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Student teachers' development of a positive attitude towards research and research knowledge and skills

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The aim of this study is 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 the students' 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 students' perceptions, the introductory course contributed to the development of both a positive attitude towards research and research knowledge and skills. The students 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.

Keywords: teacher education curriculum; teacher researchers; student teacher attitudes; student development; Netherlands

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 students a bachelor's degree and prepare them for teaching practice. Although the Dutch universities of applied sciences introduced professorships in 2001 and, since

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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 and Herr 1999; Alcorn 2006; Gemmell, Griffiths, and 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, lecturers 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 students’ 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, teacher 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 and MacLaughlin 1999; Doornekamp et al. 1997; Hall 2009; Hargreaves 1998; Ponte 2002; Zeichner and Noffke 2001). Second, by carrying out research, teachers are able to develop their knowledge (Ponte, Beijaard, and Wubbels 2004), and provide their own evidence of what works in practice and why (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 2004; Gore and 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 et al. 2001).

Recently, many Dutch handbooks on teacher research have appeared. The focus in these books is mainly on improving students’ research skills and adjusting students’ 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, and Coombe 2008; Gitlin et al. 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, Harrison, and Coombe (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 students’ 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 students’ 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 carry out 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 teacher research in such a way that the student teachers would develop a positive attitude towards teacher research, and that they would also develop research knowledge and skills.

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 students' development of a positive attitude towards research.

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 carry out 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 students; 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 2007; Ledoux et al. 2009).

Table 1 is an attempt (which does not claim to be comprehensive) 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, and Troen 2005; Cochran-Smith and Lytle 1999, 2004; Lankshear and Knobel 2004; Lunenberg, Ponte, and Van de Ven 2007; Reis-Jorge 2005, 2007; Van der Rijst et al. 2008; Verschuren 2009).

The focus of this study is on the introduction of teacher 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 carry out 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.

Developing a positive attitude towards teacher research

An important reason for putting the introduction to teacher 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 carrying out 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

Table 1. Characteristics of teacher research and the research knowledge and skills required by teachers.

Teacher research. . .	A teacher needs to. . .
<p>focuses on context-specific and practice-oriented problems, rooted in teaching practice;</p> <p>arises from individual or collective (school) interest and the responsibility to provide professional teaching performance;</p> <p>aims at developing knowledge, insights and products which contribute to problem solving, and/or developments in teaching practice;</p> <p>requires a critical, reflective and research-oriented attitude from the teacher;</p>	<p>have a knowledge of what kinds of problems/interests are suitable for teacher research;</p> <p>be able to notice practical problems and translate them via proper problem analyses into research questions;</p> <p>be able to constantly seek out improvements and view practice in a professional way;</p> <p>be able to evaluate, interpret and reflect on the results of (other) research and translate them into practical implications;</p>
<p>makes use of appropriate methods and meets research criteria such as reliability and validity, without reducing the practical relevance of the research;</p>	<p>have a knowledge of the different phases in research;</p> <p>have a knowledge of the different appropriate research designs and methods;</p> <p>be able to choose (to fit the research questions), develop, execute and analyse appropriate methods of data collection;</p> <p>have a knowledge of the criteria for research quality and the skills to apply this knowledge in their own research;</p> <p>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;</p>
<p>is conducted by the ‘problem-owner/teacher’, either in collaboration with colleagues or external researchers.</p>	<p>be able to research their own practice alone and in collaborative ‘research teams’.</p>

introduced to teacher 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 teacher research in practice (Joram 2007; Schulz and Mandzuk 2005), the varying nature of research activities that they were confronted with as students 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 students’ potential preconceptions of research into consideration when they are introduced to teacher research, because these preconceptions might influence the development of their attitude towards research and eventually their behaviour regarding carrying out and using research in practice (Wubbels 1992).

The concept of attitude is often divided into three aspects: cognitive, affective and behavioural (Ajzen 2001; Ajzen and Fishbein 2000; Eagly and 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 actual behaviour of a person or their 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 students need to know and understand the possibilities of carrying out and using teacher research (and to perceive it as important for them as prospective teachers). The affective aspect concerns the fact that students need to feel good about and enjoy conducting and using teacher research (and to perceive it as interesting for them as prospective teachers). Finally, the behavioural aspect occurs when a student attempts to carry out or to use teacher research, or plans to learn more about it.

In addition to paying attention to the influence of students' cognitive, affective and behavioural aspects of their attitude, there is also a need to address the development of the students' confidence in conducting and using research (e.g., Jarvis and Rennie 1998; Mulholland and 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 teacher research (Dyson 1997). There is a need to include self-efficacy as an aspect of students' attitude, because it influences students' behaviour in a positive or negative sense. When self-efficacy with regard to conducting and using research increases, it becomes more likely that students will not only develop a positive attitude towards research, but that they will also carry out and use teacher research in practice (Dyson 1997). Combining the four aspects of attitude, we assume that student teachers will develop a positive attitude towards teacher research when they:

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

Research questions

The aim of this study is to investigate the experiences of student teachers participating in an introductory course in teacher 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 students' 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 is needed about which elements were perceived by the students to be the most contributing, and which elements were less contributing. Therefore, it is also interesting to investigate whether the students can be clustered, in order to learn whether different groups of students differ in their rating of elements of the course (e.g., to investigate whether there is a need for differentiation in the course).

Table 2. Elements and examples of the introductory course.

Elements of the introductory course	Examples from the introductory course
The introductory course needs to be an integral part of the overall curriculum of the teacher education institute (Burke and Hutchins 2007)	<ul style="list-style-type: none"> • Topics from the regular curriculum are used in examples of teacher research. For example, students are busy with learning how they need to prepare lessons at the point when 'design-based research' is introduced during the course, including the connection between the two • Research-related tasks from the regular curriculum are used and discussed in meetings. For example, students investigating teaching methods and materials, systematically observing pupils in schools and discussing the way to do this
Through the course, teachers and student teachers need to become aware and attuned to the student teachers' prior knowledge and preconceptions of research (Bransford and Johnson 1972; Merrill 2002; Vosniadou et al. 2001)	<ul style="list-style-type: none"> • Every meeting starts by asking what the students know about certain subjects or what they remember from the past meetings • Students discuss their opinions and conceptions about teacher research by, for example, discussing the different feasibilities of research topics or methodologies in groups
It must become obvious for students why they are confronted with teacher research in this stadium of their teacher education (Ponte 2002)	<ul style="list-style-type: none"> • At the beginning of the introductory course, it is explained to the students that they are learning about teacher research in this early stage 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
The activities in the introductory course need to provide meaningful experiences for the students: the learning activities, tasks and examples must be clearly connected to or derived from primary teaching practice in order to be useful for the students (Van Merriënboer 1997; Vosniadou et al. 2001; Diezmann 2005)	<ul style="list-style-type: none"> • Students get to know and practise research by working with authentic examples and tasks. For example, when they have read and discussed some examples of the research reports of primary school teachers, they need to perform a task where they plan and motivate methodological choices for answering research questions from a fictional research case

(Continued)

Table 2. (Continued).

Elements of the introductory course	Examples from the introductory course
Student teachers need to have the opportunity to choose subjects of authentic tasks which will be connected to their urgent concerns	<ul style="list-style-type: none"> • In a task where students practise planning research methods, they will have the opportunity to choose different task subjects
During their instruction, performing tasks and in evaluating tasks or meetings, students need to work together in couples or groups in which they can interact with one another. In classroom interactions, students need to feel free to elaborate on their ideas or new perspectives and to receive different kinds of feedback from different participants (Van Swet et al. 2009)	<ul style="list-style-type: none"> • All tasks, performed during meetings or outside of meetings, are performed in collaborative pairs or groups so that students have the opportunity to discuss with one another • After performing tasks, students need to provide written feedback on two tasks performed by their fellow students and discuss the feedback they have given and received • In group meetings, the opinions and conceptions of the students are encouraged and discussed
For most students, 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)	<ul style="list-style-type: none"> • The authentic examples of research used at the beginning of the course are less complicated in terms of the methods or design used than those which are used at the end of the course

Therefore, the research questions are:

- (1) What attitude towards research do student teachers have after participating in the introductory course in teacher research?
- (2) How do student teachers perceive their development of research knowledge and skills during the introductory course in teacher research?
- (3) Which elements of the introductory course in teacher 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?

Method

Context

The institute of primary teacher education in which the introductory course in teacher research was investigated 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, and Duffy 2000). The introductory course in teacher research for second-year students contained 11 obligatory meetings of two hours each, and was taught by two teacher educators over a period of

Table 3. Items of the 'attitude' scale and the 'development of attitude' scale.

Aspects of the students' attitude towards teacher research	Items 'Attitude towards teacher research'	Items 'Development of attitude towards teacher research'
'Cognitive' and 'carrying out research'	I think it is important that primary school teachers carry out research	My opinion about the importance of carrying out 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 'carrying out research'	I think that I enjoy carrying out research as a primary school teacher	My opinion about enjoying carrying out 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 'carrying out research'	I am planning to carry out research as a primary school teacher	My opinion about planning to carry out 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 'carrying out research'	I think that I will be able to carry out research as a primary school teacher	My opinion about being able to carry out 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...

four months. By studying policy documents and research literature, different elements of the introductory course on teacher research emerged. Table 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.

Instruments

A student questionnaire was developed in order to measure the students' 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 3 shows the items concerning the students' attitude. In the first part, the students' attitude towards research was measured. The statements pertained to the cognitive, affective, behavioural and self-efficacy-related aspects of attitude (Ajzen and 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 students' perceptions of the development of their attitude. For the same eight items as in the first part, the students 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).

Students' perceptions of the contribution that the introductory course had made towards their development of research knowledge and skills were measured. 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, the students' perceptions were measured regarding what elements of the introductory course (from Table 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 include: 'In this course I learned... from working with examples from practice', and 'In this course I experienced... connection to the overall curriculum'.

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 students 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.

Analysis

In order to determine the attitude of students 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 students differed in their attitude towards ‘carrying out’ 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 students’ 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, we tested whether the differences in the mean ratings of the elements were significant. In order to determine whether there were any groups of students 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 students 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.

Results

Students’ attitude towards research

With all of the aspects of attitude taken together, the students’ average value for ‘attitude towards carrying out and using research’ was 3.57 (on a scale of 1–5, $\alpha = .83$; see Table 4). The results of the paired t-tests regarding the differences between the aspects of attitude showed that the students found carrying out and using research to be significantly more important (cognitive aspect) than attractive (affective aspect) ($t(80) = 9.49, p = .00$), and that they were more likely to consider it to be important than plan to carry it out (behavioural aspect) ($t(79) = 6.16, p = .00$). The results also showed that students think that they are more capable of carrying out 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 carry out research and use it in their teaching practice later in life ($t(79) = 3.60, p = .00$).

Regarding the students’ 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 5 shows that a rather large group of students perceived that their cognitive aspect regarding carrying out research had ‘developed positively’ ($57 = 70\%$), in

Table 4. Means and standard deviations of (aspects of) students' 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

Table 5. Frequencies of aspects of attitude development, divided into attitude towards carrying out and using the results of research (N = 81).

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

comparison to their affective (22 = 27%) or behavioural (39 = 48%) aspects. Moreover, a large group of students indicated that during the introductory course, their opinions had remained stable over time, or perceived negative development of their affective aspect (in both 'carrying out': 59 = 73% and 'using': 67 = 83%). A rather large group of students also indicated that they developed in a positive direction in their belief that they would be capable of carrying out and using research as a primary school teacher ('carrying out': 59 = 73% and 'using': 53 = 65%).

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' (nine items, $\alpha = .86$); (2) 'method scale' (10 items, $\alpha = .91$); and (3) 'research design scale' (two items, $\alpha = .76$); see Table 6.

Paired t-tests of the scale means showed that, according to the students' 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 ($t(79) = 2.80, p = .00$).

The contribution of the elements of the introductory course to the perceived development of the students' attitude, research knowledge and skills

The overall mean score for how much the students 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

Table 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'

Table 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 students	3.07	.96
Opportunities to choose	3.01	.72
Connection to the overall curriculum	2.36**	.83

Notes: * significantly higher mean than all the other elements ($p < .01$); ** significantly lower mean than all the other elements ($p < .00$).

practice', 'performing realistic tasks' and 'working together in pairs or groups'; see Table 7) scored significantly higher than the other elements. The element 'connecting to the overall curriculum' was, in the students' opinions, the element which had contributed least to their learning.

Clustering students 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 8). The three clusters were termed: (1) 'most developed in terms of teacher research', (2) 'medium developed in terms of teacher research', and (3) 'least developed in terms of teacher research'. The 'most developed' group of students ($N = 21$) had a significantly higher mean on all of the scales compared to both other groups. The students in this group had a more positive attitude towards research, perceived that their positive attitude developed more during the introductory course and that they perceived more development on all three scales of

Table 8. Clusters for the five questionnaire scales.

Clusters and frequencies	Attitude total (ETA SQ*: .29)		Development of attitude ^a (ETA SQ*: .26)		Science- oriented scale (ETA SQ*: .37)		Method-scale (ETA SQ*: .29)		Research design- scale (ETA SQ*: .59)	
	M	SD	M	SD	M	SD	M	SD	M	SD
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

Notes: (a) 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.

Table 9. Significant differences between the groups of students in terms of elements of the introductory course.

Elements of the introductory course	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

research knowledge and skills. The 'least developed' group of students 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 students' 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.

Further analyses (one-way ANOVA with post-hoc Scheffe test) were conducted in order to investigate whether the groups of students 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 9). The 'most developed' group perceived all three of the aforementioned elements as contributing more to their development than the 'least developed' group.

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 teacher research. Overall, the students 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, Harrison, and Coombe 2008; Gitlin et al. 1999; Schulz and Mandzuk 2005). Dunn, Harrison, and Coombe (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 students described teacher research as more important in comparison to the extent to which they were planning on carrying our research or using it in practice. The students in our research also stated that teacher 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' (327).

The students 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 students. '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, 2007; Van Merriënboer and Kirshner 2001), and these elements should be included in an introductory course in teacher 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 and Hutchins 2007). It is possible that students 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 students 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 teachers regarding how to differentiate between these groups. Further research is necessary in order to investigate the differences between the groups in more detail.

Discussion

Although research by students 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 carrying out and using research is an important prerequisite for students 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 students in this course were investigated. The operationalisation of the students' attitude into four aspects (Ajzen and 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 students should have accomplished.

Students 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 students 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 students in the course, there is a need to know what the students' attitude, knowledge and skills were before and not only after the course. Knowing this information beforehand would provide opportunities to better connect with the students' needs during the execution of the course. Another point we encountered regarding the clusters is the impossibility of connecting students' 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 students' development in terms of attitude, knowledge and skills by investigating it in a qualitative way, because several questions remain unanswered. Why do students think that teacher 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 students' 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.

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