward chaining" methods in completion problems (Van Merriënboer &amp; Kirschner, 2007; Van Merriënboer &amp; Krammer, 1987), they can practise conducting research in small steps, with constantly maintaining overview on the whole research process. Student teachers have the opportunity then to get used</p>	<p>related to the teaching practice (see principles above) and in that way recognizable for the student teachers. Also, the start of the course was dominated by topics regarding research activities that were closely related to the daily teaching practice. From that kind of activities (like designing tests for pupils or analysing pupil-scores), topics as reliability and validity were introduced. Then, the whole process of conducting research was introduced using worked examples.</p> <ul style="list-style-type: none"> <li>- The worked examples of research used at the beginning of the course were less extensive and complicated in terms of the methods and/or design than those which were used later on in the course.</li> <li>- Completion tasks (as described above with 'authentic learning tasks') were used to practise writing a conclusion and discussion, analysing data,</li> </ul>	<p>attitude towards research</p> <p>Results from chapter 5:</p> <ul style="list-style-type: none"> <li>- Knowledge and skills development</li> <li>- Increases student teachers' motivation</li> </ul>
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	to the research process several times, without having to conduct research themselves each time. This has a positive effect on student teachers motivation as well as on their developments (step by step they can develop knowledge and skills and experience the relevance of the different research phases).	planning and describing a method section and for practising the formulation of research questions. This sequence was used so that the student teachers could use knowledge and skills they developed in previous tasks.	
Opportunities to choose	There should be opportunities for student teachers to choose subjects or topics that are connected to their urgent concerns (Ryan & Deci, 2000). This increases student teachers' motivation for learning, because they experience more autonomy in their own learning process.	<ul style="list-style-type: none"> <li>- Most of the authentic learning tasks consisted of several examples of research reports that differed from the main topic and problem statements. Student teachers were allowed to choose the topic of the task that was closest to their interest.</li> <li>- Student teachers had also the opportunity to choose with whom they wanted to perform or discuss their tasks.</li> </ul>	<p>Results from chapter 5:</p> <ul style="list-style-type: none"> <li>- Increases student teachers' motivation</li> </ul>
Collaborative methods for student learning	Student teachers should have the opportunity to work together in pairs or groups in which they feel free to elaborate on their ideas or new	<ul style="list-style-type: none"> <li>- All tasks during meetings or outside of meetings were performed in collaborative pairs or groups.</li> </ul>	<p>Results from chapter 2:</p> <ul style="list-style-type: none"> <li>- Developing knowledge, skills and a positive attitude</li> </ul>

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perspectives (Korthagen, Loughran, & Russell, 2006) and give and receive different kinds of feedback to and from different participants in a structured way (Hattie & Timperley, 2007; Van Swet, Roosken, Ansems, Siebelink, & Den Hartog, 2009). They learn from each other by working together on performing tasks, because student teachers relate to each others' situation (they have more or less the same expertise regarding research, they need to perform the same task and experience the same 'struggle') (Hawley & Barnard, 2005; Korthagen, Loughran, & Russell, 2006). Another intended effect is that, in this way, student teachers get prepared for and become better in working together with colleagues in their later practice (Galesloot, Koetsier, & Wubbels, 1997). Conducting research in cooperation with colleagues is one of the characteristics of teacher research (e.g., Ponte, 2002). By stimulating

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- After performing the tasks, the student teachers needed to provide spoken or written feedback on two tasks performed by their fellow students and discuss the feedback they had given to and received from each other. The student teachers received instruction how to give feedback and forms were constructed on which they could write down their feedback.
- In all group meetings, explaining student teachers' opinions and conceptions was constantly encouraged and discussed.

towards research

Results from chapter 3:

- Positively changing student teachers' attitude towards research

Results from chapter 5:

- Knowledge and skills development
- Increases student teachers' motivation
- Critical attitude development



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student teachers to give structured feedback to each other during instruction and in executing and evaluating the tasks, student teachers have the opportunity to learn from each others' experiences, the way other student teachers underpin their arguments and develop a critical attitude (Van Swet, Roosken, Ansems, Siebelink, & Den Hartog, 2009). Effective feedback provides insight in what a learner has achieved and how the unreached goals can be achieved (Hattie & Timperley, 2007). Peer feedback is commonly more accessible and approachable, and is in this way very valuable combined with lecturers' feedback.

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Integration and alignment	<p>The introductory course needs to be an integral part of and in alignment with the overall curriculum of the institute for teacher education (Burke &amp; Hutchins, 2007). The more curriculum activities are integrated and aligned, the more the chances increase of student teachers developing knowledge and skills</p> <ul style="list-style-type: none"> <li>- Topics or tasks from the regular curriculum were used in the course meeting where relevant. For example, student teachers had to observe children with learning difficulties, and the way to do this properly was discussed in the course meetings.</li> <li>- Research-related tasks from the</li> </ul>
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	<p>better (Garet, Porter, Desimone, Birman, &amp; Yoon, 2001; Van Veen, Zwart, Meirink, &amp; Verloop, 2010).</p> <p>regular curriculum were used and discussed in the course meetings. For example, when student teachers investigated teaching methods and materials or had to observe pupils in schools, the way to do this systematically was discussed.</p> <ul style="list-style-type: none"> <li>- The institute of primary teacher education in which the introductory course was executed, has a socio-constructivist perspective on learning. Learners are encouraged to construct their own knowledge in realistic situations together with others (Simons, van der Linden, &amp; Duffy, 2000). The introductory course was designed in alignment with these principles (see ‘worked examples’, ‘authentic learning tasks’ and ‘collaborative methods for student learning’ for example).</li> </ul>	
Lecturers’ role model	<p>Besides facilitating what has been stated above, the executing lecturers should be a role model of a teacher as</p> <ul style="list-style-type: none"> <li>- The executing lecturers had expertise on educational research and were enthusiastic about and</li> </ul>	<p>Results from chapter 3:</p> <ul style="list-style-type: none"> <li>- Positively changing student teachers’</li> </ul>

<p>researcher (Korthagen, Loughran, &amp; Russell, 2006). By performing in this way, the chances increase for student teachers to develop the same intended attitude towards research ('modelling'; e.g., Merrill, 2002).</p>	<p>convinced of the importance of teaching student teachers how to conduct and use research.</p>	<p>attitude towards research*</p>
	<p>- The lecturers participated in group discussions in a way that they questioned student teachers' remarks, comments and answers so that the student teachers were forced to underpin their statements with valid arguments.</p> <p>- The lecturers were at all time receptive for student teachers' questions, comments and opinions.</p> <p>- The lecturers audio-taped the course meetings to be able to compare their teaching and interpret differences in student teachers' developments. This was explained to the student teachers.</p> <p>- All meetings were evaluated with the student teachers at the end of the meeting. Directly afterwards</p>	<p>Results from chapter 5:</p> <p>- Increases student teachers' motivation</p> <p>- Critical attitude development</p>

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the two lecturers evaluated the meetings based on their and the student teachers' perceptions (supported by the audio-tapes). Where necessary direct improvements were made in the next meetings (for example, tasks were attuned to student teachers' prior knowledge or concerns at that moment). Comments on improvements for next year were listed. Improvements were communicated to the student teachers in the next meeting.

- The aim and design of the pre- and post-test measurements that were done to determine student teachers' developments, were also explained to the student teachers and used as examples of research methods.

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\*The lecturers' role model was described in 'expert feedback' by the student teachers

## Summary

### **A design-based approach to introducing student teachers in conducting and using research**

In the Netherlands, teaching student teachers how to conduct and use results of research is the responsibility of institutes for teacher education. The context of the study in this dissertation is an institute for primary teacher education, embedded in a university of applied sciences. In many of these institutes several difficulties emerged regarding the development and implementation of research activities, mostly caused by a lack of research tradition and research culture in these venues. In addition, the majority of (student) teachers have misconceptions and negative opinions about the usability and usefulness of research in education. Evidence regarding the ways student teachers can be taught and motivated to conduct and use results of research in their (future) teaching practice is scarce, especially in the context of education for primary school teachers.

#### *Background of the study*

It is important to change student teachers' beliefs and attitudes towards research, because these strongly influence their intention to conduct and use results of research. Especially the introduction of research, early in the curriculum, might be of crucial importance for the student teachers' development of positive beliefs and a positive attitude towards research. That is why this study focussed on *the introduction of research in the curriculum of an institute for primary teacher education* in such a way that second-year student teachers develop:

- positive beliefs about research, so that they learn to appreciate the value and applicability of conducting research and using results of research for improving teaching practice;
- a positive attitude towards research, in the sense that they learn to perceive research as important and attractive and intend to conduct and use research as a teacher;
- research knowledge and skills that enable them to conduct research and use the results of research as a teacher.

In this study beliefs are conceived of as cognitions consisting of a mix of generalizations, rules of thumb, expectations, values and opinions grouped in a more or less structured way. Beliefs are strong predictors of

behaviour, in this study, thus, pertaining to student teachers conducting research and using results of research. Student teachers' attitude towards research has been operationalized in this study by four attitudinal aspects described as follows: (1) *the cognitive aspect*, referring to the fact that student teachers need to understand and perceive the possibilities of conducting and using research as important for them as prospective teachers; (2) *the affective aspect*, concerning the need for student teachers to enjoy and be attracted to conducting and using research as prospective teachers; (3) *the self-efficacious aspect*, indicating student teachers' positive judgement about being able to conduct and use research as teachers in practice; and (4) *the intended behaviour*, thus when a student teacher plans to conduct or use the results of research or wishes to learn more about it. Finally, when student teachers need to conduct and use the results of research, they need to develop specific knowledge and the skills referring to:

- the goals and benefits of research for their functioning as a teacher;
- the kind of research topics that are suitable for teachers;
- the research process for conducting research and the different phases of research, consisting of the translation of relevant topics via proper problem analyses into research questions, the choice of an appropriate research design and methods for the collection and analysis of data;
- the criteria for research quality and the consequences of these criteria for their own research;
- reporting research results in such a way that colleagues in education get a clear view of the process, the results and the practical implications of the research.

#### *Aim of the study and research questions*

The study focussed on the introduction of research to student teachers in primary teacher education. The aim was to generate a set of theoretically and empirically grounded design principles that underpin an introductory course that contributes to student teachers' development of research knowledge and skills, as well as positive beliefs and attitudes regarding research. A design-based research approach was used in order to gain insight in how these knowledge, skills, beliefs and attitudes towards research could be taught effectively. A literature study was done aiming at formulating design principles that in theory positively influence student teachers' learning about research, followed by an operationalization of these principles into concrete starting points for the

introductory course in research. The course was executed and investigated twice: in a pilot study and a study one year later. The main research question of this dissertation was:

*What design principles of an introductory course in research in an institute for primary teacher education contribute to the development of student teachers' knowledge, skills, positive beliefs and attitude regarding research and how do they contribute?*

The main research question was divided into the following five more specific research questions. Research questions of the pilot study:

1. (a) How do student teachers perceive their development of research knowledge and skills, and change in attitude towards research during the pilot of the introductory course, and (b) what elements of the introductory course do they perceive as contributing to this development and change?
2. (a) What are student teachers' perceptions of research and how are these related to the cognitive, affective, self-efficacious and intended behaviour aspect of their attitude towards research, and (b) what elements of the introductory course do they perceive as contributing to the positive change of their attitude towards research?

Research questions of the second study:

3. Do student teachers develop research knowledge, positive beliefs and a positive attitude towards research during the (improved) introductory course in research?
4. How do student teachers perceive the importance of each design principle of the introductory course in terms of their learning about conducting and using research?
5. What and how are the relations between student teachers' beliefs about research, their cognitive, affective and self-efficacy aspect of their attitude towards research, their level of research knowledge and their intention to conduct and use research?

### *Pilot study*

In this first study, a questionnaire was used to gain insight in student teachers' (N = 81) attitude towards research after having participated in the introductory course, and their perceptions of the development of their attitude, knowledge and skills during the course (see chapter 2). For gaining more insight in how the course elements

contributed to student teachers' development, questionnaire items were used about which elements student teachers perceived to be the most contributing.

According to the student teachers, the introductory course contributed to the development of both a positive attitude towards research and research knowledge and skills. The questionnaire results showed a significant difference in the perceived development of aspects of student teachers' attitude towards research. Student teachers described research as more important (cognitive attitudinal aspect) in comparison to the extent to which they would plan to conduct research or use research results in practice (intended behaviour). The student teachers also stated that research is important, but that they did not equally enjoy conducting or using it as a (prospective) teacher (affective attitudinal aspect). Concerning the development of their research knowledge and skills, student teachers perceived more development in science-oriented topics (like criteria of quality for research and the selection of reliable literature) and less in research methods and research designs. The different elements of the introductory course did not contribute to the perceived development of the student teachers in the same way. 'Working together in pairs and groups' on 'realistic tasks' derived from and supported by 'research examples from primary teaching practice' were rated as the most useful elements in the course for developing a positive attitude towards research and research knowledge and skills.

From the results of the questionnaire in the pilot study, questions arose about student teachers' attitude towards research, i.e., what this attitude comprised and how student teachers could develop a positive attitude towards research (see chapter 3). Six group interviews with (a total of 29) student teachers were conducted to determine what student teachers' views were on the cognitive, affective and self-efficacious aspects of their attitude and their intended behaviour towards research, and what elements of the course contributed positively to these aspects. The group interviews revealed that the student teachers perceived conducting research and using the results of research as an important professional development strategy to improve their own capabilities as teachers and as an important means to improve lessons (cognitive aspect). They indicated that it is attractive to them that teachers, by conducting and using results of research, have the opportunity to learn more about specific topics of professional interest (affective aspect). However, student teachers' relatively positive attitude towards research



could decrease during the course; some student teachers considered research to be something big, of large scale, and hard to do alongside the teaching job, because it is time consuming and difficult to conduct. Student teachers believed in their own capabilities of conducting research and using research results as a teacher after the course (self-efficacy). They perceived ‘opportunities to practise more during teacher education’ as a good way to increase their self-efficacy. Finally, they intended to conduct and use the results of research in their future profession rather than in their ‘student phase’ (intended behaviour). They stated that they needed to be more involved with the pupils and the school to be able to come up with interesting research topics.

Regarding the elements of the introductory course, opportunities to practise different research steps through tasks with a direct link to the teaching practice were perceived as important for the development of a positive attitude towards research. ‘The use of authentic examples from practice’ was specifically mentioned as contributing to student teachers’ cognitive aspect of their attitude. ‘Working together with other student teachers’ in combination with ‘expert feedback’ were most contributing to student teachers’ self-efficacy. Overall, they stated that these elements contributed to the development of a positive attitude towards research by increasing their insight in and appreciation of the value and application of research in primary education.

### *Second study*

The results of the pilot study were used to improve the introductory course. Results of the pre-and post-test concept map measurements ( $N = 75$ ) of the study that were conducted the second time the introductory course was executed, showed that the student teachers who participated in the introductory course developed research knowledge, specifically regarding the ‘research process’, the ‘quality of research’ and ‘research methodology’ (see chapter 4). The number of concepts regarding ‘research topics’, ‘goals and benefits’ and ‘participants’ of research by primary school teachers did not increase significantly during this introductory course.

For determining change in student teachers’ beliefs and attitude regarding research, a questionnaire was used ( $N = 79$ ). The results of the pre- and post-test questionnaire showed that during the introductory course, student teachers’ positive beliefs about research increased and their negative beliefs decreased. They changed positively in the way they perceived research as a part of the teaching job. The student teachers’

cognitive aspect of their attitude and their intended behaviour did not significantly increase. However, the positive affective aspect of their attitude towards research did increase. Thereby, student teachers' research self-efficacy had a positive relationship with the change in the positive affective attitudinal aspect. Thus, the more student teachers at the end of the introductory course were convinced of their ability to conduct and use the results of research, the more attracted they were to research as a part of their teaching job. Furthermore, student teachers' research self-efficacy correlated with student teachers' beliefs and attitude regarding research; the more student teachers were convinced of their ability to conduct and use the results of research after the course, the more positive were their beliefs and their attitudes towards research. Finally, student teachers' research self-efficacy also related positively to their intention to conduct and use research in practice.

For a second time, group interviews were conducted (with a total of 20 student teachers that participated in the second execution of the introductory course), this time particularly aiming at which design principles were perceived as important in terms of contributing to student teachers' learning about research, including student teachers' perceptions of how these design principles contributed to their learning (see chapter 5). The results showed that all the design principles that were derived from the literature contributed in one or more ways to student teachers' learning about research, except for the principle that prescribed integration and alignment with the overall curriculum. The way the design principles contributed to student teachers' learning was diverse, particularly with regard to their contribution to their motivation. In this introductory course the following design principles accounted for the increase in student teachers' motivation:

- insight into their own development by comparing this with the development of others in discussing prior knowledge, conceptions, authentic learning tasks and peer-feedback;
- a realistic view of the value and applicability of research in general and in their practice schools in particular by getting the clarity on the goals, by discussing worked examples and performing the authentic tasks;
- providing a balance between theory and practice in each course meeting by the use of worked examples and performing the authentic tasks;

- the possibilities to learn about topics the student teachers were interested in;
- the enthusiasm and expert role model of the lecturers.

Regarding student teachers' perceptions of the way the design principles contributed to their knowledge development, it can be concluded that the student teachers needed:

- the instruction and discussion with other student teachers to know what was important;
- the tasks to discover what they had understood from the instruction;
- the cooperation with other student teachers to discover and process new knowledge;
- the evaluation and (peer) feedback as confirmation of their developments.

The student teachers' critical attitude changed mostly when they were (constantly) forced to underpin their opinions with valid arguments.

Finally, relations between student teachers' research knowledge, beliefs and aspects of their attitude towards research after having participated in an introductory course were explored (see chapter 6). Structural Equation Modelling on the results of the questionnaire and concept maps from the second study showed that student teachers' positive beliefs, their cognitive attitudinal aspect and research self-efficacy were positively related to their affective attitudinal aspect. Thus, the more positive beliefs about research student teachers had, the more they thought research to be important (cognitive attitudinal aspect) and the more they judged themselves to be capable of conducting and using research, the more attractive they perceived research (positive affective attitudinal aspect). The results showed also that student teachers' cognitive aspect of their attitude had the strongest relation to their intended behaviour. Thus, the more student teachers thought about research to be important for a teacher, the more they intended to (learn more about to) conduct and use research.

### *General conclusions*

In general it could be concluded that it is possible to develop an introductory course in research for student teachers that succeeds in developing research knowledge and skills, together with positively changing their beliefs and attitude regarding research, even in an institute for primary teacher education with a lack of research tradition and culture. The findings of the studies in this dissertation indicate it is

important to introduce research in an early stage of a curriculum of an institute for primary teacher education. There seem to be two major characteristics such an introductory course needs to have. Firstly, in the introduction of research, it is crucial to use practical research examples that are embedded in teachers' daily practice as much as possible. Not only worked examples and authentic learning tasks of research by teachers appeared to be valuable, but also making clear that research knowledge and skills are valuable in the daily teaching job (in for example analysing students' learning gains, or constructing a valid test). Secondly, student teachers appreciated the 'inquiring' set up of the meetings, which means that they were stimulated to express their prior knowledge and conceptions, discuss about their opinions and 'forced' to underpin their opinions with valid arguments. This research culture in the meetings not only contributed to student teachers' knowledge and skills development, but also to the development of a critical attitude and their insight in the value and applicability of research for their future teaching practice. Lecturers in institutes for teacher education that are responsible for designing and the execution of courses in research have to be experts in practitioners' research in the educational field on the one hand and be able to translate this expertise to a 'researching/inquiry' environment in the course meetings on the other.

#### *Limitations and directions for future research*

A first limitation pertains to the generalizability of the results. The findings of the studies presented in this dissertation are all based on two cohorts of second-year student teachers from one institute for primary teacher education in the Netherlands. We suggest to further research the impact of our introductory course in a wider context, thus testing our design principles in other institutes for primary teacher.

A second limitation relates to the fact that the groups of student teachers who participated in the course and the subsequent studies were not very large, especially the number of student teachers who participated in the group interviews. In addition to the suggestion for further research mentioned above, it might be useful to investigate the impact of the course on a larger scale, including comparing subsamples of participants from different contexts. Thereby, only the introductory course for second-year students is involved in the studies. It would be very useful to investigate student teachers' intentions about conducting and using research in the rest of the curriculum provided in the students' third and fourth year and beyond.

A third limitation pertains to the kind of data collected and the way they were collected. The focus of the measurements in the studies in this dissertation was mostly on student teachers' perceptions of their development and the way the introductory course contributed to this development. It would be interesting to use (also) instruments that are less depending on student teachers' subjective perceptions such as observations of video-taped course meetings and more indirect analyses of student teachers' products or results of assignments. In addition, it might be considered to study the use of concept maps for knowledge measurement more closely. A last limitation to be mentioned here might be the lack of a control group; consequently the impact of other influences than those intended by the course could not be excluded. For example, it would be interesting to more explicitly investigate the influence of experiences in practice schools and different approaches of lecturers in teacher education on the contributions of an introductory course in conducting and using research.

#### *Implications for practice*

Institutes for teacher education might use the findings of this study for their research activities. The design principles might also be applicable in other contexts, like institutes embedded in universities of applied sciences that also have no or little experience with research activities in their curriculum. Another important implication for practice is that, if we want student teachers to really become competent in conducting and using research, just paying attention to research in an introductory course is not enough. On the one hand, attention must be paid to how in the rest of the curriculum valuable research activities can be implemented in a way that student teachers have the opportunity to practise and refine their research knowledge and skills. On the other hand, attention needs to be paid to the 'research culture' in the entire curriculum of the institutes for teacher education and in primary schools as well. When examples of research by lecturers in teacher education institutes and by teachers in primary schools are scarce, and opinions about the value and applicability in these venues continue to be rather negative, student teachers' positive intentions towards conducting and using research will most likely decrease. One of the implications for practice from the study in this dissertation could be to redesign the introductory course for practicing primary school teachers and lecturers in teacher education in a way that they develop the same important elements as the student teachers: positive beliefs and a positive attitude

towards research and the knowledge and skills to conduct and use research. Finally, the results of both studies in this dissertation showed that the second-year student teachers preferred learning in an ‘inquiry’-environment that was focused on strategies to develop own knowledge regarding topics of own interest. They perceived the set-up of the course meetings as contributing to the development of knowledge and a critical attitude. Lecturers in teacher education must be aware of this preference and adapt their course meetings to these findings. They need to become a role models of critical, almost provocative teachers, who provide insight to the student teachers in what way they use (results of) research in their own teaching and stimulate student teachers to always underpin their opinions with valid arguments.

## Samenvatting

### Een ontwerpgerichte aanpak voor de introductie van het uitvoeren en gebruiken van onderzoek in een pabocurriculum

De context van deze studie vormt de lerarenopleiding basisonderwijs (pabo). Veel van deze HBO-instituten ondervinden problemen bij het implementeren van onderzoeksactiviteiten in hun curricula, vooral door een gebrek aan onderzoekstraditie en -cultuur. Daarbij komt dat het merendeel van de pabostudenten misconcepties en een negatieve mening heeft over de waarde en bruikbaarheid van onderzoek in de onderwijspraktijk. Er is weinig onderzoek gedaan naar hoe deze studenten onderwezen en gemotiveerd kunnen worden in het uitvoeren en gebruiken van onderzoek in hun (toekomstige) onderwijspraktijk.

#### *Theoretische achtergrond*

De negatieve opvattingen en houding van pabostudenten ten aanzien van onderzoek zullen veranderd moeten worden, omdat deze een sterke invloed hebben op hun intentie om onderzoek te gaan doen en gebruiken in de praktijk. De manier en het tijdstip waarop onderzoek wordt geïntroduceerd in het curriculum, kunnen een cruciale rol spelen bij de ontwikkeling van een positieve opvattingen en houding met betrekking tot onderzoek. Om deze reden richt het onderzoek in dit proefschrift zich op *de introductie van onderzoek in het tweede jaar van het pabocurriculum*, op een zodanige manier dat studenten:

- positieve opvattingen over onderzoek ontwikkelen (zodat ze de waarde en bruikbaarheid van het doen en gebruiken van onderzoek voor de onderwijspraktijk leren waarderen);
- een positieve houding ten opzichte van onderzoek ontwikkelen (waardoor ze onderzoek als belangrijk en aantrekkelijk percipiëren en de intentie hebben om als leraar onderzoek te gaan doen en gebruiken);
- kennis en vaardigheden op het gebied van onderzoek ontwikkelen die hen in staat stellen onderzoek te doen en te gebruiken als leraar.

In dit onderzoek worden opvattingen omschreven als een geïntegreerd geheel van generalisaties, vuistregels, verwachtingen en meningen van een persoon. Opvattingen zijn daardoor sterke voorspellers van gedrag, in dit onderzoek dus het doen en gebruiken van

onderzoek door leraren. Een positieve houding ten opzichte van onderzoek is in dit proefschrift geoperationaliseerd in termen van de volgende vier aspecten: (1) *het cognitieve aspect*, dat verwijst naar het feit dat pabostudenten de mogelijkheden en het belang van het doen en gebruiken van onderzoek voor henzelf als aankomende leraren begrijpen en onderschrijven; (2) *het affectieve aspect*, dat verwijst naar het feit dat pabostudenten onderzoek doen en gebruiken aantrekkelijk vinden voor henzelf als aankomende leraren; (3) *het self-efficacy aspect*, dat verwijst naar een positief oordeel van studenten over de eigen capaciteiten om als leraar onderzoek te kunnen doen en gebruiken; en (4) *het gedragsmatige aspect*, dat naar voren komt wanneer pabostudenten plannen hebben om onderzoek te gaan doen of gebruiken of er meer over willen leren. Ten slotte, wanneer pabostudenten onderzoek moeten leren doen en gebruiken hebben ze kennis en vaardigheden nodig met betrekking tot:

- de doelen en waarde van onderzoek voor leraren;
- het soort onderwerpen dat relevant is voor leraren om te onderzoeken;
- het onderzoeksproces en de verschillende fasen van onderzoek, bestaande uit de doorvertaling van relevante onderwerpen naar onderzoeksvragen door een grondige probleemanalyse, de keuze van geschikte onderzoeksdesigns en methoden voor het verzamelen en analyseren van data;
- de kwaliteitscriteria voor onderzoek en de manier waarop deze criteria toe te passen op het eigen onderzoek;
- het rapporteren van onderzoeksresultaten op een manier die collega's in de onderwijspraktijk goed inzicht geven in het onderzoeksproces, de resultaten en de praktische implicaties van het onderzoek.

#### *Doel van de studie en onderzoeksvragen*

Het onderzoek in dit proefschrift richtte zich op de introductie van onderzoek in het curriculum van een pabo. Het doel was om een aantal theoretisch en empirisch onderbouwde design-principes te genereren die ten grondslag zouden moeten liggen aan een introductiecursus 'onderzoek' gericht op de ontwikkeling van onderzoekskennis en -vaardigheden, positieve opvattingen en een positieve houding ten aanzien van onderzoek bij tweedejaars pabostudenten. Bij de opzet van het onderzoek is een ontwerpgerichte aanpak gehanteerd. Er heeft een literatuurstudie plaatsgevonden met als doel design-principes te formuleren die in theorie een positieve invloed hebben op het leren van studenten over onderzoek. Deze principes zijn



als uitgangspunt genomen om de introductiecursus te ontwikkelen. Deze cursus is twee keer uitgevoerd en onderzocht: in een pilotstudie en een tweede studie één (studie)jaar later. De centrale onderzoeksvraag van dit promotieonderzoek luidde als volgt:

*Welke design-principes van een introductiecursus in onderzoek in een pabocurriculum dragen bij aan de ontwikkeling van onderzoekskennis en –vaardigheden, positieve opvattingen en een positieve houding ten aanzien van onderzoek, en op welke manier dragen zij daaraan bij?*

Deze centrale onderzoeksvraag is nader gespecificeerd in onderstaande vijf onderzoeksvragen. De onderzoeksvragen van de pilotstudie:

1. (a) Hoe percipiëren pabostudenten de ontwikkeling van hun onderzoekskennis en –vaardigheden, en verandering in hun houding ten opzichte van onderzoek tijdens een introductiecursus, en (b) welke elementen van de cursus dragen volgens de studenten bij aan deze ontwikkeling?
2. (a) Hoe percipiëren pabostudenten onderzoek en op welke manier relateren zij dat aan hun cognitief, affectief, self-efficacy en gedragsmatig aspect van hun houding ten opzichte van onderzoek, en (b) welke elementen van de introductiecursus dragen volgens de studenten bij aan een positieve verandering van hun houding ten opzichte van onderzoek?

De onderzoeksvragen van de tweede studie:

3. Ontwikkelen pabostudenten onderzoekskennis, positieve opvattingen en een positieve houding ten opzichte van onderzoek tijdens de (verbeterde) introductiecursus in onderzoek?
4. Wat is volgens de studenten de bijdrage van elk design-principe aan hun leren over het doen en gebruiken van onderzoek?
5. Welke relaties zijn er tussen de opvattingen van de pabostudenten, hun cognitieve, affectieve en self-efficacy houdingsaspecten, hun onderzoekskennis en hun intentie om onderzoek te gaan doen en gebruiken in de praktijk (gedragsmatig houdingsaspect)?

#### *Pilotstudie*

In deze eerste studie is een vragenlijst gebruikt om inzicht te krijgen in de houding van pabostudenten (N = 81) ten opzichte van

onderzoek, hun percepties van de ontwikkeling van die houding, en onderzoekskennis en -vaardigheden tijdens de introductiecursus (zie hoofdstuk 2). Daarnaast is de vragenlijst ook gebruikt om inzicht te krijgen in welke elementen van de cursus volgens de studenten aan deze ontwikkeling hebben bijgedragen.

Uit de resultaten van de vragenlijst bleek dat, volgens de studenten, de introductiecursus bijdroeg aan de ontwikkeling van zowel een positieve houding ten opzichte van onderzoek als aan de ontwikkeling van onderzoekskennis en -vaardigheden. Uit de resultaten bleek ook dat studenten verschillen in de ontwikkeling van de houdingsaspecten percipieerden. Zij omschreven onderzoek als ‘belangrijk’ (cognitief houdingsaspect), maar minder aantrekkelijk om te doen (affectief houdingsaspect) en dat ze het ook minder van plan zijn om te gaan doen (gedragmatig houdingsaspect). Met betrekking tot de ontwikkeling van hun onderzoekskennis en -vaardigheden bleek dat de studenten meer ontwikkeling in de ‘wetenschap-georiënteerde’ kennis en vaardigheden (zoals de ‘criteria voor onderzoek’ en ‘het kritisch kunnen beschouwen van bronnen’) percipieerden en minder in kennis en vaardigheden met betrekking tot (het toepassen van) onderzoeksmethoden en -designs.

Volgens de studenten was ook sprake van verschillen in de bijdragen die de elementen van de introductiecursus hadden. ‘Samenwerken met medestudenten’ aan ‘realistische, authentieke opdrachten’ die uit ‘onderzoeksvoorbeelden uit de directe onderwijspraktijk’ voortkomen, werden als de meest waardevolle cursuselementen beschouwd voor het ontwikkelen van een positieve houding en onderzoekskennis en -vaardigheden.

De resultaten van de vragenlijst uit de pilot studie hebben tot een aantal vragen geleid met betrekking tot de houding van de studenten ten opzichte van onderzoek (zie hoofdstuk 3). Om te onderzoeken hoe pabostudenten de cognitieve, affectieve, self-efficacy en gedragsmatige houdingsaspecten beschouwen en welke elementen er volgens hen positief aan bijdragen, zijn zes groepsinterviews gehouden (met in totaal 29 pabostudenten). De resultaten van deze groepsinterviews lieten zien dat pabostudenten onderzoek doen en gebruiken ervaren als een belangrijke professionaliseringsstrategie voor leraren om eigen capaciteiten en lessen/onderwijs te kunnen verbeteren (cognitief houdingsaspect). De studenten gaven tevens aan dat het aantrekkelijk voor hen is wanneer leraren door het doen en gebruiken van onderzoek meer te weten kunnen komen over specifieke onderwerpen die

voortkomen uit eigen (professionele) interesse (affectief houdingsaspect). Een deel van de studenten gaf echter aan onderzoek (nog steeds) te zien als iets dat ‘grootschalig, langdurig en moeilijk te doen is naast je taken als leraar’ en dat het ‘veel tijd kost en een complex en moeilijk proces is’. De pabostudenten hadden wel vertrouwen in de eigen capaciteiten om onderzoek te doen en te gebruiken na de introductiecursus (self-efficacy houdingsaspect). Wanneer ze de mogelijkheid zouden krijgen om in de rest van het pabocurriculum meer te oefenen, zou dit volgens hen een positieve uitwerking hebben op hun self-efficacy. Met betrekking tot het gedragsmatige houdingsaspect stelden de studenten dat zij als gediplomeerde leraren eerder onderzoek zouden doen en gebruiken dan nu als student/stagiaire: binding met de leerlingen en de school is volgens hen noodzakelijk om relevante onderzoeksonderwerpen te kunnen kiezen.

In het algemeen droegen de cursuselementen bij aan de ontwikkeling van een positieve houding ten opzichte van onderzoek wanneer de studenten ‘mogelijkheden kregen om de verschillende onderzoeksfasen aan de hand van praktijk gerelateerde opdrachten te kunnen oefenen’. ‘Het gebruik van authentieke voorbeelden van lerarenonderzoek’ werd specifiek genoemd als waardevol voor de ontwikkeling van het cognitieve houdingsaspect. ‘Samenwerken met medestudenten’, ondersteund door ‘expert feedback van de docent’ werd beschreven als belangrijkste element voor de ontwikkeling van hun self-efficacy. Samenvattend stelden de studenten dat wanneer een cursuselement bijdroeg aan hun inzicht in de waarde en toepassingsmogelijkheden van onderzoek als leraar, dit een positief effect had op hun houding ten opzichte van onderzoek.

### *Tweede studie*

De resultaten van de pilot studie zijn gebruikt om de introductiecursus te verbeteren. De ontwikkeling van onderzoekskennis is in de tweede studie (bij de uitvoering van de verbeterde cursus) gemeten aan de hand van een voor- en nameting met behulp van concept maps (N = 75). De resultaten hiervan lieten zien dat de studenten tijdens de introductiecursus kennis ontwikkelden met betrekking tot ‘het onderzoeksproces’, ‘de kwaliteitscriteria van onderzoek’ en de ‘onderzoeksmethodologie’ (zie hoofdstuk 4). Het aantal concepten met betrekking tot ‘onderzoeksonderwerpen’, ‘doelen en waarde van onderzoek’ en ‘participanten’ groeide niet tijdens de cursus.

Om een verandering in de opvattingen en de houding van de studenten ten opzichte van onderzoek te kunnen bepalen, is een vragenlijst gebruikt (N = 79). De resultaten van de voor- en nameting lieten zien dat gedurende de introductiecursus de positieve opvattingen van de studenten positiever werden en de negatieve opvattingen minder negatief. Kortom, de studenten ontwikkelden meer positieve opvattingen over onderzoek als een deel van het leraarsvak. Uit de resultaten van de vragenlijst bleek verder dat het cognitieve houdingsaspect en de intentie van de studenten om onderzoek te doen en gebruiken niet veranderden tijdens de cursus. Hun affectief houdingsaspect veranderde wel positief. Uit de resultaten van de vragenlijst bleek ook dat de self-efficacy van de studenten een positieve relatie had met verandering in hun affectief houdingsaspect. Met andere woorden, hoe meer de studenten aan het eind van de cursus overtuigd waren van hun capaciteiten om onderzoek te kunnen doen en gebruiken, hoe aantrekkelijker onderzoek doen en gebruiken als leraar voor hen werd. De self-efficacy van de studenten bleek ook te correleren met hun opvattingen en houding in totaal; hoe meer studenten overtuigd waren van hun capaciteiten om onderzoek te doen en te gebruiken, hoe positiever hun opvattingen en houding ten opzichte van onderzoek doen en gebruiken was. Tot slot bleek self-efficacy ook een positieve relatie te hebben met de intentie van studenten om onderzoek te gaan doen en gebruiken in de praktijk.

Voor een tweede keer werden groepsinterviews gehouden (met in totaal 20 studenten die de verbeterde cursus hadden gevolgd). Deze keer met als doel te achterhalen welke design-principes hebben bijgedragen aan hun leren over onderzoek, en de manier waarop deze principes hebben bijgedragen (zie hoofdstuk 5). Uit de resultaten van de groepsinterviews kwam naar voren dat alle design-principes die aan de literatuur waren ontleend op één of meer manieren bijdroegen aan het leren van de studenten over onderzoek, behalve het principe die 'integratie en afstemming' met de rest van het curriculum voorschreef. De manier waarop de design-principes bijdroegen aan het leren van de studenten was divers, zeker wat betreft hun invloed op de motivatie van de studenten. Op basis van de ontwikkelde introductiecursus kan gesteld worden dat studenten gemotiveerd raakten om meer te leren over onderzoek door:

- inzicht te krijgen in de eigen ontwikkeling door de discussies over voorkennis en concepties, het werken aan authentieke leertaken en de uitwisseling van feedback;

- een realistische kijk te krijgen op de waarde en bruikbaarheid van onderzoek in het algemeen én specifiek voor de onderwijspraktijk, vooral als gevolg van het krijgen van inzicht in de doelen van de cursus, het discussiëren over praktijkvoorbeelden en het uitvoeren van authentieke opdrachten;
- evenwicht in de cursusbijeenkomsten te ervaren tussen theorie en praktijk; praktijkvoorbeelden en het oefenen met authentieke taken spelen daar een belangrijke rol in;
- de mogelijkheden te ervaren om over voor de student interessante onderwerpen iets te leren;
- het enthousiasme en de rol van de docent als 'expert' (rolmodel).

Met betrekking tot de design-principes die volgens de studenten bijdroegen aan hun kennisontwikkeling, kan geconcludeerd worden dat de studenten:

- de instructie van de docent en de discussie met de medestudenten nodig hadden om te kunnen bepalen wat belangrijke kennis was om die vervolgens te ontwikkelen;
- de authentieke opdrachten nodig hadden om te bepalen in hoeverre ze de instructie/nieuwe begrippen hadden begrepen en toe konden passen;
- de samenwerking met medestudenten nodig hadden om verschillende concepten te begrijpen en te kunnen verwerken;
- de evaluatie en (peer)feedback nodig hadden als bevestiging van hun kennisontwikkeling.

De kritische houding van de studenten veranderde het meest wanneer zij geconfronteerd werden met de eis hun mening te moeten onderbouwen met gegronde feiten.

Tot slot zijn de relaties tussen de onderzoekskennis, de opvattingen over onderzoek en de houding ten opzichte van onderzoek van de pabostudenten na de introductiecursus nader verkend (zie hoofdstuk 6). Structural Equation Modelling, toegepast op de resultaten van de concept maps en de resultaten van de vragenlijst uit de tweede studie, liet zien dat de positieve opvattingen van de studenten, hun cognitief houdingsaspect en hun self-efficacy een positieve relatie hadden met hun affectief houdingsaspect. Met andere woorden, de studenten vonden onderzoek doen en gebruiken aantrekkelijker naarmate zij positievere opvattingen hadden, onderzoek belangrijker vonden en

zichzelf meer capabel voelden om onderzoek te doen en gebruiken. De resultaten lieten ook zien dat het cognitieve houdingsaspect de sterkste relatie had met het gedragsmatige aspect. Hoe meer studenten vonden dat onderzoek belangrijk is, hoe meer zij de intentie hadden om onderzoek te gaan doen/gebruiken of daar meer over te leren.

### *Algemene conclusies*

Samenvattend kan geconcludeerd worden dat het mogelijk is om in een pabo een introductiecursus ‘onderzoek’ te ontwikkelen waarin pabostudenten onderzoekskennis en –vaardigheden ontwikkelen, tezamen met positieve opvattingen en een positieve houding ten aanzien van onderzoek. De bevindingen van de studies in dit proefschrift geven aan dat het belangrijk is om onderzoek in het begin van de opleiding te introduceren. Er lijken twee ‘karakteristieken’ voor het slagen van een dergelijke cursus essentieel te zijn. Ten eerste is het van belang om zoveel mogelijk voorbeelden van onderzoek uit de onderwijspraktijk te gebruiken. Niet alleen voorbeelden van onderzoek door leraren, maar ook voorbeelden van hoe onderzoek en onderzoeksvaardigheden een plek hebben in de dagelijkse praktijk van de leraar (zoals bij het analyseren van leerlinggegevens of het construeren van een goede toets). Ten tweede noemden de studenten de ‘onderzoeksmatige’ opzet van de bijeenkomsten in de cursus als waardevol. Het stimuleren van het delen van voorkennis en concepties, daarover discussiëren en het ‘moeten’ onderbouwen van meningen en opvattingen droegen niet alleen bij aan de kennisontwikkeling, maar ook aan de ontwikkeling van een kritische houding en inzichten in de waarde en toepassingsmogelijkheden van onderzoek in de onderwijspraktijk. Docenten in lerarenopleidingen die zich bezighouden met onderzoeksactiviteiten zouden volgens de studenten niet alleen experts moeten zijn op het gebied van onderzoek, maar ook in staat moeten zijn om deze expertise door te vertalen naar een ‘onderzoeksmatige’ leeromgeving tijdens de cursusbijeenkomsten.

### *Beperkingen en suggesties voor vervolgonderzoek*

Een eerste beperking van dit onderzoek hangt samen met de generaliseerbaarheid van de resultaten. De resultaten van de studies zijn gebaseerd op twee cohorten tweedejaars pabostudenten van één specifiek instituut in Nederland. De impact van de introductiecursus zou in een bredere context onderzocht moeten worden, bijvoorbeeld door de design-principes toe te passen in andere lerarenopleidingen basisonderwijs. Daarnaast zijn bij dit onderzoek alleen de tweedejaars

pabostudenten betrokken. Het zou waardevol zijn om de intenties die de studenten met betrekking tot het doen en gebruiken van onderzoek hebben aan het eind van de introductiecursus opnieuw te onderzoeken in het derde en vierde studiejaar en zelfs na hun diplomering.

Een derde beperking is dat de dataverzameling in dit onderzoek veelal gericht is geweest op de perceptie van de studenten (met betrekking tot hun ontwikkeling en wat daaraan heeft bijgedragen). Het lijkt interessant om in de toekomst ook gebruik te maken van instrumenten die minder afhankelijk zijn van de subjectieve percepties van studenten, zoals bijvoorbeeld observaties op basis van videobeelden of directe analyses van producten of toetsen van studenten. In het verlengde daarvan zou de bruikbaarheid van concept maps voor het meten van kennisontwikkeling wat specifieker onderzocht moeten worden. Tot slot is het feit dat er geen controlegroep gebruikt is in dit onderzoek een beperking. De invloed van andere factoren op de ontwikkeling van de studenten kon daardoor niet worden meegenomen. Daarbij moet bijvoorbeeld gedacht worden aan de invloed van stage-ervaringen en andere didactische aanpakken in de rest van de opleiding.

### *Implicaties voor de praktijk*

Lerarenopleidingen zouden moeten overwegen de bevindingen van dit onderzoek, met name de manier waarop de design-principes bijdragen aan het leren over onderzoek door de studenten, door te vertalen naar hun eigen curriculum. De design-principes uit dit onderzoek lijken ook geschikt voor andere hbo-instellingen die vanuit min of meer dezelfde problematiek (gebrek aan onderzoekstraditie en -cultuur) verplicht zijn onderzoek in hun curriculum te borgen. Een andere belangrijke implicatie voor de praktijk is dat, wil men dat pabostudenten bekwame onderzoekers van hun eigen praktijk worden, niet kan worden volstaan met een introductiecursus. Enerzijds moet aandacht besteed worden aan een doorlopende onderzoekslijn in de overige jaren, anderzijds moet er in de gehele opleiding werk gemaakt worden van de 'onderzoekscultuur'. Wanneer studenten in de rest van het curriculum niet of nauwelijks met onderzoek in aanraking komen, niet meer afgerekend worden op het onderbouwen van een mening of wanneer ze juist in aanraking komen met negatieve opvattingen over onderzoek, dan bestaat het gevaar dat hun positieve opvattingen en houding afnemen. Een andere implicatie zou kunnen zijn dat de design-principes worden doorvertaald naar een cursus voor leraren uit de praktijk, zodat zij dezelfde noodzakelijke opvattingen, houding en kennis

en vaardigheden met betrekking tot onderzoek kunnen ontwikkelen als de studenten. Tot slot toonden beide studies in dit proefschrift aan dat de pabostudenten een voorkeur hadden voor ‘onderzoeksmatig’ onderwijs waarin strategieën om eigen kennis te ontwikkelen met betrekking tot onderwerpen die aansluiten bij hun eigen interesse centraal zouden moeten staan. Docenten en ontwikkelaars op lerarenopleidingen zouden zich hier meer bewust van moeten zijn en de mogelijkheden moeten verkennen om deze bevindingen door te vertalen naar een bepaalde didaktiek. Daarnaast zouden zij zich bewust moeten worden van het belang dat studenten hechten aan het rolmodel van de docent: een kritische, bijna provocatieve docent die in zijn of haar lessen duidelijk maakt waarop hij/zij zich baseert en de studenten uitdaagt om meningen en ervaringen te onderbouwen met steekhoudende argumenten.



## List of publications

### *Articles in peer-reviewed journals*

- Van der Linden, W., Bakx, A., Ros, A., Beijaard, D., & Vermeulen, M. (2012): Student teachers' development of a positive attitude towards research and research knowledge and skills. *European Journal of Teacher Education*, 35(4), 401-419.
- Van der Linden, W., Bakx, A., Ros, A., & Beijaard, D. (under review). *Student teachers' attitude towards research*.
- Van der Linden, W., Bakx, A., Ros, A., & Beijaard, D. (under review). *The development of student teachers' research knowledge, beliefs and attitude*.
- Van der Linden, W., Bakx, A., Ros, A., & Beijaard, D. (under review). *An introductory course in research: What works according to student teachers?*

### *Conference contributions*

- Van der Linden, W., Bakx, A., Ros, A., & Beijaard, D. (2012, September). *The development of student teachers' research knowledge, beliefs and attitude*. Paper presented at Joint Researcher Training – Summer School, Essen-Duisburg, Germany.
- Griffioen, D., Engelbert, R., Van der Linden, W., & Boerma, K. (2011, November). *Bridging the gap between research and teaching in professional higher education: Praxis in a Conceptual Framework*. Paper presented on a symposium at the EAPRIL conference, Nijmegen, the Netherlands.
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- Van der Linden, W., Bakx, A., Ros, A., & Beijaard, D. (2010, June). *Het opleiden van onderzoekende leraren*. Paper presented at Onderwijs Research Dagen (ORD), Enschede, the Netherlands.

- Van der Linden, W., Verbiest, E., Beijaard, D. (2009, December). *The Teacher as Researcher – A design-research on the first phase of learning how to do and use research by students in Primary Teacher Education*. Interactive poster presentation at Joint Researcher Training – Winter School, Rovaniemi, Finland.
- Van der Linden, W., Verbiest, E., Beijaard, D. (2009, August). *The teacher as researcher. A design-research on a teaching program ‘research competences’ for students in primary teacher education*. Interactive round table discussion at the EARLI, Amsterdam, the Netherlands.

## Curriculum Vitae

Wietse van der Linden was born on 11 May 1978 in Steenbergen, the Netherlands. After finishing higher general secondary education (havo) in 1995, and graduating in 1999 at the institute of primary teacher education Tilburg, he studied at the Radboud University of Nijmegen and graduated from the master's programme Educational Science in 2003. During his master study he worked part-time as a primary school teacher and afterwards as a junior-researcher at the department of Educational Science of the Radboud University until 2006. In 2007-2008 he worked as a primary school teacher again and as a lecturer at the institute for primary teacher education in Tilburg. He started his PhD project in 2008, at Fontys University of Applied Sciences and Eindhoven School of Education (Eindhoven University of Technology) of which the results are presented in this dissertation.



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