Teacher research in secondary education

Leuverink, Kitty

[Link to publication in Tilburg University Research Portal](#)

TEACHER RESEARCH IN SECONDARY EDUCATION

AN EMPIRICAL STUDY INTO TEACHER RESEARCH AS A MEANS FOR PROFESSIONAL DEVELOPMENT AND SCHOOL DEVELOPMENT

KITTY REGINA LEUVERINK

Teacher research in secondary education
*An empirical study into teacher research as a means for
professional development and school development*

Kitty Regina Leuverink

Teacher research in secondary education
*An empirical study into teacher research as a means for
professional development and school development*

Proefschrift ter verkrijging van de graad van doctor aan Tilburg
University

op gezag van de rector magnificus, prof. dr. K. Sijtsma, in het
openbaar te verdedigen ten overstaan van een door het college
voor promoties aangewezen commissie in de Aula van de Universiteit
op dinsdag 26 november 2019 om 13.30 uur door

Kitty Regina Leuverink,

geboren te Den Helder

CONTENTS

CHAPTER 1: RESEARCH ON TEACHER RESEARCH

CHAPTER 2: EXPLORING SECONDARY EDUCATION TEACHERS' RESEARCH ATTITUDE

CHAPTER 3: A QUALITY ASSESSMENT OF TEACHER RESEARCH

CHAPTER 4: A MIXED METHODS STUDY INTO THE DEVELOPMENT OF TEACHER-RESEARCHERS' RESEARCH KNOWLEDGE

CHAPTER 5: CHANGES IN TEACHERS' PROFESSIONAL BEHAVIOR THROUGH CONDUCTING TEACHER RESEARCH

CHAPTER 6: CONCLUSION AND DISCUSSION

APPENDICES

1

Research on teacher research

1.1   RESEARCH QUESTION AND RELEVANCE

This book is about the professional development of teachers and school development. It originates from a project that I started working on, in the school year 2013-2014. The project entailed a course in teacher research in which secondary education teachers are learning to conduct research. The idea behind the project was that by conducting teacher research, the professionalism of teachers could be promoted since a teacher would critically review educational practice and make improvements in that practice based on his or her own research findings.

In the educational literature, different possible effects with respect to teacher research can be distinguished. Teachers' engagement in research is seen as a key component in their professional development (OECD, 2009). It is considered an effective strategy for teachers to develop as professionals and thereby improve their educational practice (e.g. Cochran-Smith & Lytle, 1990; Ponte, Ax, Beijaard, & Wubbels, 2004; Zeichner, 1993).

In the Netherlands, as in other countries, teacher research over the past years has been increasingly promoted and initiated at secondary schools (Oolbekkink-Marchand, van der Steen, & Nijveldt, 2013; Ponte, 2005). For the realization of a research culture in schools, the Dutch Ministry of Education, Culture and Sciences provided financial grants for the establishment of Professional Development Schools (PDS), which is reminiscent of school-centered initial teacher training (SCITT) programs. In this study, the term PDS refers to the so-called *academische opleidingsscholen* in the Netherlands. A PDS is a partnership of secondary schools and higher education teacher training institutes that combines the education of student teachers with establishing a research culture in the schools, including conducting teacher research (Ministerie van Onderwijs, Cultuur en Wetenschap, 2005).

Four of these PDS started under the umbrella of the school consortium Ons Middelbaar Onderwijs (OMO, Our Secondary Education) in the Dutch province of Noord-Brabant. In these PDS the development of a research attitude among teachers is being stimulated in different ways. Research related project were set up, such as professional learning

communities of teachers and pre-service teachers (so-called: *leerateliers*), collaborations of secondary school teachers and university researchers in research projects, for example on the topic of 'deep learning' and courses in teacher research. Two PDS, one in the Western part and the other in the middle part of Noord-Brabant, in which Tilburg University is a partner, took up the initiative to set up and implement a course in teacher research.

Within these two PDS, I had had the shared responsibility to develop the course in teacher research.[1] We held meetings in which secondary education teachers conducted research while receiving training and guidance by us as supervisors. We worked with groups of teachers who were eager to improve their educational practice. We also offered individual consultation hours in which teachers discussed their research with me. This resulted in very inspiring conversations about education.

What was unclear to me, however, was whether and how exactly the course in teacher research actually contributed to the professional development of teachers and to school development. Educational literature on the impact of teacher research does indicate that it contributes to the professional development of teachers and to school development. But what exactly does this concept of professional development and school development entail, and do insights from contemporary educational literature also apply to our project?

At a certain moment I noticed that, as part of my work in the PDS project, I was in fact collecting data by conducting focus-group interviews with and distributing questionnaires among the teacher-researchers to evaluate their professional development and the impact of teacher research on school development. In hindsight, that data collection marked the beginning of this study.

The background of the study is described in this chapter. Below I shall first describe the research questions that were central to the study and

---

1   The TR-course was partly sponsored by the PDS of Ons Middelbaar Onderwijs and partly by the Dutch Ministry of Education, Culture and Science in the context of the Professional Learning Communities project. For this research financial support was provided by Ons Middelbaar Onderwijs.

the study's relevance. In section 1.2, I shall describe the context of the study, i.e. education in the Netherlands. Successively, I shall present a description of the teacher research course that is at the heart of the study (section 1.3), the theoretical framework (section 1.4), and the methodology of the study (section 1.5). I shall conclude this chapter with an overview of the empirical chapters that report on the four studies that were conducted in this research (section 1.6).

1.1.1   Research aims and research questions

The main objective of my research was to acquire a better understanding of the impact of teacher research on teachers' professional development and school development. The study aims to find empirical support for the assumption of teacher research as a promising professionalization strategy for teachers and schools. The empirical evidence that has been collected will also be applied to further elaborate on the conditions for performing teacher research in schools. The findings may provide information to assist secondary education schools to implement and foster teacher research as a professionalization strategy.

My central research question was formulated as follows:
> *· What is the impact of conducting teacher research in secondary education on teachers' professional development and school development?*

To answer this central research question, four studies were conducted. Each study focused on a different aspect of teachers' professional development and school development (as argued in section 1.4 that presents the theoretical framework of the study): teachers' attitudes, skills, knowledge, and behavior.

Each of these aspects was dealt with in a separate empirical study with a separate set of research questions. In the first study (see chapter 2), investigating teacher-researchers' professional development, the focus was on the development of teachers' research *attitude*. The research questions were formulated as follows:

> *· How does the research attitude of teacher-researchers differ before and after having conducted teacher research?*

· How does the research attitude of teacher-researchers after having conducted teacher research differ from the research attitude of teachers who did not conduct research?

In the second study (see chapter 3) the quality of research conducted by secondary education teachers was studied. It was investigated to what degree teacher-researchers had acquired the *skills* to conduct teacher research. The central research question was:

· What is the quality of teacher research conducted by teacher-researchers?

The third study (see chapter 4) aimed at gaining a deeper insight into the professional development of teacher-researchers, focusing on the development of their research *knowledge*. The research question central to this study was:

· How does the research knowledge of teacher-researchers differ before and after having conducted teacher research?

The fourth study (see chapter 5) investigated changes on teachers' professional *behavior*, the impact of such changes on their professional development and school development, and conditions that affect such changes. The research question central to this study was threefold:

· How does teacher-researchers' professional behavior differ before and after having conducted teacher research?
· What is the impact of such changes in teacher-researchers' professional behavior on professional development and school development?
· How do personal and contextual factors affect changes in teacher researchers' professional behavior?

Further theoretical and methodological elaborations related to these research questions can be found in the relevant chapters.

1.1.2 Relevance of the study
The answers to the research questions of this study are relevant for various reasons and in various domains. In the following, I present both the theoretical and practical relevance of this study.

Theoretical relevance

A review of relevant literature shows that empirical evidence for the existence of an impact of teacher research on teachers' professional development and school development is rather scarce, certainly in the context of the Netherlands. In view of this limited empirical evidence, I found it relevant to further investigate the assumption that conducting teacher research contributes to teachers' professional development and school development. This dissertation thereby contributes to both a better understanding of theories about teacher and school professionalization, and theories about research conducted by teachers.

I also found it relevant to further investigate the impact of teacher research for teachers and schools, since prior studies on teacher research were mainly small-scale studies, conducted over a relatively short time span (e.g. one school year). As change takes time however, in order to investigate teachers' professional development and school development a long-term study is advisable (McDonough, 2006; Oolbekkink-Marchand et al., 2013). The context of the five year PDS project I was involved in, offered the opportunity for a long-term cohort study to investigate the results of teacher research on professional development of teachers and school development.

Previous studies were furthermore largely restricted to self-reported data as a basis for analyzing what results teacher research has for the teachers and schools involved. Studies using different research instruments for data collection are scarce. However, including a variety of instruments is advisable knowing that what teachers report to do may differ from what they actually do (den Brok, Bergen, & Brekelmans, 2006; Geerdink, Boei, Willemse, Kools, & van Vlokhoven, 2016). As focusing solely on self-reported data might thus not be providing a full picture, in this study a mixed methods design was chosen. I wanted to gain a holistic perspective and enable a deeper and more complex answer to my research questions to do justice to the highly complex educational practice and gain a more extended understanding of the impact of teacher research on teacher development and school development.

Practical relevance

In addition to its theoretical relevance, it is important to know more about the impact of teacher research from a practical point of view. Now that research related student activities are becoming part of the curriculum in secondary schools in the Netherlands (*Besluit bekwaamheidseisen onderwijspersoneel*, 2017, August 8th; Onderwijsraad, 2014a) and other countries (OECD, 2017), secondary education teachers should acquire research knowledge and skills in order to be able to supervise students who perform these activities. In addition, now that the teachers' role is expanding and that there has been a growing acknowledgement of the need for teachers' engagement in research (OECD, 2012a), it is relevant to increase our understanding of how to best facilitate teachers to be able to take this role successfully.

It is furthermore important to understand to what extent a specific professional development course such as the course in teacher research is effective since substantial financial resources are spent. By investigating teacher research, schools and teachers can decide on the effectiveness of teacher research for school development and the professional development of teachers. As such, PDS can benefit from the results of this study as they obtain insight into the revenues of the funds allocated to teacher research.

All in all, for me, it was evident that more research was needed to increase our understanding of teacher research as a professional development activity embedded in schools.

1.2   THE DUTCH CONTEXT

When I started this study, education was considered a priority area by the Government of The Netherlands (Ministerie van Onderwijs, Cultuur en Wetenschap, 2011; Onderwijsraad, 2013a). The Government was highly committed to improve the quality of education (Onderwijsraad, 2013a). They revealed their ambition to become one of the five best performing knowledge economies in the world (Onderwijsraad, 2013a). The Netherlands was ranked 10th of the world in the 2012 Program for International Student Assessment (PISA) findings in which the Organization for Economic Co-operation and Development (OECD)

assessed 15-year-olds in 65 countries on their reading, mathematics and science skills (OECD, 2012b). Where in other countries the quality of education seemed to increase, the Education Council of the Netherlands (*Onderwijsraad*) – an independent governmental advisory body which advises the Ministry of Education, Culture and Sciences, the Parliament and local authorities – observed a stabilizing situation in the Netherlands (Onderwijsraad, 2013a, 2014b).

Optimizing the quality of education was considered to be an opportunity to contribute to the Netherlands becoming one of the five performing knowledge economies in the world. In the 2012 coalition agreement, the Government disclosed their plans to invest 689 million euros in education and research by 2017. On top of this investment, 256 million euros became available for education by the Haersma Buma Agreement (Rijksoverheid, 2013). The total investment in education and research was planned to be 945 million euros by 2017 (Rijksoverheid, 2013). The investment was intended to place higher demands on teachers and school leaders (see Coalitie, 2012, p. 1).

Placing teachers at the center of attention seems self-evident knowing that education stands or falls with good teachers (Onderwijsraad, 2013b, p. 7). Currently, there is a strong consensus that the continuous professional development of teachers is crucial for improving the quality of education. There is also a strong consensus in educational literature that teachers have a big influence on student achievement (e.g. Hattie, 2009; Marzano, 2003). Knowing that the quality of education depends largely on teacher quality, it seems reasonable to assume that investing in teacher quality by stimulating the continuous development of teachers will ultimately result in an increase in the quality of education. In line with this reasoning, the Government explicitly stated that the quality of teachers is of crucial and decisive importance for becoming one of the top five best performing knowledge economies (Coalitie, 2012).

And precisely the quality of teachers has been a topic of discussion. For example, the Education Council expressed its concerns regarding the quality of secondary education teachers. The Education Council observed that the level of teachers' education is decreasing while society's level of education is increasing (Onderwijsraad, 2013a). The

Education Council stated that the professionalism of teachers has become a necessity (Onderwijsraad, 2003, p. 36) knowing that teachers' influence on education will further increase in our current society in which the work of the teacher at the same time becomes more and more complex (Onderwijsraad, 2013b). This complexity entails, according to the Educational Council, ongoing technological innovations, a more diverse student population, a shortage of teachers, a higher amount of students with special educational needs, and a louder call for schools to contribute to actual societal developments such as globalization and digitalization (European Commission, 2012; Onderwijsraad, 2003). This complex educational practice requires a new set of competences, which demands the continuous professional development of teachers.

In contemporary, rapidly and continuously changing society, there is no golden standard for education: 'the 'best' educational system is unknown' (Onderwijsraad, 2014b, p. 14). It is important for teachers (and school leaders) to have the ability to adapt their teaching practices to the current demands of the local society (Onderwijsraad, 2013b, 2014b). Such a form of decentralization is considered to be essential to modern education (Onderwijsraad, 2014a). In the Netherlands, schools obtained increased autonomy, meaning that the Government should only define content (the *what*), not the way of teaching (the *how*) (Goetheer & van der Vlugt, 2008). The schools and teachers themselves have to decide what works in their teaching practice. They should continuously make inquiries about the most effective way of teaching in their educational practice and adjust their teaching practice based on their findings (Onderwijsraad, 2013a). In increasing autonomy, the professionalization of school leaders and teachers is a prerequisite (Onderwijsraad, 2013a, p. 52). Hence, explicit attention for their professionalism is of high importance (Onderwijsraad, 2014a).

The explicit attention for the professionalism of teachers becomes apparent in laws and regulations. The current law on professions in education warrants teachers to professionalize (*Wet op de beroepen in het onderwijs*, 2004). Furthermore, in 2013, the Dutch Ministry of Education, Culture and Sciences presented a 'teachers agenda' (*lerarenagenda*) entitled 'the teacher makes the difference' in which it is stated that professionalism is not only a right but also an obligation (Ministerie

van Onderwijs, Cultuur en Wetenschap, 2013). In addition, the teachers themselves aimed for their own professionalization, and had united themselves in 2011 in a teachers' union – the Education Cooperation (*Onderwijscoöperatie*) – to contribute to educational policy.

In line with this recognized need to professionalize, the Education Council advised the Government to provide teachers with professionalization hours (Onderwijsraad, 2003). In the collective labor agreement (*CAO*) for teachers, it is recommended to reserve 10 percent of the working hours for professionalization activities (see: VO-raad, 2014, article 17.2).[2] The 10 percent should preferably be spent on long term and intensive professionalization activities – e.g. getting a master's degree or conduct research – as such activities have more impact on professionalism as compared to short term professionalization activities, such as one day seminars (Ministerie van Onderwijs, Cultuur en Wetenschap, 2011; OECD, 2009; Onderwijsraad, 2013b).

Conducting research seemed to be a promising professionalization activity as it is a long term and intensive activity that is consistent with the abovementioned need for teachers to adjust their teaching practice to local, societal needs. By conducting research, the teacher should continuously reflect on his/her teaching practice and evaluate whether it matches the students' needs. Educational literature indeed puts forward teacher research as a means to improve the quality of education and teachers' professional development (e.g. Ponte et al., 2004; van der Linden, 2012; Vrijnsen-de Corte, 2012). As a result, in the Netherlands as in other countries, there is a growing tendency to conduct research in educational practice (Oolbekkink-Marchand et al., 2013; Ponte, 2005). Teachers ought to exploit existing knowledge and gain new knowledge to improve the quality of education (Onderwijsraad, 2013a). Teachers have to become 'innovators and researchers in education, not just civil servants who deliver curricula' (OECD, 2012a, p. 4). In addition to performing teaching activities, teachers should also conduct small

---

2   Employees of OMO (the school consortium Ons Middelbaar Onderwijs that is central to this dissertation) fall, when it comes to professionalization policy, under the collective labor agreement of OMO. In this agreement it is stated that professionalization is part of teachers' regular teaching activities (OMO, 2018, article F4.3). Yearly, OMO employees are entitled to professionalization activities up to an amount of at least € 600 per year (OMO, 2018, article F7.1).

inquiries, collect and interpret student data, and implement research findings into their teaching practice (Onderwijsraad, 2003).

To be able to conduct research, teachers should acquire basic research skills such as formulating research questions, collecting and analyzing data, and reporting about research findings. Therefore, the Education Council advises teachers with an affinity for research to engage in research activities (Onderwijsraad, 2003). To set up research activities, schools are provided with governmental funding. Several initiatives were established throughout the country among which the course in teacher research as developed by the two PDS I am engaged in, in which Tilburg University collaborates with secondary schools in the Dutch province of Noord-Brabant. A description of the course in teacher research that has been developed and taught, is given in the following section.

1.3   THE TEACHER RESEARCH COURSE

The abovementioned course for teacher research provided the context of my study. As indicated before, in the Netherlands, two PDS have developed a Teacher Research Course (TR-course) in which teachers are learning to conduct research. The learning process of the teachers takes place by being trained in doing research while at the same time conducting a classroom or school related research project. The supervisors of the TR-course support teachers in conducting research, thereby aiming at enhancing their professional development which was defined by the PDS as the growth of individual teachers' attitudes, skills, knowledge, and behavior, and school development which was defined by the PDS as the improvement of educational practice and establishing a research culture in the school. Within each PDS one group of teacher-researchers was established. The content of the TR-course was the same for both groups, but the groups worked autonomously (since they worked in different regions). The TR-course runs over a period of one school year (September to July). The research timeline of my study covered five school years (2013/14 to 2017/18).

The TR-course was primarily facilitated by the Professional Development Schools of OMO. Next to that, for four years (2013-2017) funding was

received from the Dutch Ministry of Education, Culture and Sciences.[3] The funding included time (teacher-researchers were exempted from regular school work for four hours per week for participating in the TR-course), provision of a meeting location and assistance of two supervisors of Tilburg University. The supervisors provided training in research skills and were involved in supervising and coaching the teachers in the process of conducting research. A website (www.docentonderzoekbrabant.nl) was created and used as a platform for exchanging information. Every year, the participating teacher-researchers were asked to reflect on the TR-course. Based on their comments, improvements were made to the TR-course (e.g., more authentic educational situations were used in the training, a larger amount of time was spent on peer review).

The TR-course consisted of thirteen group meetings during a school year, in which the teacher-researchers were trained by the supervisors in research skills. For developing the content of the TR-course, we used educational literature and handbooks on teacher research (e.g. Baarda, 2014; Berg, 2004; van der Donk & van Lanen, 2012). In general, the topics covered in the group meetings included the whole research process, i.e. all six stages of the research cycle as described in the handbook for teacher research that was used in the TR-course (van der Donk & van Lanen, 2012), as depicted in Figure 1.1.

---

3   From the Dutch Ministry of Education, Culture and Sciences project 'Development of Professional Learning Communities' (Dutch: *Ontwikkeling van professionele leergemeenschappen*).
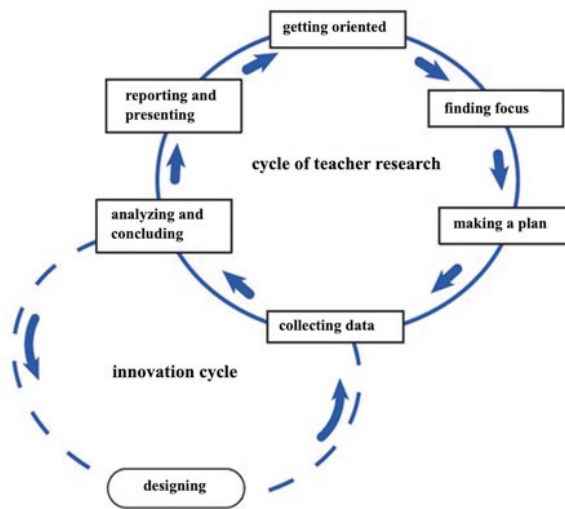
Figure 1.1 Cycle of teacher research (van der Donk & van Lanen, 2012, p. 35, my translation from Dutch)

Teacher research starts with an orientation phase in which the teacher-researcher explores the research theme by investigating the background of the problem and formulating research aims and questions. The following steps are to find focus (conduct a literature study and specify the research questions) and to make a plan (choose an appropriate research method and formulate a time schedule). Next, the teacher-researcher collects data (with the help of existing or newly developed research instruments), analyzes the data and draws conclusions. In case of design research, the teacher-researchers enters the innovation cycle by making a design (e.g. lesson plans, lesson materials) and evaluating this design in practice (testing and improving the design). The research cycle is completed by reporting about the research. As a result of the investigation, further research questions can arise, and the cycle might start again. This research cycle is used in multiple studies on teacher research in both the Netherlands and elsewhere (e.g. Dana, Pape, Griffin, & Prosser, 2016; van der Linden, 2012; Vrijnsen-de Corte, 2012).

In the TR-course there were two kinds of group meetings: training meetings – which were obligatory for first year teacher-researchers only – and peer review meetings – which were attended by all teacher-researchers. During training meetings, theoretical background was given concerning each separate phase of the research cycle and practical

assignments were fulfilled. In the joint peer review meetings, the teacher-researchers provided each other with feedback on their research. The last group meeting was a public presentation meeting in which teacher-researchers presented their research findings to colleagues. In addition to the group meetings, teacher-researchers could schedule individual meetings in which they had the opportunity to discuss their research with one of the supervisors. The supervisor was at all times available for questions via email. Both the group meetings and the individual consultation moments took place at one of the participating secondary schools.

Teacher-researchers conducted their research individually or in pairs. Most teacher-researchers attended the TR-course for one year, some entered for a second year in which they participated in parts of the course. Successful completion of the TR-course resulted in receiving a certificate. All teacher-researchers participated in the TR-course on a voluntary basis. Either they had responded to a call from their school leader to conduct research into a specific school issue, or they came up with their own research topic originating from a problem encountered in their teaching practice. As a result, the teacher-researchers conducted research at classroom or school level on a variety of themes. For example, a teacher-researcher (female, age 27, teacher of Arts) conducted research into students' participation in extracurricular activities. Another teacher-researcher (female, age 30, teacher of Economics) investigated the presence of urban culture in her school. A teacher-researcher (male, age 29, teacher of English) investigated the applicability of gamification in English language lessons and one teacher-researcher (female, age 43, teacher of Geography) conducted research into a new examination plan for the development of schoolwide testing criteria. A team of two teacher-researchers (male, age 39, teacher of Arts and female, age 52, teacher of Dutch) conducted research into the development of an academic research curriculum for pre-university students.

1.4   THEORETICAL FRAMEWORK

This section provides a theoretical framework that enables the description and analysis of teacher research, professional development of teachers, and school development. In each of the following empirical

chapters of this dissertation, parts of this framework will be defined in more detail related to the specific research topic and questions addressed there.

1.4.1 Teacher research

Within the educational research field terms like 'practitioner research', 'action research', 'action inquiry', and 'teacher research' are used interchangeably. In this study, the term 'teacher research' is used as all research central to this study is conducted by secondary education teachers. The term 'teacher-researcher' will be used for teachers who, next to performing regular teaching tasks, conduct teacher research in the context of the TR-course.

Teacher research is defined by Lytle and Cochran-Smith (1994) as a 'systematic and intentional inquiry carried out by teachers in their own schools and classrooms' (p. 24). Lunenberg, Ponte, and van de Ven (2007) defined teacher research as 'a method of obtaining critical insight into a problem experienced in the real world and of solving that problem, in order to learn from the experience for future action' (p. 15). For defining teacher research in this study, I adhered to the definition in the handbook we used in the TR-course: 'Teacher research is the systematic and interactive inquiry by teachers into their own practice for the purpose of improving this practice' (van der Donk & van Lanen, 2012, p. 17, my translation from Dutch).

In chapter 3, six characteristics are formulated constituting the central notions of teacher research. A first characteristic of teacher research is the involvement of a *teacher-as-researcher* (Stenhouse, 1975). This characteristic entails that practitioners (teachers) are engaging in the research process (Carr & Kemmis, 2005). The *collaborative* character of teacher research entails the involvement of stakeholders (colleagues, students, parents) in the research process (Admiraal, Ben, & Zwart, 2013). Teacher research is *context specific* (Admiraal et al., 2013). This characteristic refers to the practice-oriented base of teacher research. The educational practice in which teacher research is conducted is *dynamic* with its many participants in a continuously changing setting (Piggot-Irvine, Rowe, & Ferkins, 2015). Two other characteristics are that teacher research must be carried out *systematically* in order to contribute

to *the primary aim of improving practice* (Piggot-Irvine & Zornes, 2016; Somekh & Zeichner, 2009). This improvement of practice entails the professional development of teachers and school development. Hence, it is important to first consider what is meant by professional development and school development.

1.4.2 Professional development

Generally speaking, professional development implies teacher learning (Runhaar, 2008). In educational literature, professional development is considered to be important in helping teachers to continuously learn and improve education. However, no single, straightforward definition of professional development can be found in the literature. There rather seems to exist an overlap in the wide range of definitions of professional development.

Desimone (2009) argues that there is a set of core elements for defining professional development of teachers: 'although empirical studies that include all elements are rare, the basic components are nearly universal in theoretical notions of the trajectories of teacher learning' (p. 185). Several authors have proposed models for studying teachers' professional development. The first models took improved student outcomes as the ultimate goal of teachers' professional development and presupposed causal chains in development (Fullan, 1982). The supposition was that teacher training programs would lead to a change in teachers' knowledge and beliefs, which would then lead to changes in classroom practice and would have as a final result a change in student learning outcomes.

Guskey (1985; 1986) proposed an alternative model (see Fig. 1.2) in which changes in student outcomes lead to changes in beliefs and attitudes instead of following from them. In his view, teacher development is an experientially based learning process. Guskey (1985) suggested that staff development programs lead to changes in educational practices. These changes in practices lead to changes in student outcomes. Only after teachers have experienced changes in student learning outcomes, significant changes in teachers' attitudes and beliefs are likely to take place.

Figure 1: A New Model of Teacher Change.

STAFF DEVELOPMENT → Change in TEACHERS' CLASSROOM PRACTICES → Change in STUDENT LEARNING OUTCOMES → Change in TEACHERS' BELIEFS AND ATTITUDES
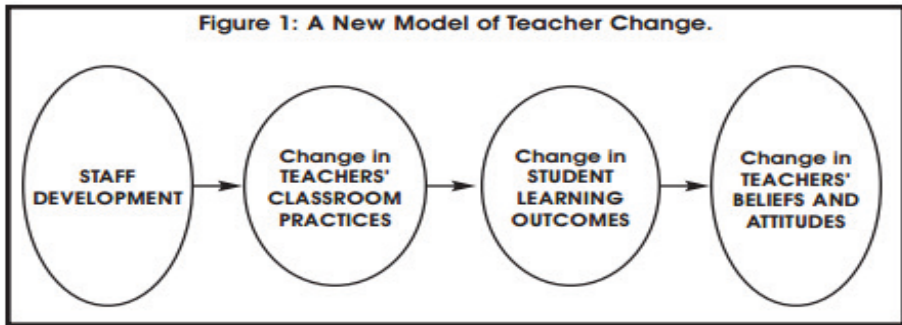
Figure 1.2 Model of teacher change (Guskey, 1985, p. 58)

Desimone (2009) on the other hand, argued that teachers' professional development starts with a change in teachers' knowledge, beliefs, and attitudes. These changes result in a change in instruction which leads to a change in improved student learning (Figure 1.3). Although the relationships between the elements are not linear per se, Desimone (2009) argued that teacher's professional development likely follows these steps. Other than in Guskey's (1985) model, teachers' beliefs and attitudes are not the outcome of a change in classroom practice, but a mediating variable between professional development and a change in classroom practice. Moreover, Desimone (2009) included teachers' attitudes and beliefs as well as teachers' knowledge and skills as variables affecting classroom practice.

Core features of professional development
~ Content focus
~ Active learning
~ Coherence
~ Duration
~ Collective participation

↔ Increased teacher knowledge and skills; change in attitudes and beliefs ↔ Change in instruction ↔ Improved student learning

Context such as teacher and student characteristics, curriculum, school leadership, policy environment
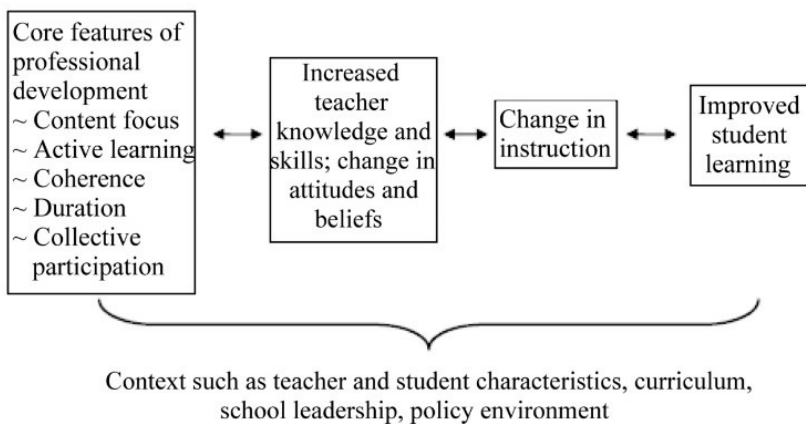
Figure 1.3 Conceptual framework for studying the effects of professional development on teachers and students (Desimone, 2009, p. 185)

The linearity of these models of teachers' professional growth (such as the model of Guskey, 1985 and the one of Desimone, 2009) was more and more criticized (Clarke & Peter, 1993; Cobb, Wood & Yackel, 1990). Clarke (as cited in Clarke & Hollingsworth, 2002) suggested that the model of Guskey (1985) should be viewed as a cyclic model that could be entered at different points. In the view of Cobb, Wood and Yackel (1990) a model of teacher change should involve a continuous interplay between beliefs and practice. Challenging the approaches and beliefs of teachers would motivate them to change their classroom practice, while a change in practice once again would lead to a change in their beliefs. Another non-linear model of teacher change was proposed by Clarke and Hollingsworth (2002) (Figure 1.4). Their Interconnected Model of Teacher Professional Growth (IMTPG) has multiple connections between the four distinct but related domains in which a change in teachers' professional development can be identified: the external domain, the domain of practice, the domain of consequence, and the personal domain. The last three domains together constitute the individual teacher's professional world of practice, consisting of actions, inferred consequences of these actions, and knowledge, beliefs and attitudes that prompted and responded to those actions (Clarke & Hollingsworth, 2002). The four domains are interconnected, meaning that change in one domain is related to change in another domain, as is reflected by the arrows in Figure 1.4. Clarke and Hollingsworth (2002) distinguished two change processes: reflection (active, persistent and careful consideration) and enactment (which is more than just acting as it refers to action prompted by a belief). All change processes occur within (the limits of) the context in which teachers work; the so-called change environment.

The Change Environment

Personal Domain

External Domain

External Sources of Information or Stimulus

Domain of Practice

Knowledge Beliefs And Atititude

Professional Experimen- tation

Salient Outcomes

Domain of Consequence

→ Enactment

←- - - - Reflection
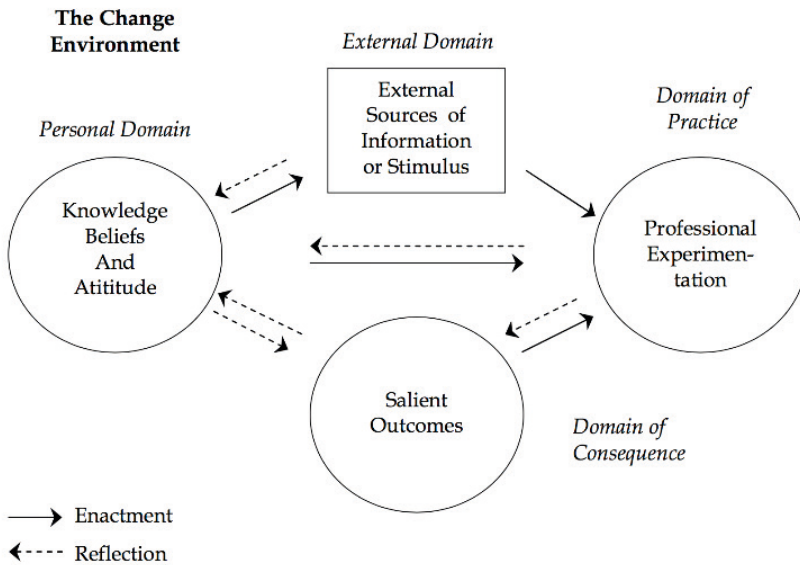
Figure 1.4 The Interconnected Model of Teacher Professional Growth (Clarke & Hollingsworth, 2002, p. 951)

In my study, I adhered to the IMTPG because more than other models on professional development, the IMTPG, being a non-linear model with multiple connections between the components, does justice to the complexity of the educational setting in which professional development takes place (Vermeulen, 2016). In addition, compared to other models for evaluating professional development, the components of IMTPG are defined in more general terms. For example, Desimone (2009) refers to 'a change in instruction' whereas the IMTPG refers to 'professional experimentation'. As not all research conducted by the teachers participating in the TR-course is related to a change in instruction, the more general notions of the IMTPG suited my research better.

When comparing the three models on their elements, it becomes clear that all models depict a professional development program: 'staff development' in Guskey's (1985) model, 'the external domain' in the Interconnected Model of Teacher Professional Growth (IMTPG) of Clarke and Hollingsworth (2002), and 'core features of professional development' in Desimone's (2009) model. All models also depict changes in outcomes at teacher and/or student level. When focusing

on the teacher level, the models include aspects of teacher change: a change in a teacher's beliefs, attitudes, skills, knowledge, and practice. Although, the knowledge aspect is not specifically mentioned in Guskey's (1985) model, he argues that knowledge, skills, and attitudes should be measured when evaluating what participants have learned from their professional development experience (Guskey, 2002).

The aspects mentioned above - beliefs, attitudes, skills, knowledge, and practice - are also recurring in the various definitions of professional development of teachers. For example, Mitchell (2013) defines professional development as 'the process whereby an individual acquires or enhances the skills, knowledge and/or attitudes for improved practice' (p. 390). The aspects are reminiscent of Evans' (2011) notion of professionalism which entails three components: a behavioral, attitudinal, and intellectual component. According to Fraser, Kennedy, Reid, and McKinney (2007) teachers' professional development represents 'the processes that [...] result in specific changes in the professional knowledge, skills, attitudes, beliefs or actions of teachers' (p. 157). Since within attitude research it is suggested that beliefs function as a determinant of attitude meaning that an individual's attitude is predicted by an individual's belief (see the expectancy-value model in e.g. Ajzen, 2001; Fishbein, 1963), this study referred to the aspect 'attitude' and did not put special emphasis on 'beliefs'.

Hence, four aspects – attitudes, skills, knowledge, and behavior – guided the four studies that were conducted in this research for measuring professional development of teachers and school development. In my study, research *attitude* is conceptualized in ten aspects found in the literature (see chapter 2). It encompasses for example the inclination to know, which entails wondering and wanting to know, and the inclination to be innovative, which comprises distancing oneself from routines, questioning the obvious and daring to choose your own direction. Research *skills* are all the skills that are needed to conduct research such as formulating research questions and analyzing data (see chapter 3). Research *knowledge* entails knowledge of the process of conducting teacher research (see chapter 4). Teachers' *behavior* entails teachers' professional actions in their regular educational practice (see chapter 5). The four aspects will be further elaborated in the empirical chapters.

1.4.3 School development

'Teacher development and school development must go hand in hand. In general, you cannot have one without the other,' argued Watson and Fullan (1992, p. 213). They argued that teacher development and school improvement are 'inextricably related'.

School development is dependent on teacher development (McLaughlin, Black-Hawkins, McIntyre, & Townsend, 2007). For example, by conducting teacher research, teachers develop professional knowledge (Ponte et al., 2004), gain evidence on what works in their educational practice (Pater & van Driel, 2014) and arrive at a better understanding of their practice (Ponte, 2005). Schools benefit from this knowledge as they develop the capacity to solve their own problems (Sharp, Eames, Sanders, & Tomlinson, 2006). If, for example, a school encounters a decrease in students' reading ability, teachers can study the background of the reading difficulties of the students and come up with suitable interventions the school can implement to improve students' ability in reading.

Teacher development is in turn dependent on schools providing facilities to stimulate teacher learning (McLaughlin et al., 2007). 'The context in which teachers work can have a substantial impact on their professional growth,' argued Clarke and Hollingsworth (2002, p. 962). Several studies (Bieschke, 2016; Coenders, 2010; Vrijnsen-de Corte, 2012) indeed demonstrated the impact of the environment on teachers' professional development. In this sense, investigating school development implies investigating the professional development of teachers and the conditions which support it (Ainscow et al., 2000).

The question is how schools can best contribute to their own improvement through fostering the professional development of their teachers. In educational literature, several characteristics in the school environment that might affect teachers' professional growth are distinguished. Ros and Keuvelaar-van den Bergh (2016) present a set of eight contextual characteristics while focusing on research conducted in Dutch schools. An exemplary characteristic is the involvement of the team which entails whether or not a group of teachers is involved in the research creating support for the research in the school. Other

characteristics are the role of the school leader (whether he/she has a research attitude and supports teacher research) and the organizational use of knowledge (whether policy decisions within the school are based upon research findings). All eight contextual characteristics of the school environment as mentioned by Ros and Keuvelaar-van den Bergh (2016) are described in detail in chapter 5.

1.5   METHODOLOGY

In this section, the methodology of the study is described. First, I shall discuss the design of the study and describe its participants. After that, I shall reflect on my double role as a supervisor in the TR-course and a researcher of the TR-course.

1.5.1   Case study research with a mixed-methods approach

This study is a case study with a mixed-methods approach to investigate the impact of teacher research on teachers' professional development and school development.

The case study method is applied extensively in many research field including educational research, for example in studies to evaluate the effectiveness of professional development programs (Zainal, 2007). A case study is defined by Yin (2003) as 'an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident' (p. 13).

In this definition the phenomenon refers to the case. Merriam (1998) provided a more concrete definition of a case: 'a single entity, a unit around which there are boundaries. [...] The case then, could be a person such as a student, a teacher, a principal; a program [...] and so on' (p. 27). In my research the case under study is the TR-course and its impact on teachers' professional development and school development.

Case study research allows and in-depth and holistic investigation of a complex setting, such as educational practice (Zainal, 2007). It enables researchers to go beyond the data from a single source (e.g. interviews, observations) since an important aspect of case study research is the

use of data from multiple sources (Yin, 2003). In my study, the use of multiple data sources is evident in the mixed-methods approach.

Mixed-methods research is a type of research in which elements of qualitative and quantitative research approaches are combined (Creswell, 1999; Johnson, Onwuegbuzie, & Turner, 2007). Mixed-methods research is distinct from multi-method research in which either multiple qualitative approaches or multiple quantitative approaches are used (Schoonenboom & Johnson, 2017). Traditionally, quantitative and qualitative research paradigms were not mixed resulting in two research cultures: one professing that research should focus on (e.g.) deduction, generalization and statistical analysis (quantitative inquiry) and one professing that research should focus on (e.g.) induction, exploration and qualitative analysis (qualitative inquiry). Johnson and Onwuegbuzie (2004) presented mixed-methods research as a third paradigm arguing that both quantitative and qualitative research are useful, and that the combination offers unique opportunities to answer research questions. Researchers can take an eclectic approach to method selection as long as the research methods chosen follow the research question (Johnson & Onwuegbuzie, 2004).

My research question was about teacher and school development which encompasses individual as well as organizational aspects. A qualitative research approach was most appropriate for investigating the individual aspects because capturing teachers' professional development is highly complex (Borko, 2004; Clarke & Hollingsworth, 2002). Borko (2004) stated that 'learning is a slow and uncertain process for teachers […]. Some teachers change more than others through participation in professional development programs. Further, some elements of teachers' knowledge and practice are more easily changed than others' (p. 6). Qualitative research is found useful for studying a limited number of complex cases in rich detail (Johnson & Onwuegbuzie, 2004). The organizational aspects of my research were best captured with quantitative research methods since these aspects were investigated on a larger scale (102 teacher-researchers from 27 schools). Quantitative research is found useful for studying large numbers of cases (Johnson & Onwuegbuzie, 2004).

Another reason for choosing a mixed-methods approach in this study, is that mono-method research (applying a single research method) would not offer a holistic understanding. For example, from educational literature it is known that what teachers report to do may differ from what they actually do (den Brok et al., 2006; Geerdink et al., 2016). Vrijnsen-de Corte (2012) argued that combining several instruments is useful 'for obtaining insight into […] differences between what is in the heads of involved participants and what is visible to outsiders' (p. 38). I had to conduct an in-depth investigation by using several data collection instruments to offer a holistic understanding. Hence, a mixed-methods approach suited my research as several instruments for data collection could complement each other and provide a more clarified and elaborate understanding of teachers' professional development and school development. Furthermore, the use of both qualitative and quantitative methods for data collection, served as a means for a more qualitative (in-depth) investigation of quantitative research results. I, for example, collected in-depth data by conducting lesson observations in addition to surveying teacher-researchers. The rationale for applying a mixed-methods approach are described by Greene (2007) with the notions of 'complementarity' (seeking a more elaborate understanding of the same phenomenon) and 'expansion' (extending the range of the investigation).

Another important reason for choosing a mixed-methods approach was that by employing several different data collection instruments, the internal validity of this study could be improved. Educational literature considers triangulation as a technique to enhance the validity and reliability of research into educational practices (Maulana & Helms-Lorenz, 2016). Greene (2007) argued that one of the purposes of using mixed-methods in research is triangulation; using different data collection instruments to seek for correspondence in the results. If the results in research correspond, the confidence in those results is increased (Greene, 2007; Johnson & Onwuegbuzie, 2004).

My study included five instruments for data collection: interviews, questionnaires, observations, knowledge tests (e.g. concept maps), and logbooks (my own field notes). In each of the following empirical chapters, the relevant research instruments are described in more detail.

1.5.2 Participants

All secondary education teachers who participated in the TR-course were participants in my study. This study covered five years of the TR-course (one TR-course per school year), from 2013 to 2018. In the first TR-course year, 23 teacher-researchers participated. Respectively 20, 36, 32, and 18 teacher-researchers participated in the subsequent years. In total, 129 teacher-researchers participated of which 27 re-entered in a subsequent year. Hence, 102 different teacher-researchers participated in the TR-course over the course of five school years. The teacher-researchers taught at 27 different schools for secondary education in the province of Noord-Brabant in the Netherlands. General characteristics of these 102 teacher-researchers are shown in Table 1.1.

Table 1.1 Background information of the participants

		Teacher-researchers					
		All cohorts	Cohort 1 ('13-'14)	Cohort 2 ('14-'15)	Cohort 3 ('15-'16)	Cohort 4 ('16-'17)	Cohort 5 ('17-'18)
Number (re-entered)		102	23	20 (3)	36 (6)	32 (11)	18 (7)
Age[1]	Mean	41.6	43.7	42.1	40.9	40.4	42.4
	Range	25-63	26-62	27-59	25-63	26-62	27-60
Gender	Male	46%	48%	30%	53%	47%	33%
	Female	54%	52%	70%	47%	53%	67%
Subject taught[2]	Alpha	30%	26%	20%	30%	38%	33%
	Beta	20%	26%	35%	14%	6%	17%
	Gamma	27%	26%	15%	28%	31%	22%
	Other	23%	22%	30%	28%	25%	28%
Teaching degree[3]	First degree	56%	57%	45%	53%	66%	72%
	Second degree	39%	39%	50%	39%	34%	28%
	Other	5%	4%	5%	8%	0%	0%

[1] n=97 for age (as there were five missing scores)

[2] Alpha: languages (e.g., Dutch, English), beta: natural science (e.g., Mathematics, Physics), gamma: social sciences (e.g., Economy, History), other: Physical education, Arts, Dramatic arts, Health and Nursing care

[3] First degree: certificated for all forms of secondary education, second degree: certificated for all forms of secondary education except the last three years of the two highest educational levels, other: uncertificated or certificated as primary school teacher

The average age and male-female ratio of the teacher-researchers in my study is representative for Dutch secondary education teachers (Voion, 2016). Relatively many first-degree teachers (56%) are participating in the study compared to the overall percentage (approximately 25%) of first-degree teachers in Dutch secondary education (Voion, 2016).

Not all cohorts of teacher-researchers were participants in all parts of the study. The research attitude of teacher-researchers, which we focus on in chapter 2, is studied in cohort 3 (36 teacher-researchers of which 29 participants in the study). In chapter 3, in which research skills are investigated, four cohorts of teacher-researchers (cohort 1, 2, 3 and 4) participated, amounting to a total of 111 teacher-researchers. The 80 teacher-researchers that completed the course participated in this study. In chapter 4, which focuses on research knowledge, 26 (out of the 32) teacher-researchers from cohort 4 participated in the study. Finally in chapter 5, all 102 teacher-researchers from all five cohorts participated in the overall study, while six teacher-researchers from cohort 5 also participated in the in-depth-study.

1.5.3   Being an 'insider' researcher

I was an 'insider' researcher in this study, not a researcher who works outside of practice. As a researcher, I was part of the research environment as a professional working in this environment. Essentially, this is similar to the teacher-researchers who were participating in the TR-course. The 'teacher-as-researcher' (Stenhouse, 1975) is a practitioner (teacher) who is engaging in the research process. My research was like teacher research, i.e. not an investigation of the situation (conducted by an outsider), but an investigation in the situation (conducted by a teacher). This resembles the distinction made by Green and Bloome (1997) between 'ethnography-of-education' and 'ethnography-in-education' (in the latter not an outsider, but a teacher explores his/her own educational practice).

The 'insider' position of me as a researcher required that I had to be a reflective practitioner. Stenhouse (1975) argued that a reflective practitioner should have the commitment and the skills to systematically investigate one's own teaching. My commitment to my research may be clear from the fact that I started my research at my own initiative

because I wanted to know the impact of the TR-course on teacher and school development. The skills needed to conduct my research have been further developed during my trajectory as PhD-student at Tilburg University.

Like the teacher-researchers, I had to take a critical attitude with regard to my research because an important part of researching your own practice is the capacity to reflect critically and systematically on your investigation. Stenhouse (1975) stated that a reflective practitioner should be transparent about his/her research and discuss it with others (e.g. fellow teachers). During group meeting of the TR-course, I frequently referred to a quote by Carr and Kemmis (1986) who stated that 'what is being abandoned is an unreflective attitude so that a more critical, scientific attitude can be adopted towards established educational creeds' (p. 123). I stressed that critical reflection 'can assist us in subjecting our practice to a more critical gaze' (Fook, 2002, p. 39). Hence, during my own research, I reflected continuously on what I did by allowing insiders (e.g. the teacher-researchers in the TR-course) as well as outsiders (e.g. colleagues from other universities) to take on the role of a critical friend. I was transparent about the research as this could not only clarify my decision-making in my research process, but also could inform others about the research method and outcomes.

My 'insider' position both enhanced and challenged my ability to carry out my intentions as a researcher. Because of my involvement as a supervisor in the TR-course, I was in the unique position to make an in-depth investigation of the impact of the TR-course on teachers' professional development and school development. I had access to all information necessary to understand what went on. I was a connoisseur-researcher having 'a kind of heightened awareness or education perception […] that comes from intimate familiarity with the phenomenon being examined' (Schwandt, 1994, p. 129). This awareness could have improved my ability to perceive and interpret nuances in the TR-course (Kennedy-Lewis, 2012). Furthermore, my years of supervising have provided me with a large network (two PDS, 27 secondary schools with their principals and teachers). It would take an outsider a long time to acquire such information, relationships and rapport.

The challenge of my role as participant-supervisor in the TR-course is that I might have been too closely involved. However, as I stayed in close contact with colleagues from other universities who offered similar professional development programs, I had the opportunity to see the TR-course in its wider context. And not once during my research I felt constraints (imposed by the schools) on what I could ask, observe or publish.

One might furthermore argue that I could have had a preference for one research outcome over the other since being a supervisor is part of my living. However, I knew from the start that the TR-course would run for several years only in this setting because it received funding for a fixed period. During those years, I gave all teacher-researchers my full commitment. Certainly, I couldn't escape leaving my mark as a supervisor on the TR-course as we know from educational research that the teacher matters (Hattie, 2009; Marzano, 2003), i.e. he/she has an influence on (student) outcomes. However, my role of supervisor did not bring my role as a researcher at stake. Although, I spent a lot of time and energy in providing the TR-course as a supervisor, as a researcher I had no interest in whatsoever a certain outcome of my research.

All in all, I think it is important to bear in mind, as Hammersley (2002) put it, that as a researcher 'no position, not even a marginal one, guarantees valid knowledge; and no position prevents it either. [...] Each position has advantages and disadvantages, though these will take on slightly different weights depending on the particular circumstances and purposes of the research' (p. 219). For my research, I am convinced that it has had more advantages than disadvantages to have been an 'insider' researcher.

1.6   OVERVIEW OF THE DISSERTATION

In this dissertation, I present a study into the impact of teacher research on teachers' professional development and school development. In order to answer the central research question – *What is the impact of conducting teacher research in secondary education on teachers' professional development and school development?* – four different studies were conducted. These four studies are presented in chapters 2 to 5. Each chapter focuses on one of the four central concepts – attitudes, skills,

knowledge, and practice respectively – that have been distinguished in section 1.4. All chapters go into professional development of teachers, whereas chapters 3 and 5 also explicitly include school development. All chapters have been published in or submitted to relevant academic journals in the field of education (see below for details). In all chapters the first author has been the main and leading author.

In chapter 2, I investigate the development of a research *attitude* in secondary education teachers who are conducting teacher research. Together with my colleague supervisor in the TR-course, we operationalized the concept 'research attitude', constructed a questionnaire and handed out evaluation forms to empirically investigate its development. The central research questions this study attempts to answer are *How does the research attitude of teacher-researchers differ before and after having conducted teacher research?* and *How does the research attitude of teacher-researchers after having conducted teacher research differ from the research attitude of teachers who did not conduct research?* The study had a pre-test-post-test design. Questionnaire outcomes were compared with a control group of teachers. This chapter has been submitted to *Action in Teacher Education*.

In chapter 3, I go into the question whether teachers are able to conduct teacher research, i.e. on their research *skills*. With my colleague supervisor, we wanted to assess the quality of research conducted by Dutch secondary education teachers. The central research question was: *What is the quality of teacher research conducted by teacher-researchers?* We first needed to investigate the criteria used for evaluating teacher research. We then analyzed research reports and evaluation forms of the participating teacher-researchers over a period of four years. The findings of this study have been published in *Educational Action Research* (see Leuverink & Aarts, 2018).

In chapter 4, I report on a mixed- methods study into the development of research *knowledge* of secondary education teacher-researchers. The central research question was: *How does the research knowledge of teacher-researchers differ before and after having conducted teacher research?* I collected data by using questionnaires, interviews, concept maps, oral

tests and logbooks. This chapter has been accepted for publication by *International Journal of Learning and Development.*

In chapter 5, I discuss the impact of conducting teacher research on teachers' professional *behavior.* Changes in teachers' professional behavior, the impact of such changes on teachers' professional development and school development, and conditions (personal and environmental) that affect such changes were investigated. The following three questions were central to this study: *How does teacher-researchers' professional behavior differ before and after having conducted teacher research?, What is the impact of such changes in teacher-researchers' professional behavior on professional development and school development?, How do personal and contextual factors affect changes in teacher researchers' professional behavior?* Questionnaires were distributed among all teacher-researchers who participated in the TR-course in the period from 2013 to 2018. In-depth data was collected by conducting lesson observations and surveying students. The chapter has been submitted to *Journal of Educational Change.*

In the following chapters of this dissertation, the four studies will be presented in more detail. The four chapters are linked to each other, but can also be understood independently. Since the chapters were submitted as separate manuscripts to international peer-reviewed scientific journals, some recurrence and overlap across chapters is inevitable.

REFERENCES

Admiraal, W., Ben, S., & Zwart, R. (2013). *Academisch docentschap in het basis- en voortgezet onderwijs: Aard en betekenis van onderzoek van docenten naar hun onderwijspraktijk* (411.11.691). Retrieved from https://www.nro.nl

Ainscow, M., Harris, A., Hopkins, D., Beresford, J., Southworth, G., & West, M. (2000). *Creating the Conditions for School Improvement: A Handbook of Staff Development Activities*. London: Routledge. Retrieved from https://books.google.nl

Ajzen, I. (2001). Nature and operation of attitudes. *Annual Review of Psychology*, *52*, 27-58. doi:10.1146/annurev.psych.52.1.27

Baarda, B. (2014). *Dit is onderzoek!* (2nd ed.). Groningen: Noordhoff Uitgevers.

Berg, B. L. (2004). *Qualitative Research Methods for the Social Sciences* (5th ed.). Essex: Pearson Education.

Besluit bekwaamheidseisen onderwijspersoneel. (2017, August 8th). Retrieved from http://wetten.overheid.nl

Bieschke, K. J. (2016). Research Self-Efficacy Beliefs and Research Outcome Expectations: Implications for Developing Scientifically Minded Psychologists. *Journal of Career Assessment, 14*(1), 77-91. doi:10.1177/1069072705281366

Borko, H. (2004). Professional Development and Teacher Learning: Mapping the Terrain. *Educational Researcher, 33*(8), 3-15. doi:10.3102/0013189X033008003

Carr, W., & Kemmis, S. (1986). *Becoming Critical: Education, Knowledge and Action Research* Abingdon: Deakin University Press. Retrieved from https://pdfs.semanticscholar.org

Carr, W., & Kemmis, S. (2005). Staying Critical. *Educational Action Research, 13*(3), 347-358. doi:10.1080/09650790500200296

Clarke, D., & Hollingsworth, H. (2002). Elaborating a model of teacher professional growth. *Teaching and Teacher Education, 18*(8), 947–967. doi: 10.1016/S0742-051X(02)00053-7

Clarke, D. J., & Peter, A. (1993). Modelling teacher change. In B. Atweh, C. Kanes, M. Carss, & G. Booker (Eds.), Contexts in mathematics education. Proceedings of the 16th annual conference of the Mathematics Education Research Group of Australasia (MERGA). Queensland: Mathematics Education Research Group of Australasia. Retrieved from: https://www2.merga.net.au

Coalitie. (2012). *Regeerakkoord 'Bruggen slaan'*. Retrieved from https://www.rijksoverheid.nl

Cobb, P., Wood, T., & Yackel, E. (1990). Classrooms as learning environments for teachers and researchers. In R. B. Davis, C. A. Mayer, & N. Noddings (Eds.), Constructivist views on the teaching and learning of mathematics (pp. 125–146). Reston: National Council of Teachers of Mathematics. Retrieved from https://www.researchgate.net/

Cochran-Smith, M., & Lytle, S. L. (1990). Research on Teaching and Teacher Research: The Issues That Divide. *Educational Researcher, 19*(2), 2-11. doi:10.3102/0013189X019002002

Coenders, F. (2010). *Teachers' professional growth during the development and class enactment of context-based chemistry student learning material* (Doctoral dissertation). Enschede: University of Twente. Retrieved from https://research.utwente.nl

Creswell, J. W. (1999). Mixed-Method Research: Introduction and Application. In G. J. Cizek (Ed.), Handbook of Educational Policy (pp. 455-472). Cambridge: Academic Press. Retrieved from http://cachescan.bcub.ro

Dana, N. F., Pape, S. J., Griffin, C. C., & Prosser, S. K. (2016). Incorporating practitioner inquiry into an online professional development program: the Prime Online experience. *Professional Development in Education, 43*(2), 212-231. doi:10.1080/19415257.2016.1152592

den Brok, P. J., Bergen, T. C. M., & Brekelmans, M. (2006). Convergence and divergence between students' and teachers' perceptions of instructional behaviour in Dutch secondary education. In D. L. Fisher & M. S. Khine (Eds.), *Contemporary approaches to research in learning environments: Worldviews* (pp. 125-160). Singapore: World Scientific. doi: 10.1142/9789812774651_0006

Desimone, L. M. (2009). Improving Impact Studies of Teachers' Professional Development: Toward Better Conceptualizations and Measures. *Educational Researcher, 38*(3), 181-199. doi:10.3102/0013189x08331140

European Commission (2012). *Supporting the Teaching Professions for Better Learning Outcomes.* Retrieved from http://ec.europa.eu

Evans, L. (2011). The 'shape' of teacher professionalism in England: professional standards, performance management, professional development and the changes proposed in the 2010 White Paper. *British Educational Research Journal, 37*(5), 851-870. doi:10.1080/0141 1926.2011.607231

Fishbein, M. (1963). An investigation of the relationships between beliefs about an object and attitude toward that object. *Human Relations, 16*, 233-240. doi:10.1177/001872676301600302

Fook, J. (2002). *Social Work: Critical Theory and Practice.* London: Sage Publications Ltd Retrieved from https://books.google.nl

Fraser, C., Kennedy, A., Reid, L., & McKinney, S. (2007). Teachers' continuing professional development: contested concepts, understandings and models. *Journal of In-service Education, 33*(2), 153-169. doi:10.1080/13674580701292913

Fullan, M. (1982). The meaning of educational change. New York: Teachers College Press. Retrieved from: https://content.taylorfrancis.com

Geerdink, G., Boei, F., Willemse, M., Kools, Q., & van Vlokhoven, H. (2016). Fostering teacher educators' professional development in research and in supervising student teachers' research. *Teachers and Teaching, 22*(8), 965-982. doi:10.1080/13540602.2016.1200544

Goetheer, G., & van der Vlugt, J. (2008). *Tijd voor Onderwijs*. Den Haag: Sdu. Retrieved from https://www.parlement.com

Green, J., & Bloome, D. (1997). Ethnography and ethnographers of and in Education. In J. Flood, S. B. Heath, & D. Lapp (Eds.), *Handbook of research on teaching literacy through the communicative and visual arts* (pp. 181-202). New York: Macmillan Publishers.

Greene, J. C. (2007). *Mixed Methods in Social Inquiry.* San Francisco: Jossey-Bass. Retrieved from https://books.google.nl

Guskey, T. R. (1985). Staff development and teacher change. *Educational Leadership, 42*(7), 57-60. Retrieved from www.ascd.org

Guskey, T. R. (1986). Staff development and the process of teacher change. *Educational Researcher, 15*(5), 5–12. Retrieved from: http://citeseerx.ist.psu.edu

Guskey, T. R. (2002). Professional Development and Teacher Change. *Teachers and Teaching: theory and practice, 8*(3), 381-391. doi:10.1080/135406002100000512

Hammersley, M. (2002). On the teacher as researcher. In M. Hammersley (Ed.), Educational research: Policymaking and Practice. London: Paul Chapman Publishing. Retrieved from https://books.google.nl

Hattie, J. (2009). *Visible Learning: A Synthesis of Over 800 Meta-Analyses Relating to Achievement*. Abingdon, UK: Routledge.

Johnson, R. B., & Onwuegbuzie, J. A. (2004). Mixed Methods Research: A Research Paradigm Whose Time Has Come. *Educational Researcher, 33*(7), 14-26. doi: 10.3102/0013189X033007014

Johnson, R. B., Onwuegbuzie, J. A., & Turner, L. A. (2007). Toward a Definition of Mixed Methods Research. *Journal of Mixed Methods Research, 1*(2), 112-133. doi:10.1177/1558689806298224

Kennedy-Lewis, B. L. (2012). When a Teacher Becomes a Researcher: Using Self-Narrative to Define One's Role as Participant Observer. *Theory Into Practice, 51*(2), 107-113. doi:10.1080/00405841.2012.662865

Leuverink, K. R., & Aarts, A. M. L. (2018). A quality assessment of teacher research. *Educational Action Research*, 1-20. doi:10.1080/09650792.2018.1535445

Lunenberg, M., Ponte, P., & van de Ven, P.-H. (2007). Why Shouldn't Teachers and Teacher Educators Conduct Research on Their Own Practices? An Epistemological Exploration. *European Educational Research Journal, 6*(1), 13-24. doi: 10.2304/eerj.2007.6.1.13

Lytle, S. L., & Cochran-Smith, M. (1994). Inquiry, Knowledge, and Practice. In S. Hollingsworth & H. Sockett (Eds.), *Teacher Research and Educational Reform* (pp. 22-51). Chicago: National Society for the Study of Education.

Marzano, R. J. (2003). *What Works in Schools: Translating Research into Action*. Alexandria: Association for Supervision and Curriculum Development.

Maulana, R., & Helms-Lorenz, M. (2016). Observations and student perceptions of the quality of preservice teachers' teaching behaviour: construct representation and predictive quality. *Learning Environments Research, 19*(3), 335-357. doi:10.1007/s10984-016-9215-8

McDonough, K. (2006). Action Research and the Professional Development of Graduate Teaching Assistants. *The Modern Language Journal, 90*(1), 33-47. doi: 10.1111/j.1540-4781.2006.00383.x

McLaughlin, C., Black-Hawkins, K., McIntyre, D., & Townsend, A. (2007). *Networking Practitioner Research.* Abingdon: Routledge Retrieved from https://books.google.nl

Merriam, S. B. (1998). Case study as qualitative research. In S. B. Merriam (Ed.), Qualitative research and case study applications in education (pp. 26-43). San Francisco: Jossey-Bass. Retrieved from http://www.appstate.edu

Ministerie van Onderwijs, Cultuur en Wetenschap. (2005). *Subsidieregeling Dieptepilot voor de opleidingsschool en de academische school 2005–2008.* Den Haag: Ministerie van Onderwijs, Cultuur en Wetenschap.

Ministerie van Onderwijs, Cultuur en Wetenschap. (2011). *Actieplan Beter Presteren: opbrengstgericht en ambitieus. Het beste uit leerlingen halen.* Den Haag: Ministerie van Onderwijs, Cultuur en Wetenschap.

Ministerie van Onderwijs, Cultuur en Wetenschap. (2013). *Lerarenagenda 2013-2020: de leraar maakt het verschil.* Retrieved from https://www.delerarenagenda.nl

Mitchell, R. (2013). What is professional development, how does it occur in individuals, and how may it be used by educational leaders and managers for the purpose of school improvement? *Professional Development in Education, 39*(3), 387-400. doi:10.1080/19415257.2012.762721

OECD. (2009). *Creating Effective Teaching and Learning Environments: First Results from TALIS.* Retrieved from http://www.oecd.org

OECD. (2012a). *Does performance-based pay improve teaching?* Retrieved from https://www.oecd-ilibrary.org

OECD. (2012b). *PISA 2012 Results in Focus: What 15-year-olds know and what they can do with what they know.* Retrieved from http://www.oecd.org

OECD. (2017). *The Nature of Problem Solving: Using Research to Inspire 21st Century Learning*. Retrieved from http://www.oecd.org

OMO. (2018). *Collectieve Arbeidsovereenkomst OMO 2018*. Retrieved from http://www.omo.nl

Onderwijsraad. (2003). *Kennis van onderwijs*. Retrieved from https://www.onderwijsraad.nl

Onderwijsraad. (2013a). *Een smalle kijk op onderwijskwaliteit*. Retrieved from https://www.onderwijsraad.nl

Onderwijsraad. (2013b). *Kiezen voor kwalitatief sterke leraren*. Retrieved from https://www.onderwijsraad.nl

Onderwijsraad. (2014a). *Een eigentijds curriculum*. Retrieved from https://www.onderwijsraad.nl

Onderwijsraad. (2014b). *Een onderwijsstelsel met veerkracht*. Retrieved from https://www.onderwijsraad.nl

Oolbekkink-Marchand, H. W., van der Steen, J., & Nijveldt, M. (2013). A study of the quality of practitioner research in secondary education: Impact on teacher and school development. *Educational Action Research, 22*(1), 122-139. doi:10.1080/09650792.2013.854175

Pater, C., & van Driel, J. (2014). *Professionele leraren. Opbrengsten en inzichten uit praktijkgerichte onderzoeksprojecten van de VO-raad*. Utrecht: VO-raad. Retrieved from http://www.vo-raad.nl

Piggot-Irvine, E., Rowe, W., & Ferkins, L. (2015). Conceptualizing indicator domains for evaluating action research. *Educational Action Research, 23*(4), 545-566. doi:10.1080/09650792.2015.1042984

Piggot-Irvine, E., & Zornes, D. (2016). Developing a Framework for Research Evaluation in Complex Contexts Such as Action Research. *SAGE Open, 6*(3). doi:10.1177/2158244016663800

Ponte, P. (2005). A Critically constructed concept of action research as a tool for the professional development of teachers. *Journal of In-service Education, 31*(2), 273-296. doi:10.1080/13674580500200279

Ponte, P., Ax, J., Beijaard, D., & Wubbels, T. (2004). Teachers' development of professional knowledge through action research and the facilitation of this by teacher educators. *Teaching and Teacher Education, 20*(6), 571-588. doi:10.1016/j.tate.2004.06.003

Rijksoverheid. (2013). *Nationaal Onderwijsakkoord: De route naar geweldig onderwijs.* Retrieved from https://www.rijksoverheid.nl

Ros, A., & Keuvelaar-van den Bergh, L. (2016). *Scan onderzoekscultuur in de school & Interventiekaarten.* Retrieved from https://www.platformsamenopleiden.nl

Runhaar, P. R. (2008). *Promoting teachers' professional development* (Doctoral dissertation). Enschede: University of Twente. Retrieved from https://research.utwente.nl

Schoonenboom, J., & Johnson, R. B. (2017). How to Construct a Mixed Methods Research Design. *Kölner Zeitschrift für Soziologie und Sozialpsychologie, 69*(Suppl 2), 107-131. doi:10.1007/s11577-017-0454-1

Schwandt, T. A. (1994). Constructivist, Interpretivist Approaches to Human Inquiry. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of Qualitative Research* (pp. 118-137). London: Sage Publications Ltd. Retrieved from https://www.researchgate.net

Sharp, C., Eames, A., Sanders, D., & Tomlinson, K. (2006). *Leading a Research-engaged School* Retrieved from http://dera.ioe.ac.uk

Somekh, B., & Zeichner, K. (2009). Action research for educational reform: Remodelling action research theories and practices in local contexts. *Educational Action Research, 17*(1), 5-21. doi:10.1080/09650790802667402

Stenhouse, L. (1975). *An introduction to curriculum research and development.* London: Heinemann Educational.

van der Donk, C., & van Lanen, B. (2012). *Prakijkonderzoek in de school.* Bussum: Coutinho.

van der Linden, W. (2012). *A design-based approach to introducing student teachers in conducting and using research* (Doctoral dissertation). Eindhoven: Eindhoven University of Technology. Retrieved from https://pure.tue.nl

Vermeulen, M. (2016). *Leren organiseren: Een rijke leeromgeving voor leraren en scholen.* Retrieved from https://www.kpcgroep.nl

VO-raad. (2014). *Collectieve Arbeidsovereenkomst voor het voortgezet onderwijs.* Retrieved from https://www.vo-raad.nl

Voion. (2016). *Onderwijsatlas voortgezet onderwijs: De onderwijsarbeidsmarkt in beeld.* Retrieved from https://www.voion.nl

Vrijnsen-de Corte, M. C. W. (2012). *Researching the teacher-researcher* (Doctoral dissertation). Eindhoven: Eindhoven University of Technology. Retrieved from https://pure.tue.nl

Watson, N., & Fullan, M. G. (1992). Beyond School District-University Partnerships. In M. G. Fullan & A. Hargreaves (Eds.), Teacher Development And Educational Change. Abingdon: Routlegde. Retrieved from https://books.google.nl

Wet op de beroepen in het onderwijs. (2004). Retrieved from http://wetten.overheid.nl/BWBR0016944/2013-07-04

Yin, R. K. (2003). *Case study research: Design and methods.* London: Sage Publications Ltd Retrieved from https://books.google.nl

Zainal, Z. (2007). Case study as a research method. *Kemanusiaan The Asian Journal of Humanities, 5*(1), 1-6. Retrieved from http://psyking.net

Zeichner, K. M. (1993). Action Research: Personal renewal and social reconstruction. *Educational Action Research, 1*(2), 199-219. doi:10.1080/0965079930010202

2

Exploring secondary education
teachers' research attitude

This chapter reports on the development of a research attitude in secondary education teachers who are conducting teacher research. We aimed to investigate the professional development of teachers who are conducting teacher research, focusing on the development of their research attitude. We operationalized the concept 'research attitude', constructed a questionnaire and handed out questionnaires in which teachers self-reported on their research attitude. The study had a pre-test-post-test design. Questionnaire outcomes were compared with a control group of teachers. Findings show that the research attitude of the teacher-researchers increased during the school year, but the difference with the beginning of the school year was not significant. Compared to the control group, the teacher-researchers had a significantly higher research attitude at the end of the school year.[4]

2.1 INTRODUCTION

'Conducting teacher research is inspiring and enriching. It increases your consciousness of your (in)competence and thereby enables you to really change something.' (male, 38, teacher of Geography)

'Conducting teacher research changed my view on education and increased my willingness to innovate.' (female, 35, teacher of Physics)

This chapter reports on the development of a research attitude in secondary education teachers who are conducting teacher research. Teacher research has been initiated increasingly in secondary schools, with the goal of professional development (here defined as the growth of individual teachers' research ability) and school development (here defined as the improvement of educational practice and establishing a research culture in the school) (Ponte, 2005). This study aims to investigate the professional development of teachers who are conducting teacher research, focusing on the development of their research attitude. The study was conducted in the Netherlands, in the context of a Professional Development School (PDS) project; a partnership of secondary education schools in the Dutch province of Noord-Brabant and Tilburg University. The PDS has developed a course in teacher research (henceforth referred to as the TR-course), aiming at both professional and school development. Although research attitude is seen as a key concept in teachers' professional development through teacher research (e.g. Ponte, 2005; Tack & Vanderlinde, 2014; Wolkenhauer & Hooser, 2017), data on its development are scarce. In this study, we set out to gather such data within the context of the before mentioned TR-course.

This chapter first presents a theoretical framework that will be used as a basis for operationalizing the concept 'research attitude'. Operationalizing the concept was necessary to construct a questionnaire and evaluation forms by which a research attitude could be evaluated. The chapter then evaluates the development of a research attitude in secondary education teachers by analyzing questionnaire data and evaluation forms.

2.2   THEORETICAL FRAMEWORK

2.2.1 Teacher research as a means for professional development

Teachers' engagement in research is seen as a key component in the professional development of teachers (OECD, 2009). It is an effective strategy for teachers to develop as professionals and thereby improve their educational practice (Schwartz & Ray, 2018; van der Linden, 2012; Vrijnsen-de Corte, 2012). By conducting teacher research, teachers generate knowledge about their educational practice (Ponte, 2002; Ponte, Ax, Beijaard, & Wubbels, 2004; Vanderlinde & van Braak, 2010). It provides them with evidence on what works in their educational practice (Pater & van Driel, 2014; Schenke, 2015) and with a better understanding of this practice (Ponte, 2005). Based on this enriched understanding, teachers are better able to improve their practice (Lunenberg, Ponte, & van de Ven, 2007).

Research by Zeichner (2003) pointed out that teachers who conduct research are more responsive to (difficult) situations that emerge in their teaching. Also, when conducting teacher research, teachers are encouraged to constantly reflect on their educational practice (Kayaoglu, 2015; Zeichner, 2003) and develop a critical, reflective stance (Cochran-Smith & Lytle, 1999b; Hall, 2009; van der Linden, 2012; Vrijnsen-de Corte, 2012). These are all aspects of what is referred to as 'research attitude'.

2.2.2 Research attitude

'Research attitude' is closely related to constructs like 'inquiry as stance' (Cochran-Smith & Lytle, 2009), 'inquiry-based attitude' (Meijer, Geijsel, Kuijpers, Boei, & Vrieling, 2016), 'inquiry habit of mind' (Earl & Katz, 2002), 'researcherly disposition' (Tack & Vanderlinde, 2014), 'scientific attitude' (de Vos & Genseberger, 2000) and 'scientific research disposition' (van der Rijst, van Driel, Kijne, & Verloop, 2008). The construct is described as 'the position teachers […] take towards knowledge and its relationship to practice' (Cochran-Smith & Lytle, 1999a, p. 288) and 'the tendency to engage in research' (Tack & Vanderlinde, 2014, p. 297). All terms and definitions slightly differ, but they all at the core refer to a 'disposition'. A disposition is a 'tendency to act' (van der Rijst et al., 2008, p. 2). Van der Rijst et al. (2008) state that 'although dispositions are difficult to change,

individuals can put more emphasis on certain aspects of a disposition above others' (p. 2). In several studies it has been suggested that a research attitude can be developed by engagement in research (Bakx, Breteler, Diepstraten, & Copic, 2009; Donche & Struyf, 2008; Lawton-Sticklor & Bodamer, 2016).

In this study, a 'research attitude' is conceptualized in ten aspects found in the literature. Our exploration of research attitude started from de Vos and Genseberger (2000) who argued for a greater focus on the development of a 'scientific attitude' in secondary education students. They stressed the importance of such attitude from three different perspectives: students, science and society. De Vos and Genseberger (2000) emphasized that education should encourage students' desire to know. Students should jointly perform their research activities, as conducting research is not an individual matter. In addition, students should develop a critical stance as they are confronted with research (results) in society. On this basis, de Vos and Genseberger (2000) indicated three aspects of a scientific attitude: an inclination to know, to share and to be critical.

Earl and Katz (2002) described several characteristics of school leaders with a so-called 'inquiry habit of mind'. According to them, school leaders have an inquiry habit of mind when they strive for a thorough understanding, meaning that they persevere and continue investigating until they know for sure. School leaders with an inquiry habit of mind work evidence-based and constantly process data systematically. In addition, they withhold their judgment, are not put off by uncertainty and are willing to change perspective. In line with Earl and Katz (2002), Kreijns, Vermeulen, Evers, and Meijs (2019) distinguished similar dimensions of an inquiry habit of mind: value deep understanding, reserve judgment and tolerate ambiguity, take a range of perspectives and pose increasingly focused questions.

Van der Rijst et al. (2008) found six aspects of what they called a 'scientific research disposition'. This disposition consists of the three aspects distinguished by de Vos and Genseberger (2000), supplemented with an inclination to understand, to achieve and to be innovative. In their study, they interviewed 23 professors from Leiden University's

departments of Mathematics and Natural sciences to identify aspects of this scientific research disposition. All academics had teaching and research experience. Interview questions were related to both the teaching context and the research context. Results showed that the professors varied with respect to their notion of which aspect was central to a scientific research disposition, but the most identified aspects were the inclination to understand and the inclination to be critical (van der Rijst et al., 2008).

The studies by de Vos and Genseberger (2000), Earl and Katz (2002), van der Rijst et al. (2008) focus on educational practice, but not specifically on secondary education teachers. We could further clarify the meaning of 'research attitude' related to teachers in secondary education with work of Bruggink and Harinck (2012). They stressed the importance of a research attitude in secondary education teachers and therefore wanted to investigate what the research attitude of these teachers entails. In their literature review they identified aspects of a research attitude in ten national (Dutch) and twelve international key publications (which were selected from an initial query). Bruggink and Harinck (2012) found nine generic characteristics which overlap with the aspects as distinguished by de Vos and Genseberger (2000), Earl and Katz (2002), and van der Rijst et al. (2008). One aspect (the inclination to achieve) is reported by van der Rijst et al. (2008) and Earl and Katz (2002), but is not mentioned as such in the nine characteristics of Bruggink and Harinck (2012). They do however put emphasis on the importance of perseverance in the research attitude, which shows correspondence with the inclination to achieve. Therefore, we decided to use a model of research attitude containing the ten aspects, derived from the literature, as listed below:

1. Inclination to be critical
2. Inclination to know
3. Willingness to share
4. Inclination to be innovative
5. Inclination to understand
6. Inclination to achieve
7. Inclination to know for sure
8. Inclination to work evidence-based

9. Open mindedness
10. Willingness to change perspective

The *inclination to be critical* entails reflecting critically on the content and quality of data and questioning information. The aspect *inclination to know* entails wondering and wanting to know and investigate. It denotes a profound interest into a theme and the existence of an initial curiosity which might lead to an inquiry. *Willingness to share* entails the desire to talk and write about one's research findings in order to make others familiar with them. The *inclination to be innovative* comprises distancing oneself from routines, questioning the obvious and daring to choose one's own direction. The *inclination to understand* indicates a desire to gain insight, for understanding on a fundamental level. The *inclination to achieve* comprises the dedication and tenacity to do research. The desire to use high quality data, to be precise and to work responsibly (e.g. gathering data in a scientifically correct way) is reflected in the aspect *inclination to know for sure*. The *inclination to work evidence-based* means that one uses data sources and elaborates on former research to construct new knowledge. An *open-minded* attitude comprises awareness of one's own perspective and assumptions. It also entails the ability to reserve one's judgment and be receptive for feedback. The aspect of *being willing to change perspective* entails the examination of views and positions from various perspectives.

The ten aspects give guidance in our attempt to operationalize the concept 'research attitude'. However, we do note that several aspects show overlap. For example, the focus on resources is reflected in both the inclination to know for sure and the inclination to work evidence-based. Another example is that the receptivity to multiple perspectives is reflected in the aspects open mindedness and willingness to change perspective. We also raise a question regarding the applicability in educational practice. A direct reference to this practice is missing even though all aspects have been mentioned for/by educational practitioners. For example, students – being key stakeholders in education – are not reflected in the aspects. In the present study, we want to shed light on the research attitude of teachers who conduct research in their regular teaching practice. Because of the above mentioned shortcomings of

current conceptualizations of research attitude, we included an in-depth analysis of the concept in our research (see section 2.3.5).

2.3   METHODOLOGY

2.3.1   Research objectives and questions

The aim of the study was to investigate the development of a research attitude in secondary education teachers who are conducting teacher research. We wanted to assess whether, as has been suggested in several studies, engagement in research has a positive effect on the development of a research attitude. To investigate the development of a research attitude in secondary education teachers, the concept of 'research attitude' was operationalized in order to construct an instrument by which a research attitude in secondary education teachers could be evaluated.

The following two research questions were formulated:
· *How does the research attitude of teacher-researchers differ before and after having conducted teacher research?*
· *How does the research attitude of teacher-researchers after having conducted teacher research differ from the research attitude of teachers who did not conduct research?*

2.3.2 Context

A Dutch course for teacher research (TR-course) provides the context of this study. The TR-course was developed by two PDS in which secondary education schools and Tilburg University are partners. The TR-course runs over a period of one school year (September – July). When conducting this study (2015-2016), the TR-course ran for the fourth year.

The TR-course was facilitated by the Dutch Ministry of Education, Culture and Sciences. This included time (teachers were made free from teaching for one afternoon per week), provision of a meeting location and assistance from two supervisors of Tilburg University. They provided training in research skills and were involved in supervising and coaching the teachers in the process of conducting research. A website (www. docentonderzoekbrabant.nl) was created and used as a platform for

exchanging information. The TR-course was evaluated by the PDS every year and revised if needed.

Teacher-researchers in the TR-course conducted research on a variety of themes. Examples are: effects of implementing creative writing in Dutch lessons, developing and designing sciences lessons, application of reading strategies in beta lessons, focusing on answering strategies in Geography lessons. All participating teachers took part on a voluntary basis. A certificate was handed out to the teacher-researchers who completed their research project successfully (meaning that their research report was graded as sufficient by the TR-course supervisors).

The two groups of teacher-researchers each met thirteen times a year including at a seminar in which research findings were presented. In addition to these group meetings (of two hours each), teacher-researchers could schedule individual meetings (of half an hour) in which they had the opportunity to discuss their research with one of the supervisors. The number of individual meetings differed; some teachers only scheduled one meeting, while others scheduled up to nine meetings. Both group and individual meetings took place at a secondary school.

During group meetings, teacher-researchers discussed the research process and content, and gave and received feedback to and from peers (fellow teacher-researchers) and supervisors. In addition, the supervisors provided research skills training. No explicit attention was paid to the concept research attitude. A handbook on teacher research (van der Donk & van Lanen, 2012) was used during the training. Topics covered in the group meetings included: formulating research questions, designing questionnaires and analyzing data. Teachers ran the whole process from diagnosing the problem to reporting on their findings (write and submit a research report and present findings).

2.3.3 Participants

The participants in this study were teacher-researchers on the one hand as an experimental group and teachers who did not participate in the TR-course on the other hand as a control group. Of the 102 different teacher-researchers who participated in the five years of the TR-course (see Table 1.1), a total of 36 teacher-researchers were involved in the

TR-course in 2015-2016 (the year in which this study was conducted). Seven of them had already started in 2014-2015 and participated for a second time by continuing their research or starting up a new one. All 36 teacher-researchers taught at secondary schools throughout the Dutch province of Noord-Brabant. There was a group of teachers in the central region of Noord-Brabant in which 16 teachers from five schools participated (group A) and a group in the western region of Noord-Brabant in which 20 teachers from four schools participated (group B). All the teacher-researchers participated in the study at the beginning of the school year. During the year, the group's composition changed due to participants dropping out and a delayed start (due to miscommunication about the start date of the TR-course). Four teachers joined group B in October. One teacher from group A and three teachers from group B left the TR-course during the school year. Reasons for this drop out were an increased workload at school or personal circumstances. A total of 36 teacher-researchers completed the questionnaire at the end of the school year. We have questionnaire data on both the beginning and the end of the school year of 29 teacher-researchers (of which six teacher-researchers who participated in the TR-course for the second year). These data will be used for further analyses.

A total of 97 teachers who did not conduct teacher research, participated in the study as a control group. All these teachers taught at secondary schools throughout the Dutch province of Noord-Brabant. Data on research attitude were collected of 97 teachers, but we could collect background information of 47 teachers only (as a result of a construction error in the online survey software). The missing data are probably in line with the collected data as these correspond to the population of secondary education teachers in the Netherlands with 46.3% male teachers and 53.7% female teachers with an average age of 44.3 years in 2015 (www.stamos.nl). In Table 2.1 an overview is presented of the participants in the study.

Table 2.1 Background information of the participants

		Teacher-researchers (n=29)	Control group (n=47)
Age (mean)		38.6	45.7
Gender	Male	51.7%	46.9%
	Female	48.3%	53.1%
Subject taught[1]	Alpha	48.3%	36.2%
	Beta	10.3%	31.9%
	Gamma	34.5%	25.5%
	Other	6.9%	6.4%

[1] Alpha: languages (e.g. Dutch, English), beta: natural science (e.g. Mathematics, Biology), gamma: social sciences (e.g. Economy, History), other: Physical education, Dramatic arts and Health and Nursing care

Prior to the start of the TR-course no statistically significant difference in the score for research attitude was found between the teacher-researchers and the control group for gender, subject taught or age. We concluded that both groups come from the same population. Furthermore, no difference in the score for research attitude existed within the groups for gender, subject taught or age. Moreover, we have no reason to believe that the teacher-researchers who participated in the TR-course for the second year are different from the other teacher-researchers, since we found no statistical difference in scores for research attitude between these participants and the teacher-researchers who participated in the TR-course for the first year.

2.3.4 Instruments

Since no questionnaire for evaluating teachers' research attitude based on the ten aspects as described above was available, a new questionnaire was developed. This questionnaire was based on the descriptions of the ten aspects in the literature (see de Vos & Genseberger, 2000; Earl & Katz, 2002; van der Rijst et al., 2008; Bruggink & Harinck, 2012). Additionally, the questionnaire for measuring teacher competences (Huizinga, 2009), the curiosity questionnaire as created by Litman and Spielberger (2003) and the innovativeness questionnaire as constructed by Goldsmith (1991) served as inspiration in the construction of the questionnaire for evaluating teachers' research attitude.

The questionnaire consisted of 50 items, each presenting a statement dealing with an aspect of a research attitude (five items on each aspect). Example of statements are *I critically review my educational practice* and *I wonder why things happen as they do.* A five-point Likert scale was used (1 = 'totally disagree'; 5 = 'totally agree') on which the items were rated. The Dutch questionnaire is presented in Appendix 1.

Two versions of the questionnaire were administered because some items were not applicable to teachers who do not conduct research. Seven items with a direct reference to research activities had to be formulated in more general terms. For example, *I do not talk much with others about my research* became *I do not talk much with others about my teaching practice.* On both questionnaires, eleven item reversals were made in order to reduce response bias (particularly the effect of acquiescence). For example, *I persevere when things go wrong* became *I tend to give up when things go wrong.*

All 50 items were evaluated by both TR-course supervisors independently. In case of different interpretations, the item was adapted. The questionnaires were piloted with the 2014-2015 cohort of the TR-course and demonstrated adequate face validity meaning that these teachers did not encounter any difficulties in answering the questionnaire. Therefore, after piloting, no items from the questionnaire were reformulated.

In addition to the questionnaire, an evaluation form was constructed (see Appendix 2). Teacher-researchers were asked to reflect on the impact of their research on their professional development. By including comments from the evaluation forms in our study, we aimed at eliciting more spontaneous and grounded responses and to correct for a possible tendency to answer in a socially desirable manner. For the purpose of data triangulation, different instruments were used. Greene (2007) argued that if the results correspond, the confidence in those results is increased. Hence, for this study, quotations from the evaluation forms in which teacher-researchers commented on their research attitude were included.

2.3.5 Instrument analysis

An instrument analysis for the questionnaire was conducted on 142 responses (from 29 teacher-researchers, 97 teachers in the control group and 16 teachers in the pilot group). Overall, the instrument to measure a research attitude (with 50 items) had a high reliability, Cronbach's α = .85. However, at the level of the ten aspects (with five items on each aspect), we found relatively low reliability scores (Cronbach's α between .13 and .59). Therefore, a factor analysis was conducted in order to find out whether there were other underlying variables (factors) present in the instrument to measure a research attitude.

A principal component analysis (PCA) was conducted on the 50 items with orthogonal rotation (varimax). The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis, KMO = .73 and all but one KMO value for individual items were above the acceptable limit of 0.5 (Field, 2013). This item was excluded from further analysis. With 49 items the KMO measure verified the sampling adequacy and all individual items above the acceptable limit. Bartlett's test of sphericity (c2 (1176) = 3070.81, p < .00), indicated that correlations between the items were sufficiently large for PCA.

Fifteen components had eigenvalues above Kaiser's criterion of 1 and in combination explained 67.07% of the variance. However, the scree plot was slightly ambiguous. To determine the optimum number of components, Stevens (in Field, 2013) recommends interpreting only factor loadings with an absolute value greater than 0.4, irrespective of the sample size. The PCA showed nine components with three or more variables with loadings higher than 0.4 (see Appendix 3).This number of components is close to the a priori criteria for determining the number of components as the instrument contained ten aspects. Therefore, we repeated the analysis with nine factors to extract. The items that cluster on these components suggest that the components represent the aspects as described in Table 2.2. In formulating the aspect labels, we tried to make an association with the teachers' educational practice to enhance their practical applicability in education. The reliability of all the aspects was reasonable, considering the fact that when dealing with psychological constructs (such as attitudes) values below .70 can be expected (Field, 2013).

Table 2.2 Aspects of a 'research attitude'

	Aspect	Items	Cronbach's α
1	Inclination to reorient	12	.78
2	Willingness to apply new ideas in an educational practice	9	.73
3	Scientific working method	7	.66
4	Ongoing observation	4	.65
5	Ongoing verification	4	.57
6	Orientation towards new ideas	4	.56
7	Focus on an educational practice	3	.52
8	Aimed at students	2	.60
9	Willingness to propagate findings	4	.55

The aspect *inclination to reorient* entails determining whether a current situation still meets actual needs. The teacher wonders about the way things go. The teacher uses input (opinions and perspectives of others) and is being critical. The aspect *willingness to apply new ideas in an educational practice* entails a focus on application in educational practice. The teacher has an inclination to take a closer look at his/her educational practice and to innovate, apply new ideas. A *scientific working method* means that a teacher works systematically and thoroughly. The teacher wants to know for sure and uses multiple sources to conduct a proper inquiry. The aspect *ongoing observation* entails the discipline and perseverance of the teacher to keep reflecting and observing. The teacher is continuously registering and noticing things. The *ongoing verification* aspect entails the discipline and perseverance of the teacher to keep verifying. The teacher is not satisfied with shallow and simplistic information or conclusions, but feels the need to verify. The aspect *orientation towards new ideas* entails an openness and willingness to consider new ideas and different opinions. The aspect *focus on an educational practice* entails the contextual focus of the teachers on their educational practice. The teacher reads professional journals and is aware of recent developments in an educational practice. *Aimed at students* means that the teacher pays attention to the students and is keen on optimizing the students' learning situation. The aspect *willingness to propagate* entails that the teacher has an inclination to contribute to the knowledge base of teaching and has a willingness to publicize (research) findings.

The majority of the items (43%) loaded on the first two aspects (the inclination to reorient and the willingness to apply new ideas in an educational practice) which had Cronbach's α values greater than .70 (see Table 2.2). It seems to be that those two aspects form the central notion of a research attitude. The fact that many items load on one aspect was to be expected as the aspects taken from the literature showed overlap. This overlap also becomes apparent when comparing the two lists of aspects of a research attitude. The inclination to reorient was reflected in the aspects inclination to be innovative and inclination to be critical. A scientific working method appeared in the inclination to work evidence-based. The aspects ongoing observation and ongoing verification were reflected in the inclination to know, to understand, to know for sure, and to achieve. The orientations towards new ideas was reflected in the aspects open mindedness and willingness to change perspective. The willingness to propagate appeared in the aspect the willingness to share. The aspects that were not reflected as such in the literature are the willingness to apply new ideas in an educational practice, a focus on an educational practice and being aimed at students. Hence, the aspects that were added are mainly the focus on educational practice and application/implementation in educational practice aimed at students' benefit.

2.3.6 Data collection
All teacher-researchers were asked to complete the questionnaire during a group meeting. Participants did not receive any instruction other than to react to all 50 statements on the questionnaire provided. All teacher-researchers filled out a paper version of the questionnaire in September 2015 (pre-test) and an identical online version in August 2016 (post-test).

The evaluation form was handed out to the teacher-researchers during the last group meeting; 22 teacher-researchers completed the evaluation form.

The coordinators of both PDS distributed the questionnaire among teachers who did not participate in the TR-course. The 97 teachers who responded, completed the online questionnaire in January 2016.

2.3.7 Data analysis

The data analysis for this study was conducted using SPSS 24.0. The assumption of normality of the data was explored by testing for skewness and kurtosis. Plots in combination with values indicated a normal distribution of the data. The Levene's test indicated that variances on all aspects of a research attitude were equal.

Descriptive statistics (means and standard error) were calculated in order to determine the overall score and scores on the newly constructed aspects of a research attitude. By using a dependent (paired samples) t-test, it was determined whether a research attitude of teacher-researchers differed before and after conducting teacher research. By using an independent t-test, it was determined whether after conducting teacher research a research attitude of teacher-researchers differed from a research attitude of teachers who did not conduct research. Pearson's correlation coefficients were calculated in order to determine the effect size to not only report the statistical significance of the research results, but also the relevance of the difference (see Field, 2013).

Quotations from the evaluation forms in which teacher-researchers self-reported on their research attitude were analyzed for a more in-depth investigation of teacher-researchers' research attitude. I categorized the quotations to the ten aspects of a research attitude. In addition, a random selection of quotations was categorized independently by my colleague TR-course supervisor. In case of differences in categorization, the categorization was discussed until consensus was reached. The quotations used in this study were translated from Dutch to English adhering to the content of the original quote, but formulating a grammatically correct English sentence.

2.4 FINDINGS

In Figure 2.1, the scores for research attitude are presented for teacher-researchers at the beginning (pre-test) and end (post-test) of the school year, and for teachers who did not conduct teacher research (control group).
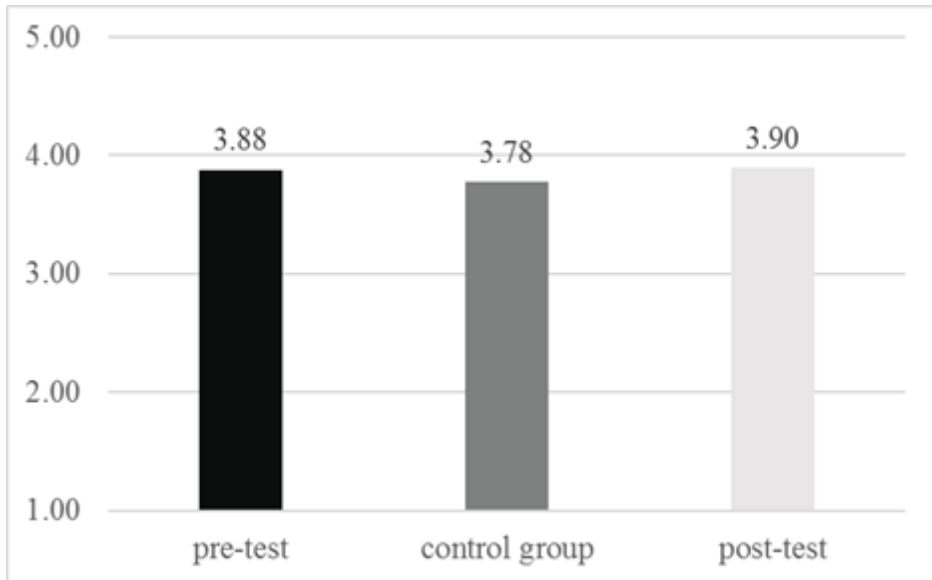
Figure 2.1 The scores for research attitude of teacher-researchers (pre-test and post-test, n=29) and teachers (the control group, n=97)

The average score of a research attitude of teacher-researchers at the beginning of the school year is M = 3.88 (SE = .04). At the end of the school year the average score is M = 3.90 (SE = .06). 16 teacher-researchers had a somewhat more well-developed research attitude whereas 13 teacher-researchers had a somewhat less well-developed research attitude. The average score of teachers who did not conduct research is M = 3.78 (SE = .27). A more detailed description of the scores of a research attitude is given below in which answers to the two research questions are presented.

How does a research attitude of teacher-researchers differ before and after conducting teacher research?
In Figure 2.2 the scores on the nine aspects of a research attitude before (pre-test) and after (post-test) conducting teacher-research are presented.
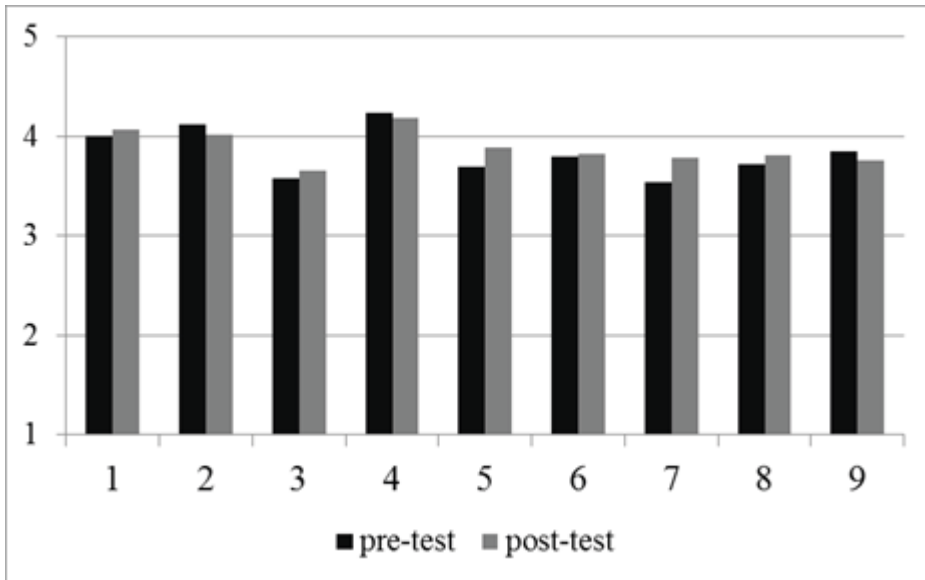
Figure 2.2 Scores of teacher-researchers on aspects of a research attitude before and after conducting teacher research (n=29) (1 = inclination to reorient, 2 = willingness to apply new ideas, 3 = work scientifically, 4 = ongoing observation, 5 = ongoing verification, 6 = orientation towards new ideas, 7 = focus on own teaching practice, 8 = aimed at students, 9 = willingness to propagate)

Findings show that on six out of nine aspects of a research attitude, teacher-researchers' mean scores were higher at the end of the school year. The differences in scores were however not statistically significant. At the end of the school year, teacher-researchers had a somewhat stronger inclination to reorient, to work scientifically and to ongoing verification. Furthermore, they were somewhat more orientated towards new ideas, more focused on their teaching practice and more aimed at students.

Statements from the evaluation forms exemplified that teacher-researchers' research attitude increased. In total, 14 out of the 22 teacher-researchers (63.6%) spontaneously referred to their research attitude. For example, a teacher-researcher (male, age 38, teacher of Geography) stated that teacher research 'increases your consciousness of your (in)competence and thereby enables you to really change something.' Another teacher researcher (male, age 33, teacher of Biology) reported: 'Conducting research has contributed to my research attitude. And my wish to increase this attitude even more.' According to another

teacher-researcher (female, age 28, teacher of Dutch), 'conducting teacher research has provided me with a more professional and critical stance'.

In the evaluation forms, multiple comments reflecting an increase in either of the six aspects (as described above) were found. In the following, several exemplary quotes are presented. An increase in the inclination to reorient is reflected in the comment of a teacher-researcher (female, age 27, teacher of Dutch) who states that 'Conducting research made me and my colleagues critically review our teaching practice.' Comments showed an increased way of working scientifically, for example 'By conducting research, I now work more systematically and am better able to substantiate my ideas' (male, age 63, teacher of Physical education). Comments were found to indicate an inclination for ongoing verification: 'I have become more curious. I have the intention to conduct a follow-up study among other classes to test whether my own conclusions are correct' (male, age 28, teacher of English).

Comments also showed a stronger orientation towards new ideas: 'Conducting research changed my way of looking at educational practice. I am now more open to new ideas' (female, age 55, teacher of Health and Nursing care). And: 'Conducting teacher research changed my view on education and increased my willingness to innovate' (female, age 35, teacher of Physics). Comments were found to indicate a stronger focus on the teaching practice and a stronger focus on the students: 'I am more explicitly concerned with the 'why' of what I do in my lessons. I have found a better balance between my own personal development and the development of the students' (male, age 40, teacher of Arts).

Questionnaire data showed that on three aspects of the research attitude teacher-researchers' mean scores went down (although not statistically significant) during the school year. Teacher-researchers had a smaller willingness to apply new ideas and to propagate, and had a smaller inclination for ongoing observation at the end of the school year. From the evaluation forms, no comments were found to indicate a decrease in these aspects of the research attitude.

How does a research attitude of teacher-researchers after conducting teacher research differ from a research attitude of teachers who did not conduct research?

In Figure 2.3 the scores on the nine aspects of a research attitude after conducting teacher research (post-test) and the scores of the control group are presented.
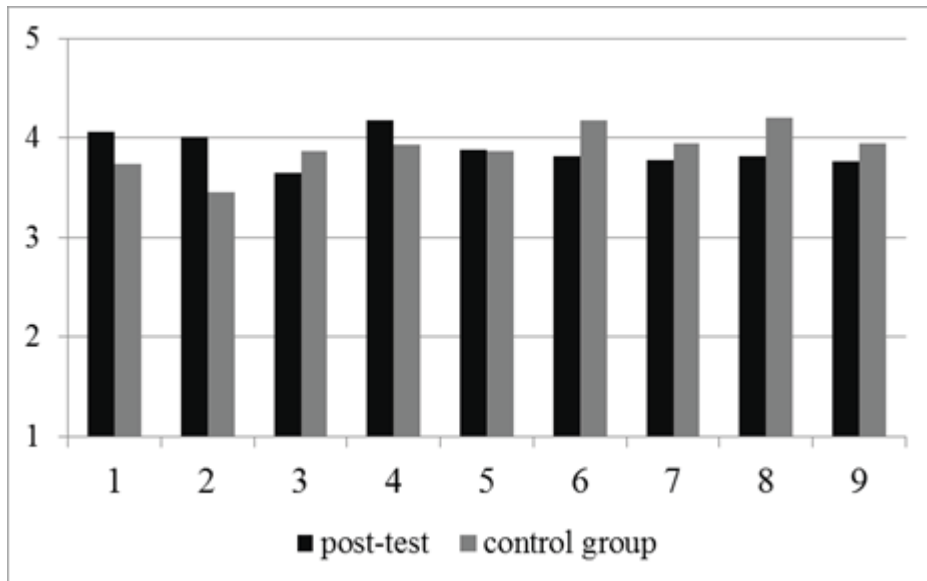
Figure 2.3 Scores of teacher-researchers on aspects of a research attitude after conducting teacher research (n=29) compared to scores of the control group (n=97) (1 = inclination to reorient, 2 = willingness to apply new ideas, 3 = work scientifically, 4 = ongoing observation, 5 = ongoing verification, 6 = orientation towards new ideas, 7 = focus on own teaching practice, 8 = aimed at students, 9 = willingness to propagate)

Findings show that on four out of nine aspects of a research attitude teacher-researchers' scores were higher than the scores of teachers who did not conduct research. A statistically significant difference between the two groups was found in three of those aspects. At the end of the school year, teacher-researchers had a stronger inclination to reorient (M = 4.06, SE = .08) than teachers in the control group (M = 3.74, SE = .04). This difference was significant (t(124) = 3.71, p < .00) and did represent a medium-sized effect (r = .34). Teacher-researchers had a greater willingness to apply new ideas (M = 4.01, SE = .09) than teachers in the control group (M = 3.45, SE = .04). This difference was significant

(*t*(124) = 6.55, *p* < .00) and did represent a large-sized effect (*r* = .51). They also had greater inclination for ongoing observation (M = 4.18, SE = .11) than teachers in the control group (M = 3.93, SE = .05). This difference was significant (*t*(124) = 2.37, *p* < .05) and did represent a small-sized effect (*r* = .21). Teacher-researchers had a greater inclination for ongoing verification, but this difference in scores with the control group was not statistically significant and no more than a small effect was found.

Teacher-researchers' scores were lower than the control group teachers' scores on five aspects of a research attitude. A statistically significant difference between the two groups was found in three of those aspects. On average, teacher-researchers had a smaller inclination to work scientifically (M = 3.65, SE = .09) than teachers in the control group (M = 3.86, SE = .04). This difference was significant (*t*(124) = -2.44, *p* < .05) and did represent a small-sized effect (*r* = .21). Teacher-researchers had a smaller orientation towards new ideas (M = 3.82, SE = .10) than teachers in the control group (M = 4.17, SE = .04). This difference was significant (*t*(124) = -3.41, *p* < .00) and did represent a small-sized effect (*r* = .29). They also were less aimed at students (M = 3.81, SE = .12) than teachers in the control group (M = 4.20, SE = .04). This difference was significant (*t*(124) = -3.72 *p* < .00) and did represent a medium-sized effect (*r* = .32). Teacher-researchers' scores were also lower on the focus on their teaching practice and on their willingness to propagate, but these scores did not prove statistically different between the two groups and no more than a small-sized effect was found.

2.5   CONCLUSIONS

This study was an attempt to gain more insight into the development of a research attitude in secondary education teachers who are conducting teacher research. In this section, we will answer the two research questions on the development of a research attitude in secondary education teachers.

How does a research attitude of teacher-researchers differ before and after conducting teacher research?
The results of the pre- and post-test cannot support the claim that teacher-researchers develop a stronger research attitude when

conducting teacher research during a school year. Their research attitude is only slightly stronger at the end of the school year. The mean scores have increased slightly on six out of nine aspects of a research attitude and have gone down slightly on three aspects. Therefore, in this study, we cannot affirm the claim that teacher research has an impact on a research attitude of teachers. It indeed seems to be the case that attitudes or dispositions are difficult to change (van der Rijst et al., 2008). The one-year TR-course that the teacher-researchers were engaged in did not have sufficient impact to substantively heighten the research attitude of the participants. However, statements from the teacher-researchers in the evaluation indicated that they themselves did experience an increase in research attitude. Teacher-researchers claimed that as a result of conducting teacher research, they (e.g.) were more open to new ideas, worked in a more scientific way, and were more inclined to reorient on their teaching practice.

How does a research attitude of teacher-researchers after conducting teacher research differ from a research attitude of teachers who did not conduct research?
In our study, we found a difference between teachers who were and teachers who were not engaged in teacher research. After having conducted research during a school year, teacher-researchers had a stronger research attitude than teachers who did not conduct research. We found that teacher-researchers were more willing to apply new ideas in their teaching practice, had a stronger orientation to reorient and a stronger inclination for ongoing observation than teachers who did not conduct teacher research. As the findings of this study show that the aspects 'inclination to reorient' and 'willingness to apply new ideas' are the central notions of a research attitude, it seems that teacher-researchers indeed have a stronger research attitude than teachers who did not conduct teacher research. Teacher-researchers scored lower on three aspects: their focus on students, their orientation towards new ideas and their inclination to work scientifically.

2.6   DISCUSSION

The results of this first study add to the existing literature about teachers' research attitude by analyzing the concept and providing empirical data.

Insight into the aspects that encompass teachers' research attitude is essential in understanding and measuring this attitude. Analysis of the research attitude instrument on the basis of empirical data led us to come up with a new model encompassing nine aspects. This model seems to be more adapted to the context of teachers performing teacher research, in which they do inquiries for the sake of improving educational practice. Noticeably, the willingness of teachers to constantly ask themselves whether their teaching practice still meets actual needs (reorient) and their willingness to apply new ideas in their practice, are the core aspects of a teacher's 'research attitude'.

Most of the teachers who participated in the TR-course indicated as outcomes positive changes in their research attitude. In the questionnaire however, no significant impact of the TR-course on the development of a research attitude could be found. A possible explanation could be that a one-year TR-course might not provide enough time for impact (i.e. change in research attitude) to appear. Our findings support a study by Zwart, Wubbels, Bolhuis, and Bergen (2008) proposing that one year might not be enough to make a mind switch. Our findings also support a study by van der Rijst et al. (2008) who argued that dispositions (e.g. research attitude) are difficult to change. It indeed seems that teachers' research attitude is quite stable and does not change easily. As indicated earlier, in several studies (e.g. Bakx et al., 2009) it has been suggested that a research attitude can be developed by engagement in research, but that it is still unclear how this happens exactly.

When looking at our findings, we should note that there was not much room for improvement. Teacher-researchers seem to already possess a rather well developed research attitude at the beginning of the school year; their average score was 3.88 (on a five-point scale). These high scores could be an effect of participants displaying a tendency to answer in a socially desirable manner. Such bias can occur in this form of data collection (Desimone, 2009). We tried to reduce a possible social desirability bias by piloting the questionnaire and assuring participants that there were no right answers and that the data would be processed confidentially. If we assume these high scores at the beginning of the school year to reflect reality, we might hypothesize that the TR-course is especially attractive to teachers who already have a strong research

attitude. However, the results of this study show that teachers who do not conduct research also already have a strong research attitude (see also van den Bergh, Ros, Vermeulen, & Rohaan, 2017), albeit less than the teacher-researchers. This leads us to insert that nowadays having a research attitude can be considered as a core teacher quality. Items of a research attitude questionnaire indeed show a resemblance with standards for teacher educators (see Garrett Holbert & Fisher, 2017) and the Dutch standards of teaching competence (standards for being employed in secondary education; *Besluit bekwaamheidseisen onderwijspersoneel* 2005, August 23th). According to these standards, a teacher has to be able to (e.g.): identify actual developments in an educational practice (reminiscent of the inclination to reorient) and make use of new technologies (reminiscent of willingness to apply new ideas). In a recently established professional profile of teachers, designing education and making use of research are explicitly mentioned as belonging to the task of teachers (Snoek et al., 2017). We may conclude that the aspects of a research attitude are represented in the standards and profile for Dutch teachers. So, if teachers are trained to meet these standards, taking on a research attitude is a necessary component. Our research findings indeed showed that the participants had a well-developed research attitude.

Although all participants have a well-developed research attitude, scores on the aspects of a research attitude significantly differed between teacher-researchers and teachers who are not engaged in research. We argue that participation in the TR-course may explain teacher-researchers' stronger inclination to reorient, their higher willingness to apply new ideas in their teaching practice and their stronger inclination for ongoing observation. In the TR-course, explicit attention was paid to the curiosity and critical attitude of teacher-researchers. Throughout the school year during group meetings, teacher-researchers were continuously encouraged to ask questions in their daily practice, to wonder what was going on and what could be improved. Moreover, they were encouraged to discuss their problems in daily practice and their ideas for improvement with the other participants and to critically review each other's work. As expected, these activities may have resulted in the established increase of teacher-researchers' 'inclination to reorient', 'willingness to apply new ideas' and 'ongoing observation'. These findings

are supported by a study by Heyma et al. (2016) who found that teachers who obtained their master's degree (having an emphasis on conducting research) had a more critical stance than teachers without a master's degree. Additionally, we want to argue that for the aspect 'ongoing observation' – in which perseverance is important – participation in the TR-course testifies for endurance among teacher-researchers. As indicated above, conducting research is complementary to the teaching tasks of the teacher-researcher. Perseverance is assumed to be vital for teacher-researchers' completion of the research project.

Remarkably, there were aspects on which teacher-researchers scored lower than teachers who did not perform research. We hypothesize that the lower score of teacher-researchers on the aspect 'work scientifically' (7 items) may be a result of teacher-researchers becoming aware that they do not fully master the required skills to conduct research. Teachers who did not attend the TR-course, have probably not been confronted with lacking competence to work scientifically, resulting in higher scores on the aspect 'working scientifically'. It is difficult to explain the finding of teacher-researchers being less keen on optimizing students' learning situations and having a smaller orientation towards new ideas and opinions. As these aspects are consisting of only a few items (2 and 4 respectively), we think these findings should be treated with caution. An assumption could be made that these findings originate from teacher-researchers' disappointment in the practical application of their findings. Oolbekkink-Marchand, van der Steen, and Nijveldt (2013) found that teacher research primarily led to transformations in knowledge and attitudes, more than in actions. As changes in knowledge and attitudes may feel less visible and innovative than concrete changes in actions, teacher-researchers may lower their expectations of being able to use new ideas to optimize the learning situation for students.

It was beyond the scope of this study to examine to what extent teacher-researchers integrate their research findings into their teaching practice in order to improve this practice. However, it would be valuable to investigate what impact conducting teacher research has on teaching practices. That study is described in chapter five. In this study, it proved valuable to use different forms of data collection, a questionnaire and an evaluation form, as they enabled us to combine quantitative

and qualitative data. Comments of the teacher-researchers from the evaluation forms, proved useful for a more in-depth investigation of their research attitude.

Overall, this study has provided a renewed insight into the concept of 'research attitude' by analyzing the concept and providing empirical data. This study also showed that we should nuance the claim that teacher research has an impact on the development of a research attitude. In the context of a short one-year TR-course, support for this claim was not found. We did however find teachers who were involved in teacher research to be more inclined to reorient, to apply ongoing observation and to apply new ideas in their teaching practice than teachers who were not involved in teacher research. What merits further investigation is the question whether doing research leads to these attitudes or having these attitudes leads to one's choice for being involved in teacher research.

REFERENCES

Bakx, A., Breteler, H., Diepstraten, I., & Copic, J. (2009). Onderzoek pabo-studenten verankerd in curriculum Succesfactoren en keerzijden. *Tijdschrift voor Lerarenopleiders, 30*(1), 28-35. Retrieved from https://velon.nl

Besluit bekwaamheidseisen onderwijspersoneel. (2005, August 23th). Retrieved from http://wetten.overheid.nl

Bruggink, M., & Harinck, F. (2012). De onderzoekende houding van leraren: wat wordt daaronder verstaan? *Tijdschrift voor Lerarenopleiders, 33*(3), 46-53. Retrieved from https://velon.nl

Cochran-Smith, M., & Lytle, S. L. (1999a). Relationships of Knowledge and Practice: Teacher Learning in Communities. *Review of Research in Education, 24*, 249-305. doi: 10.2307/1167272

Cochran-Smith, M., & Lytle, S. L. (1999b). The Teacher Research Movement: A Decade Later. *Educational Researcher, 28*(7), 15-25. doi:10.3102/0013189X028007015

Cochran-Smith, M., & Lytle, S. L. (2009). *Inquiry as Stance: Practitioner Research in the Next Generation.* New York: Teachers College Press.

de Vos, W., & Genseberger, R. (2000). 'Onderzoek doen' in de natuurwetenschappelijke vakken. *Tijdschrift voor Didactiek der Bètawetenschappen, 17*(1), 4-13. Retrieved from http://www.fi.uu.nl

Desimone, L. M. (2009). Improving Impact Studies of Teachers' Professional Development: Toward Better Conceptualizations and Measures. *Educational Researcher, 38*(3), 181-199. doi:10.3102/0013189x08331140

Donche, V., & Struyf, E. (2008). Leeronderzoek in de stagepraktijk: beschrijven, verklaren of toetsen? *Tijdschrift voor Lerarenopleiders, 29*(4), 13-19. Retrieved from https://velon.nl

Earl, L., & Katz, S. (2002). Leading Schools in a Data-Rich World. In K.A. Leithwood and P. Hallinger (Eds.), *Second International Handbook of Educational Leadership and Administration* (pp. 1003-1022). Dordrecht: Kluwer Academic Publishers. Retrieved from https://books.google.nl

Field, A. (2013). *Discovering Statistics Using IBM SPSS Statistics* (4th Revised edition ed.). Thousand Oaks: Sage Publications Ltd.

Garrett Holbert, R. M., & Fisher, R. (2017). Classroom Teachers as Associated Teacher Educators: Applying ATE Standards for Teacher Educators. In C. M. Crawford & S. L. Hardy (Eds.), *Redefining Teacher Preparation: Learning from Experience in Educator Development*. Lanman: Rowman & Littlefield. Retrieved from https://books.google.nl

Goldsmith, R. E. (1991). The Validity of a Scale to Measure Global Innovativeness. *Journal of Applied Business Research, 7*(2), 89-97. doi:10.19030/jabr.v7i2.6249

Greene, J. C. (2007). *Mixed Methods in Social Inquiry.* San Francisco: Jossey-Bass. Retrieved from https://books.google.nl

Hall, E. (2009). Engaging in and engaging with research: teacher inquiry and development. *Teachers and Teaching, 15*(6), 669-681. doi:10.1080/13540600903356985

Heyma, A., van den Berg, E., Snoek, M., van Veldhuizen, B., Sligte, H., & Emmelot, Y. (2016). *Effecten van een masteropleiding op leraren en hun omgeving; Tussenmeting 2015*. Amsterdam: SEO. Retrieved from http://www.seo.nl

Huizinga, T. (2009). *Op weg naar een instrument voor het meten van docentcompetenties voor het ontwikkelen van curricula* (Masters Thesis). Enschede: Twente University. Retrieved from https://essay.utwente.nl

Kayaoglu, M. N. (2015). Teacher researchers in action research in a heavily centralized education system. *Educational Action Research, 23*(2), 140-161. doi:10.1080/09650792.2014.997260

Kreijns, K., Vermeulen, M., Evers, A., & Meijs, C. (2019). The development of an instrument to measure teachers' inquiry habit of mind. *European Journal of Teacher Education*, *42*(3), 1-17. doi:10.1080/02619768.2019.1597847

Lawton-Sticklor, N., & Bodamer, S. F. (2016). Learning to take an inquiry stance in teacher research: An exploration of unstructured thought partner spaces. *The Educational Forum, 80*(4), 394-406. doi:10.1080/00131725.2016.1206161

Litman, J. A., & Spielberger, C. D. (2003). Measuring epistemic curiosity and its diversive and specific components. *Journal of Personality Assessment, 80*(1), 75-86. doi:10.1207/S15327752JPA8001_16

Lunenberg, M., Ponte, P., & van de Ven, P.-H. (2007). Why Shouldn't Teachers and Teacher Educators Conduct Research on Their Own Practices? An Epistemological Exploration. *European Educational Research Journal, 6*(1), 13-24. doi:10.2304/eerj.2007.6.1.13

Meijer, M.-J., Geijsel, F., Kuijpers, M., Boei, F., & Vrieling, E. (2016). Exploring teachers' inquiry-based attitude. *Teaching in Higher Education, 21*(1), 64-78. doi:10.1080/13562517.2015.1115970

OECD. (2009). *Creating Effective Teaching and Learning Environments: First Results from TALIS*. Retrieved from http://www.oecd.org

Oolbekkink-Marchand, H. W., van der Steen, J., & Nijveldt, M. (2013). A study of the quality of practitioner research in secondary education: Impact on teacher and school development. *Educational Action Research, 22*(1), 122-139. doi:10.1080/09650792.2013.854175

Pater, C., & van Driel, J. (2014). *Professionele leraren. Opbrengsten en inzichten uit praktijkgerichte onderzoeksprojecten van de VO-raad*. Utrecht: VO-raad. Retrieved from http://www.vo-raad.nl

Ponte, P. (2002). Actie-onderzoek als professionaliseringsstrategie voor docenten uitgevoerd en begeleid. *Tijdschrift voor Lerarenopleiders, 23*(3), 11-19. Retrieved from https://velon.nl

Ponte, P. (2005). A Critically constructed concept of action research as a tool for the professional development of teachers. *Journal of In-service Education, 31*(2), 273-296. doi:10.1080/13674580500200279

Ponte, P., Ax, J., Beijaard, D., & Wubbels, T. (2004). Teachers' development of professional knowledge through action research and the facilitation of this by teacher educators. *Teaching and Teacher Education, 20*(6), 571-588. doi:10.1016/j.tate.2004.06.003

Schenke, W. (2015). *Connecting practice-based research and school development. Cross-professional collaboration in secondary education* (Doctoral dissertation). Amsterdam: University of Amsterdam. Retrieved from http://dare.uva.nl

Schwartz, G., & Ray, B. (2018). Teacher Research in Teacher Education: Emancipatory Potential in Discouraging Times. *Journal of Interdisciplinary Studies in Education, 6*(2), 49-62. Retrieved from http://isejournal.org

Snoek, M., de Wit, B., Dengerink, J., van der Wolk, W., van Eldik, S., & Wirtz, N. (2017). *Een beroepsbeeld voor de leraar: over ontwikkelrichtingen en groei van leraren in het onderwijs*. Amsterdam/Utrecht: Drukproef. Retrieved from https://www.beroepsbeeldvoordeleraar.nl

Tack, H., & Vanderlinde, R. (2014). Teacher Educators' Professional Development: Towards a Typology of Teacher Educators' Researcherly Disposition. *British Journal of Educational Studies, 62*(3), 297-315. doi:10.1080/00071005.2014.957639

van den Bergh, L., Ros, A., Vermeulen, M., & Rohaan, E. (2017). De onderzoekende houding en literatuurgebruik in onderzoekende basisscholen: een exploratie. *Pedagogische Studiën, 94*, 478-495. Retrieved from http://pedagogischestudien.nl

van der Donk, C., & van Lanen, B. (2012). *Prakijkonderzoek in de school*. Bussum: Coutinho.

van der Linden, W. (2012). *A design-based approach to introducing student teachers in conducting and using research* (Doctoral dissertation). Eindhoven: Eindhoven University of Technology. Retrieved from https://pure.tue.nl

van der Rijst, R. M., van Driel, J. H., Kijne, J. W., & Verloop, N. (2008). *Exploring Scientific Research Disposition from the Perspective of Academics*. Paper presented at the National Association of Research in Science Teaching. Retrieved from http://www.ecent.nl

Vanderlinde, R., & van Braak, J. (2010). The gap between educational research and practice: views of teachers, school leaders, intermediaries and researchers. *British Educational Research Journal, 36*(2), 299-316. doi:10.1080/01411920902919257

Vrijnsen-de Corte, M. C. W. (2012). *Researching the teacher-researcher* (Doctoral dissertation). Eindhoven: Eindhoven University of Technology. Retrieved from https://pure.tue.nl

Wolkenhauer, R., & Hooser, A. (2017). 'Inquiry is Confidence': How Practitioner Inquiry Can Support New Teachers. *Journal of Practitioner Research, 2*(1). doi:10.5038/2379-9951.2.1.1028

Zeichner, K. M. (2003). Teacher research as professional development for P–12 educators in the USA[1]. *Educational Action Research, 11*(2), 301-326. doi:10.1080/09650790300200211

Zwart, R. C., Wubbels, T., Bolhuis, S., & Bergen, T. C. M. (2008). Teacher learning through reciprocal peer coaching: An analysis of activity sequences. *Teaching and Teacher Education, 24*(4), 982-1002. doi:10.1016/j.tate.2007.11.003

3

A quality assessment of teacher research

This chapter reports on the assessment of the quality of research conducted by secondary education teachers. In order to make such an assessment, we needed to investigate the criteria for evaluating teacher research. The research timeline of this study covered four school years. We analyzed research reports and evaluation forms. We found that the five quality criteria as proposed by Anderson and Herr (1999) are useful for assessing teacher research. We made concrete operationalizations of these five criteria and their indicators. We found that successfully conducted teacher research contributes both to professional and school development, although its contribution to professional development is greater and more concrete than to school development.[5]

---

5   This chapter has been accepted for publication by *Educational Action Research.*

3.1   INTRODUCTION

'The beauty of conducting teacher research is that, unlike teachers usually do, you are working on your professional development. It provides you with knowledge, but above all a lot of satisfaction. Indirectly, you cannot do your students a bigger favor!' (male, 39, teacher of Arts)

This chapter reports on the assessment of the quality of research conducted by secondary education teachers. In the Netherlands, governmental funding is provided to schools for improving the quality of education by implementing research activities. The initiatives that are the focus of this study are undertaken by two Professional Development Schools (PDS) in the Dutch province of Noord-Brabant. These schools have set up a professional development program in which secondary education teachers conduct research while receiving training and guidance by supervisors of Tilburg University, henceforth referred to as the TR-course. The TR-course aims at professional development (defined as the growth of individual teachers' knowledge, skills, action, and/or attitude) and school development (defined as the improvement of educational practice and establishing a research environment in the school).

To evaluate whether the aims of the TR-course are achieved, it is necessary to assess the research conducted in the TR-course. No clear format however turned out to be available for conducting such a quality assessment. In addition, there are no widely accepted criteria for assessing practitioner research. The research question central to this study is: *What is the quality of teacher research conducted by teacher-researchers?* This research question is addressed in two steps. First, a literature review is presented wherein quality criteria for assessing teacher research (not limited to the Dutch context) are investigated. These quality criteria are necessary for being able to assess the quality of research conducted by teachers. Next, the quality of teacher research is determined by assessing teacher-researchers' written research reports and analyzing evaluation forms. Thereby, an answer is provided to the question whether the TR-course contributes to professional development and school development.

3.2 THEORETICAL FRAMEWORK

3.2.1 Teacher research in education

Teachers' engagement in research is known as teacher research. Teacher research is defined by Lytle and Cochran-Smith (1994) as a 'systematic and intentional inquiry carried out by teachers in their own schools and classrooms' (p. 24). This study adheres to the definition in the handbook used in the TR-course: 'Teacher research is the systematic and interactive inquiry by teachers into their own practice for the purpose of improving this practice' (van der Donk & van Lanen, 2012, p. 17, my translation from Dutch).

Within the educational research field terms as (e.g.,) 'practitioner research', 'action research', 'action inquiry', and 'teacher research' are used interchangeably. Piggot-Irvine, Rowe, and Ferkins (2015) remarked that the term chosen is dependent on the situation in which the research takes place. In this study, the term 'teacher research' is used as all research central to this study is conducted by secondary education teachers.

Educational research literature puts forth teacher research as an effective strategy for teachers to develop as professionals and thereby improve their teaching practice (Cochran-Smith & Lytle, 1990; Dinkelman, 2003; Ponte, Ax, Beijaard, & Wubbels, 2004). In order to contribute to teachers' professional development this research has to meet certain quality criteria. If the research is, for example, carried out unsystematically, i.e., non-scientifically, it might not lead to an increase in knowledge or a more critical attitude of the teacher-researchers (Cochran-Smith & Lytle, 1999; Newton & Burgess, 2008; Ponte, 2005) and as such not to professional development. 'Practitioner research excludes [...] ad hoc and unsystematic, reflection' (Lunenberg, Ponte, & van de Ven, 2007, p. 15).

Oolbekkink-Marchand, van der Steen, and Nijveldt (2013) argue that a specific focus on research quality might increase the impact on professional development and school development. And precisely the quality of practitioner research has been topic of discussion (Ellström, 2008). No general guidelines for conducting teacher research are available as there is much variation in this type of research (Piggot-Irvine

et al., 2015). As more and more teachers are being trained in teacher research and the amount of teacher research is growing (Cochran-Smith & Boston College Evidence Team, 2009; Ponte, 2005), this lack of guidelines is becoming a problem. In addition, there are no clear criteria for assessing practitioner research (Admiraal, Ben, & Zwart, 2013; Furlong & Oancea, 2005; Oolbekkink-Marchand et al., 2013). Without criteria for assessment however, 'there is nothing to prevent us from making the wrong conclusions and encouraging the wrong work habits' (Lewin, 1946, p. 35).

3.2.2 The characteristics of teacher research

To assess the quality of research, standards have already been established for diverse research methods. These standards were found not applicable however for evaluating teacher research because of its unique nature (Anderson & Herr, 1999; Lunenberg et al., 2007; Meyer, 2000; Newton & Burgess, 2008; Schön, 1995). To provide insight into this unique nature, it is necessary to clarify how teacher research is distinct from other research types. Several authors have described teacher research as a unique research method. This study wants to provide a concise overview of recurrent, reported characteristics of teacher research.

We analyzed 30 publications to identify the unique characteristics of teacher research. Among those publications was work by Somekh and Zeichner (2009) who reviewed 49 publications about action research. We also included the review study by Admiraal et al. (2013) in which the characteristics of teacher research were explored in 160 publications. Furthermore, we took into account work of the Evaluation Study of Action Research, in which Piggot-Irvine and colleagues identified characteristics of action research for the purpose of evaluating the research impact of more than 100 action research studies (Piggot-Irvine et al., 2015; Piggot-Irvine & Zornes, 2016). In addition, we included work by Enthoven and de Bruijn (2010) who reviewed three handbooks on teacher research. Starting point for our analyses were publications by key figures - as identified by Somekh and Zeichner (2009) - Lewin, Corey, Stenhouse, Elliot, Carr and Kemmis. In the following, we discuss six characteristics as constituting the central notions of teacher research.

Teacher-as-researcher

Stenhouse (1975) introduced the notion of the teacher-as-researcher. This notion entails that practitioners (teachers) are engaging in the research process (Admiraal et al., 2013; Carr & Kemmis, 2005; Piggot-Irvine & Zornes, 2016; Somekh & Zeichner, 2009). The teachers themselves – whether or not in collaboration with a research partner from, for example, a university – conduct the research. Teacher research is not research on the situation (conducted by an outsider), but research in the situation (conducted by a teacher). This is reminiscent of the distinction made by Green and Bloome (1997) between *ethnography-of-education* and *ethnography-in-education* (in the latter not an outsider, but the teacher explores his or her own educational practice). The researcher is part of the research environment as a professional working in this environment.

Systematic

As stated earlier, teacher research must be carried out systematically in order to contribute to the primary aim of improving practice. However, within educational literature it remains vague what is meant by 'systematic' in teacher research. This may be due to the many different interpretations of teacher research (Furlong & Oancea, 2005; Lunenberg et al., 2007; Somekh & Zeichner, 2009; Zeichner, 1993).

In handbooks for action research (Berg, 2004, chapter 7) systematic entails that the teacher-researcher passes through all core activities of a research cycle in a stepwise manner. In the handbook for teacher research as used in the TR-course this cycle consists of six stages. The cycle starts with an orientation on the 'problem of practice' (the issue in the educational practice the teacher-researcher is focusing on) and the formulation of a research question, continuing with defining the problem, planning the research process, collecting data, analyzing data and drawing conclusions, and fulfilling the cycle with reporting the research findings (van der Donk & van Lanen, 2012). This systematic process is cyclic in that the conducted research might raise new research questions.

Improvement of practice

The primary goal of teacher research is the improvement of educational practice (Admiraal et al., 2013; Lunenberg et al., 2007; Piggot-Irvine & Zornes, 2016; Somekh & Zeichner, 2009). In order to do so, teacher research aims at understanding educational practice. In many other (academic/scientific) research types the primary goal is creating external knowledge (Kemmis, 2010) and contributing to a general knowledge base. It is not ruled out that teacher research could also contribute to a knowledge base of teaching (Cochran-Smith & Lytle, 2009; Elliott, 2005; Meyer, 2000; Oolbekkink-Marchand et al., 2013; Zeichner, 1993). However, the creation of general knowledge is seen as an additional, secondary goal of teacher research (Kemmis, 2010; Ponte, 2005).

Collaborative

The collaborative character of teacher research entails the involvement of stakeholders (colleagues, students, parents) in the research process (Admiraal et al., 2013; Carr & Kemmis, 2005; Cochran-Smith & Lytle, 2009; Piggot-Irvine & Zornes, 2016). All stakeholders play an active role in the research as subjects or critical friends (Meyer, 2000). During the research process the teacher-researcher holds a continuous dialogue with the stakeholders (Heydenrych, 2001). Thus, teacher research is a joint enterprise, a collaborative action.

Context specific

Teacher research is context specific. This refers to the practice-oriented base of teacher research. In their review study, Admiraal et al. (2013) found that teacher research is mainly oriented at and carried out in the teacher's educational practice. The reason for conducting the research arises from the educational practice of the teacher (Elliott, 2007; Ponte, 2005).

The context specific nature of teacher research has consequences for the generalizability of its research findings. One might argue that generalization is problematic as no two contexts are identical. However, Cochran-Smith and Lytle (2009) state that, although teacher research is constructed in a specific context, the findings are not limited to that context as the results might be relevant to other contexts as well. In line with Elliott (2007), Meyer (2000) and Vogrinc and Zuljan (2009)

argue that research findings can be generalized based on the principle of analogy, meaning that readers can transfer relevant findings if their own educational practice shows resemblance with the research context. It is therefore necessary that the teacher-researcher reports accurately about the research and its specific context.

Dynamic setting

The educational practice in which teacher research is conducted is dynamic with its many participants in a continuous changing setting (Anderson & Herr, 1999; Karran, 2009; Piggot-Irvine et al., 2015). Hence, teacher-researchers should have an openness to unpredictability during the research process as this research process might not be known exactly in advance and the practice evolves in the course of the research (Carr & Kemmis, 2005; Dick, 1997; Lunenberg et al., 2007; Somekh & Zeichner, 2009). Heydenrych (2001) states that teacher research 'is about flexibility and adaptation. Initial plans and successive steps will therefore be modified in the light of experience' (p. 47).

3.2.3 Quality criteria in teacher research

The specific character of teacher research has opened a debate on the criteria by which teacher research should be judged. Wiek, Talwar, O'Shea and Robinson (as cited in Piggot-Irvine et al., 2015) argued that current standards to evaluate research are inadequate for evaluating teacher research. Schön (1995) stated that 'action research [has] norms of its own, which will conflict with the norms of technical rationality-- the prevailing epistemology built into the research universities' (p. 27). '[Judging] practitioner research by traditional positivistic research criteria [is] like comparing apples and pears', as argued by (Lunenberg et al., 2007, p. 21).

Thus, the challenge is to establish a set of quality criteria that do justice to the abovementioned characteristics of teacher research. Setting out specific quality criteria that match the characteristics of a research method, is nothing new. Anderson and Herr (1999) argued that research forms other than the traditional ones, e.g., positivism, 'insisted on their own validity criteria [...] because they felt their work would be unfairly evaluated by others' criteria' (p. 15). Appropriate quality criteria matching the purposes and characteristics of the inquiry should be established

(Anderson & Herr, 1999; Kemmis, 2010; Newton & Burgess, 2008; Zeichner & Noffke, 2001).

Several researchers have proposed quality criteria to evaluate teacher research. Heikkinen, Huttunen, and Syrjälä (2007) proposed five criteria or principles, namely historical continuity, reflexivity, dialectics, workability and evocativeness. These criteria were developed for evaluating action research narratives. As not all teacher research conducted in the TR-course is of narrative nature, the five criteria of Heikkinen et al. (2007) are not very suitable for this study. Elliott (2007) presented sixteen criteria to assess the quality of action research, based on his experience in coordinating this type of research. Most of the criteria are however derived from projects including experimental teaching by teachers or from research conducted by groups of teachers. As these types of research are not common in our TR-course, the criteria as proposed by Elliott (2007) are not appropriate for this study. Furlong and Oancea (2005) have also contributed to the debate about quality criteria by presenting a framework, which entails four dimensions of quality (each divided into several features) along which research can be evaluated. The four dimensions – epistemic, technological, capacity development and economic – are proposed to assess the scientific and the social, economic robustness of the research. We found that not all features are in line with the characteristics of teacher research which also makes this framework less suitable for this study. The five criteria as set out by Anderson and Herr (1999) are choosen as a framework for this study, as they are most in line with the characteristics of teacher research discussed above. The criteria will be described hereafter.

The first criterion is *outcome validity*. With this criterion one examines whether the research question is answered and a solution is given for the problem of practice (Anderson & Herr, 1999). This criterion also entails the extent to which new research questions are generated (Anderson & Herr, 1999). The primary goal, i.e. the improvement of practice, and the context specific nature of teacher research is reflected in this criterion.

The second criterion is *process validity*. This criterion is about choosing and applying an adequate research method for addressing the problem of practice (Newton & Burgess, 2008; Oolbekkink-Marchand et al., 2013).

Anderson and Herr (1999) argue that process validity is not limited to the research method, but do not elaborate on what furthermore is included in this criterion. They do however state that the notion of triangulation (including multiple perspectives, methods, sources) fits this criterion and that process validity is reflected in other criteria because: 'if the process is superficial or flawed, the outcome will reflect this' (Anderson & Herr, 1999, p. 16). Process validity reflects the necessity to conduct the research systematically. Furthermore, it reflects the dynamic nature of teacher research as it entails reflective cycles and an ongoing problematization.

The third criterion, *democratic validity*, refers to the extent to which stakeholders (colleagues, students, parents, and administrators) are included in the research. This criterion entails collaborating with all stakeholders. They should be included in the research (as informants) to ensure the relevance of the solution for the problem of practice for all stakeholders in the context under study. Democratic validity reflects the context specificity of teacher research as research findings should be relevant for all stakeholders in the context under study. This criterion also reflects the collaborative nature of teacher research in that the teacher-researchers should collaborate and seek a dialogue with stakeholders.

Catalytic validity, the fourth criterion, refers to the extent in which the research brings about changes (in knowledge, skills, actions, and/or attitudes) for parties involved in the research (Oolbekkink-Marchand et al., 2013). It entails the extent to which the teacher-researcher and all stakeholders, for example, deepen their understanding and reorient their view of educational practice. The criterion of catalytic validity reflects the improvement of practice as the research should transform educational practice and its practitioners. This criterion is also reminiscent of the context specific nature of teacher research (as transformations must be relevant for the specific educational practice under investigation).

The fifth criterion, *dialogic validity*, refers to the extent to which the teacher-researcher uses peer feedback and engages in a dialogue with other teachers and researchers. Dialogic validity reflects the collaborative nature of teacher research in that the teacher-researcher should include

colleague teachers and researchers in the research process as critical friends.

The five quality criteria are helpful in studying the quality of teacher research as the validities can be associated with the unique characteristics of teacher research, as is shown in Table 3.1.

Table 3.1   Quality criteria and characteristics of teacher research matched

Quality criterion	Characteristic
Outcome validity	Improvement of practice and context specific
Process validity	Systematic and dynamic
Democratic validity	Context specific and collaborative
Catalytic validity	Improvement of practice and context specific
Dialogic validity	Collaborative

By adding the condition that teacher research must be conducted by a teacher in order to be teacher research, all characteristics are reflected in the five quality criteria.

Anderson and Herr (1999) emphasize that the order of the criteria is arbitrary and that all criteria are of equal importance. However, a teacher-researcher might put more emphasis on one criterion over another based on the purpose of her/his inquiry. Newton and Burgess (2008) do order the criteria by formulating primary and secondary validities based on the purpose of the inquiry (generating knowledge focused on theory, improving practice, or raising stakeholders' consciousness about educational problems). Newton and Burgess (2008) claim that, for example, process validity is of secondary importance when the purpose of the study is improving practice or raising consciousness. Although we acknowledge the importance of taking all quality criteria into consideration, we question hierarchically ordering the quality criteria. We argue that process validity cannot be a secondary validity because - as we stated earlier – unsystematic research (a thread to process validity) might lead to wrong decision making. Research findings of any research that does not meet the requirement of process validity are difficult to assess.

3.2.4 Operationalizing process validity

For process validity, the definitions proposed in the literature differed and turned out to be not concrete enough to make an assessment. Several authors allude to *a scientific approach*, but there is no widespread agreement on its interpretation. Traditional concepts of *(internal) validity* and *reliability* are often cited as these are assumed as prerequisites for research (Hammersley, 2008). However, several authors claim that these concepts need to be revised for teacher research having its own characteristics (Anderson & Herr, 1999; Heikkinen et al., 2007). Such redefining is nothing uncommon as the concepts of validity and reliability have undergone many transformations for different types of research (Heikkinen et al., 2007).

We analyzed the literature for indicators to further define the concept of process validity. We found that the concept of process validity is reminiscent of, but not the same as, one of Furlong and Oancea's (2005) quality dimensions for teacher research: *methodological and theoretical robustness*. It also resembles what Verschuren (2011) calls *epistemological validity*, i.e., what Meyer (2000) describes as the *confidence in trustworthiness* or what Newton and Burgess (2008) call the *goodness of fit to justify research findings*. We argue – based on our literature study – that process validity for teacher research entails the following requirements:

Adopting appropriate research methods

Teacher research 'implies no specific methods of inquiry. Methods are context-bound and will be operationally shaped in the light of the problems that are presented in the context' (Elliott, 2005, p. 370). Therefore, a teacher-researcher has to choose appropriate research methods from established research methods to address the research problem and substantiate this choice (Andriessen & Butter, 2016; Butter & Verhagen, 2014; Karran, 2009). The teacher-researcher should adhere to the criteria set out for the chosen research methods (Furlong & Oancea, 2005).

Applying triangulation

In teacher research, triangulation is of importance (Andriessen & Butter, 2016). Triangulation refers to the combining of multiple perspectives,

methods and sources (Anderson & Herr, 1999; Feldman, 2007). A teacher-researcher could, for example, use both observations and questionnaires to gather data, thus applying methodological triangulation. Incorporating different perspectives, for example those of pupils, colleagues and school management, is also a common phenomenon in teacher research.

Reporting transparently
The teacher-researcher should give a clear, detailed and informed description of the study regarding its research design, data collection and research procedure (Butter & Verhagen, 2014; Feldman, 2007; Heikkinen et al., 2007; Meyer, 2000) to make it public and open to critique (Stenhouse, 1981) and to make it 'peer-reviewable' (Furlong & Oancea, 2005, p. 12).

Reflecting continuously
The teacher-researcher should give a critical reflection on the study. The teacher-researcher should constantly consider alternative interpretations (Dick, 1997; James, Pollard, Rees, & Taylor, 2005), seek for alternatives and criticize all information used for the study (Feldman, 2007; Heikkinen et al., 2007).

3.3   METHODOLOGY

3.3.1   Research objective and question
The research question central to this study was: *What is the quality of teacher research conducted by teacher-researchers?* The first step in answering this research questions was to conduct a literature review wherein quality criteria for assessing teacher research were investigated. The second step in answering the research question was to assess the quality of the research conducted by Dutch secondary education teachers who participated in the TR-course.

3.3.2 Context
A Dutch one-year course for teacher research (TR-course) provides the context of this study. The TR-course was established by two secondary education PDS in the Netherlands, which partnered with Tilburg University. The TR-course aims at professional development (defined as the growth of individual teachers' knowledge, skills, action, and/or

attitude with respect to research) and school development (defined as the improvement of educational practice and establishing a research environment in the school). The TR-course was facilitated by the Dutch Ministry of Education, Culture and Sciences. Facilitation included time (teacher-researchers were exempted from regular school work for half a day per week), provision of a meeting location and assistance of two supervisors of Tilburg University. The research timeline of this study covered four school years.

The TR-course consisted of 13 group meetings in the course of a school year, in which the teacher-researchers were trained by the supervisors of Tilburg University in research skills, i.e. all the skills needed to conduct research such as formulating research questions and analyzing data. In group meetings, teacher-researchers also discussed the research process and exchanged feedback with their fellow teacher-researchers. Topics covered in the group meetings included the whole research process, i.e. all six stages of the research cycle as described in the handbook for teacher research that was used in the TR-course (van der Donk & van Lanen, 2012). Teacher-researchers ran the whole process from diagnosing the problem to reporting on their findings. The last group meeting was a public presentation meeting in which teacher-researchers presented their research findings to colleagues. In addition to the group meetings, teacher-researchers could schedule individual meetings with me as supervisor to get feedback on their research.

All teacher-researchers participated in the TR-course on a voluntary basis. Either they had responded to a call from their school leader to conduct research into a specific school issue, or they came up with their own research topic originating from a problem of practice. The teacher-researchers conducted research at classroom or school-wide level on a variety of themes. For example, a teacher-researcher (female, age 27, teacher of Arts) conducted research into students' participation in extracurricular activities. Another teacher-researcher (female, age 30, teacher of Economics) investigated the presence of urban culture in her school. A teacher-researcher (male, age 29, teacher of English) investigated the applicability of gamification in English language lessons. A team of two teacher-researchers (male, age 39, teacher of Arts and female, age 52, teacher of Dutch) conducted research into the development of an

academic research curriculum for pre-university students. The research instruments used by teacher-researchers consisted in the majority of cases of questionnaires and interviews. Only occasionally, observations were made or experiments were carried out.

3.3.3 Participants

This study was conducted after the fourth year of the TR-course, so four cohorts of teachers-researchers participated. These cohorts consisted of 133 teacher-researchers[6] in total. The teacher-researchers taught at 25 different secondary education schools in the province of Noord-Brabant in the Netherlands. Out of the 133 teachers-researchers, 80 (60%) completed the TR-course by writing a research report. The other teachers did not manage to complete the TR-course successfully within a year because of different reasons. The most common reasons for drop-out were a lack in facilitation from their school, unforeseen extra workload or personal circumstances. Table 3.2 presents an overview of the age, gender, subject taught and teaching degree of the 80 teacher-researchers who completed the TR-course and wrote a research report.

Table 3.2 Teacher-researchers in four cohorts who wrote a research report (n=80)

		Cohort 1 (n=17)	Cohort 2 (n=17)	Cohort 3 (n=27)	Cohort 4 (n=19)
Age[1] (mean)		42.3	41.6	39.4	42.4
Gender	Male	7	4	16	8
	Female	10	13	11	11
Subject taught[2]	Alpha	5	4	9	9
	Beta	4	5	3	2
	Gamma	5	3	8	5
	Other	3	5	7	3
Teaching degree[3]	First degree	10	7	13	14
	Second degree	7	9	11	5

6   Out of these 133, 22 teacher-researchers never really managed to start participating in the TR-course. Therefore, the total amount of participants in the first four cohorts was set to 111 (see Table 1.1).

Table 3.2 Continued

	Cohort 1 (n=17)	Cohort 2 (n=17)	Cohort 3 (n=27)	Cohort 4 (n=19)
Other	-	1	3	-

[1] For age, n=15 in cohort 1 and n=14 in cohort 2
[2] Alpha: languages (e.g., Dutch, English), beta: natural science (e.g., Mathematics, Physics), gamma: social sciences (e.g., Economy, History), other: Physical education, Arts, Dramatic arts, Health and Nursing care
[3] First degree: certificated for all forms of secondary education, second degree: certificated for all forms of secondary education except the last three years of the two highest educational levels

3.3.4 Instrument to evaluate teacher research

We constructed a coding scheme based on the quality criteria for teacher research with the purpose of assessing the teachers' research reports. The operationalization of the criteria was based on our literature review, with specific attention to the work of Anderson and Herr (1999), Oolbekkink-Marchand et al. (2013) and Aarts and Mathijsen (2014). In Table 3.3 the operationalization in the form of indicators is presented per validity type.

Table 3.3 Validity types for teacher research and indicators

Validity	Indicators
Outcome validity	Research question is answered Solution is given for the problem of practice New research questions are generated
Process validity	Appropriate research methods are used Triangulation is applied The report is transparent There has been continuous reflection
Democratic validity	Stakeholders' perspectives are taken into account by: - consulting them in the design phase of the study, - including them as informants in the study, - informing them about their interventions in practice
Catalytic validity	Transformation of knowledge, skills, actions, and/or attitudes of the teacher-researcher (professional development) Transformation of knowledge, skills, actions, and/or attitudes within the school (school development)
Dialogic validity	Peer-reviewing within and outside school Dissemination of knowledge within and outside school

As for catalytic validity, the four aspects -knowledge, skills, actions, and attitudes – can be specified as follows. *Knowledge* is gained when the teacher-researcher reports something new has been learned or has

deepened his/her understanding. A change in *skills* is indicated when the teacher-researcher reports a development in professional skills. An indication for a change in *action* is the teacher-researcher reporting that new insights have been applied in practice. An indication of a change in *attitude* is the teacher-researcher having developed a renewed, reshaped view of the teacher role.

3.3.5 Data collection
The research timeline of this study covered four cohorts, i.e., school years, of teacher-researchers. Participating teacher-researchers in this study completed the TR-course with a written research report, which we analyzed to evaluate outcome, process and democratic validity. In total, we analyzed 68 reports of 80 teacher-researchers; twelve reports were written by a team of two teacher-researchers.

We evaluated catalytic validity by information obtained from evaluation forms completed by the participants (as this validity type could not be evaluated by analyzing the research reports). Information was requested by open-ended questions about the application of research findings in their educational practice (see Appendix 2 for the Dutch evaluation form). Evaluations were collected anonymously by the coordinators of both PDS. The first two cohorts (2013-2014 and 2014-2015) completed the evaluation on paper, whereas the second two cohorts (2015-2016 and 2016-2017) completed an identical, but online version of the evaluation in which they could fill in their names. By doing so, we could link the research reports to the evaluation forms.

Out of the 133 teacher-researchers who participated in the TR-course, 80 teacher-researchers completed the evaluation form. Respectively 14 (48%), 13 (52%), 36 (86%) and 17 (46%) teacher-researchers responded in cohort 1, 2, 3, and 4. Not all teacher-researchers who completed their research report, completed the evaluation form and vice versa.

With regard to dialogic validity, we argue that participating in the TR-course provided the context for the opportunity for this validity. In the meetings, teacher-researchers were encouraged to engage in a critical dialogue on their research (providing peer feedback) with fellow teacher-researchers, the supervisors and colleagues within their school. The

dissemination of knowledge (an aspect of dialogic validity) is guaranteed with a supra-school conference at the end of the school year. Quotations from the evaluation forms in which teacher-researchers comment on aspect of dialogic validity were included in the analysis.

3.3.6   Data analysis

Research reports

My colleague supervisor assessed the research reports on three of the five quality criteria using the indicators. Outcome, process and democratic validity of the research were graded on a seven-point scale from *insufficient* to *excellent* (following the international evaluation system of seven-point grading). My colleague supervisor was involved in the group meetings, but not in the individual consultation hours. Hence, she was less aware of the research process than I was as the provider of the individual consultation hours. Together we discussed the evaluation marks. The evaluations of my colleague supervisor turned out to match my expectations. Occasionally, a grade on a validity type was adjusted but never more than one step on the grading scale. Not once we disagreed on whether or not a research report sufficiently met a quality criterion.

Evaluation forms

As catalytic and dialogic validity could not be evaluated by analyzing the research reports, we used information from the evaluation forms. For doing so, I categorized quotations of the teacher-researchers to the four aspects of catalytic validity: knowledge, skill, action, and attitude. My colleague supervisor independently categorized a random selection of quotations. The intercoder reliability was 82.8%. In case of differences in categorization between us, we discussed the categorization until consensus was reached.

For outcome validity, process validity and democratic validity, the reported percentages are based on the total number of research reports (n=68). For catalytic validity and dialogic validity, the reported percentages are based on the total number of teacher-researchers (n=80). We could combine data of the research reports and the evaluation forms for cohort 3 and 4 as teacher-researchers wrote down their name on the evaluation form. The quotations used in this study were translated

from Dutch to English adhering to the content of the original quote, but formulating a grammatically correct English sentence.

3.4   FINDINGS

In this section, data are presented on the quality of teacher research conducted by secondary education teachers participating in the TR-course. First, data on outcome validity, process validity and democratic validity based on assessment of the research reports of the teacher-researchers will be described. Next, data on catalytic validity and dialogic validity based on the evaluation forms will be presented.

Table 3.4   Assessment of the research reports in four cohorts on outcome, process and democratic validity (n=68, numbers are frequencies and percentages)

Score	Meaning	Outcome validity	Process validity	Democratic validity
7	Excellent	1 (1.5%)	0 (0.0%)	0 (0.0%)
6	Very good	3 (4.4%)	5 (7.4%)	7 (10.3%)
5	Good	34 (50.0%)	16 (23.5%)	26 (38.2%)
4	More than sufficient	13 (19.1%)	17 (25.0%)	24 (35.3%)
3	Sufficient	13 (19.1%)	21 (30.9%)	11 (16.2%)
2	Poor	3 (4.4%)	3 (4.4%)	0 (0.0%)
1	Insufficient	1 (1.5%)	6 (8.8%)	0 (0.0%)
	Average score	4.3	3.7	4.4

3.4.1   Outcome validity

The criterion of outcome validity examines whether the research question is answered, a solution is given for the problem of practice and new research questions are generated. On average, outcome validity was graded with a 4.3 (on a seven-point scale). Once, a research report was scored as excellent (score of 7) and once a research report was scored as insufficient (score of 1), as can be found in Table 3.4. From this, we conclude that the outcome validity of most studies was satisfactory.

3.4.2   Process validity

Process validity is concerned with the research method, triangulation, reporting and reflecting. On average, process validity was graded with a 3.7 (on a seven-point scale). Six times a research report was scored as insufficient regarding process validity. In 44% of the research reports,

process validity was scored with 3 or lower. We further analyzed the assessments of the research reports on process validity to find out what the scores represent.

Five reports were graded as very good (a score of 6) on process validity. The evaluations showed that the method was described in detail and was substantiated. Overall, the reporting was transparent. In addition, the teacher-researchers reflected critically on the research process. Five research reports were graded as sufficient (a score of 3). The evaluation of all these reports showed that the research method was not described in sufficient detail and was barely substantiated. Overall, the reporting was in need for more structure. In the research reports, there were signs of some critical reflection, but the reflection remained superficial. In all six research reports in which process validity was graded as insufficient (score of 1), there was no explicit reporting on the research method, the overall report was found unstructured and there was no sign of a critical reflection on the research process.

3.4.3 Democratic validity

Democratic validity refers to the extent to which stakeholders are included in the research. On average, democratic validity was graded with a 4.4 (on a seven-point scale). The highest score given was *very good* (a score of 6), the lowest score given was *sufficient* (a score of 3).

In almost all research reports (98%) it was reported that stakeholders were included in the research process. Stakeholders mainly were colleagues (78%) and students (54%) within the school. To a lesser extent, the teacher-researchers included external parties (22%) – such as other schools or educational advisory institutes – and parents (6%) as source for information.

3.4.4 Catalytic validity

With respect to catalytic validity, we asked teacher-researchers in an open-ended question about the application of research outcomes in their educational practice (professional development or school development). Teacher-researchers reported mainly in abstract terms on the research's contribution to school development: 'Hopefully my study created more awareness within the school' and 'This study is the first step into the

development of certain didactics'. The teacher-researchers' comments on their professional development were more concrete: 'I have gained research skills' and 'I have developed a lesson series which I use now'.

In Table 3.5 the percentages of teacher-researchers reporting on a transformation in one of the four subcategories of the catalytic validity are presented. For all four subcategories quotations from the evaluation forms are described below.

Table 3.5   Transformation in knowledge, skills, action, and attitude in teacher-researchers (n=80, numbers are frequencies and percentages)

	Knowledge	Skills	Action	Attitude
Individual	58 (72.5%)	21 (26.3%)	16 (20.0%)	34 (42.5%)
School	22 (27.5%)	2 (2.5%)	33 (41.3%)	14 (17.5%)

Knowledge transformation
Teacher-researchers noted that their knowledge of the research theme was deepened or that they had gained more insight into the topic central to the research (e.g., 'I have increased my knowledge about mathematics'). Several teacher-researchers pointed out that they were now better able to substantiate new ideas or working methods than before the TR-course. Furthermore, the teacher-researchers reported that the research has provided them with a confirmation of their initial ideas on educational improvement (e.g., 'Now, I am able to give a substantiated response when it comes to using digital methods in my lessons').

Skills transformation
Comments providing evidence for this type of transformation were mostly about the development of research skills. A teacher-researcher indicated she now 'reflects critically on literature and is able to refer to sources according to APA standards'. Twice, a transformation in content related or didactic skills was reported. Two of the 80 teacher-researchers explicitly linked their development of skills to school development.

Action transformation
Most transformation in action was reported at the school level. Teacher-researchers reported on the development of policy plans, measurement instruments, curriculum plans or lesson series. Comments included: '[I

have developed] a lesson series creative writing for talented students' and 'In the following years, the current lesson series on technology will be changed into a new one which is more broadly oriented'.

Attitude transformation
Comments from the evaluation forms revealed that teacher-researchers were more inspired, enthusiastic, driven and motivated for their profession after conducting the research. One teacher-researcher puts it as follows: '[Conducting research] has given me a lot of motivation. For a long time now, I was doubting whether I should continue working as a teacher. Conducting this practitioners' research had given me the challenge I was looking for'. Comments also showed that teacher-researchers were more confident about their ability. Furthermore, teacher-researchers reported that they were more conscious of their educational practice and reflected more often on this practice. In addition, it became evident that teacher-researchers were more critical and curious about educational practice. This became apparent in for example the following quote: 'By conducting practitioners' research, you dwell upon the educational processes within the school you normally perform automatically. Research forces you to reflect upon these processes and to question the obvious'.

3.4.5 Dialogic validity
Dialogic validity refers to the extent to which the teacher-researcher uses peer feedback and engages in a critical dialogue with others (fellow researchers, colleagues, supervisors). From the evaluation forms, it appeared that teacher-researchers engaged in a critical dialogue about their study, as can be seen in the following comment: 'The group meetings provided me with the opportunity to share and discuss my work with fellow teacher-researchers. This, I have experienced as very pleasant, especially because I conducted the research individually.'

Despite the fact that 73 teacher-researchers (91%) explicitly referred to discussing the research (project) with fellow teacher-researchers, not everyone was satisfied with the peer feedback process. One teacher-researcher put it as follows: 'Others' contribution to my study was somewhat disappointing as a result of the variation in research theme and researchers' research skills.' Most consistent among teacher-researchers

was the call for more collaboration and more critical peer feedback. A teacher-researcher had advice for future teacher-researchers: 'Talk with colleagues about your study and find yourself a critical friend within the school'.

3.5   CONCLUSIONS

The primary aim of this study was to assess the quality of research conducted by secondary education teachers participating in a one-year professional development program (the TR-course). We thereby wanted to determine whether the TR-course contributes to professional development and school development. For being able to assess the quality of the research, we needed to investigate the (usefulness of) the criteria for evaluating practitioners' research which was the secondary aim of this study.

3.5.1   Five quality criteria

In our study, we found that the five quality criteria as proposed by Anderson and Herr (1999) can be applied for assessing teacher research. The five criteria (outcome validity, process validity, democratic validity, catalytic validity, and dialogic validity) are useful for evaluating teacher research as they do justice to the characteristics of this type of research. Using quality criteria that match the characteristics of an inquiry was found of importance within the literature (Anderson & Herr, 1999; Kemmis, 2010; Newton & Burgess, 2008; Zeichner & Noffke, 2001).

We needed to further operationalize the quality criteria for assessing the research reports, as some quality criteria were not described in detail. Based on a literature study we could define the criteria and the indicators more concretely. In its current form, the five criteria with their indicators (see Table 3.3) offer a useful framework to evaluate teacher research. Hence, we could formulate an answer to the research question central to this study: *What is the quality of teacher research conducted by teacher-researchers?*

3.5.2   The quality of teacher research

From the research reports reviewed in this chapter, it appeared that teacher-researchers were able to answer their research question and find

a solution for their problem of practice. The average score on outcome validity was 4.3 (on a seven-point scale). A lower average score (3.7) was found on process validity; almost half of the teacher-researchers obtained low or just sufficient scores on this aspect. Teacher-researchers seem to find it difficult to use an appropriate research method, apply triangulation, report transparently, and reflect continuously on the research process. The requirements for democratic validity, with an average of 4.4, are mostly met as stakeholders (mostly colleagues and students) are in one way or another included as informants in the study.

From the evaluations, we concluded that a transformation in knowledge, skills, action, and attitude (catalytic validity) has taken place. Most teacher-researchers reported a transformation of knowledge, almost half a transformation of attitude and about a quarter reported a transformation of action and skills. Our findings are in line with findings of Oolbekkink-Marchand et al. (2013) who found that teacher research primarily led to transformations in knowledge and attitudes, more than in actions. The requirements for dialogic validity were built into the TR-course. From the evaluations, we noted that the majority of the teacher-researchers reported explicitly on a form of dialogic validity (e.g., peer consultation, knowledge dissemination).

3.5.3   The importance of process validity

Six times a research report was scored as insufficient regarding process validity. Those six reports were also graded as insufficient in total. This is in line with Anderson and Herr's (1999) claim that process validity is reflected in other criteria. We found that in case of low process validity, teacher-researchers were unable to comment on the contribution to either professional or school development. These findings confirm other studies stating that research needs to be carried out systematically in order to lead to professional development (cf. Cochran-Smith & Lytle, 1999; Lunenberg et al., 2007; Newton & Burgess, 2008; Ponte, 2005). Furthermore, it appeared that research with low process validity did not contribute to professional development and school development. These findings confirm our idea of the importance of process validity in teacher research. We believe process validity is a prerequisite in teacher research and not a secondary validity, as argued by Newton and Burgess (2008).

3.5.4 Professional development and school development

In our study, teacher-researchers who have successfully conducted their research (i.e., their research report is graded as sufficient or higher) reported its contribution to their professional development and school development. Teacher-researchers commented on a transformation in knowledge, attitude, and skill within themselves. On the school level, they reported transformations to a much lesser extent. Transformations in action however, were reported mainly at the school level. Thus, our study confirmed that teacher research is an effective strategy for teachers' professional development (Cochran-Smith & Lytle, 1990; Dinkelman, 2003; Ponte et al., 2004), but is more limited regarding its contribution to school development.

3.6   DISCUSSION

Based on our findings, we concluded that teacher research is an effective strategy for teachers' professional development. We do however have to keep in mind that not all teachers were in fact able to make use of this strategy. In our TR-course, 40 percent of the teacher-researchers dropped out during the process. Although the reasons for dropout were mostly external (unforeseen extra workload or personal circumstances), we cannot rule out the possibility that the TR-course did not fulfill the professionalization needs of these teachers.

We also concluded that the effect of teacher research on school development is limited. We hypothesize that that the one-year duration of the TR-course may be too short to bring about school development.

This study furthermore showed that, for a successful completion of teacher research, it is important to meet process validity. However, teacher-researchers found it difficult to meet the requirements for process validity. The difficulty may originate from the fact that activities like selecting appropriate research methods and reporting transparently are not part of teachers' daily activities. According to the standards of teaching competence (for being employed in secondary education; *Besluit bekwaamheidseisen onderwijspersoneel*, 2005, August 23th) teachers have to be able to (e.g.): signal and resolve problems in educational practice,

and raise questions in search for continuous development of educational practice (reminiscent of outcome validity criteria).

Teachers should also consult colleagues and students (reminiscent of democratic validity criteria). Apart from the need for a teacher to critically reflect on educational practice, we found no indicators for process validity in the standard of teaching competence. So, when teachers are trained to meet these standards, they are indirectly also trained in competencies in the field of outcome and democratic validity, more than competencies having to do with process validity. Our research findings indeed showed that teacher-researchers had most difficulty in meeting the criteria for process validity.

The importance of process validity does not mean that other validity types are of minor importance as all validity types adhere to the characteristics of teacher research. Hence, we argue that it is of importance to take all quality criteria into account when evaluating teacher research and by doing so providing a complete picture of its overall quality. Therefore, we recommend not to rank the quality criteria in primary and secondary validities, as proposed by Newton and Burgess (2008), or put emphasis on one validity type, as suggested by Anderson and Herr (1999).

For a complete evaluation of teacher research, it is necessary to closer evaluate catalytic validity. In this study, we needed to examine evaluation forms to assess catalytic validity. To make the assessment more efficient, we recommend asking teacher-researchers to report explicitly on catalytic validity by indicating the transformations at the professional and school level emerging from the study.

Limitations and directions for future research

There are some limitations to this study. One is the fact that the context in which the study was conducted is a rather specific one. Results of this study apply to research done by secondary education teachers conducting research while receiving training by supervisors. Elliott (2007), Meyer (2000) and Vogrinc and Zuljan (2009) argue that research findings can be generalized based on the principle of analogy, meaning that readers can transfer relevant findings if their own educational practice shows resemblance with the research context. We found that the setting of this study shows resemblance with other settings as reported in the literature (Oolbekkink-Marchand et al., 2013). Furthermore, rather than to be able to generalize our findings, we wanted to provide a detailed understanding of the quality of teacher research.

Another limiting factor of this study is the fact that our findings concerning catalytic validity are based upon the self-reports of teacher-researchers. Teacher-researchers commented on their research's contribution to either professional development or school development. Those comments are subjective and were not verified in practice. In a follow-up study, we explored the effects on professional and school development in depth (see chapter 5). The reasons of teacher research impacting to a limited degree on school development need to be investigated in order to be able to increase this impact.

Despite the limitations mentioned and the topics that need further investigation, we believe our study provided insight into the quality of teacher research in relation to its specific characteristics. Moreover, our study showed promising effects of teacher research on professional development, thereby providing support for the role of teacher research in improving educational quality.

REFERENCES

Aarts, R., & Mathijsen, I. (2014). Praktijkonderzoek in de school: Kwaliteit en dilemma's. *Script!* Retrieved from https://www.narcis.nl

Admiraal, W., Ben, S., & Zwart, R. (2013). *Academisch docentschap in het basis- en voortgezet onderwijs: Aard en betekenis van onderzoek van docenten naar hun onderwijspraktijk* (411.11.691). Den Haag: NWO. Retrieved from https://www.nro.nl

Anderson, G. L., & Herr, K. (1999). The New Paradigm Wars: Is There Room for Rigorous Practitioner Knowledge in Schools and Universities? *Educational Researcher, 28*(5), 12-40. doi:https://doi.org/10.3102/0013189X028005012

Andriessen, D., & Butter, R. (2016). Doe recht aan de diversiteit. Kwaliteitscriteria voor onderzoek in het hbo. *THEMA, 5*(15), 20-25. Retrieved from https://www.narcis.nl

Berg, B. L. (2004). *Qualitative Research Methods for the Social Sciences* (5th ed.). Essex: Pearson Education.

Butter, R., & Verhagen, S. (2014). *De padvinder en het oude vrouwtje: een pleidooi voor transparante en pluriforme kwaliteit van praktijkgericht onderzoek en aanzet tot integraal prestatiemanagement.* Utrecht: Kenniscentrum Sociale Innovatie. Retrieved from https://www.kenniscentrumsport.nl

Carr, W., & Kemmis, S. (2005). Staying Critical. *Educational Action Research, 13*(3), 347-358. doi:10.1080/09650790500200296

Cochran-Smith, M., & Boston College Evidence Team (2009). 'Re-Culturing' Teacher Education: Inquiry, Evidence, and Action. *Journal of Teacher Education, 60*(5), 458-468. doi:10.1177/0022487109347206

Cochran-Smith, M., & Lytle, S. L. (1990). Research on Teaching and Teacher Research: The Issues That Divide. *Educational Researcher, 19*(2), 2-11. doi:10.3102/0013189X019002002

Cochran-Smith, M., & Lytle, S. L. (1999). The Teacher Research Movement: A Decade Later. *Educational Researcher, 28*(7), 15-25. doi:10.3102/0013189X028007015

Cochran-Smith, M., & Lytle, S. L. (2009). *Inquiry as Stance: Practitioner Research in the Next Generation.* New York: Teachers College Press.

Dick, B. (1997). Rigour and relevance in action research. *Research Papers in Education.* Retrieved from http://www.aral.com.au

Dinkelman, T. (2003). Self-Study In Teacher Education: A Means And Ends Tool For Promoting Reflective Teaching. *Journal of Teacher Education, 54*(1), 6-18. doi: 10.1177/0022487102238654

Elliott, J. (2005). Becoming Critical: The failure to connect. *Educational Action Research, 13*(3), 359-374. doi:10.1080/09650790500200297

Elliott, J. (2007). Assessing the quality of action research. *Research Papers in Education, 22*(2), 229-246. doi:10.1080/02671520701296205

Ellström, P.-E. (2008). *Knowledge Creation Through Interactive Research: A Learning Perspective*. Paper presented at the The European Conference on Educational Research, Gothenburg. Retrieved from http://center.hj.se

Enthoven, M., & de Bruijn, E. (2010). Beyond locality: The creation of public practice-based knowledge through practitioner research in professional learning communities and communities of practice. A review of three books on practitioner research and professional communities. *Educational Action Research, 18*(2), 289-298. doi:10.1080/09650791003741822

Feldman, A. (2007). Validity and quality in action research. *Educational Action Research, 15*(1), 21-32. doi:10.1080/09650790601150766

Furlong, J., & Oancea, A. (2005). *Assessing Quality in Applied and Practice-based Educational Research A Framework for Discussion*. Oxford: Oxford University Department of Educational Studies. Retrieved from https://www.birmingham.ac.uk

Green, J., & Bloome, D. (1997). Ethnography and Ethnographers of and in Education. In J. Flood, S. B. Heath, & D. Lapp (Eds.), *Handbook of research on teaching literacy through the communicative and visual arts* (pp. 181-202). New York: Macmillan Publishers.

Hammersley, M. (2008). Troubling criteria: A critical commentary on Furlong and Oancea's framework for assessing educational research. *British Educational Research Journal, 34*(6), 747-762. doi:10.1080/01411920802031468

Heikkinen, H. L. T., Huttunen, R., & Syrjälä, L. (2007). Action research as narrative: five principles for validation. *Educational Action Research, 15*(1), 5-19. doi:10.1080/09650790601150709

Heydenrych, J. (2001). Improving educational practice: Action research as an appropriate methodology. *Progressio, 23*(2), 37-51. Retrieved from https://core.ac.uk

James, M., Pollard, A., Rees, G., & Taylor, C. (2005). Researching learning outcomes: Building confidence in our conclusions. *Curriculum Journal, 16*(1), 109-122. doi:10.1080/0958517042000336863

Karran, T. (2009). *Quality criteria in educational research: Is beauty more important than popularity?* Paper presented at the International Association for the Scientific Knowledge Teaching and Learning Conference, Porto. Retrieved from https://link.springer.com

Kemmis, S. (2010). What is to be done? The place of action research. *Educational Action Research, 18*(4), 417-427. doi:10.1080/09650792.2010.524745

Lewin, K. (1946). Action Research and Minority Problems. *Journal of Social Issues, 2*(4), 34–46. doi:10.1111/j.1540-4560.1946.tb02295.x

Lunenberg, M., Ponte, P., & van de Ven, P.-H. (2007). Why Shouldn't Teachers and Teacher Educators Conduct Research on Their Own Practices? An Epistemological Exploration. *European Educational Research Journal, 6*(1), 13-24. doi: 10.2304/eerj.2007.6.1.13

Lytle, S. L., & Cochran-Smith, M. (1994). Inquiry, Knowledge, and Practice. In S. Hollingsworth & H. Sockett (Eds.), *Teacher Research and Educational Reform* (pp. 22-51). Chicago: National Society for the Study of Education.

Meyer, J. (2000). Evaluating action research. *Age and Ageing, 29*(2), 8-10. doi: 10.1093/oxfordjournals.ageing.a008104

Newton, P., & Burgess, D. (2008). Exploring Types of Educational Action Research: Implications for Research Validity. *International Journal of Qualitative Methods, 7*(4), 19-30. Doi: 10.1177/160940690800700402

Oolbekkink-Marchand, H. W., van der Steen, J., & Nijveldt, M. (2013). A study of the quality of practitioner research in secondary education: Impact on teacher and school development. *Educational Action Research, 22*(1), 122-139. doi:10.1080/09650792.2013.854175

Piggot-Irvine, E., Rowe, W., & Ferkins, L. (2015). Conceptualizing indicator domains for evaluating action research. *Educational Action Research, 23*(4), 545-566. doi:10.1080/09650792.2015.1042984

Piggot-Irvine, E., & Zornes, D. (2016). Developing a Framework for Research Evaluation in Complex Contexts Such as Action Research. *SAGE Open, 6*(3). doi:10.1177/2158244016663800

Ponte, P. (2005). A Critically constructed concept of action research as a tool for the professional development of teachers. *Journal of In-service Education, 31*(2), 273-296. doi:10.1080/13674580500200279

Ponte, P., Ax, J., Beijaard, D., & Wubbels, T. (2004). Teachers' development of professional knowledge through action research and the facilitation of this by teacher educators. *Teaching and Teacher Education, 20*(6), 571-588. doi:10.1016/j.tate.2004.06.003

Schön, D. A. (1995). Knowing-In-Action: The New Scholarship Requires a New Epistemology. *Change: The Magazine of Higher Learning, 27*(6), 27-34. doi: 10.1080/00091383.1995.10544673

Somekh, B., & Zeichner, K. (2009). Action research for educational reform: Remodelling action research theories and practices in local contexts. *Educational Action Research, 17*(1), 5-21. doi:10.1080/09650790802667402

Stenhouse, L. (1975). *An introduction to curriculum research and development*. London: Heinemann Educational.

Stenhouse, L. (1981). What counts as research? *British Journal of Educational Studies, 29*(2), 103-114. doi:10.1080/00071005.1981.9973589

van der Donk, C., & van Lanen, B. (2012). *Prakijkonderzoek in de school*. Bussum: Coutinho.

Verschuren, P. J. M. (2011). *Why a methodology for practice-oriented research is a necessary heresy*. Nijmegen : Radboud University. Retrieved from https://repository.ubn.ru.nl

Vogrinc, J., & Zuljan, M. V. (2009). Action research in schools – An important factor in teachers' professional development. *Educational Studies, 35*(1), 53-63. doi:10.1080/03055690802470399

Zeichner, K. M. (1993). Action Research: Personal renewal and social reconstruction. *Educational Action Research, 1*(2), 199-219. doi:10.1080/0965079930010202

Zeichner, K. M., & Noffke, S. (2001). Practitioner Research. In V. Richardson (Ed.), *Handbook of Research on Teaching* (4 ed., pp. 298-332). Washington: American Educational Research Association.

4

A mixed methods study into the development
of teacher-researchers' research knowledge

This chapter reports on a mixed methods study into the development of research knowledge of secondary education teachers conducting research in the context of a professional development program. 26 teachers of 12 schools in the Netherlands participated in the study. Data were collected by using questionnaires, interviews, concept maps, oral tests and logbooks. Findings show a positive research knowledge development in teacher-researchers after following a one-year course in teacher research. This development was not only found in teachers' self-reports, but was also measured by tests. In the process of research knowledge development, teacher-researchers mainly have difficulties with formulating research questions, developing research instruments, and reporting about their research.

4.1 INTRODUCTION

Teacher research has been increasingly initiated at secondary schools (Oolbekkink-Marchand, van der Steen, & Nijveldt, 2013; Ponte, 2005) for the purpose of improving educational practice. It is considered a promising activity for teachers' professional development (OECD, 2009; Ponte, Ax, Beijaard, & Wubbels, 2004; Rust & Meyers, 2007; Vrijnsen-de Corte, 2012). It is found to be an effective strategy for teachers to generate knowledge about their educational practice (Lunenberg, Ponte, & van de Ven, 2007; van der Linden, 2012) by which teachers are better capable of improving their practice (Lunenberg et al., 2007).

The aim of the present study was to gain a deeper insight into the professional development of teachers, focusing on the development of research knowledge in teachers who are conducting teacher research. Although in an extensive body of literature teacher research is indicated as a promising activity for teachers' professional development, an in-depth investigation of what teachers actually learn seems to be lacking. Participating in a course in teacher research (or other forms of teacher professional communities) 'seems to be a promising way to trigger teacher learning' (Admiraal, Lockhorst, & van der Pol, 2012, p. 360).

In educational literature, we could not find much research reporting on the development in research knowledge of teachers. In their study conducted in the setting of a University of Applied Sciences, Geerdink, Boei, Willemse, Kools, and van Vlokhoven (2016) found that teacher educators reported to have increased their research knowledge after participating in research related professional development activities. Similarily, Reis-Jorge (2005) and van der Linden (2012) found that student teachers reported that a course in research contributed to their research knowledge. Van der Linden (2012) also found an increase in research knowledge as measured by a knowledge test. As far as in-service teachers are concerned, Vrijnsen-de Corte (2012) found that teachers reported having positively developed research knowledge after having conducted research. Altogether, relatively little attention has been paid to teachers' research knowledge development (Reis-Jorge, 2005). However, further investigation of teachers' development of research knowledge is relevant for multiple reasons.

Firstly, it is relevant as research knowledge is essential for conducting research which in turn leads to professional development and school development. Secondly, it is relevant for educationalists and teacher-educators who want to determine to what extent conducting teacher research fosters research knowledge. With this study, insight is gained into the aspects of research knowledge that are most difficult for teacher-researchers (i.e., a teacher who, in addition to performing teaching activities, conducts research into his/her educational setting). These findings are valuable for setting up courses in teacher research. Thirdly, it is relevant to study the development of research knowledge now that research related activities are becoming part of the curriculum in secondary schools in the Netherlands (*Besluit bekwaamheidseisen onderwijspersoneel*, 2017, August 8th; Onderwijsraad, 2014) and other countries (OECD, 2017). Secondary education teachers should therefore acquire research knowledge in order to be able to supervise students who perform these activities.

4.1.1   Teacher research

Within the educational research field terms as 'practitioner research', 'action research', 'action inquiry', and 'teacher research' are used interchangeably. They all have in common that in this kind of research both theory and practice are involved. Piggot-Irvine, Rowe, and Ferkins (2015) noted that the term chosen is dependent on the situation in which the research takes place. In this study, the term 'teacher research' is used as all research central to this study is conducted by secondary education teachers. The term 'teacher-researcher' will be used for teachers who, next to performing regular teaching tasks, conduct teacher research in the context of the TR-course.

Teacher research is defined by Lytle and Cochran-Smith (1994) as a 'systematic and intentional inquiry carried out by teachers in their own schools and classrooms' (p. 24). Lunenberg et al. (2007) defined teacher research as 'a method of obtaining critical insight into a problem experienced in the real world and of solving that problem, in order to learn from the experience for future action' (p. 15). For defining teacher research in this study, we adhered to the definition in the handbook we used in the TR-course: 'Teacher research is the systematic and interactive inquiry by teachers into their own practice for the purpose of improving

this practice' (van der Donk & van Lanen, 2012, p. 17, my translation from Dutch).

In educational literature, six characteristics are formulated constituting the central notions of teacher research (see also chapter 3). In sum, these characteristics are the following (presented in arbitrary order). A characteristic of teacher research is the *collaborative* nature which entails the involvement of stakeholders (colleagues, students, parents) in the research process (Admiraal, Ben, & Zwart, 2013). Teacher research is *context specific* (Admiraal et al., 2013). This characteristic refers to the practice-oriented base of teacher research. The educational practice in which teacher research is conducted is *dynamic* with its many participants in a continuous changing setting (Piggot-Irvine et al., 2015). Two other characteristics are that teacher research must be carried out *systematically* in order to contribute to *the primary aim of improving practice* (Piggot-Irvine & Zornes, 2016; Somekh & Zeichner, 2009). Another characteristic of teacher research is the involvement of a *teacher-as-researcher* (Stenhouse, 1975). This characteristic entails that practitioners (teachers) are engaging in the research process (Carr & Kemmis, 2005). In order to be able to engage in this process (i.e. to conduct teacher research), teachers should acquire research knowledge.

4.1.2 Research knowledge
Research knowledge entails knowledge of the process of conducting teacher research (van der Linden, Bakx, Ros, Beijaard, & van den Bergh, 2015). Next to this, teacher-researchers need to have insight into quality criteria for teacher research in order to conduct successful research (van der Linden, 2012). In the course in teacher research (TR-course), the five quality criteria as described by Anderson and Herr (1999) - outcome, process, democratic, catalytic, and dialogic validity - were used to establish the quality of teacher research.

In handbooks for teacher research (Berg, 2004; Campbell, McNamara, & Gilroy, 2010; Lankshear & Knobel, 2004) the process of conducting teacher research is presented in a research cycle. In the handbook (van der Donk & van Lanen, 2012) used in the TR-course this cycle consists of six phases that focus on ten aspects of research knowledge:

1. Getting oriented: research themes (1) and research questions (2)
2. Finding focus: literature study (3)
3. Making a plan: research methods (4)
4. Collecting data: research sample (5) and research instruments (6)
5. Analyzing and concluding: data analysis (7), concluding and discussing (8)
6. Reporting and presenting: referencing (9) and writing the research report (10)

This research cycle is used in multiple studies on teacher research in both the Netherlands and elsewhere (e.g. Dana, Pape, Griffin, & Prosser, 2016; van der Linden, 2012; Vrijnsen-de Corte, 2012). By using it in our study, we align with these other studies on teacher research.

If teachers conduct research by passing through the phases of the research cycle, this will enable them to evaluate and adjust their teaching practice (Smeets & Ponte, 2009). To be able to do so, teachers should have knowledge of the six phases and the corresponding ten aspects. In our study, the development of teacher-researchers' research knowledge was therefore characterized by knowledge of the ten aspects of research knowledge. When talking about development in research knowledge, we mean a positive development (i.e., more elaborate and/or deep knowledge) unless stated otherwise. For good understanding of the development of research knowledge, a detailed process description of the TR-course is given below.

4.2   CONTEXT

4.2.1   Background of the TR-course
This study was conducted in the context of a Professional Development School (PDS) project in the Netherlands. Two PDS – in which secondary schools and Tilburg University are partners - have developed a course in teacher research in which teachers are learning to conduct research: the TR-course. The learning process takes place by being trained in doing research while at the same time conducting a research project. The supervisors of the TR-course support teachers in conducting research, thereby aiming at enhancing their professional development (here defined as the growth of individual teachers' research ability) and school

development (here defined as the improvement of educational practice and establishing a research culture in the school).

Within each PDS one group of teacher-researchers was formed. The content of the TR-course was the same for both groups, but the groups worked autonomously (since they worked in different regions). All teacher-researchers participated on a voluntary basis. They were exempted from regular school work half a day per week for participating in the TR-course. Successful completion of the TR-course resulted in receiving a certificate. No pre-service teachers participated in the TR-course.

During the data collection for the present study, the TR-course was being carried out for the fourth year. The TR-course covers one school year which is the timeline of the present study. Most teacher-researchers attend the TR-course for one year, some enter in a second year in which they participate in parts of the course.

4.2.2 Program of the course

The TR-course consisted of thirteen group meetings in which two supervisors (i.e. me and my colleague supervisor) provided a research skills training covering all six phases of the research cycle of teacher research (see section 4.1.2). There were two kinds of group meetings: training meetings which were obligatory for first year teacher-researchers only and peer review meetings which were attended by all teacher-researchers. During training meetings, theoretical background was given concerning each separate research phase and practical assignments were made. In the joint peer review meetings, the teacher-researchers provided each other with feedback on their research. The first and last group meetings also were joint meetings in which they respectively introduced themselves and their ideas on their research, and reflected on the TR-course. The twelfth meeting was a public presentation meeting in which teacher-researchers presented their research findings to colleagues. Table 4.1 gives an overview of the research phases covered in the group meetings.

Table 4.1   Overview of TR-course: group meetings and research phases

Meeting number and type	Research phase
1. Peer review	Introduction
2. Training	Getting oriented
3. Training	Finding focus
4. Peer review	Finding focus
5. Training	Making a plan
6. Peer review	Making a plan
7. Training	Collecting data
8. Peer review	Collecting data
9. Training	Analyzing and concluding
10. Peer review	Analyzing and concluding
11. Training	Reporting and presenting
12. Peer review	Presentations
13. Peer review	Evaluation

Every year, the participating teacher-researchers were asked to reflect on the TR-course. Based on their comments, improvements were made to the TR-course (e.g., more authentic educational situations were used in the training, a larger amount of time was spent on peer review). Figure 4.1 presents the agenda of a typical training meeting.

14:00	Group meeting starts with information on program and goals
14:10	Teacher-researchers ask and answer questions
14:20	Supervisor gives theoretical background on a specific research aspect
14:50	Break
15:00	In pairs, the teacher-researchers make several assignments to practice
15:30	Teacher-researchers work on their research individually or in pairs
16:00	Group meeting ends with short evaluation and preview of the next meeting

Figure 4.1 Agenda of a typical training meeting

In addition to the group meetings, individual consultation moments of half an hour were held in which a teacher-researcher discussed the research (process) with the supervisor. The supervisor was at all times available for questions via email. Both the group meetings and the individual consultation moments took place at a secondary school.

4.2.3 Research themes

At the start of the course, most teacher-researchers had already thought of a research theme and objective. Some teachers came up with their own theme and objective, others had responded to a call from their school leader to conduct research into a specific theme. For example, a teacher-researcher (female, age 27, teacher of Arts) conducted research into pupils' participation in extracurricular activities. Another teacher-researcher (male, age 41, teacher of Philosophy) conducted research to find common ground between colleagues about the curriculum. A teacher-researcher (female, age 52, teacher of Dutch) examined how to support vocabulary development in all school subjects. A teacher-researcher (female, age 43, teacher of Geography) conducted research into a new examination plan for the development of schoolwide testing criteria. Teacher-researchers conducted their research individually or in pairs. During the school year in which this study was conducted, 14 teacher-researchers worked individually and 12 teacher-researchers worked in pairs.

4.3 METHODOLOGY

4.3.1 Mixed methods

A mixed methods study was conducted to examine the development of teacher-researchers' research knowledge. As suggested by van Driel, Beijaard, and Verloop (2001) and Kagan (1990), qualitative and quantitative research approaches were combined in the design (triangulation by method). Next to self-reported learning outcomes, learning outcomes as measured by tests were included, as what teachers report to do may differ from what they actually do (Geerdink et al., 2016). Moreover, this study intended to make the learning process explicit by monitoring it throughout the TR-course as recommended by van Driel et al. (2001).

4.3.2 Research questions

The research question central to this study was: *How does the research knowledge of teacher-researchers differ before and after having conducted teacher research?* This question was divided into three sub questions:

· What is the self-reported research knowledge development of teacher-researchers?
· What is the research knowledge development of teacher-researchers as measured by tests?
· What difficulties do teacher-researchers encounter during the process of conducting teacher research?

4.3.3 Participants

This study was conducted in the school year 2016-2017 which was the fourth year of TR-course. A total of 32 teachers of thirteen schools were involved at the start of the TR-course in this school year (see also Table 1.1). Six teachers dropped out because of a lack in facilitation (2x), unforeseen extra workload (3x) or personal circumstances (1x). The remaining 26 teachers of twelve schools are the participants in this study. There were two groups (one per PDS) of respectively eight and eighteen teachers. In Table 4.2 information on the participating teacher-researchers in this study is provided. The average age and male-female ratio is representative for Dutch secondary education teachers (www. stamos.nl).

Table 4.2   Background information on the participants (n=26)

		Teacher-researchers
Age (mean)		41.12
Gender	Male	52%
	Female	48%
Subject taught[1]	Alpha	46%
	Beta	4%
	Gamma	31%
	Other	19%
Teaching degree[2]	First degree	73%
	Second degree	27%

[1] Alpha: languages (e.g., Dutch, English), beta: natural science (e.g., Mathematics, Physics), gamma: social sciences (e.g., Economy, History), other: Physical education, Arts, Dramatic arts, Health and Nursing care
[2] First degree: certificated for all forms of secondary education, second degree: certificated for all forms of secondary education except the last three years of the two highest educational levels

Relatively many first-degree teachers (73%) are participating in the TR-course compared to the overall percentage (24%) of first-degree teachers in Dutch secondary education (www.stamos.nl), and relatively few beta subjects are represented.[1]

4.3.4 Data collection and analysis

Five instruments were used to collect data on the development of research knowledge in teacher-researchers. Table 4.3 presents an overview of the instruments, providing information on which research question is being answered by using it, what kind of data are yielded and the number of participants.

Table 4.3 Overview of instruments and kind of data being collected

Instrument	Research question	Data	n
Questionnaire	1	Self-reported knowledge development	18
Interview	1	Self-reported knowledge development	6
Concept map	2	Knowledge development as measured by tests	15
Oral test	2	Knowledge development as measured by tests	6
Logbook	3	Process of conducting teacher research	26

We have a full data set including data from all five instruments of six teacher-researchers. Of seven teacher-researchers we have collected all the data, except the interviews and oral tests. Five teacher-researchers provided only questionnaire and logbook data, while two teacher-researchers provided only concept map and logbook data. Six teacher-researchers provided only logbook data.

In all the instruments, the development of research knowledge was investigated by the ten aspects (see section 4.1.2), except for the concept maps in which a specific coding schema was used. In the following, the instruments, procedures and analyses are described in more detail.

Questionnaire

The questionnaire consisted of twelve statements that were rated on a three-point scale (1 = *no*, 2 = *a little,* 3 = *yes*). Statements were formulated according to the ten aspects of research knowledge as described above,

---

1   Probably as a result of many other professional development projects for beta subjects.

complemented with one statement about the research cycle and one statement about quality criteria. Teachers were asked to rate the degree to which they felt they had knowledge about the aspects prior to participating in the TR-course and how this knowledge had developed after participating. An example:

> · Before participating in the course, I knew how to formulate research questions.
> · After participating in the course, I know better how to formulate research questions.

The questionnaire was completed online prior to the last group meeting. All teacher-researchers were approached via email. Out of the 26 teacher-researchers, 18 responded (69%). Questionnaire data were analyzed by calculating average scores and standard error. The questionnaire in Dutch is presented in Appendix 4.

Interview

The interview consisted of an evaluative question that was added to the oral research knowledge test (see below) at the end of the school year. Teacher-researchers were explicitly asked about any perceived changes in their research knowledge. See Appendix 5 for the evaluative question in Dutch.

Concept map

Knowledge development can be assessed with concept maps (see Figures 4.2 and 4.3 for examples) by using a pre-test-post-test design (Novak, 2002). In this study, the teacher-researchers drew a concept map during the first group meeting and once again during the last group meeting of the TR-course. Prior to the task, they received instructions on how to make a concept map. Both times their task was to construct a concept map of all their knowledge about the core concept 'teacher research'. No more predefined concepts were listed because predefined concepts could restrict teachers in the expression of their knowledge (Meijer, Verloop, & Beijaard, 1999). Following Koopman, Teune, and Beijaard (2011) and van der Linden (2012), the task was divided into three steps:

    1. think of 20-40 concepts related to 'teacher research',
    2. cluster concepts that are related,
    3. draw the concept map (write down clusters in order of importance and connect related concepts with lines).

Subsequently, participants were asked to write down how well the map reflected their research knowledge and whether they enjoyed making the concept map (Meijer et al., 1999). After finishing their second concept map, teacher-researchers were handed-out their first concept map and were instructed to indicate the differences between both maps. They were given 30 minutes to construct the concept map. Fifteen teacher-researchers drew both a concept map at the beginning and at the end of the TR-course.

For concept map analysis, a coding scheme by Koopman et al. (2011) was used. This coding scheme entails a three-phase procedure in which I analyzed the concept maps manually. In the first phase, research knowledge was evaluated on seven characteristics:

    1. Total number of concepts (counting the number of concepts)
    2. Total number of links between concepts (counting the lines drawn between the concept)
    3. Ratio between concepts and links (calculating the ratio by dividing the number of concepts by the number of links)
    4. Ratio between relevant and irrelevant concepts (calculating the ratio by dividing the relevant concepts by the irrelevant concepts in which the relevance is determined by the concepts as used in the TR-course)
    5. Position of concepts to the core (analyze the position of a concept relative to the core concept and evaluate this arrangement on a three-point scale)
    6. Depth (determine the maximum number of layers counting from the core concept)
    7. Total number of clusters of concepts (counting the number of clusters of concepts)

In the second phase, the quality was determined on a five-point Likert scale (*very poor organization of knowledge* to *very good organization of*

knowledge) based on findings in the first phase. In the third phase, knowledge development was determined by comparing the quality of the concept maps (drawn before and after participating in the TR-course) on a five-point Likert scale (*strong decrease of knowledge* to *strong increase of knowledge*).

The data analysis for this study was conducted using SPSS 24.0. The assumption of normality of the data was explored by testing for skewness and kurtosis. Plots in combination with values indicated a normal distribution of the data, except for the characteristic 'ratio between concepts and links' and the characteristic 'ratio between relevant and irrelevant concepts'. For these characteristics, the Wilcoxon signed-rank test (the non-parametric equivalent of the dependent t-test) was reported.

In addition to the three-phase procedure, we conducted a content analysis in which all items in the concept maps were categorized by me according to the ten aspects of research knowledge (as described above).

Oral research knowledge test
Eight teacher-researchers (four from each PDS) participated in the oral research knowledge test at the beginning of the TR-course. During the school year, two of those teachers dropped out the TR-course because of personal circumstances. Therefore, only six teachers participated again at the end of the TR-course.

The oral research knowledge test was pre-structured and consisted of questions covering ten aspects of research knowledge as described above. These questions formed a knowledge test by which the knowledge development was measured. See Appendix 5 for the oral research knowledge test in Dutch.

The oral research knowledge test was conducted face-to-face at the schools of the teacher-researchers or by telephone. I audio recorded all oral tests with the teachers' consent. The average duration of the oral test was fifteen minutes. All recordings were transcribed verbatim and analyzed per question. Answers were scored by me on their correctness and completeness using the handbook of the TR-course as a point of

reference. Furthermore, answers at the beginning and end of the TR-course were compared with each other.

Logbook

Throughout the TR-course, I kept a logbook in order to document the consultation hours and the questions received via email. Immediately following a consultation hour, I made notes of the consultation hour. Each email question was documented. All logbook entries were coded according to the ten aspects of research knowledge as described above. For example, the question *'I have found an article in which a researcher describes that there was no unanimous description of ownership in education. Therefore, he formulated his own criteria. How can I refer to these criteria?'* was coded as 'Reporting and presenting: referencing (9)'. The question *'I have doubts about the questionnaire that I have developed. Is it too long? Should I reduce the amount of questions? Should I use these subscales?'* was coded as 'Collecting data: research instruments (6)'. When a logbook entry included more than one aspect, it was given multiple codes.

4.4   FINDINGS

In this section, the findings on the teacher-researchers' research knowledge development are presented. First, a description of the self-reported knowledge development is given (sub question 1) and after that the research development as measured by tests (sub question 2) is described. In the last section, the process of the research knowledge development is described (sub question 3).

4.4.1   Self-reported research knowledge

The teacher-researchers' self-reported research knowledge development was assessed with questionnaire (statements that were rated on a three-point scale) and interview (an evaluative question) data. The questionnaire data showed that on average, the teacher-researchers reported relatively high scores about their research knowledge before attending the TR-course (M = 2.38, SE = .15). Despite these high scores, they on average did also report an increase in their research knowledge (M = 2.33, SE = .15). The increase in research knowledge was reported on all aspects (score 2 or more, see Table 4.4). Of all 180 responses (18 teacher-researchers x 10 responses), 52 percent presented a substantial

increase (score 3), 30 percent a modest increase (score 2) and 18 percent no increase (score 1) in research knowledge.

Table 4.4 Self-reported initial research knowledge and self-reported growth in research knowledge (n=18, average scores on a three-point scale and SE)

Aspects of research knowledge (per research phase)	Initial *Before the TR-course, I knew*	Growth *After the TR-course, I know better*
Research theme (getting oriented)	2.17 (.22)	2.33 (.18)
Research question (getting oriented)	2.44 (.17)	2.39 (.18)
Literature study (finding focus)	2.50 (.19)	2.11 (.20)
Research methods (making a plan)	2.44 (.17)	2.44 (.19)
Research sample (collecting data)	2.44 (.17)	2.22 (.21)
Research instruments (collecting data)	2.22 (.17)	2.56 (.17)
Data analysis (analyzing and concluding)	2.22 (.17)	2.28 (.18)
Concluding (analyzing and concluding)	2.28 (.14)	2.39 (.16)
Referencing (reporting and presenting)	2.50 (.19)	2.28 (.21)
Writing the research report (reporting and presenting)	2.44 (.15)	2.33 (.16)

In addition, teacher-researchers reported that their initial knowledge of the quality criteria (M = 2.44, SE = .15) increased by conducting teacher research (M = 2.33, SE = .16). Their initial knowledge of the different phases of conducting research (M = 2.39, SE = .20) also increased (M = 2.33, SE = .20).

To get a more complete picture of the self-reported development in research knowledge, six teacher-researchers were interviewed. In one open-ended interview question, they were asked to comment on their development in research knowledge. Overall, a positive development in research knowledge was indicated by all six teacher-researchers. Two of them specifically indicated that they knew more of the process of conducting research after having participated in the TR-course. Three teacher-researchers indicated a development in their knowledge of research methods. A perceived increase in knowledge of research instruments was indicated twice. Teacher-researchers also explicitly reported on increased knowledge about formulating research questions, conducting data analysis and the literature study (all three aspects were mentioned once).

4.4.2 Research knowledge development as measured by tests

The research knowledge development of the participants was measured by means of concept maps and oral tests. First, the analysis of the concept maps is presented, starting with an example of the concept maps drawn by the same teacher-researcher (who I will call Teacher A) before and after the TR-course (see Figures 4.2 and 4.3). For readability, both concept maps were digitalized and translated to English.
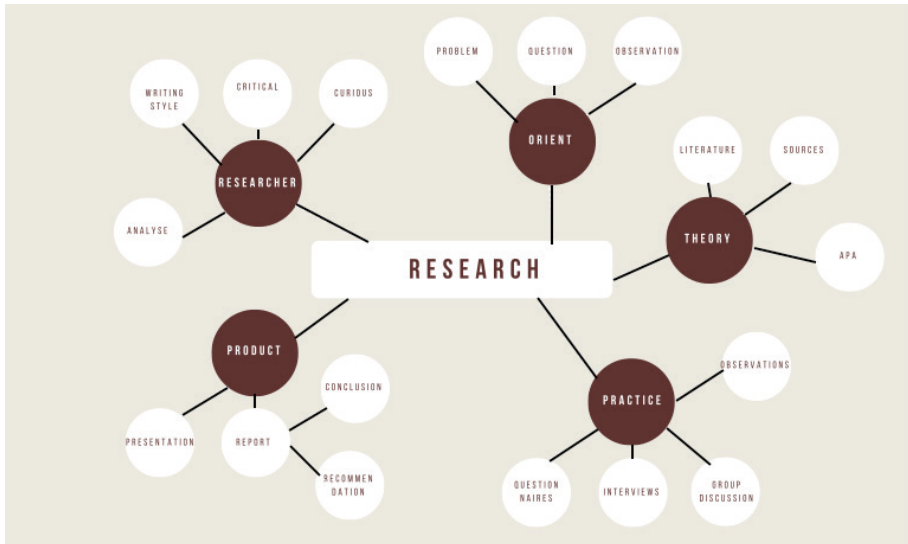
Figure 4.2 Concept map drawn by Teacher Z before participating in the TR-course
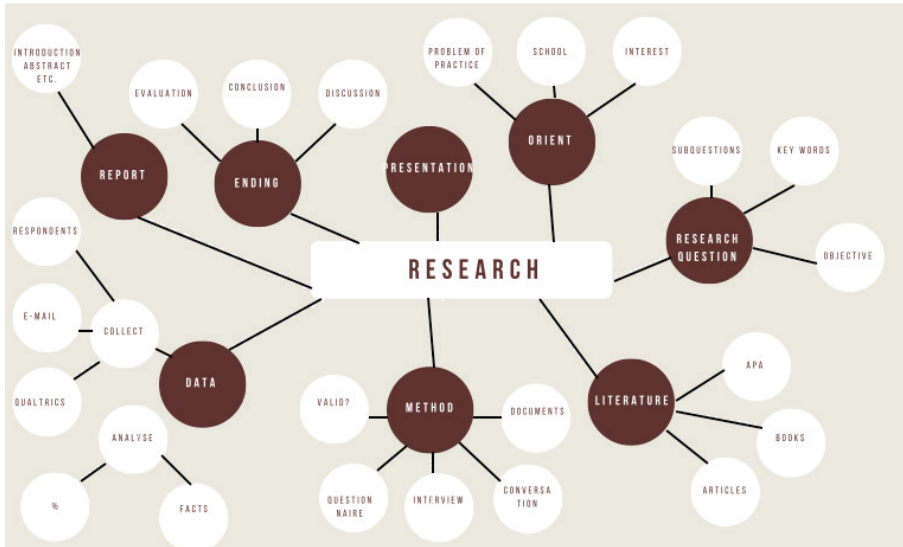
Figure 4.3 Concept map drawn by Teacher Z after participating in the TR-course

Next, the data of the analysis of the concept maps of 15 participants are given (see Table 4.5). For each characteristic of the concept maps the difference between the maps drawn before and after the TR-course is tested for significance. Furthermore, these differences are illustrated using the concept maps of Teacher Z as an example.

Table 4.5 Mean scores on seven characteristics of the concept maps (n=15)

	Before TR-course	After TR-course
Total number of concepts	26.40	26.20
Total number of links	28.40	24.93
Ratio between concepts and links	0.94	1.11
Ratio between relevant and irrelevant concepts	1.02	0.98
Position of concepts to the core	1.93	2.13
Depth (number of layers)	2.87	2.47
Number of clusters of concepts	4.73	3.40

The first analysis phase, examination of the concept maps on seven characteristics (see Table 4.5 for an overview), showed that the total number of concepts increased in the concept maps of eight teacher-researchers and decreased in the concept maps of seven teacher-researchers.

On average, the number of concepts before the TR-course (M = 26.40, SE = 2.20) was statistically not significantly different from the number of concept after the TR-course (M = 26.20, SE = 2.18), $t(14) = 0.20$, $p = 0.92$. In Teacher Z's concepts maps, 23 concepts could be identified in the concept map drawn before the TR-course and 33 concepts in the concept map drawn after the TR-course (see Figure 4.2 and 4.3). The total number of links increased in six and decreased in nine concept maps. On this aspect, no statistically significant difference was found between the concept map drawn before (M = 28.40, SE = 2.58) and after (M = 24.93, SE = 1.90) the TR-course, $t(14) = 3.47$, $p = 0.25$. In Teacher Z's concept map, we identified 23 (before) respectively 33 (after) links between concepts. The ratio between concept and links varied with a lower ratio in three, an equal ratio in four and a higher ratio in eight concept maps. Also on this aspect, no statistically significant difference was found between the concept map drawn before (M = 0.94, SE = 0.03) and after (M = 1.11, SE = 0.13) the TR-course, $T(14)$, $p = 0.09$. The ratio in the concept maps of Teacher Z was both times 1.

Hardly any difference was found in the concept map drawn before (M = 1.02, SE = 0.05) and after (M = 0.98, SE = 0.02) the TR-course in ratio between relevant and irrelevant concepts and no statistically significant difference was found $T(8)$, $p = 0.60$. All concepts of Teacher Z's concept maps were judged as relevant. The position of concepts to the core remained approximately the same before the TR-course (M = 1.93, SE = 0.12) and after the TR-course (M = 2.13, SE = 0.13) and no statistically significant difference was found $t(14) = -0.20$, $p = 0.08$. We found that the concepts in Teacher Z's concept maps drawn before the TR-course were more logically positioned than in her concept map drawn after the TR-course. Furthermore, the depth was the same in most concept maps; an increase in two and a decrease in five in the number of layers was found. No statistically significant difference was found on this aspect between the concept map drawn before (M = 2.87, SE = 0.13) and after (M = 2.47, SE = 0.22) the TR-course, $t(14) = 0.40$, $p = 0.14$. In both of Teacher Z's concept maps, the maximum number of layers was three. The average number of clusters of concepts was higher in the concept maps drawn before the TR-course (M = 4.73, SE = 0.67) compared to the concept maps drawn after the TR-course (M = 3.40, SE = 0.62), but not statistically significantly different $t(14) = 1.33$, $p = 0.15$.

In Teacher Z's concept map drawn before the TR-course, we identified five clusters of concepts, in her concept map drawn after the TR-course we identified seven clusters of concepts.

Phase two of the analysis showed that the overall quality of the concept maps that were drawn after participating in the TR-course (M = 2.87, SE = 0.19), was on average not different from the quality of the concept maps drawn before participating in the TR-course (M = 2.80, SE = 0.18), $t(14)$ = -0.07, p = 0.72. We judged the quality of the concept maps drawn before the TR-course as poor (5x), neutral (8x) or good (2x) and the quality of the concept maps drawn after the TR-course as poor (5x), neutral (7x) or good (3x). The concept map drawn by Teacher Z before the TR-course was judged as neutral and the concept map drawn after the TR-course as good.

During phase three of the analysis, the teacher-researchers' knowledge development was determined by comparing the quality of both concept maps of each participant. In the concept maps of three teacher-researchers a slight decrease of knowledge was found, while those of four teacher-researchers showed a slight increase in knowledge. In the concept maps of eight teacher-researchers no difference in knowledge was found between the maps drawn before and after the TR-course. This indicates that the research knowledge of teacher-researchers remained approximately the same during the school year. In Teacher Z's concept maps, we found a slight improvement in knowledge (the quality of her concept maps increased from neutral to good).

Further examination of the concept maps indicated that all concept maps clearly showed aspects of research knowledge. Of all concepts that were noted in the concept maps, 73 percent (before the TR-course) and 79 percent (after the TR-course) could be categorized as pertaining to the aspects of research knowledge. Most concepts in the concept maps drawn both before and after the TR-course were related to the phase of analyzing and concluding (20% and 21% respectively). In the concept maps drawn before the TR-course, a great number of concepts concerned the phases of getting oriented, finding focus and collecting data (17%, 19% and 17% respectively). The same holds for the concept maps drawn after the TR-course (getting oriented 19%, finding focus

13%, collecting data 16%). Hence, also with regard to the content of the concept maps, no positive development in teacher-researchers' research knowledge was detected.

However, teacher-researchers themselves did report differences between their concept maps. Teacher Z for example stated that her concept map drawn after the TR-course contained more content and that the research cycle was better represented in that concept map. Overall, six teacher-researchers indicated that their concept map drawn after the TR-course was better structured. Four teacher-researchers indicated that this map was drawn from experience more than from knowledge only. Three teacher-researchers observed that the last phases of the research cycle were overrepresented in their concept map (as that was what they had recently been working on). Overall, the teacher-researchers (12 out of 15), including Teacher Z, reported that the concept maps represented their knowledge of teacher research. Furthermore, most teacher-researchers (12 out of 15), including Teacher Z, enjoyed making the concept maps.

Data from the oral research knowledge test were analyzed to further measure the research knowledge development in teacher-researchers. Six teacher-researchers were tested before and after participating in the TR-course. From the analysis, it became apparent that teacher-researchers did positively develop their knowledge of research, as is shown in Table 4.6.

Table 4.6 Number of participants that improved (+), stayed the same (=) and decreased (-) per aspect of research knowledge, after following the TR-course, as established in the oral research knowledge test (n=6)

Aspects of research knowledge (per research phase)	-	=	+
Research theme (getting oriented)[1]	-	-	-
Research question (getting oriented)	2	1	3
Literature study (finding focus)	1	1	4
Research methods (making a plan)	0	1	5
Research sample & instruments (collecting data)[2]	0	3	3
Data analysis (analyzing and concluding)	0	2	4
Concluding (analyzing and concluding)	2	0	4
Referencing (reporting and presenting)[1]	-	-	-
Writing the research report (reporting and presenting)	0	0	6

[1] On these aspects, research knowledge development could not be measured by the oral tests
[2] The aspects *research sample* and *research instruments* were merged during the interview

The oral test data also revealed that teacher-researchers' knowledge of the quality criteria increased. Before participating in the TR-course, all six teacher-researchers had some ideas about the quality criteria, but they could not give a complete answer. After having participated in the TR-course, the answers of four of the six teacher-researchers showed improvement (one answer remained the same and one answer was less elaborate). They were also somewhat better in indicating the different phases of the teacher research cycle after having participated in the TR-course. Three of the initial answers were correct, the other three answers contained relevant elements but were incomplete or the order of the elements was incorrect. After having participated in the TR-course, four answers were correct and two answers contained relevant elements but were incomplete or the order of the elements was incorrect.

4.4.3 Difficulties in the process of conducting teacher research

During the TR-course, questions teacher-researchers asked in consultation hours and via email were documented. In total, 132 questions were posed of which 112 could be categorized as related to aspects of research knowledge (20 questions were of an organizational, practical nature). Most research knowledge questions were asked about the phase of getting oriented (21%) and the phase of reporting (30%), of which 6% on referencing only. There were questions about the phase of

data collection (19%) – which were not about the research sample but on research instruments only – and the phase of analyzing and concluding (13%). Fewer questions were asked about the phase of finding focus (9%) or making a plan (8%). No questions were asked during consultation hours or via email about the quality criteria.

The documentation of questions provided a clear picture of what the teacher-researchers were engaged in concerning their research. Their questions reflected the research cycle. At the beginning of the school year, most questions were about the orientation phase. During the school year, more questions arose about the planning and data collection phase. At the end of the school year, the majority of the questions concerned reporting about the research. Table 4.7 gives an overview of these findings.

Table 4.7 Teacher-researchers' questions in consultation hours and via email per research phase (numbers are frequencies, n=112)

	1	2	3	4	5	6	Total
1 Getting oriented	4	10	4	3	2	1	24
2 Finding focus	-	2	-	4	2	2	10
3 Making a plan	-	1	-	6	1	1	9
4 Collecting data	-	2	-	15	2	2	21
5 Analyzing and concluding	-	-	-	7	5	2	14
6 Reporting and presenting	1	2	2	5	8	16	34

(1 = phase of getting oriented, 2 = phase of finding focus, 3 = phase of making a plan, 4 = phase of collecting data, 5 = phase of analyzing and concluding, 6 = phase of reporting and presenting)

4.5   CONCLUSIONS

The purpose of this study was to gain insight into the development of teacher-researchers' research knowledge during a one-year course on teacher research. To enhance the credibility of its findings the study included (1) teacher-researchers' self-reported research knowledge development, (2) teacher-researchers' research knowledge development as measured by tests and (3) teacher-researchers' self-reported difficulties during the process of conducting research as established by the logbook.

The phases of the research cycle (as retrieved from handbooks on teacher research) provided a starting point for defining research knowledge. Ten aspects concerning the phases of the research cycle were used to examine the research knowledge in teacher-researchers. The aspects were used for data analysis in all data sources: questionnaires, interviews, concept maps, oral tests and a logbook.

Based on the results of this study, it can be concluded that teacher-researchers reported a positive development in their research knowledge. These findings are in line with findings of Geerdink et al. (2016), van der Linden et al. (2015) and Vrijnsen-de Corte (2012). The results of the questionnaire show that although teacher-researchers report quite positively on their initial research knowledge, they also experience a growth in their research knowledge on all aspects. This in in line with the findings in the interviews in which teacher-researchers indicated an overall positive development of their research knowledge.

Teacher-researchers' research knowledge development is however not readily evident from the analysis of the teacher-researchers' concept maps as no difference was found in research knowledge between the maps drawn before and after the TR-course. However, teacher-researchers themselves found their second concept maps better structured and more written from experience rather than from knowledge only. Indeed, findings of the oral research knowledge test show that teacher-researchers did positively develop their research knowledge on a number of aspects. This study confirms findings of Reis-Jorge (2005) who found that teachers' knowledge of selecting research methods, developing instruments, analyzing and concluding increased during a TR-course. Furthermore, a positive knowledge development was observed in teacher-researchers understanding of the research process and the quality criteria after having participated in the TR-course. The findings of this study are in line with findings of van der Linden et al. (2015) who also found an increase in teachers' knowledge about research in a setting of a course in teacher research.

Concerning the process of conducting teacher research, findings indicate that teacher-researchers had most difficulties in the phase of getting oriented (formulating research aims and questions), collecting data

(developing research instruments), and reporting (writing about the research).

4.6   DISCUSSION

The participating teacher-researchers in the TR-course reported having already substantial research knowledge before participating in the TR-course. It can be hypothesized that they felt confident in their research knowledge as they did already conduct some research as prospective teachers during their higher vocational or university education. The fact that they also reported an increase in their knowledge, may be explained by the self-efficacy theory of Bandura (1982), stating that people's self-efficacy increases when they gain new skills.

The difference in knowledge development as measured by the concept maps and the oral tests may be explained by what Reis-Jorge (2005) refers to as *accessible input*. Accessible input are those parts of all knowledge input that a learner actually takes in. These are the parts a learner finds most relevant for (in this study) conducting research. Both the concept maps drawn before and after the TR-course showed overrepresentation of items concerning the phase of analyzing and concluding. Indeed, we as supervisors observed a focus of teacher-researchers on the outcomes of the research. Ponte et al. (2004) similarly observed that 'left to themselves teachers […] reflected mainly on desirable action and not on what they were actually doing' (p. 586). During the interviews of this study, it indeed became clear that the practical applicability of the findings was highly valued by teacher-researchers. The focus on the analyzing and concluding research phase may have resulted in concept maps that were structured quite similarly. Hence, no positive development in research knowledge in the concept maps was observed. As in the oral test the teacher-researchers were explicitly asked about all aspects of research knowledge, they were forced to think about more aspects than the ones they found most relevant. This may have resulted in a more complete picture of their knowledge development.

The fact that teacher-researchers, as shown by the questions they asked to the supervisors, encountered most difficulties in getting oriented, collecting data, and reporting may be explained by the following

considerations. Teachers' questions concerning getting oriented may be a result of the difference in setting between research (indicated by some teacher-researchers as slow, patient, postponing action) and educational practice (indicated as dynamic, fast changing, direct action). Teachers may be less used to make a thorough orientation on educational practice as they do not have the time to do so in their daily practice (Verbiest, 2003). Ponte et al. (2004) suggest that 'daily practice tempts teachers to seek immediate […] solutions' (p. 587). Teachers' questions concerning collecting data (more specifically: developing instruments) may be explained by a difference between theoretical (academic/scientific research) and more practical research (e.g. teacher research). In teacher research, stakeholders play an active role as subjects or critical friends (Meyer, 2000), more than in theoretical research. Teacher-researchers are probably less familiar with the inclusion of stakeholders in their research as most research conducted during their higher vocational or university education likely was theoretical research. This assumption was confirmed by several teacher-researchers who indicated that they had conducted only theoretical research before participating in the TR-course. Understandably, in this case more questions arise on developing instruments than on conducting a literature study. Finally, the need for support in reporting on research, may originate from the fact that this kind of reporting is likely not part of teachers' daily activities.

The findings of this study are hard to generalize, bearing in mind the small sample size and the context dependent setting. However, the small sample size made it possible to use a variety of methods and make an in-depth study of the research knowledge development in teacher-researchers who attend a TR-course. As the data corroborate with other research in the field, the findings are applicable in other educational settings in which teachers conduct research (Greene, 2007; Johnson & Onwuegbuzie, 2004).

A next step in a follow-up study is to investigate how teacher-researchers' research knowledge effects their educational practice (see chapter 5). Future research could investigate whether teachers with more knowledge on research are also able to conduct better research.

Altogether, this study showed that teacher-researchers develop research knowledge during a one-year course in teacher research. Hence, this study supports educational literature in which teacher research is considered as a promising strategy for teachers' professional development.

REFERENCES

Admiraal, W., Ben, S., & Zwart, R. (2013). *Academisch docentschap in het basis- en voortgezet onderwijs: Aard en betekenis van onderzoek van docenten naar hun onderwijspraktijk* (411.11.691). Retrieved from https://www.nro.nl

Admiraal, W., Lockhorst, D., & van der Pol, J. (2012). An expert study of a descriptive model of teacher communities. *Learning Environments Research, 15*(3), 345-361. doi:10.1007/s10984-012-9117-3

Anderson, G. L., & Herr, K. (1999). The New Paradigm Wars: Is There Room for Rigorous Practitioner Knowledge in Schools and Universities? *Educational Researcher, 28*(5), 12-40. doi:10.3102/0013189X028005012

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist, 37*(2), 122-147. doi:10.1037/0003-066X.37.2.122

Berg, B. L. (2004). *Qualitative Research Methods for the Social Sciences* (5th ed.). Essex: Pearson Education.

Besluit bekwaamheidseisen onderwijspersoneel. (2017, August 8th). Retrieved from http://wetten.overheid.nl

Campbell, A., McNamara, O., & Gilroy, P. (2010). *Practitioner Research and Professional Development in Education.* London: Paul Chapman Publishing. Retrieved from https://ebookcentral.proquest.com

Carr, W., & Kemmis, S. (2005). Staying Critical. *Educational Action Research, 13*(3), 347-358. doi:10.1080/09650790500200296

Dana, N. F., Pape, S. J., Griffin, C. C., & Prosser, S. K. (2016). Incorporating practitioner inquiry into an online professional development program: the Prime Online experience. *Professional Development in Education, 43*(2), 212-231. doi:10.1080/19415257.2016.1152592

Geerdink, G., Boei, F., Willemse, M., Kools, Q., & van Vlokhoven, H. (2016). Fostering teacher educators' professional development in research and in supervising student teachers' research. *Teachers and Teaching, 22*(8), 965-982. doi:10.1080/13540602.2016.1200544

Greene, J. C. (2007). *Mixed Methods in Social Inquiry.* San Francisco: Jossey-Bass. Retrieved from https://books.google.nl

Johnson, R. B., & Onwuegbuzie, J. A. (2004). Mixed Methods Research: A Research Paradigm Whose Time Has Come. *Educational Researcher, 33*(7), 14-26. doi: 10.3102/0013189X033007014

Kagan, D. M. (1990). Ways of Evaluating Teacher Cognition: Inferences Concerning the Goldilocks Principle. *Review of Educational Research, 60*(3), 419-469. doi: 10.3102/00346543060003419

Koopman, M., Teune, P., & Beijaard, D. (2011). Development of student knowledge in competence-based pre-vocational secondary education. *Learning Environments Research, 14*(3), 205-227. doi:10.1007/s10984-011-9092-0

Lankshear, C., & Knobel, M. (2004). *A handbook for teacher research. From design to implementation.* Berkshire: Open University Press. Retrieved from https://books.google.nl

Lunenberg, M., Ponte, P., & van de Ven, P.-H. (2007). Why Shouldn't Teachers and Teacher Educators Conduct Research on Their Own Practices? An Epistemological Exploration. *European Educational Research Journal, 6*(1), 13-24. doi:10.2304/eerj.2007.6.1.13

Lytle, S. L., & Cochran-Smith, M. (1994). Inquiry, Knowledge, and Practice. In S. Hollingsworth & H. Sockett (Eds.), *Teacher Research and Educational Reform* (pp. 22-51). Chicago: National Society for the Study of Education.

Meijer, P. C., Verloop, N., & Beijaard, D. (1999). Exploring language teachers' practical knowledge about teaching reading comprehension. *Teaching and Teacher Education, 15*(1), 59-84. doi:10.1016/S0742-051X(98)00045-6

Meyer, J. (2000). Evaluating action research. *Age and Ageing, 29*(2), 8-10. doi: 10.1093/oxfordjournals.ageing.a008104

Novak, J. D. (2002). Meaningful learning: The essential factor for conceptual change in limited or inappropriate propositional hierarchies leading to empowerment of learners. *Science Education, 86*(4), 548-571. doi:10.1002/sce.10032

OECD. (2009). *Creating Effective Teaching and Learning Environments: First Results from TALIS.* Retrieved from http://www.oecd.org

OECD. (2017). *The Nature of Problem Solving: Using Research to Inspire 21st Century Learning.* Retrieved from http://www.oecd.org

Onderwijsraad. (2014). *Een eigentijds curriculum*. Retrieved from https://www.onderwijsraad.nl

Oolbekkink-Marchand, H. W., van der Steen, J., & Nijveldt, M. (2013). A study of the quality of practitioner research in secondary education: Impact on teacher and school development. *Educational Action Research, 22*(1), 122-139. doi:10.1080/09650792.2013.854175

Piggot-Irvine, E., Rowe, W., & Ferkins, L. (2015). Conceptualizing indicator domains for evaluating action research. *Educational Action Research, 23*(4), 545-566. doi:10.1080/09650792.2015.1042984

Piggot-Irvine, E., & Zornes, D. (2016). Developing a Framework for Research Evaluation in Complex Contexts Such as Action Research. *SAGE Open, 6*(3). doi:10.1177/2158244016663800

Ponte, P. (2005). A Critically constructed concept of action research as a tool for the professional development of teachers. *Journal of In-service Education, 31*(2), 273-296. doi:10.1080/13674580500200279

Ponte, P., Ax, J., Beijaard, D., & Wubbels, T. (2004). Teachers' development of professional knowledge through action research and the facilitation of this by teacher educators. *Teaching and Teacher Education, 20*(6), 571-588. doi:10.1016/j.tate.2004.06.003

Reis-Jorge, J. M. (2005). Developing teachers' knowledge and skills as researchers: a conceptual framework. *Asia-Pacific Journal of Teacher Education, 33*(3), 303-319. doi:10.1080/13598660500286309

Rust, F., & Meyers, E. (2007). The bright side: teacher research in the context of educational reform and policy-making. *Teachers and Teaching, 12*(1), 69-86. doi:10.1080/13450600500365452

Smeets, K., & Ponte, P. (2009). Action research and teacher leadership. *Professional Development in Education, 35*(2), 175-193. doi:10.1080/13674580802102102

Somekh, B., & Zeichner, K. (2009). Action research for educational reform: Remodelling action research theories and practices in local contexts. *Educational Action Research, 17*(1), 5-21. doi:10.1080/09650790802667402

Stenhouse, L. (1975). *An introduction to curriculum research and development*. London: Heinemann Educational.

van der Donk, C., & van Lanen, B. (2012). *Prakijkonderzoek in de school*. Bussum: Coutinho.

van der Linden, W. (2012). *A design-based approach to introducing student teachers in conducting and using research* (Doctoral dissertation). Eindhoven: Eindhoven University of Technology. Retrieved from https://pure.tue.nl

van der Linden, W., Bakx, A., Ros, A., Beijaard, D., & van den Bergh, L. (2015). The development of student teachers' research knowledge, beliefs and attitude. *Journal of Education for Teaching, 41*(1), 4-18. doi: 10.1080/02607476.2014.992631

van Driel, J. H., Beijaard, D., & Verloop, N. (2001). Professional Development and Reform in Science Education: The Role of Teachers' Practical Knowledge. *Journal of Research in Science Teaching, 38*(2), 137-159. doi:10.1002/1098-2736(200102)38:2

Verbiest, E. (2003). Collectief leren, professionele ontwikkeling en schoolontwikkeling: facetten van professionele leergemeenschappen. In B. Creemers, Giesbers, J., Krüger, M., & van Vilsteren, C. (Ed.), *Handboek schoolorganisatie en onderwijsmanagement: Leiding geven in bestel, school en klas* (pp. 1-24). Deventer: Kluwer.

Vrijnsen-de Corte, M. C. W. (2012). *Researching the teacher-researcher* (Doctoral dissertation). Eindhoven: Eindhoven University of Technology. Retrieved from https://pure.tue.nl

5

Changes in teachers' professional behavior
through conducting teacher research

The purpose of this study was to investigate whether teachers' engagement in research fosters teachers' professional development and school development. We investigated changes in teachers' professional behavior, the impact of such changes, and factors that affect such changes. Questionnaires were distributed among more than hundred teachers who participated in a course on teacher research in the period from 2013 to 2018. We also collected data by conducting lesson observations and surveying students. Findings showed that teacher-researchers' professional behavior had changed. The changes relate both to teachers' professional development and school development. Our findings suggest that personal and contextual factors may have contributed to changes in teacher-researchers' professional behavior. Altogether, the findings of this study substantiate the relevance of teacher research for education.[8]

---

8   This chapter has been submitted to *Journal of Educational Change*.

5.1   INTRODUCTION

'It is almost impossible to not change professionally when conducting teacher research.' (male, age 37, teacher of History)

The context for this study, that took place over a five-year period (2013-2018), is a course in teacher research (TR-course). Two Professional Development Schools (PDS; a cooperation between secondary education schools and Tilburg University) in the Netherlands have developed and implemented a course in which secondary education teachers are learning to conduct research into their own educational practice. In this study, those teachers are referred to as teacher-researchers.

Teacher research (in literature also referred to as 'practitioner research', 'action research', 'action inquiry') is defined by Lytle and Cochran-Smith (1994) as a 'systematic and intentional inquiry carried out by teachers in their own schools and classrooms' (p. 24). Lunenberg, Ponte, and van de Ven (2007) defined teacher research as 'a method of obtaining critical insight into a problem experienced in the real world and of solving that problem, in order to learn from the experience for future action' (p. 15). For defining teacher research in this study, we adhered to the definition in the handbook we used in the TR-course: 'Teacher research is the systematic and interactive inquiry by teachers into their own practice for the purpose of improving this practice' (van der Donk & van Lanen, 2012, p. 17, my translation from Dutch).

Teacher research has been shown to be a powerful activity in the professional lives of teachers and to have the potential to positively contribute to school development (Berger, Boles, & Troen, 2005). Studies from various countries have reported that teachers take on a more critical and reflective attitude as a result of conducting teacher research (Atay, 2006; Cochran-Smith & Lytle, 1999; McDonough, 2006). It is found that teachers develop professional knowledge (Ponte, Ax, Beijaard, & Wubbels, 2004), gain evidence on what works in their educational practice (Pater & van Driel, 2014) and arrive at a better understanding of their practice (Ponte, 2005). Schools benefit from teacher research as schools develop the capacity to solve their own problems (Sharp, Eames, Sanders, & Tomlinson, 2006).

Doing research may be attractive to teachers since it could lead to a change in a teacher's role within the school (Guerra & Díaz, 2015). A teacher's professional status may increase within the school (Olson, 1990), as the teacher, for example, becomes known as an innovator (Guerra, 2015), which in turn could boost his or her confidence (Fishman & McCarthy, 2000; Lankshear & Knobel, 2004). Doing research may also be attractive to teachers, as they believe it will expand their knowledge and skills, next to making their classroom behavior more effective (Guskey, 2002). Teachers often hope to gain concrete and practical ideas that relate directly to their everyday classroom practice (Fullan & Miles, 1992).

In spite of the attention already given to teacher research, teacher research needs to be investigated further. Many studies on the impact of teacher research report a development in teachers' attitudes or knowledge, but data on changes in teachers' professional behavior as a result of conducting teacher research are scarce. Furthermore, such data mainly came from small-scale studies in which teachers self-reported on the impact of their research on professional development. For example, Oolbekkink-Marchand, van der Steen, and Nijveldt (2013) found that teacher-researchers frequently reported on changes in future actions and their intentions to change their professional behavior. The question remained to what extent these intentions were actually carried out in practice. In this study, we want to reveal how teachers' professional behavior changed after the course in teacher research was finished. In what follows, we describe the model that is used in this study to investigate changes in teachers' professional behavior that appear after having conducted teacher research.

5.2   THEORETICAL FRAMEWORK

5.2.1   Investigating teachers' professional development
Generally speaking, professional development implies teacher learning (Runhaar, 2008). In educational literature, professional development is considered to be important in helping teachers to continuously learn and improve education. However, no single, straightforward definition of professional development can be found in the literature. Still, there seems to exist a clear overlap in the wide range of available

definitions of professional development. Desimone (2009) argues that there is a set of core elements for defining professional development of teachers: 'although empirical studies that include all elements are rare, the basic components are nearly universal in theoretical notions of the trajectories of teacher learning' (p. 185). For example, Mitchell (2013) defines professional development as 'the process whereby an individual acquires or enhances the skills, knowledge and/or attitudes for improved practice' (p. 390). The aspects are reminiscent of Evans' (2011) notion of professionalism which entails three components: a behavioral, attitudinal, and intellectual component. According to Fraser, Kennedy, Reid, and McKinney (2007) teachers' professional development represents 'the processes that […] result in specific changes in the professional knowledge, skills, attitudes, beliefs or actions of teachers' (p. 157).

Over the years, several authors have contributed to developing a model for investigating teachers' professional development (e.g. Clarke & Hollingsworth, 2002; Desimone, 2009; Evans, 2014; Guskey, 2002). When comparing these models, Desimone (2009) found their content to be quite similar, as they included the same aspects. The models however vary in the way they present these aspects. The model which we used in this study to investigate teachers' professional development, is the Interconnected Model of Teacher Professional Growth (IMTPG) as proposed by Clarke and Hollingsworth (2002). More than other models on professional development, the IMTPG, being a non-linear model with multiple connections between the components, does justice to the complexity of the educational setting in which professional development takes place (Vermeulen, 2016). In addition, compared to other models for evaluating professional development, the components of IMTPG are defined in more general terms. For example, Desimone (2009) refers to 'a change in instruction' whereas the IMTPG refers to 'professional experimentation'. As not all research conducted by the teachers participating in the TR-course is related to a change in instruction, the more general notions of the IMTPG suit our research. Furthermore, in the IMTPG model a distinction is made between teachers' professional behavior and the impact of this behavior in educational practice, including school development, which is a relevant distinction in this study. A description of the IMTPG is given below.

5.2.2 The Interconnected Model of Teacher Professional Growth

The IMTPG entails four distinct but related domains in which a change in teachers' professional development can be identified. The model is shown in Figure 5.1.
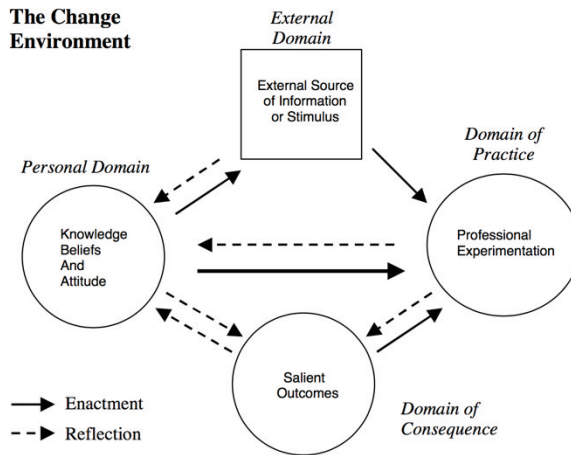
Figure 5.1 The Interconnected Model of Teacher Professional Growth (Clarke & Hollingsworth, 2002, p. 951)

The IMTPG consists of four domains: the external domain, the domain of practice, the domain of consequence, and the personal domain. The last three domains together constitute the individual teacher's professional world of practice, consisting of actions, inferred consequences of these actions, and knowledge, beliefs and attitudes that prompted and responded to those actions (Clarke & Hollingsworth, 2002). The four domains are interconnected, meaning that change in one domain is related to change in another domain, as is reflected by the arrows in Figure 5.1. Clarke and Hollingsworth (2002) distinguish two change processes: reflection (active, persistent and careful consideration) and enactment (which is more than just acting as it refers to action prompted by a belief). All change processes occur within (the limits of) the context in which teachers work; the so-called change environment. Below, a description is given of each of the four domains and the change environment.

External domain

External sources, such as professional development programs, are located in the external domain. In this study, the external domain comprises the TR-course in which the teacher-researchers participated (see section 5.3.1 for a description of the TR-course.) The TR-course is consistent with the philosophy of the IMTPG which situates growth in the professional context of the teachers who are viewed as active learners.

Domain of practice

The domain of practice entails teachers' professional experimentation in educational practice. Teacher-researchers make informed modifications to their educational practice based on their research. In several studies, the professional experimentation took place in the classroom, e.g. experimenting with self-developed learning materials in class (see Coenders, 2010; Justi & van Driel, 2006; Witterholt, Goedhart, Suhre, & van Streun, 2012). In our study, not all experimentation was located in the classroom. In line with Vrijnsen-de Corte (2012), we therefore defined the domain of practice as a change in teachers' professional behavior.

Domain of consequences

The domain of consequences contains the so-called 'salient outcomes', meaning the inferred consequences of the professional experimentation that characterizes the domain of practice (Clarke & Hollingsworth, 2002). The teacher-researcher reflects on the consequences of the modifications in educational practice. The consequences are often referred to as students' learning results. In our study, the domain of consequences is defined more broadly to refer not only to inferred impact in the teaching practice, but also to inferred impacts within the school context.

Personal domain

The personal domain of the IMTPG entails three aspects: knowledge, beliefs, and attitudes (concerning doing research, in this study). The inclusion of these three aspects is in line with educational literature in which they are intertwined (Verloop, van Driel, & Meijer, 2001), and inclusively referred to as 'practical knowledge' (Witterholt et al., 2012). Research already showed that changes in teachers' knowledge, beliefs and/or attitudes affect their professional behavior, as in Bandura's theory

on self-efficacy (Bandura, 1982) and Ajzen's (1985) theory of planned behavior. The IMTPG however illustrates that the relationship also works the other way around: a change in professional behavior may lead to a change in teachers' knowledge, beliefs and/or attitudes. In this study, we included an additional aspect that affects people's behavior: their intentions to perform certain behavior. In research literature (Ajzen, 1985) this intended behavior is seen as a mediator between people's beliefs and attitudes, and their actual behavior.

The change environment
Clarke and Hollingsworth (2002) state that 'the context in which teachers work (the Change Environment) can have a substantial impact on their professional growth' (p. 962). Several studies (Bieschke, 2016; Coenders, 2010; Gelso, Mallinckrodt, & Judge, 1996; Roberts, 1993) indeed demonstrated the impact of the environment on teachers' professional development. Therefore, the change environment is – like the personal domain – included in this study as it may affect teachers' professional behavior.

Clarke and Hollingsworth (2002) state that the change environment can facilitate or constrain changes in teacher's professional growth. They give examples of affordances in the change environment such as the possibility to participate in a professional development program and being able to share experiences in a group of colleagues. An example of a constraint to change could be a school culture in which high value is given to class control, which in turn discourages teachers to experiment. In a literature review on teachers' innovative behavior, Thurlings, Evers, and Vermeulen (2015) distinguished six categories of organizational factors: actors/relations, resources, culture, task factors, physical characteristics and external factors. The context in which teacher professionalization takes place determines which factors play a role, leading to different factors being found in different studies. For example, the basis of the characteristics as distinguished by Gelso et al. (1996) was a graduate education program on research whereas Coenders (2010) described characteristics originating from a study in which secondary education teachers conducted research for the purpose of developing teaching materials. Therefore, it seemed prudent to use for our study a set of

characteristics that originates from a context similar to the context of our study.

Work by Ros and Keuvelaar-van den Bergh (2016) proved suitable for this study as it contains a set of contextual characteristics matching the characteristics as reported in educational literature while focusing on research conducted in Dutch schools. Ros and Keuvelaar-van den Bergh (2016) distinguished eight contextual characteristics of a school research culture:

1. Organization of research in the school: groups of teachers conduct research with the purpose of improving the school.
2. Choice of research theme: themes are of relevance for (a group of teachers within) the school.
3. Involvement of the team: a group of teachers is involved in the research creating support for the research in the school.
4. Role of the school leader: he/she has a research attitude and supports teacher research.
5. Individual use of knowledge: teachers reflect on their lessons and use literature for the purpose of improving their educational practice.
6. Organizational use of knowledge: within the school, policy decisions are based upon research findings.
7. Dialogue for professional development: teachers talk about education for the purpose of improving their professional behavior.
8. Dialogue for vision development and knowledge sharing: teachers' dialogue results in a shared vision on education. Knowledge within the school is shared within and outside the school.

5.3   METHODOLOGY

The aim of this study was to investigate changes in teachers' professional behavior, the impact of such changes on professional development and school development, and factors (personal and contextual) that affect such changes. To this end, we conducted a long-term cohort study, which according to McDonough (2006) and Oolbekkink-Marchand et al. (2013) is necessary as change, especially sustained change (e.g. lasting teacher growth), takes time.

The research questions addressed in this study are:

> *· How does teacher-researchers' professional behavior differ before and after having conducted teacher research?*
> *· What is the impact of such changes in teacher-researchers' professional behavior on professional development and school development?*
> *· How do personal and contextual factors affect changes in teacher researchers' professional behavior?*

When referring to the IMTPG, research question 1 relates to the domain of practice, research question 2 relates to the domain of consequences, and research question 3 refers to the personal domain and the change environment. The external domain is in this study the TR-course. For good understanding, a description of the TR-course is given below.

5.3.1   The teacher research course

A Dutch course for teacher research provides the context of this study. Two PDS – in which secondary schools and Tilburg University are partners – have developed a course in teacher research (TR-course) in which teachers are learning to conduct research. Funding was provided by the PDS, which included time (teachers were exempted from regular school work half a day per week), provision of a meeting location and assistance from two supervisors of Tilburg University (me and my colleague supervisor).

The TR-course ran over a period of one school year. The course consisted of 13 meetings in which the teacher-researchers discussed the research process and content, and gave and received feedback to and from peers (fellow teacher-researchers) and supervisors. In addition, the supervisors provided a research skills training in which theoretical background information was given regarding the different research phases, and practical assignments were made. Next to these group meetings (of two hours each), teacher-researchers could schedule individual meetings (consultation time) of half an hour in which they had the opportunity to discuss their research with one of the supervisors.

All teacher-researchers participated voluntarily in the TR-course. Either they had formulated their own research objective and questions, or

they were approached by their school leader to conduct research into a specific theme. The teacher-researchers conducted research at classroom or school-wide level on a variety of themes. These included for example implementing formative assessment in Spanish language lessons, designing an online examination program, dealing with unsocial student behavior in school. Teachers ran the whole process from diagnosing the problem to reporting on their findings (write/submit a research report and present the findings).

5.3.2 Participants

In total, 129 teacher-researchers participated in the research program offered by the PDS during five school years (from 2013 to 2018). Thus, the study consists of five cohorts of teacher-researchers, containing respectively 23, 20, 36, 32, and 18 teacher-researchers. A substantial number (27) re-entered in a subsequent year which means that 102 different teacher-researchers attended the TR-course. The teacher-researchers taught at 27 different secondary education schools in the province of Noord-Brabant in the Netherlands. In Table 5.1, background information of the participants is presented.

Table 5.1 Background information of the teacher-researchers (N=102)

		Teacher-researchers
Age[1] (mean)		41.6
Gender	Male	46%
	Female	54%
Subject taught[2]	Alpha	30%
	Beta	20%
	Gamma	27%
	Other	23%
Teaching degree[3]	First degree	56%
	Second degree	39%
	Other	5%

[1] n=97 for age (as there were five missing scores)
[2] Alpha: languages (e.g., Dutch, English), beta: natural science (e.g., Mathematics, Biology), gamma: social sciences (e.g., Economy, History), other: Physical education, Arts, Dramatic arts, Health and Nursing care
[3] First degree: certificated for all forms of secondary education, second degree: certificated for all forms of secondary education except the last three years of the two highest educational levels, other: uncertificated or certificated as primary school teacher

In cohort 5 (2017-2018), we collected in-depth data of six (of the in total eighteen participating) teacher-researchers, by conducting classroom observations and surveying their students at the beginning and end of the school year. Due to unforeseen circumstances during the school year, we could not collect all data of all six teachers. We were able to make classroom observations of five teacher-researchers. We could collect questionnaire data among students of four teacher-researchers. An overview is given in Table 5.2.

Table 5.2 Data collection and background information of the teacher-researchers of the in-depth study

Teacher	Lesson observations	Student questionnaires	Age	Gender	Subject taught
Teacher A	+	n=17	48	Male	Classical languages
Teacher B	+	n=25	40	Female	Mathematics
Teacher C	+	n=17	30	Female	Spanish
Teacher D	+	-	29	Female	Dutch
Teacher E	+	-	27	Female	Physical education
Teacher F	-	n=18	35	Female	Dutch

5.3.3 Instruments, data collection and analysis

In this study, we combined both observations and questionnaires as instruments and involved both teacher-researchers and student as respondents. Including several instruments is necessary knowing that what teachers report to do may differ from what they actually do (den Brok, Bergen, & Brekelmans, 2006; Geerdink, Boei, Willemse, Kools, & van Vlokhoven, 2016). We made an in-depth investigation because 'research instruments – such as observations or student questionnaires – can be useful for obtaining insight into [..] differences between what is in the heads of involved participants and what is visible to outsiders' (Vrijnsen-de Corte, 2012, p. 38). The instruments used for data collection are presented in Table 5.3 and described in detail below.

Table 5.3 Instruments used for data collection

	Beginning of course year	End of course year	End of long-term study
Cohort 1-5 (N=102)		Personal domain questionnaire	Change questionnaire
Cohort 5 (n=6)	ICALT observation	ICALT observation	
	ICALT student questionnaire	ICALT student questionnaire	

ICALT observation
In cohort 5 (2017-2018), six teacher-researchers were studied more intensively to explore changes in teachers' professional behavior. Teacher-researchers explored different topics in their research projects, which means that this could lead to changes in different aspects of their professional behavior. We choose to observe one of the aspects of professional behavior, i.e. teaching behavior in the classroom. This choice was based on the fact that teaching behavior in classroom is a core element of teachers' professional behavior. A second reason is that teaching behavior can be observed in everyday classroom practice and a validated observation instrument is available for this purpose. Finally, the ICALT observation can be supplemented with a students' questionnaire, in which the same domains of teaching behavior are used.

The ICALT observation instrument is based on research findings of the International Comparative Analysis of Learning and Teaching (ICALT) project on effective teacher behavior (van de Grift, 2007) and can be used to evaluate teaching behavior. This observation instrument has already been used and validated in the Netherlands and several other European countries (Maulana, Helms-Lorenz, & van de Grift, 2014).

The ICALT instrument consists of six domains of effective teacher behavior and a seventh domain of student involvement (Maulana et al., 2014; van de Grift, 2007; van de Grift, Helms-Lorenz, & Maulana, 2014):

1. A safe and stimulating learning climate: apparent from a relaxing learning atmosphere and an intellectually challenging learning environment. The teacher expresses positive expectations of students, shows respect to students and ensures respect among students.
2. Efficient classroom management: apparent when a teacher efficiently uses learning and teaching time, ensures an orderly lesson course and stands up against misbehavior of students.
3. Clarity of instruction: apparent in a lesson in which the teacher specifies the lesson objectives and gives clear instruction. The teacher checks whether students understand the instruction / task / learning materials.

4. Activating learning: apparent when a teacher uses working methods for active learning and gives interactive instruction. The teacher activates prior knowledge and asks questions that stimulate students' thinking.

5. Adaptive teaching: apparent when a teacher adapts his or her lesson (instruction, learning materials, time) to the individual learning needs of each student, i.e. differentiated teaching.

6. Teaching learning strategies: apparent when a teacher teaches metacognitive strategies, stimulates critical thinking and displays modeling behavior in problem solving activities.

7. Involvement of students: apparent in a lesson in which students are engaged in the tasks, show interest in the content and are focused on learning.

We used the ICALT observation instrument which consists of 35 statements covering all seven domains. The teaching behavior on these domains was rated on a four-point scale (ranging from *completely not applicable* to *completely applicable*). Example statements are: *The teacher explains the lesson objectives at the start of the lesson* and *The teacher encourages students to think critically.*

It was up to the teacher-researcher to decide which lesson for which group would be observed as for this study there were no pre-set requirements of the student group (as the teaching behavior of the teacher-researcher was the object of the observation). The lesson to be observed had to be a regular lesson, meaning that it should not be a lesson that e.g. was reserved entirely for making a test or for a trip outdoors. Two lessons from the same group were observed: one at the beginning and one at the end of the school year. The observer was trained and certified to conduct lesson observations with the ICALT instrument. Data from the ICALT observation instrument were analyzed by calculating means and standard errors.

ICALT student questionnaire
In cohort 5, we additionally surveyed the students of the teacher-researchers in whose classes we made classroom observations. The students were approached by email to complete an online version of

the ICALT student questionnaire both at the beginning and end of the school year. In total, 77 students completed the questionnaire.

The questionnaire was developed by Maulana et al. (2014) who converted the ICALT observation instrument into a validated student questionnaire by which students' perspectives on teachers' teaching behavior can be measured. The questionnaire consists of 24 statements (with the same four-point scale as the ICALT observation instrument) covering the first six ICALT-domains. Example statements are: *My teacher answers my questions* and *My teacher makes me feel self-confident with difficult tasks*. The student questionnaire is a valuable asset, since combining both expert observations and student perspectives provides a more complete picture of teachers' teaching behavior (Maulana et al., 2014). Data from the ICALT student questionnaire were analyzed by calculating means and standard errors.

Change questionnaire
A questionnaire, consisting of 22 items, was developed to assess changes in teachers' professional behavior, the impact of those changes on teacher-researchers and schools, and contextual factors that affect such changes. At the end of the long-term study, a personalized email was sent out to all 102 teacher-researchers who over the years had participated in the TR-course to invite them to complete the questionnaire. Out of the 102 teacher-researchers, 84 (82.4%) completed the questionnaire. A description of the questionnaire items is given below; the Dutch version can be found in Appendix 6.

Domain of practice
Regarding changes in teachers' professional behavior, nine items were included in the questionnaire: two questions and seven statements. All 102 teacher-researchers were asked the following two questions: *Did you change your professional behavior during the process of conducting teacher research? (yes/no)*; *Can you give concrete examples of this changed behavior?* If the teacher-researchers indicated that their professional behavior had not changed, they were asked to explain why not. The seven yes/no-statements covered the ICALT-domains and served to further specify any changes in teachers' professional teaching behavior. On all seven ICALT-domains, teacher-researchers were asked to indicate whether a

change had occurred. An example statement (related to ICALT-domain 'efficient classroom management') is the following: *Through conducting teacher research, my professional teaching behavior changed regarding efficiently organizing my lessons.* The yes/no questions were analyzed by calculating percentages. Teacher-researchers' comments on why their professional behavior had not changed were categorized and labeled in an open-coding process. Because of the explorative character of this study, no predefined categories grounded in the theory were available for coding the comments. While analyzing the first comments, several reasons for no change in teachers' professional behavior were identified. This resulted in a set of categories to which new categories could be added until all comments had been analyzed. During the process of open-coding a saturation was reached; teacher-researchers' comments could be categorized into the categories that were already identified. In total, five categories were distinguished which are presented, along which illustrative comments, in the results section.

Domain of consequences
The questionnaire included a general question about the impact of a change in teacher-researchers' professional behavior. In addition, teacher-researchers were asked whether any products or projects originated from their teacher research (if not, they were asked to state a reason), in what way those products/projects were useful, and to provide concrete examples of the products/projects. Asking about products/projects seemed relevant, as we noticed that many teacher-researchers developed products/projects within their teacher research. In educational literature, products/projects gain attention, for example by Coenders (2010) who extended the IMTPG with an extra domain: the Developed Material Domain.

The data obtained in the general question about the impact of a change in teacher-researchers' professional behavior were categorized and labeled in an open-coding process. Because this study was a first exploration of this impact, the categorization started from notions grounded in the reviewed literature. The notions from the ICALT observation instrument (Maulana et al., 2014; van de Grift, 2007; van de Grift, Helms-Lorenz, & Maulana, 2014) and the School Research Culture Scan (Ros & Keuvelaar-van den Bergh, 2016) (see below) served as initial categories for analyzing

the teacher-researchers' comments. This initial set of categories was changed iteratively while analyzing the comments. The comments were not only analyzed by the categories, but were also analyzed quantitatively (i.e. frequency count). All the distinguished categories, including illustrative comments, are presented in the results section.

The question related to products/projects that originated from the research was analyzed by calculating percentages. Teacher-researchers' comments on this matter were categorized and labeled in an open-coding process. Comments that exemplify how the products/projects were of value were identified. When all comments were coded it turned out that teachers mainly referred to for whom the products/projects were of value. This resulted in three categories to organize the comments: school, teachers and students. The coded comments were transformed into tables and organized into the matching category.

Change environment
Regarding the contextual factors that affect changes in teachers' professional behavior, the questionnaire included one open question and eight items. In the open question the teacher-researchers were asked to indicate any changes occurring in the research culture of the school between the moment of completing the questionnaire and the year the research was conducted as for some their research took place several years before. For this open question, the eight contextual characteristics of a research culture in the school were used as the basis for categorizing teacher-researchers' comments on the impact of teacher research for the school. For example, a teacher-researcher reported that conducting research had become part of the school's policy. This statement relates to the characteristic 'organizational use of knowledge' and was labeled as such.

The eight questionnaire items originated from the School Research Culture Scan (Ros & Keuvelaar-van den Bergh, 2016). This Scan consists of eight contextual characteristics (see section 5.2.2) by which the position of a research culture in the school can be determined. For each characteristic, there are five phases of development. Teachers had to indicate which phase best reflected the situation in their school. All phase descriptions from the original Scan were adapted for this study

from detailed descriptions to concise statements in order to enhance readability. As an example below characteristic 3 'involvement of the team', is presented.

What best defines the situation in your school?
1. teachers are not involved in research
2. teachers are informed about research
3. teachers are informed about and involved in research
4. like phase 3 + teachers show interest in research
5. like phase 4 + teachers learn collaboratively from research and undertake action based on research results

Overall, the School Research Culture Scan had a high reliability, Cronbach's α = .87. The data obtained from the School Research Culture Scan were analyzed by calculating percentages, means and standard errors.

Personal domain questionnaire
A questionnaire, consisting of twelve items and one open-ended question, was developed to assess personal factors that affect changes in teachers' professional behavior (see Appendix 7). It was reviewed by several teachers (who did not participate in the TR-course) and demonstrated adequate face validity. Each item pertained to a different research activity (e.g., formulating research questions, analyzing data, reporting about research results). Teacher-researchers used a five-point scale to gauge the degree to which they liked conducting the research activity (attitude measure), the degree to which they found themselves able to conduct the activity (self-efficacy measure) and the degree to which they found the activity important for secondary education teachers (interest measure). In an open-ended question teacher-researchers reported about their intention to conduct research. The following are two exemplary items:

· *formulating research questions:*
do I like (1 – 2 – 3 – 4 – 5)
am I able to do (1 – 2 – 3 – 4 – 5)
do I find important (1 – 2 – 3 – 4 – 5)

· reporting about research:
>   *do I like (1 – 2 – 3 – 4 – 5)*
>   *am I able to do (1 – 2 – 3 – 4 – 5)*
>   *do I find important (1 – 2 – 3 – 4 – 5)*

The questionnaire was administered to teacher-researchers at the end of the school year in which they conducted their research. Teacher-researchers from cohort 1 did not complete the questionnaire (as the questionnaire was developed after the first year of the TR-course). Out of the 102 teacher-researchers, 73 (71.6%) completed the questionnaire. (Note that this questionnaire may have been filled out twice by the same teacher-researcher as several teacher-researchers participated more than one year in the TR-course.)

Instrument analysis showed reasonable reliability for all three aspects (with twelve items each): Cronbach's α = .64 for attitude measure, .67 for self-efficacy measure, and .86 for interest measure. Data from the personal domain questionnaire were analyzed by calculating percentages, means and standard errors.

The final steps in our data analysis were determining relationships between the IMTPG domains by calculating Pearson's correlation coefficient and Pearson's chi-square, and calculating the intercoder reliability in our open-coding process. Since the categorization and labeling of teacher-researchers' comments was done by me, my colleague supervisor independently labeled a random selection of comments. The overall intercoder reliability was 85.9%.

5.4   FINDINGS

The findings of this study are presented by going into the data per research question that we set out to answer. First, a description is given of changes in teachers' professional behavior during the process of conducting teacher research. Then, the impact of those changes for teacher-researchers and schools are described. Next it is reported how personal and contextual factors affect a change in teachers' professional behavior. In the last section, relations between the different domains of the IMTPG are described.

5.4.1 Domain of practice

Our in-depth study did not reveal major changes in teacher-researchers' professional behavior. From the observations, only a small difference in teacher-researchers' professional teaching behavior was found between the beginning of the school year (M=2.34, SE = .26) and the end of the school year (M=2.53, SE = .20). From the student questionnaires, a minimal difference was found between the beginning of the school year (M=3.31, SE = .50) and the end of the school year (M=3.34, SE = .48). In Table 5.4 our findings are specified per teacher-researcher.

Table 5.4 Observed growth in teacher-researchers' professional teaching behavior per ICALT-domain, per teacher (A-F) (difference between mean pre-test and mean post-test)

ICALT-domain	Observations[1]	Student questionnaires[2]
Safe and stimulating learning climate	A (0.25), B (0.25), C (0.5), D (1.00), E (0.5)	A (0.07), C (0.10), F (0.18)
Efficient classroom management	-	A (0.11), C (0.01)
Clarity of instruction	C (1.00), E (1.43)	A (0.08), C (0.05)
Activating learning	A (0.57), B (0.42), C (0.42), D (0.29), E (0.71)	A (0.05), C (0.06)
Adaptive teaching	C (0.25), E (0.25)	C (0.14)
Teaching learning strategies	D (0.33), E (0.83)	A (0.09), C (0.03)
Involvement of students	B (0.33), E (0.66)	N/A

[1] No observation data were collected from teacher F
[2] No data were collected from the students of Teachers D and E

The observations show that all teachers made progress in their teaching behavior. Teacher E made progress in all domains, except classroom management. Teacher C made progress in four domains, while Teacher B and D did so in three domains and Teacher A in two domains. According to the students, the teachers progressed to a lesser extent. Their data show progress for Teacher A, C and F (note though that there was no observational data for teacher F and no student questionnaire for Teachers D and E, so only the data of Teacher A, B and C can be compared).

Next, data from the 'change questionnaire' are described. On the general question whether their professional behavior had changed during the process of doing research, 50 out of 84 teacher-researchers (59.5%)

answered affirmative. When they were asked to specify the changes on the basis of the ICALT-domains, the following picture arises (see Table 5.5):

Table 5.5 Teacher-researchers' perceived changes in their professional teaching behavior per ICALT domain (n=84, frequencies and percentages)

ICALT domain	Yes	No
Safe and stimulating learning climate	29 (34.5%)	55 (65.5%)
Efficient classroom management	34 (40.5%)	50 (59.5%)
Clarity of instruction	26 (31.0%)	58 (69.0%)
Activating learning	45 (53.6%)	39 (46.4%)
Adaptive teaching	42 (50.0%)	42 (50.0%)
Teaching learning strategies	32 (38.1%)	52 (61.9%)
Involvement of students	45 (53.6%)	39 (46.4%)

Of the teacher-researchers, 34.5% perceived that conducting teacher research has changed their professional teaching behavior concerning creating a safe and stimulating learning climate. Also their classroom management did become more efficient, according to 40.5% of the teacher-researchers. 31.0% perceived that their instruction became clearer through conducting teacher research. More than half of the teacher-researchers (53.6%) perceived that they activated students' learning more. Half of the teacher-researchers (50.0%) indicated that their teaching was more adapted to the individual learning needs of each student. Some (38.1%) perceived that they increased their teaching of learning strategies. A majority (53.6%) perceived that the involvement of students in the lessons increased.

The 34 teacher-researchers who did not report a change in their professional teaching behavior indicated that such change did not occur because their research was not directly related to their teaching practice (mentioned 13x) or they were not teaching (any more) (mentioned 8x). They also stated the school did not provide facilities for implementing their research findings (mentioned 5x). Three teacher-researchers had only recently or not yet finished their research which made it hard for them to indicate changes in professional teaching behavior. Five teacher-researchers stated that their teaching behavior remained the same after conducting teacher research.

Further analysis of the answers of the teacher-researchers who reported no change in their professional behavior, revealed that ten of them did in fact change their behavior but were hesitant in reporting it as such. For example: *'My research was not directly related to my teaching practice. It was about parental involvement. We did implement parent-student-teacher conversations at the beginning of the school year for first year students'*, says a teacher-researcher. Another teacher-researcher indicates that *'the research was about calculation techniques. I already started implementing research findings during the school year'*. As these answers indicate that the professional behavior did change, we included these ten teacher-researches in the group that indicated change. Hence, out of the 84 teacher-researchers who completed the 'change questionnaire', 60 (71.4%) indicated that their professional behavior had changed as a consequence of conducting teacher research. The impact of this changed professional behavior on teacher-researchers and schools is described in the following section.

5.4.2 Domain of consequences

On the open question about the impact of teacher research, 60 teacher-researchers provided an answer. All of their 70 comments (several teacher-researchers made more than one comment) indicated that their changed professional behavior positively affected them.

In a next question, when asked explicitly about the impact of having conducted research for teacher-researchers themselves, 74 comments were provided by 60 teacher-researchers (again several teacher-researchers made more than one comment). 26 teacher-researchers indicated that the research had provided them with products that they now used in their teaching practice. One teacher-researcher indicated that teacher research *'has enabled me to develop a series of lessons that I now use in my teaching'*. Their knowledge also increased, according to 12 teacher-researchers. For example, their knowledge on conducting research as is shown from the following quote: *'In assisting students with their research projects, I am better able to explain the process of conducting research. Because I have conducted research, I know better about the difficulties in conducting research.'*

Some teacher-researchers indicated that they were more involved with their teaching (mentioned 17x) and that their teaching had become more evidence-based (mentioned 7x). Two exemplary quotes: *'Normally, you experiment in your teaching practice and your students' reactions are the only feedback provided. [...] By conducting research, I was able to systematically invest my experimenting and I looked beyond my own classroom'* and *'More often, I search for relevant literature when developing my teaching'*. Teacher-researchers also indicated that the research made them experiment more in their teaching practice (mentioned 4x) and made them more open for innovations (mentioned 3x). One teacher-researcher puts it as follows: *'Conducting teacher research leads to a stronger research attitude, the desire to know more and to provide better education'*. Two teacher-researchers commented that the impact of conducting teacher-research was a difference in coaching students, e.g. *'Students themselves now set their learning goals and organize their activities. As a teacher, I take on the role as coach.'* Teacher-researchers also indicated an increase in knowledge sharing among colleagues (mentioned 1x) or having become more enthusiastic about teaching practice (1x).

Teacher-researchers were also asked specifically whether the research has provided them with new products or projects. For 72 out of 83 (86.7%) teacher-researchers this was indeed the case, for 11 (13.3%) not. These 11 teacher-researchers argued that future research was necessary (mentioned 4x), that their research goal was not to obtain products or projects (mentioned 3x) or that the school leader did not show interest (mentioned 2x). Two teacher-researchers could not indicate why their research did not provide them with products or projects. The 72 teacher-researchers who indicated that their research had provided them with products/projects, gave the following examples:

- · A new policy and ideas for outdoor classroom activities
- · Implementing peer tutoring within the school
- · A format for parent/student/teacher conversations
- · An anti-bullying protocol
- · A checklist for formative testing including exemplary methods

The question on how these products/projects were of value, was answered by 70 teachers. 39 (55.7%) reported that the products/projects

contributed to the development of the school. The products or projects were incorporated schoolwide or resulted in a new school vision or policy (mentioned 33x). The products/projects sometimes led to a greater professional dialogue within the school; e.g. colleagues cooperated more and knowledge was shared more regularly (mentioned 6x). The products/projects also contributed to the professional development of teacher-researchers. Out of the 70 teacher-researchers, 19 (27.2%) reported that they took on a different role in the school, they gained more confidence, became more enthusiastic and taught better lessons. Five teacher-researchers (7.1%) reported that the products/projects were of value to the students (e.g. students became more motivated/enthusiastic). For seven teacher-researchers (10%) it was hard to indicate whether the products/project were of value.

5.4.3 Personal domain

The personal domain questionnaire was completed at the end of the year of following the TR course by 73 teacher-researchers. Teacher-researchers were asked about the degree to which they liked conducting the research activity (attitude measure), the degree to which they found themselves able to conduct the activity (self-efficacy measure) and the degree to which they found the activity important for secondary education teachers (interest measure). Findings are presented in Table 5.6.

Table 5.6 Teacher-researchers' attitude towards research, their self-efficacy about research and their interest in research (n=73, mean score on a five-point scale and SE)

	Like	Able	Important
Formulating the motivation for research	3.82 (.09)	3.42 (.08)	4.26 (.07)
Describing the problem of practice	3.89 (.07)	3.55 (.08)	4.30 (.07)
Stating a research objective	3.71 (.09)	3.48 (.09)	4.34 (.08)
Writing research questions	3.68 (.08)	3.42 (.09)	4.36 (.07)
Conducting a literature study	3.75 (.11)	3.55 (.09)	4.37 (.07)
Determining a methodology	3.73 (.07)	3.47 (.07)	4.25 (.07)
Making a plan	3.64 (.09)	3.45 (.10)	4.22 (.08)
Collecting data	3.96 (.11)	3.77 (.08)	4.36 (.07)
Analyzing data	3.89 (.10)	3.56 (.09)	4.41 (.07)
Reporting about research	3.45 (.12)	3.41 (.11)	4.14 (.08)
Presenting the research	3.84 (.11)	3.78 (.10)	4.10 (.07)

Table 5.6 Continued

	Like	Able	Important
Implementing research findings	4.36 (.07)	3.88 (.07)	4.49 (.07)
Average score	3.81 (.04)	3.56 (.04)	4.30 (.05)

Teacher-researchers had a positive attitude towards research – which, in this study means that they liked conducting research (M=3.81, SE = .04). Of all research activities, they had the least positive attitude towards reporting about the research and the most positive attitude towards implementing the research findings. Teacher-researchers found themselves able to conduct research; their self-efficacy score was M=3.56 (SE = .04). They had least confidence in their ability to write about the research findings and had most confidence in their ability to implement the research findings. Teacher-researchers found conducting research an important activity for secondary education teachers (M=4.30, SE = .05). Presenting the research was least important and implementing the research findings was most important, according to the teacher-researchers.

In an open-ended question the teacher-researchers reported on their intention to keep conducting research. Out of the 73 teacher-researchers that answered this question, 65 (89.1%) had the intention to continue conducting research. Four (5.5%) teacher-researchers doubted, two (2.7%) did not have the intention to continue conducting research, and two answers were missing. 37 teacher-researchers intended to conduct a follow-up study; five of them during postgraduate education (e.g. obtaining a masters' degree). A teacher-researcher stated: *'Next school year, I will start a master's study. Through conducting teacher research, I became inspired. I want to investigate more educational themes'.* Also 32 teacher-researchers intended to implement and evaluate their research findings. *'I want to implement my design and test whether it meets its objectives',* as reported by a teacher-researcher.

5.4.4 Change environment
To establish the change environment, the School Research Culture Scan was used. In Table 5.7, a summary of the findings is presented. Per contextual characteristic, 81 teachers indicated which phase best reflected the situation in their school during the year in which they

conducted their research. A full example is given for the contextual characteristic 'involvement of the team' (see Table 5.8).

Table 5.7 Perceived phase per contextual characteristic of the research culture in the school (n=81, mean score on a five-point scale and SE, most chosen phase in percentage)

Contextual characteristic	Mean and SE	Major phase
Organization of research in the school	2.42 (.12)	Phase 2 (66.7%)
Choice of research theme	2.27 (.13)	Phase 2 (53.1%)
Involvement of the team	2.36 (.13)	Phase 2 (48.1%)
Role of the school leader	2.70 (.15)	Phase 2 (35.8%)
Individual use of knowledge	2.40 (.12)	Phase 2 (34.6%)
Organizational use of knowledge	2.40 (.15)	Phase 1 (32.1%)
Dialogue for professional development	2.36 (.10)	Phase 2 (59.3%)
Dialogue for vision development and knowledge sharing	2.56 (.13)	Phase 2 (55.6%)

Table 5.8 Involvement of the team (n=81, scores are percentages)

Phase	Description	Percentage	Cumulative percentage
1	Teachers are not involved in research	21.0%	21.0%
2	Teachers are informed about research	48.1%	69.1%
3	Teachers are informed about and involved in research	14.8%	84.0%
4	Like phase 3 + teachers show interest in research	6.2%	90.1%
5	Like phase 4 + teachers learn collaboratively from research and undertake action based on research results	9.9%	100.0%

In Table 5.7 it is shown that the research culture of the schools mostly reflects phase 2. For the contextual characteristic of the involvement of the team, this is specified in Table 5.8 showing that phase 2 is most chosen (48.1%). Although, phase 1 is the major phase for organizational use of knowledge (see Table 5.7), the average score for this contextual characteristic is 2.40 (SE = .15). Teacher-researchers thus indicate that the overall research culture in their school was still in a beginning stage of development at the time they were conducting their research.

80 teacher-researchers answered the open-ended question on changes in the research culture of the school. The majority (47; 58.8%) reported that the research culture within the school had changed (between the year of following the TR course and the moment of completing the

School Research Culture Scan). Three teacher-researchers indicated this change as (partly) negative arguing that facilities for conducting research decreased (mentioned 3x) and a school leader had become less enthusiastic about teacher research (mentioned 1x). All other changes were indicated as positive, hence reflecting a more embedded research culture within the school.

Main impact for the school originated from an increase of organizational use of knowledge (mentioned 24x). Teacher-researchers stated that e.g. the school policy had become more substantiated by research findings and that conducting research had become of greater importance in the school. Teacher-researchers also reported on an improved organization of research in the school (mentioned 12x); e.g. a research coordinator has been appointed, a research agenda has been drafted. Teacher-researchers also noted that new knowledge was implemented in their own educational practice (mentioned 9x); an increase in the individual use of knowledge. The dialogue on professional development had also changed, according to five teacher-researchers who noted that more and more knowledge was shared among colleagues. Teacher-researchers also perceived changes in the role of the school leader (mentioned 4x), the involvement of the team (mentioned 3x) or the choice of research theme (mentioned 1x).

The teacher-researchers (33 out of 80; 41.2%) who reported that the research culture had not changed presented several explanations for the lack of change. Reasons concerned the organization of research in the school (mentioned 3x, e.g. less research was being conducted in the school), the organizational use of knowledge (mentioned 9x, e.g. the school lacked a vision about research, there was no opportunity to implement the research findings after the research was conducted), the role of school leaders (mentioned 2x, a school leader who did not show interest in the research), and team involvement (mentioned 1x, colleagues who were barely interested in the research). Ten teacher-researchers indicated that they were currently working on implementing their research findings, hence a contextual change had not yet taken place. One teacher-researcher stated that a research culture was already common in the school. Seven teacher-researchers could not indicate why the research culture within the school had not changed.

5.4.5 Determining the relations between the IMTPG domains

The Interconnected Model of Teacher Professional Growth (IMTPG) implies several relations between the different domains (see Figure 5.1). Findings from our data showed significant relationships within the personal domain only, see Table 5.9.

Table 5.9 Correlations personal domain

	Attitude	Self-efficacy	Interest
Attitude	1	.65*	.48*
Self-efficacy		1	.32*
Interest			1

* p < .01

Teacher-researchers attitude towards research was significantly related with their self-efficacy, $r = .65$, $p < .01$, and their interest in research, $r = .48$, $p < .01$. Self-efficacy and interest in research were also significantly related, $r = .32$, $p < .01$. Teacher-researchers' intention to conduct research was significantly related to their attitude towards research, $r_{pb} = .33$, $p < .01$, but not significantly related to their self-efficacy, $r_{pb} = .11$, or interest in research, $r_{pb} = .16$.

5.5   CONCLUSIONS

This study aimed to investigate changes in teachers' professional behavior as a consequence of conducting teacher research and the impact of such changes on professional development and school development. In addition, personal and contextual factors were investigated, as literature (Clarke & Hollingsworth, 2002) indicated that these affect the changes.

Our findings from the change questionnaire of 84 teachers showed that the professional behavior of the majority of teacher-researchers who participated in the TR course has changed. According to the teacher-researchers, this change is mostly related to activating student learning and adapting their instruction to individual students' needs. They also reported that they involved students more during their lessons. In classroom observations of a sample of the teacher-researchers, we however did not find a major difference in teacher-researchers professional teaching behavior before and after the TR-course. We

found that all teacher-researchers were somewhat better able to create a safe and intellectually challenging climate and activate their students. Some teachers also gave clearer instruction, adapted their teaching more, taught learning strategies and had a higher student involvement in their lessons at the end of the school year. Students' perspectives on teachers' professional teaching behavior changed minimally during the school year in which the teacher-researcher conducted the research. In fact, the evaluations by the students was already high at the beginning of the school year. The students confirmed the observation of progress of two teachers, but for a third teacher this observation was not confirmed.

Specifying the impact of conducting teacher research for the teacher-researchers, our findings show that teacher-researchers' knowledge increased (which is in line with findings of Meijer, Oolbekkink, Meirink, and Lockhorst (2013) and Ponte et al. (2004)) and that they became more engaged in their teaching as a result of conducting teacher research. Another major impact was that the research has provided the teacher-researchers and the school with new products or projects.

For the personal factors, we found that teacher-researchers had a positive attitude towards research, found themselves able to conduct research, and found conducting research an important activity for secondary education teachers. These aspects of attitude, self-efficacy and interest were significantly related, which is in line with findings in educational literature (e.g. Bandura, 1982). The majority of the teacher-researchers also reported that they had the intention to continue conducting research. This intention was significantly related to attitude only.

For the contextual factors, we found that the research culture of the schools did not differ considerably before and after the TR-course. The research culture of the schools mostly reflects phase 2. Teacher-researchers thus indicate that the research culture in their school is in a beginning phase of development at the time they were conducting their research. However, the majority of the teacher-researchers also report a positive development in their school's research culture from the time of conducting the research to the moment of completing the questionnaire. This development was related to an increase of organizational use of

knowledge (i.e. policy decisions are increasingly based upon research findings) which was also found by Sharp et al. (2006). It was also related to an improved organization of research in the school (i.e. more teachers conduct research), and an increase in the individual use of knowledge (i.e. teachers increasingly reflect on their lessons). Schools thus seem to be developing towards a more embedded research culture.

5.6   DISCUSSION

This study showed that perceived improvements in teacher's professional teaching behavior while conducting teacher research were mainly situated in the domains of activating learning, adaptive teaching and the involvement of students. Both the domains of activating learning and adaptive teaching are higher teaching skills in the ICALT observation instrument, which implies basic teaching skills as conditional for higher teaching behavior (van de Grift et al., 2014). Teacher-researchers might have felt they already mastered basic teaching skills, leaving more room for improvement in the higher teaching skills. As a result of the improvement in teacher-researchers' higher teaching skills, the involvement of students may have increased as research (van de Grift et al., 2014) has shown that student engagement positively correlates with higher teaching skills.

For the fact that only small differences in teachers' professional behavior were found in the observations and student questionnaire, we present several considerations. The ICALT instruments (both observation checklist and student questionnaire) are used to evaluate teaching behavior only. As a consequence, we might have missed out on aspects of professional behavior other than teaching behavior. It might also be that that the one-year duration of the TR-course is too short to bring about a change in teachers' professional behavior. This consideration is confirmed by the fact that several teacher-researchers from cohort 5 found it hard to indicate changes in their professional behavior because they were currently working on implementing their research findings. We also observed that there was not much room for improvement. The average score on the ICALT-scale of all six teacher-researchers from our in-depth study was above average at the beginning of the school year according to both the observer and the students. Given this, it is not

surprising that only a small difference in score in teachers' professional behavior was found; i.e. the impact of the TR-course was limited. In our study we did notice that the youngest teacher in our sample was the one who progressed most in the observed professional behavior while the oldest teacher progressed the least. We might hypothesize that there is still more to be learned for a younger teacher.

Regarding the fact that we did not find any statistically significant relationships between the different domains of the IMTPG, we hypothesize that these relations may differ a lot between individuals. As Clark and Hollingsworth (2002) state, teacher professional growth does not follow one and the same path, but is rather idiosyncratic and individual. In fact, teacher professional growth may have specific patterns in which change sequences (change in one domain is connected with change in another domain) differ. Moreover, change sequences may also depend on time and context, so all in all they are very dynamic. This means that establishing general relationships between the domains of teacher growth is not possible and also not very relevant. Instead establishing individual teachers' growth networks may be more fruitful and lead to identifying possible change mechanisms.

Limitations and directions for future research
This study has certain limitations. Firstly, the findings of this study are hard to generalize to other settings, bearing in mind the context dependent setting. However, when the data corroborate with other research in the field, the findings are applicable in other educational settings in which teachers conduct research. Other limitations have to do with the instruments used.

We used the ICALT instrument to evaluate changes in teacher-researchers' behavior. As stated above, the ICALT instrument can only evaluate teaching behavior, which constitutes only one part of teachers' professional behavior. As a consequence, the ICALT instrument is more sensitive to changes that are directly related to the teaching practice compared to changes that occur in the wider school context. The research topics of teacher-researchers differed; some were closely related to classroom practices (e.g. the implementation of formative assessment in Spanish lessons), while others were concerned with the broader school

context (e.g. development of a school vision on the subject philosophy of life). Although a larger impact on teaching behavior might have been expected for teacher-researchers investigating subjects that are closely related to classroom practices, we did not find such a difference in our study. Concerning the ICALT instrument, it is also important to note that there is no certainty about the role of the TR-course in the changes in teacher-researchers' professional behavior. This means that we cannot be sure, based on the ICALT results only, about whether the TR-course was the main or only determinant of these changes. (See chapter 6 for a more elaborated discussion on the matter of causality.) We have tried to account for the limitations regarding the use of the ICALT instrument by complementing the ICALT observations (and student questionnaires) with questionnaire data in which the teacher-researchers were specifically asked about changes in their professional behavior (see Appendix 6).

Furthermore, our findings are mainly based on teacher-researchers self-reported perceptions. However, the relatively high number of participants (N=102) for a study of this kind, does account for possible bias. We also accounted for possible bias by applying triangulation by instrument. Additionally, we included the perspective of an external observer and students to account for different perspectives. We used the School Research Culture Scan as instrument to map the change environment. Although the Scan had a high reliability, this instrument has not been validated yet. Future research should examine whether the Scan is a valid measure of the research culture in schools. We think this would be a relevant enterprise as the Scan can (e.g.) help school leaders decide on measures to foster the research culture in their school.

Altogether, the findings of this study substantiate the relevance of teacher research for education. They not only show that conducting teacher research supports the professional development of teachers, but that it also promotes school development. As one of the teacher-researchers stated, it indeed seems hard 'to not change professionally when conducting teacher research'.

REFERENCES

Ajzen, I. (1985). From Intentions to Actions: A Theory of Planned Behavior. In J. Kuhl & J. Beckman (Eds.), *Action-control: From cognition to behavior* (pp. 11-39). Berlin: Springer-Verlag. Retrieved from https://link.springer.com

Atay, D. (2006). Teachers' Professional Development: Partnerships in Research. *Teaching English as a Second Language Electronic Journal, 10*(2), 1-15. Retrieved from http://www.tesl-ej.org

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist, 37*(2), 122-147. doi:10.1037/0003-066X.37.2.122

Berger, J. G., Boles, K. C., & Troen, V. (2005). Teacher research and school change: paradoxes, problems, and possibilities. *Teaching and Teacher Education, 21*(1), 93-105. doi:10.1016/j.tate.2004.11.008

Bieschke, K. J. (2016). Research Self-Efficacy Beliefs and Research Outcome Expectations: Implications for Developing Scientifically Minded Psychologists. *Journal of Career Assessment, 14*(1), 77-91. doi:10.1177/1069072705281366

Clarke, D., & Hollingsworth, H. (2002). Elaborating a model of teacher professional growth. *Teaching and Teacher Education, 18*(8), 947–967. doi:10.1016/S0742-051X(02)00053-7

Cochran-Smith, M., & Lytle, S. L. (1999). The Teacher Research Movement: A Decade Later. *Educational Researcher, 28*(7), 15-25. doi:10.3102/0013189X028007015

Coenders, F. (2010). *Teachers' professional growth during the development and class enactment of context-based chemistry student learning material* (Doctoral dissertation). Enschede: University of Twente. Retrieved from https://research.utwente.nl

den Brok, P. J., Bergen, T. C. M., & Brekelmans, M. (2006). Convergence and divergence between students' and teachers' perceptions of instructional behaviour in Dutch secondary education. In D. L. Fisher & M. S. Khine (Eds.), *Contemporary approaches to research in learning environments: Worldviews* (pp. 125-160). Singapore: World Scientific. doi: 10.1142/9789812774651_0006

Desimone, L. M. (2009). Improving Impact Studies of Teachers' Professional Development: Toward Better Conceptualizations and Measures. *Educational Researcher, 38*(3), 181-199. doi:10.3102/0013189x08331140

Evans, L. (2011). The 'shape' of teacher professionalism in England: professional standards, performance management, professional development and the changes proposed in the 2010 White Paper. *British Educational Research Journal, 37*(5), 851-870. doi:10.1080/0141 1926.2011.607231

Evans, L. (2014). Leadership for professional development and learning: enhancing our understanding of how teachers develop. *Cambridge Journal of Education, 44*(2), 179-198. doi:10.1080/030576 4x.2013.860083

Fishman, S. M., & McCarthy, L. (2000). *Unplayed Tapes: A Personal History of Collaborative Teacher Research*. Chicago: National Council of Teachers of English. Retrieved from https://files.eric.ed.gov

Fraser, C., Kennedy, A., Reid, L., & McKinney, S. (2007). Teachers' continuing professional development: contested concepts, understandings and models. *Journal of In-service Education, 33*(2), 153-169. doi:10.1080/13674580701292913

Fullan, M. G., & Miles, M. B. (1992). Getting reform right: What works and what doesn't. *Phi Delta Kappan, 73*, 745-752. Retrieved from https://static1.squarespace.com

Geerdink, G., Boei, F., Willemse, M., Kools, Q., & van Vlokhoven, H. (2016). Fostering teacher educators' professional development in research and in supervising student teachers' research. *Teachers and Teaching, 22*(8), 965-982. doi:10.1080/13540602.2016.1200544

Gelso, C. J., Mallinckrodt, B., & Judge, A. B. (1996). Research Training Environment, Attitudes toward Research, and Research Self-Efficacy. *The Counseling Psychologist, 24*(2), 304-322. doi:10.1177/0011000096242010

Guerra, J. R., & Díaz, C. (2015). Action research processes in a foreign language teaching program: Voices from inside. *Colombian Applied Linguistics Journal, 17*(2), 276-289. doi: 10.14483/udistrital.jour.calj.2015.2.a07

Guskey, T. R. (2002). Professional Development and Teacher Change. *Teachers and Teaching: theory and practice, 8*(3), 381-391. doi:10.1080/135406002100000512

Justi, R., & van Driel, J. (2006). The use of the Interconnected Model of Teacher Professional Growth for understanding the development of science teachers' knowledge on models and modelling. *Teaching and Teacher Education, 22*(4), 437-450. doi:10.1016/j.tate.2005.11.011

Lankshear, C., & Knobel, M. (2004). *A handbook for teacher research. From design to implementation.* Berkshire: Open University Press. Retrieved from https://books.google.nl

Lunenberg, M., Ponte, P., & van de Ven, P.-H. (2007). Why Shouldn't Teachers and Teacher Educators Conduct Research on Their Own Practices? An Epistemological Exploration. *European Educational Research Journal, 6*(1), 13-24. doi:10.2304/eerj.2007.6.1.13

Lytle, S. L., & Cochran-Smith, M. (1994). Inquiry, Knowledge, and Practice. In S. Hollingsworth & H. Sockett (Eds.), *Teacher Research and Educational Reform* (pp. 22-51). Chicago: National Society for the Study of Education.

Maulana, R., Helms-Lorenz, M., & van de Grift, W. (2014). Development and evaluation of a questionnaire measuring pre-service teachers' teaching behaviour: a Rasch modelling approach. *School Effectiveness and School Improvement, 26*(2), 169-194. doi:10.1080/09243453.2014.939198

McDonough, K. (2006). Action Research and the Professional Development of Graduate Teaching Assistants. *The Modern Language Journal, 90*(1), 33-47. doi:10.1111/j.1540-4781.2006.00383.x

Meijer, P. C., Oolbekkink, H. W., Meirink, J. A., & Lockhorst, D. (2013). Teacher research in secondary education: Effects on teachers' professional and school development, and issues of quality. *International Journal of Educational Research, 57*, 39-50. doi:10.1016/j.ijer.2012.10.005

Mitchell, R. (2013). What is professional development, how does it occur in individuals, and how may it be used by educational leaders and managers for the purpose of school improvement? *Professional Development in Education, 39*(3), 387-400. doi:10.1080/19415257.2012.762721

Olson, M. W. (1990). Opening the door to classroom research. In M. W. Olson (Ed.), *Opening the door to classroom research* (pp. 1-20). Newark: International Reading Association.

Oolbekkink-Marchand, H. W., van der Steen, J., & Nijveldt, M. (2013). A study of the quality of practitioner research in secondary education: Impact on teacher and school development. *Educational Action Research, 22*(1), 122-139. doi:10.1080/09650792.2013.854175

Pater, C., & van Driel, J. (2014). *Professionele leraren. Opbrengsten en inzichten uit praktijkgerichte onderzoeksprojecten van de VO-raad*. Utrecht: VO-raad. Retrieved from http://www.vo-raad.nl

Ponte, P. (2005). A Critically constructed concept of action research as a tool for the professional development of teachers. *Journal of In-service Education, 31*(2), 273-296. doi:10.1080/13674580500200279

Ponte, P., Ax, J., Beijaard, D., & Wubbels, T. (2004). Teachers' development of professional knowledge through action research and the facilitation of this by teacher educators. *Teaching and Teacher Education, 20*(6), 571-588. doi:10.1016/j.tate.2004.06.003

Roberts, J. R. (1993). Evaluating the impacts of teacher research. *System, 21*(1), 1-19. doi:10.1016/0346-251x(93)90003-y

Ros, A., & Keuvelaar-van den Bergh, L. (2016). *Scan onderzoekscultuur in de school & Interventiekaarten*. Retrieved from https://www.platformsamenopleiden.nl

Runhaar, P. R. (2008). *Promoting teachers' professional development* (Doctoral dissertation). Enschede: University of Twente. Retrieved from https://research.utwente.nl

Sharp, C., Eames, A., Sanders, D., & Tomlinson, K. (2006). *Leading a Research-engaged School* Retrieved from http://dera.ioe.ac.uk

Thurlings, M., Evers, A. T., & Vermeulen, M. (2015). Toward a Model of Explaining Teachers' Innovative Behavior. *Review of Educational Research, 85*(3), 430-471. doi:10.3102/0034654314557949

van de Grift, W. (2007). Quality of teaching in four European countries: a review of the literature and application of an assessment instrument. *Educational Research, 49*(2), 127-152. doi:10.1080/00131880701369651

van de Grift, W., Helms-Lorenz, M., & Maulana, R. (2014). Teaching skills of student teachers: Calibration of an evaluation instrument and its value in predicting student academic engagement. *Studies in Educational Evaluation, 43*, 150-159. doi:10.1016/j.stueduc.2014.09.003

van der Donk, C., & van Lanen, B. (2012). *Prakijkonderzoek in de school*. Bussum: Coutinho.

Verloop, N., van Driel, J., & Meijer, P. C. (2001). Teacher knowledge and the knowledge base of teaching. *International Journal of Educational Research, 35*(5), 441-461. doi: 10.1016/S0883-0355(02)00003-4

Vermeulen, M. (2016). *Leren organiseren: Een rijke leeromgeving voor leraren en scholen* Retrieved from https://www.kpcgroep.nl

Vrijnsen-de Corte, M. C. W. (2012). *Researching the teacher-researcher* (Doctoral dissertation). Eindhoven: Eindhoven University of Technology. Retrieved from https://pure.tue.nl

Witterholt, M., Goedhart, M., Suhre, C., & van Streun, A. (2012). The Interconnected Model of Professional Growth as a means to assess the development of a mathematics teacher. *Teaching and Teacher Education, 28*(5), 661-674. doi:10.1016/j.tate.2012.01.003

6

Conclusion and discussion

'It is the teacher who, in the end, will change the world of school by understanding it.' (Stenhouse, 1975, p. 205)

6.1   INTRODUCTION

This book dealt with the professional development of teachers and school development. Teachers' professional development has of late received a lot of attention because in contemporary society their work has become more complex and demanding. Ongoing technological innovations and increasingly diverse student populations ask from teachers to adapt their teaching practices to the current demands of society (Onderwijsraad, 2014). Teachers are more and more expected to continuously make inquiries about the most effective way of teaching in their own educational practice and adjust their teaching practices based on their findings (OECD, 2012; Onderwijsraad, 2013).

As a result, in many countries, including the Netherlands, there is a tendency for teachers to conduct research in their everyday school practice (Oolbekkink-Marchand, van der Steen, & Nijveldt, 2013; Ponte, 2005). To set up such research activities, schools are provided with governmental funding. Several initiatives were established throughout the Netherlands among which a course in teacher research (TR-course) as developed in a collaborative project of Tilburg University and a number of secondary schools in the province of Noord-Brabant, organized in two so-called Professional Development Schools (PDS).

The TR-course is a course in which secondary education teachers are being trained in doing research while at the same time conducting their own research project. The idea behind the TR-course was that by conducting teacher research, the professionalism of teachers could be enhanced since a teacher in conducting research can critically review educational practice and make improvements to that practice based on his or her research findings. Schools, in turn, develop professionally as an educational institution as they are more enabled to improve their own practice as a result of their teachers being involved in teacher research and feeding the outcomes of their research back to the schools.

The TR-course provided the context for the five-year study investigating the impact of teacher research on professional development of teachers and on school development that was reported upon in the earlier chapters. The general objective of the study was to acquire a

better understanding of the impact of teacher research on teachers' professional development and school development and to find empirical support for the assumption of teacher research as a promising professionalization strategy for teachers and schools. With the empirical evidence gained, the study further elaborated on the conditions for performing teacher research in schools and provided information to assist secondary education schools to implement and foster teacher research as a professionalization strategy.

The question central to my research was:

> · *What is the impact of conducting teacher research in secondary education on teachers' professional development and school development?*

To answer this central research question, four studies were conducted. Each study focused on a different aspect of professional development and school development – attitudes, skills, knowledge, and behavior – and had its own specific research questions. A mixed-methods approach was chosen for data collection in all studies.

The aspects were torn apart in order to make a structured study of each aspect, but we kept in mind the fact that these aspects are interrelated and teachers' growth can take different paths. In order to keep a view on the whole process of teacher development, we used the Interconnected Model of Teacher Professional Growth (IMTPG; Clarke & Hollingsworth, 2002; see Figure 1.4). According to this model, teachers' professional development can be identified in four domains: the external domain, the personal domain, the domain of practice and the domain of consequence. The external domain in our study is the TR course, an intervention which was expected to lead to changes in the other domains. In the TR course, the main change processes, reflection and enactment (as defined by Clarke & Hollingsworth, 2002) are incorporated, as teachers are stimulated to reflect continuously (on classroom practice, on their research process etc.). Furthermore, they are stimulated to change/improve their classroom practice on the basis of their research findings. The personal domain consists – according to Clarke and Hollingsworth (2002) – of knowledge, beliefs and attitudes of teachers. As skills are also an important aspect that might change by

doing research, we added skills to the personal domain and investigated changes on research attitude (chapter 2), research skills (chapter 3) and research knowledge (chapter 4). Next, we investigated changes in the domain of practice, professional behavior (chapter 5). In chapter 5, we also took into account the context in which teachers work, the change environment, as this context sets the limits for the possibility to change.

In this final chapter, I shall first summarize the main findings of the four studies as reported in chapters 2 to 5 and formulate general conclusions to the central research question. Successively, I shall discuss the limitations of the study and provide directions for further research. I shall conclude this chapter by outlining possible recommendations for educational practice.

6.2   MAIN FINDINGS

6.2.1   Research attitude

The first study (described in chapter 2) investigated teacher-researchers' professional development, more specifically the development of their research attitude. The study focused on investigating teachers' research attitude since attitude is – together with skills, knowledge, and behavior – part of teachers' professional development (e.g. Mitchell, 2013). Research attitude is closely related to constructs like 'inquiry as stance' (Cochran-Smith & Lytle, 2009) or 'inquiry habit of mind' (Earl & Katz, 2002) and is described as 'the tendency to engage in research' (Tack & Vanderlinde, 2014, p. 297).

Although research attitude is seen as a key concept in teachers' professional development through teacher research (e.g. Ponte, 2005; Tack & Vanderlinde, 2014), there is not much empirical data on it. The aim of my first study was therefore to investigate whether conducting teacher research has an effect on the development of a research attitude in teachers. The following two research questions were formulated:

> · *How does the research attitude of teacher-researchers differ before and after having conducted teacher research?*

· How does the research attitude of teacher-researchers after having conducted teacher research differ from the research attitude of teachers who did not conduct research?

To answer these research questions, first a literature study was conducted to operationalize the concept 'research attitude'. Secondly, a questionnaire was constructed by which the research attitude in secondary education teachers could be assessed. The questionnaire was completed by 29 teacher-researchers who attended the TR-course and 97 teachers who did not attend this course. Third, teacher-researchers provided spontaneous reactions to open questions in an evaluation form in which they were asked to reflect on the impact of conducting research on their professional development. A total of 22 teacher-researchers completed the evaluation form.

In the study, 'research attitude' was conceptualized in ten aspects found in the literature. Those ten aspects served as a basis for developing the questionnaire that consisted of 50 items, each presenting a statement dealing with an aspect of the concept research attitude. An instrument analysis was administered and relatively low reliability scores were found. Hence, a factor analysis was conducted in order to find out whether there were other underlying variables (factors) present in the instrument to measure research attitude. Nine aspects of research attitude could be distinguished of which two aspects formed the central notions: the inclination to reorient on educational practice and the willingness to apply new ideas in educational practice (see chapter 2 for a complete overview).

Based upon the questionnaire data, two conclusions could be drawn. Regarding the first research question, the results of the questionnaire did not support the claim that teacher-researchers develop a research attitude when conducting teacher research in the course of a school year. Their research attitude is only slightly stronger at the end of the school year. However, statements from the teacher-researchers in the evaluation form indicated that they themselves did experience an increase in research attitude. Teacher-researchers claimed that as a result of conducting teacher research, they were for example more open to new ideas, worked in a more scientific way, were more inclined

to critically review and improve their teaching practice. Regarding the second research question, the results of the study showed a difference between teachers who have and teachers who have not been engaged in teacher research. After having conducted research in the course of a school year, teacher-researchers had a stronger research attitude than teachers who were not engaged in conducting teacher research.

The results of this first study add to the existing literature about teachers' research attitude by analyzing the concept of research attitude and providing empirical evidence. Insight into the aspects that encompass teachers' research attitude is essential in understanding teachers' research attitude. By our operationalization of the concept 'research attitude' encompassing nine aspects, additional insight is gained into what is to be expected of teachers when adopting a research attitude. These nine aspects seem to be more fitting (than the ten aspects found in the literature) to the context of teachers performing teacher research, in which they do inquiries for the sake of improving educational practice. Noticeably, the willingness of teachers to constantly ask themselves whether their teaching practice still meets actual needs or needs a reorientation and their willingness to apply new ideas in their practice, are the core aspects of a teacher's research attitude.

We were however not able to find a significant impact of the TR-course on the development of a research attitude. A possible explanation could be that a one-year TR-course might not be enough for developing a research attitude in teacher-researchers. It might be that there was not enough time for impact (i.e. change in research attitude) to appear. This suggestion was already made by Zwart, Wubbels, Bolhuis, and Bergen (2008) who conducted research into the impact of a professional development program on teachers' learning outcomes (including teachers' attitude). The findings of our study concur with van der Rijst, van Driel, Kijne, and Verloop (2008) who argued that dispositions (here: research attitude) are difficult to change. It indeed seems that teachers' research attitude is quite stable and does not change easily. The minimal change that was found might also be a result of a tendency of teachers to overestimate their research attitude prior to the start of the TR-course. After having participated in the TR-course, teacher-researchers might have become more conscious of what research entails and thus give

more realistic (and lower) estimations of their research attitude than they did before the course started (cf. van den Berg, Daemen, & Lockhorst, 2010).

Concerning the differences between teachers who did and teachers who did not conduct research, we only established significant differences on a limited number of aspects of research attitude. Both groups of teachers reported having quite a high research attitude (between 3.5 and 4 on a five-point scale). We therefore concluded that nowadays having a research attitude might be considered a core teaching quality. Indeed, Dutch secondary education teachers are trained to take on a research attitude during their study at teacher training institutes. This is advisable knowing that teachers' attitudes are closely linked to teachers' strategies for coping with changes in their professional practice (OECD, 2009) and educational innovations frequently necessitate considerable changes in teachers' attitudes (Nicholls, 1983).

Note that this does not mean that professional development courses such as the TR-course do not add to the development of a research attitude, as our results show that teacher-researchers' research attitude developed. However, the development of a research attitude does not have to be the primary focus of the TR-course since secondary education teachers already possess a rather strong research attitude. So, the primary goals of teacher research might be located in a different field than research attitude only, for example research skills, knowledge and a change of behavior.

6.2.2 Research skills

The second study (described in chapter 3) went into the question whether teachers can acquire the skills to conduct teacher research (i.e. all the skills needed to conduct research, for example formulating research questions, collecting data, analyzing data and reporting). Investigating teacher-researchers' research skills is relevant for this study, since teacher research has to meet certain quality criteria in order to generate valid and reliable outcomes that can promote professional development and school development. The objective of the study was to assess the quality of research conducted by the teacher-researchers.

In conducting a literature review on research skills quality assessment however, no useful guidelines turned out to be available. The guidelines to assess the quality of research that have already been established for diverse research methods were found not to be applicable for evaluating teacher research because of the unique nature of teacher research (e.g. Anderson & Herr, 1999; Newton & Burgess, 2008). As more and more teachers are being trained in teacher research and the amount of teacher research is growing (Cochran-Smith & Boston College Evidence Team, 2009; Ponte, 2005), this lack of guidelines is a problem. Therefore, a literature review was conducted to provide insight into the unique nature of teacher research. The literature review revealed six characteristics constituting the central notions of teacher research. Teacher-research is conducted by a teacher, is systematic, collaborative, context specific, has a dynamic setting, and primarily aims for the improvement of practice. In line with these characteristics of teacher research, the five criteria as set out by Anderson and Herr (1999) were chosen as a framework for the study. These five criteria are: outcome validity (answering the research question and giving a solution for the problem of practice), process validity (choosing and applying an adequate research method), democratic validity (collaborating with all stakeholders), catalytic validity (bringing changes for parties involved in the research), and dialogic validity (using peer feedback and engaging in a dialogue with other researchers). Based on these five criteria, a coding scheme was constructed with the purpose of assessing teacher research in order to answer the research question of this study:

· What is the quality of teacher research conducted by teacher-researchers?

With the coding scheme, we analyzed the research reports of the participating teacher-researchers. In addition, we distributed evaluation forms in which the teacher-researchers were asked to reflect on the impact of their research on school development and their own professional development. In total, 80 teacher-researchers participated. They produced 68 research reports that were analyzed (twelve reports were written by a team of two teacher-researchers). The research timeline of the study covered four cohorts of teacher-researchers.

From the research reports analyzed in this study, it appeared that teacher-researchers were able to meet the requirements of outcome validity. They were able to answer their research question and find a solution for the problem in their teaching practice that they set out to investigate. Teacher-researchers were less able to meet the requirements of process validity; i.e. methodological requirements, for example use an appropriate research method, apply triangulation, report transparently, and reflect continuously on the research process. The requirements for democratic validity were mostly met as stakeholders (colleagues and students) were in one way or another included as informants in the teacher-researchers' studies. From the evaluation forms it could be concluded that a transformation in knowledge, skills, action, and attitude had taken place, so catalytic validity could be established. This transformation appeared, according to the teacher-researchers, more in their professional development than in school development. Furthermore, the majority of the teacher-researchers reported explicitly on a form of dialogic validity (e.g., peer consultation, knowledge dissemination).

The results of the second study contribute to the literature by offering a useful framework to evaluate teacher research. The findings showed that teacher research, when successfully conducted, contributes to professional development and, although to a smaller extent, to school development. In order to lead to reliable outcomes, teacher research should meet the requirements for process validity. If these requirements are met insufficiently, research data cannot be used as a base for decision making in school.

The study showed that most teacher-researchers experienced difficulties meeting the requirements for process validity even after having followed the TR-course. This is in line with findings of Oolbekkink-Marchand et al. (2013) and Vrijnsen-de Corte (2012) who found least evidence for process validity in their evaluation of teachers' research reports. The fact that there was room for improvement when it comes to process validity was not very surprising since this kind of validity is most hard to achieve and requires training and experience in doing research. Thus, intensive training of these research skills seems to be necessary in a TR-course. We do not claim that teacher-researchers should have the same research

skills as professional academic researchers, but teacher-researchers should be able to follow a systematic approach, reflect on the research process, use an appropriate research method and report transparently in order to come up with trustworthy and relevant research outcomes on which institutional or management decisions can be based.

6.2.3 Research knowledge

The aim of the third study (described in chapter 4) was to gain a deeper insight into the professional development of teacher-researchers, by focusing on the development of their research knowledge. Research knowledge was defined as knowledge of the process of conducting teacher research (van der Linden, Bakx, Ros, Beijaard, & van den Bergh, 2015). Although in an extensive body of literature teacher research is indicated as a promising activity for teachers' professional development, an in-depth investigation of what teachers actually learn was lacking. Hence, the research question central to this study was:

> · *How does the research knowledge of teacher-researchers differ before and after having conducted teacher research?*

This question was divided into three sub questions:

> · *What is the self-reported research knowledge development of teacher-researchers?*
> · *What is the research knowledge development of teacher-researchers as measured by tests?*
> · *What difficulties do teacher-researchers encounter during the process of conducting teacher research?*

A total of 26 teacher-researchers from cohort 4 (2016-2017) participated in this study. A mixed methods study was conducted to investigate the development of teacher-researchers' research knowledge. Five instruments were used to collect data among the teacher-researchers: a questionnaire (including twelve statements regarding aspects of research knowledge), an interview (in which teacher-researchers were asked about any perceived changes in their research knowledge), a concept map (in which teacher-researchers visually organized all their knowledge about the core concept teacher research), an oral test (about

aspects of research knowledge) and a logbook (kept by me in order to document the questions of the teacher-researchers about conducting teacher research).

Based on the results of this study, it could be concluded that teacher-researchers in the questionnaire reported a positive development in their research knowledge. Teacher-researchers' research knowledge development was not readily evident from the analysis of the teacher-researchers' concept maps. However, teacher-researchers themselves found their second concept maps better structured, e.g. the research cycle was better represented in their second concept map. Findings of the oral research knowledge test showed that teacher-researchers did positively develop their research knowledge. Concerning the process of conducting teacher research, findings indicated that teacher-researchers had most difficulties in the phase of getting oriented (formulating research aims and questions), collecting data (developing research instruments), and reporting (writing about the research). This may be due to the fact that these activities are probably most different from teaching activities, in which there is a set goal and context.

The study showed that the TR-course proved to be effective for the development of teacher's research knowledge. So, being trained in doing research while actually conducting research (as the TR-course entails), leads to a growth in research knowledge. The TR-course, which has been evaluated and improved over the years, is in its currents form found to be an appropriate approach for developing teacher-researchers research knowledge. Given the difficulties experienced by teacher-researchers, we can conclude that it remains important to focus on the phases of getting oriented, collecting data and reporting.

6.2.4 Professional behavior

The first three studies provided insight into teachers' professional development concerning their research attitude, skills and knowledge. In addition, we wanted to see to what extent teachers' attitude, skills and knowledge development led to an actual change in teachers' professional behavior which was the main topic of the fourth study (described in chapter 5). Furthermore, we wanted to gain insight into possible factors that affect a change in teacher's professional behavior.

Hence, the purpose of the fourth study was to investigate changes in teachers' professional behavior, the impact of such changes on school and professional development, and factors (personal and contextual) that affect such changes. To this end, a long-term cohort study was conducted. The research question central to this study was threefold:

· How does teacher-researchers' professional behavior differ before and after having conducted teacher research?
· What is the impact of such changes in teacher-researchers' professional behavior on professional development and school development?
· How do personal and contextual factors affect changes in teacher researchers' professional behavior?

Five cohorts of respectively 23, 20, 36, 32, and 18 teacher-researchers, participated in the study. In total, 102 different teacher-researchers participated (as 27 re-entered in a subsequent year). In this study, the Interconnected Model of Teacher Professional Growth as proposed by Clarke and Hollingsworth (2002) was used as a framework for data collection and analysis. Both observations and questionnaires were used as instruments and both teacher-researchers and their students were involved as participants. Questionnaires were distributed among all 102 teachers who participated in the TR-course in the period from 2013 to 2018. In 2017-2018, in-depth data of six teacher-researchers from cohort 5 were collected by conducting classroom observations and surveying their students.

The findings showed that the professional teaching behavior of the majority of teacher-researchers who participated in the TR-course had changed. According to the teacher-researchers, this change was largely related to being better able to create a safe and intellectually challenging climate, giving clearer instructions, activating their students more, and having a higher student involvement in their lessons at the end of the school year. However, in the lesson observations of a sample of teacher-researchers in cohort 5, no major differences in teacher-researchers' professional behavior were found. In addition, students' perspectives on these teachers' professional behavior changed minimally during the school year in which the teacher-researchers conducted their research.

Regarding the impact of teacher research for the teacher-researchers themselves, the findings showed that teacher-researchers' knowledge increased and that they became more engaged in their teaching as a result of conducting teacher research. Another major impact was that the research had provided the teacher-researchers and the school with new products or projects (e.g. a new policy and ideas for outdoor classroom activities, and implementing peer tutoring within the school).

Regarding personal factors the findings showed that teacher-researchers had a positive attitude towards research, found themselves able to conduct research, and found conducting research an important activity for secondary education teachers. The majority of the teacher-researchers also reported that they had the intention to continue conducting research.

For the contextual factors – the aspects from the School Research Culture Scan –, teacher-researchers indicated that the research culture in their school was in a beginning phase of development at the time they started conducting their research. However, the majority of the teacher-researchers also reported a positive development in their school's research culture from the time of conducting the research to the moment of completing the questionnaire. This development was related to an increase of organizational use of knowledge (i.e. policy decisions are increasingly based upon research findings). It was also related to an improved organization of research in the school (i.e. more teachers conduct research), and an increase in the individual use of knowledge (i.e. teachers increasingly reflect on their lessons). Schools thus seem to be developing towards a more embedded research culture.

Altogether, in this fourth study, teacher research was found to be a successful manner for teachers to change their teaching behavior. Teacher research thereby provides an opportunity for professional development among teachers. The study also showed that teacher research can create opportunities for increasing a research culture in schools. However, our evidence regarding the impact of teacher research in schools is limited. There still remain questions to be answered about the impact of teacher research on the research culture of schools, and vice versa. Other research (Berger, Boles, & Troen, 2005; Edwards, 2016)

also found it difficult to establish how teacher research is making a difference in the research culture of schools. If changes in the research culture in schools are found, it may not be possible to plainly attribute the observed changes to teacher research, since it is hard to rule out the impact of factors other than teacher research that may have been responsible for the change.

Nevertheless, the contextual factors do provide promising indicators of how schools may benefit from teacher research and how the impact of teacher research can be sustained. From the comments of teacher-researchers we have seen evidence of the links between teacher research and a changing research culture in the school. Teacher research in other words has the potential to affect the research culture in schools (cf. Berger et al., 2005). This study has at least provided an initial empirically grounded insight into how teacher research affects the school context (i.e. the research culture in the school) that can be used in the future as a basis for investigating this matter more deeply.

This study finally contributed to theory building, by adapting the School Research Culture Scan (Ros & Keuvelaar-van den Bergh, 2016) to make it suitable for use as a research instrument. This was a relevant enterprise given the scarcity of research done in the field of research culture in schools. The findings of this study demonstrate that the scan as a research instrument has a high reliability; future research should validate the scan and examine whether it is a representative measure of the research culture in schools. Such knowledge is valuable given the fact that the School Research Culture Scan helps school leaders decide on measures to foster the research culture in their school.

6.3   TWO CASE ILLUSTRATIONS

The four studies of my thesis each tell part of a single story on school development and professional development of teacher-researchers who are conducting teacher research. The stories have however thus far been told separately, focusing on a single aspect of the development in each study. At this point, concrete examples will be presented for the purpose of providing an overall picture in which the different aspects of the development of teachers conducting teacher research are combined.

By describing the experiences and reflections of two teacher-researchers in detail, I want to provide more concrete exemplary evidence of teachers' professional development when carrying out teacher research in their teaching practice. Such a description of individual cases is also appropriate given the idiosyncratic nature of teachers' professional development (see Clarke & Hollingsworth, 2002). By illustrating two cases in detail, I hope to further demonstrate how the different aspects of teachers' professional development are related and have an impact on the professional development of a teacher-researcher and the development of his or her school.

In the following, I describe the professional development of two teacher-researchers, Teacher X and Teacher Y. The first criterion for selecting these two cases was the amount of data available. I selected teacher-researchers of whom data on most of the above mentioned aspects of professional development (attitude, skills, knowledge, and behavior) were available. The second criterion was that I wanted to provide two different examples resulting in choosing two teachers of different gender and age, teaching different subjects, having a different teaching qualification, and working at different schools. Furthermore, the teachers differed in the kind of research topic they worked on: Teacher X worked on a wider topic (school vision on philosophy of life), while Teacher Y studies a topic directly related to classroom practice (implementing formative assessment in Spanish lessons). Finally, the schools were in a different stage of development with regard to their research culture; while the school of Teacher X was in a beginning phase, the school of Teacher Y already had a well-established research culture. Table 6.1 provides background information of the two teacher-researchers and the data that were collected.

Table 6.1 Background information of two teacher-researchers

	Gender	Age	Subject	Grade	Data collected
Teacher X	Male	41	Philosophy of life	1	attitude*, knowledge, skills, behavior (excluding observations)
Teacher Y	Female	30	Spanish	2	attitude*, skills, behavior (including observations)

* Data on attitude towards research (i.e. whether they like to conduct research), not on research attitude

6.3.1 The case of Teacher X

At the start of the TR-course, Teacher X had some experience with conducting a literature review study, but had no experience with conducting teacher research. His main reason for participation in the TR-course was to delve into the usefulness and necessity of his teaching subject – Philosophy of life – for the students. This ambition was triggered by the merger of two schools that resulted in the need for a new vision supported by both school teams about the subject Philosophy of life. Teacher X conducted a literature review into the content of the subject Philosophy of life, distributed questionnaires and conducted interviews with stakeholders, i.e., colleagues teaching Philosophy of life and school leaders of other schools.

Regarding his attitude towards research, Teacher X reported that he liked conducting research and found it an important activity. Furthermore, he found himself able to conduct research. Teacher X reported that he intended to continue conducting research in the years to come, although to a smaller extent because of the limited time available.

During the process of conducting teacher research, Teacher X asked several questions about different aspects of conducting research (e.g. data analysis, drawing conclusions) during consultation hours or through email, but he did not encounter many difficulties. Teacher X's research report was graded as good (for outcome validity and process validity) and very good (for democratic validity). Hence, Teacher X was assessed as having acquired the skills to conduct teacher research.

Teacher X's knowledge about teacher research developed positively. This became evident in the concept maps (a tool used to visually organize and represent knowledge; see section 4.3.4) that Teacher X drew during the TR-course. His second concept map, drawn at the end of the TR-course, revealed more research knowledge than his first concept map, drawn at the beginning of the TR-course. Teacher X self-reported that he found his second concept map better structured. Also, from the oral tests conducted at both the beginning and end of the school year, it appeared that Teacher X's knowledge about the quality criteria for teacher research had increased. He also knew better how to formulate a research question at the end of the TR-course. On other aspects,

the oral test did not reveal progress in knowledge about conducting teacher research mainly because of the already high initial self-reported research knowledge Teacher X had at the start of the TR-course. Teacher X reported that his research knowledge before the start of the TR-course indeed was quite developed, but he also mentioned that his knowledge further developed during the TR-course. For example, according to Teacher X, his knowledge grew concerning developing research instruments. This knowledge development was to be expected since Teacher X already had experience in conducting literature review studies, but had no experience in collecting data with research instruments such as interviews and questionnaires.

Teacher X reported that conducting teacher research has changed his behavior, which is indicative for his professional development. The following quote by Teacher X – from a questionnaire in which teachers were asked about changes in their professional teaching behavior – illustrates this:

'I now try to teach from a more thoughtful vision and keep in mind what I want the students to achieve. Before conducting teacher research the curriculum was not substantiated.' Teacher X now focuses more on philosophical questions, rather than on political and societal questions during the lessons. When specifying this change according to the International Comparative Analysis of Learning and Teaching (ICALT) domains, Teacher X noticed change only in the domain of activating learning. He said: *'Because of the variety in my teaching practice, students stay more alert during the lesson. The students have to do and discover more themselves. Philosophy of life as subject has become more practice-oriented.'* The research has provided Teacher X with a new vision which is supported by colleagues about the subject Philosophy of life.

Regarding the research culture in the school, according to Teacher X, only a small change had taken place. He indicated that the school in which he conducted his research did not have a strong research culture. According to him, the research culture of the school was in a beginning phase (i.e. positioned between phase 1 and 2 on a scale of five phases). He noted that minor changes have taken place in the year between following the TR-course and completing the questionnaire.

6.3.2 The case of Teacher Y

Teacher Y had gained some experience in conducting research during her teacher training, but had never conducted teacher research. Her motivation to join the TR-course was twofold. She wanted to adjust the curriculum for the Spanish language lessons since she and her colleagues adopted a new teaching method with a greater emphasis on providing students with feedback. She also had a more personal reason to participate in the TR-course: she wanted a new challenge and develop further as a teacher. Because she liked conducting research in her teacher training program, she decided to enroll in the TR-course. Teacher Y conducted a literature review into formative assessment and designed learning materials matching the characteristics of formative assessment. After each lesson, she distributed questionnaires among the students and commented about her experiences with the newly developed learning materials in her logbook. She also evaluated the learning materials among colleagues who also taught Spanish. Teacher Y's research report was graded as good (for democratic validity and process validity) and very good (for outcome validity) which indicates that she had the skills to conduct teacher research. For Teacher Y, professional development has taken place since she reported that she had gained much knowledge concerning formative assessment.

Teacher Y reported that she liked conducting teacher research and that she found herself able to conduct such research. She also found conducting teacher research an important activity in secondary education schools. Teacher Y reported that she wanted to continue conducting research on the implementation and evaluation of the teaching materials she developed. This indicates that Teacher Y had a positive attitude towards research.

Teacher Y reported - in the questionnaire in which she was asked about changes in her professional teaching behavior - that conducting teacher research has changed her teaching behavior which is indicative for professional development: *'I have tried out many ways of formative assessment and I intend to continue using them in the upcoming school year.'* She noticed change in her teaching behavior for all seven ICALT domains. For example, she noticed a change in the involvement of students in her lessons. In her words: *'Formative assessment improves students' awareness*

of their performance. Me and the students can modify subsequent learning activities based on the feedback provided.'

For Teacher Y, this increased her enthusiasm in teaching. The research resulted in concrete products such as a handout for colleagues about formative assessment and several teaching materials for Spanish.

From the expert observations and the student questionnaires, some minor changes in Teacher Y's teaching behavior were found. It was observed that Teacher Y was slightly better in creating a safe and stimulating learning climate (ICALT domain 1) and improved her clarity in instruction (ICALT domain 3) at the end of the school year. In Teacher Y's lessons at the end of the school year, she used more didactic methods for active learning (ICALT domain 4) and her teaching was slightly better adapted to the individual learning needs of each student (ICALT domain 5). Her students noticed minor (but positive) differences in the learning climate (ICALT domain 1) and in Teacher Y's adaptive teaching (ICALT domain 5).

In the school in which Teacher Y conducted her research, a research culture had already been established. According to Teacher Y, the research culture in the school was on average between phase 3 and 4 (on a scale of five phases; phase 1 being the lowest). Apart from this already relatively well established research culture in her school, Teacher Y noticed that *'Lately, there is a much more open-minded attitude and more knowledge sharing among colleagues.'* This is indicative of a change in research culture. However, based on the findings of the study (as described in chapter 5), we cannot be sure whether this increase in research culture is a result of the teacher research conducted by Teacher Y or vice versa (i.e. Teacher Y being able to conduct teacher research as a result of the established research culture in her school).

6.3.3 Two case illustrations compared

The case study of Teacher X illustrates that, by conducting teacher research, he developed professionally in at least two of the interrelated aspects of professional development, namely in the personal domain and the domain of practice. Teacher X's research knowledge developed by conducting teacher research and Teacher X's professional teaching

behavior changed. We do not have explicit data on a change in Teacher X's research attitude, but he appeared to have a positive attitude towards research. Concerning research skills, there was not much room for improvement since Teacher X already possessed research skills. Regarding the context for change (the change environment), we can see that the research culture in the school is not yet developed up to a high level. Also, Teacher X's story does not illustrate major changes in the research culture of his school. Altogether, although Teacher X's research had an impact on the personal domain and the domain of practice, it only had a minimal impact on school development.

Teacher Y's case study illustrates that she developed professionally through conducting teacher research. Teacher Y gained new knowledge and skills by conducting teacher research (personal domain) and her teaching behavior changed (domain of practice). From her account, we may conclude that for Teacher Y teacher research was a means for her professional development. The context for change (the change environment) for Teacher Y was quite different from the context of Teacher X, as the school already had a well-developed research culture. This may account for the fact that only minimal changes had taken place in the research culture of her school. On the other hand, this context seems to have provided the possibilities for Teacher Y to grow professionally in both the personal domain and the domain of practice.

All in all, the case stories of Teachers X and Y suggest that teachers can develop professionally when engaged in teacher research. The development seems to take place mainly in the personal domain of knowledge and skills, and the domain of practice. The school context, and more specifically the stage of development of a research culture in the school, and teacher professionalization seem to be interrelated. The school context may set boundaries to teacher professional growth on the one hand, but it can also be influenced by teacher research on the other hand. This illustrates the fact that teacher professionalization and school development are mutually dependent, as both growth processes are intertwined.

6.4   LIMITATIONS AND FURTHER RESEARCH

The studies described in this book have their limitations, which need to be taken into account when interpreting their results. In this section, I shall discuss the context and possible limitations of my study and provide directions for further research.

A possible limitation of my study is that in all four studies self-reported measurements were included. Several difficulties can be formulated with respect to the use of self-reported measurements. For example, what teacher-researchers report they are doing might differ from what they are actually doing. I accounted for this difficulty by applying triangulation by using different research instruments. Teacher-researchers' behavior (i.e. what they are actually doing) was captured also through observations in the classrooms. In addition to the perspective of an external observer, students' perspectives were included to account for possible different perspectives. Another difficulty with respect to the use of self-reported measurements is that teacher-researchers might have displayed a tendency to answer in a socially desirable manner in, for example, the pre-structured questionnaire on teacher-researchers' research attitude as used in study 1. In addition, a pre-structured questionnaire does not leave room for additional spontaneous responses other than responses to concepts raised in the questionnaire. I accounted for these difficulties by, for example, including comments from evaluation forms in the first study, to include spontaneous responses, and to correct for a possible tendency to answer in a socially desirable manner. Another example can be found in study 4 in which the relatively high number of participants (N=102) for a study of that kind, does account for possible bias that might occur when findings are mainly based on teacher-researchers' self-reported perceptions.

Although the research sample with 102 teacher-researchers is relatively large for a case study with a mixed-methods design, it is relatively small compared to the total amount of 1994,7 FTE (reference date May 1, 2018) at the secondary education schools of both PDS. Nevertheless, the research sample is quite a good reflection of the teacher population in the Netherlands. The average age and male-female ratio of the teacher-researchers in my study is representative for Dutch secondary

education teachers (Voion, 2016). However, relatively many first-degree teachers (56%) are participating in the study compared to the overall percentage (24%) of first-degree teachers in Dutch secondary education (Voion, 2016).[9] It seems that first-degree teachers are more inclined to participate in TR-courses. Compared to second-degree teachers, first-degree teachers are to a certain level more familiar with research since research related activities were to a larger extent an integral part of their teacher education curriculum. It can be expected that this lowered their threshold for participation in the TR-course. However, a difference in research skills between first-degree and second-degree teachers in the course was not found in the analysis of the teachers' research reports that showed no statistically significant differences in research quality between first-degree teachers (M=4.35 on a seven-point scale, SE = .14) and second-degree teachers (M=4.06 on a seven-point scale, SE = .16) (t(90)=1.34, p=.18). This implies that the difference in research skills between first- and second-degree teachers is minimal. Hence, the sample of teacher-researchers can be assumed to be representative for Dutch secondary education teachers and the research results can be considered applicable for the wider population of Dutch secondary education teachers participating in professional development programs like the TR-course.

Given the research sample and the specific TR-course context of this study, its research results cannot be simply generalized to other settings in which teachers participate in professional development programs. However, rather than to be able to generalize the findings, I wanted to provide a detailed understanding of the impact of teacher research on teacher development and school development. If at all relevant, case study research tends to generalize to other situations rather than to other populations (Yin, 2012). I argue, in line with Elliott (2007), Meyer (2000) and Vogrinc and Zuljan (2009), that research findings can be generalized based on the principle of analogy, meaning that readers can transfer relevant findings if their own educational practice shows resemblance with the research context from which these findings stem. I found that the setting of my study shows resemblance with other settings

---

9   In the Netherlands, first- and second-degree teachers are allowed to teach at all forms of secondary education. Only first-degree teachers however are allowed to teach during the last three years of the two highest educational levels (havo and vwo).

as reported in the literature (e.g. Oolbekkink-Marchand et al., 2013). My research findings might stimulate others to reflect on and investigate their own professional development programs. Such future research can be useful for obtaining insight into the impact of teacher research on teachers' professional development and school development in a wider context.

Regarding the context of this study, it is important to note that the teachers who participated in the TR-course showed interest in conducting research since they participated on a voluntary basis. This may have created a bias in my research findings because teachers who would not have self-selected to participate in the TR-course might have responded in a different manner when asked about research related activities. Whether teacher research can have impact on the professional development of secondary education teachers who show less interest in conducting research is a question to be answered in future research. In addition it has to be taken into account that all schools in this study received financial support from the Dutch Ministry of Education, Culture, and Sciences for each teacher who participated in the TR-course (since teachers were exempted from regular school work for four hours per week for participating in the TR-course). This funding might have stimulated school leaders to encourage (teachers to participate in) research activities and move toward a more embedded research culture in their schools. Future research could try to find out whether the same research findings do occur in contexts other than funded professional development courses.

Concerning the range of this study, it is important to note that my study did not include student outcomes in relation to teacher and school development. That would have gone far beyond the scope of my study. It would also have been very hard to investigate a direct relation between teachers' professional development and student outcomes, especially since not all research conducted by the teacher-researchers was directly related to their own classroom practice or to classroom practice at all. In the same vein, also the perceptions of school leaders were not included in the study. Knowing that school leaders play an important role in establishing a research culture within their schools (Onderwijsraad, 2018; Ros & Keuvelaar-van den Bergh, 2016; Sharp, Eames, Sanders, &

Tomlinson, 2006) it would be interesting to include their perceptions in future research as it could provide more specific insight in their interest in teacher research and how they foster a research culture in their schools.

It is also important to note that this study could only to a certain extent exclude the impact of variables other than the TR-course. Although educational practice is not a controlled environment which makes it hard to eliminate or isolate different variables, it would be interesting for future research to control more exactly for the impact of a professional development program – such as the TR-course – on teachers and schools by for example including a control group more often.

Finally, it is important to take into account my double role as supervisor and researcher of the TR-course. I was part of the research environment as a professional working in this environment. One might argue that a limitation of this insider position is that I might have been too closely involved. However, this involvement did not inflict constraints to my work as a researcher. During my research, the schools or the PDS project's external financial sponsors did not impose any limitations on what I could ask, observe or publish. In addition, because of my involvement in a network of researchers investigating different forms of professional development programs for teachers, I had the opportunity to see the TR-course in its wider context. Hence, as written earlier, for my research, I am convinced that it has had more advantages than disadvantages to haven been an 'insider' researcher or connoisseur.

6.5   OVERALL DISCUSSION AND RECOMMENDATIONS

In this study, we have seen that engaging in teacher research gave teacher-researchers the opportunity to further develop their research attitude, to develop new knowledge and skills regarding conducting teacher research, and to change their professional teaching behavior by building upon their experiences in conducting teacher research. For the teacher-researchers, teacher research is a means to make informed decisions, i.e. work evidence-based, and be more knowledgeable about whether their teaching is having a positive impact on students' performance. They were (mainly) researching their own teaching practice and had the opportunity to start making improvements to

that teaching practice. While conducting this study, I have seen many practical applications resulting from teachers' research into their teaching practice. Teachers came up with innovative ways of teaching and new curriculum initiatives. Like Zeichner (2003), I have seen many teachers becoming a happier teacher and being more enthusiastic about being a teacher. They felt they were taken seriously and experienced their work as relevant, aspects which are mentioned in literature on learning (e.g. Knowles, Holton III, & Swanson, 2005) as important for successful adult learning. Overall, teacher-researchers showed a willingness to continue their professional development.

Knowing that teachers' professional development and school development are mutually dependent (McLaughlin, Black-Hawkins, McIntyre, & Townsend, 2007), it can be inferred that since teachers develop professionally by conducting teacher research, their schools inherently also develop. The results of this study did indeed suggest that teacher research stimulated development in the school. The findings that the research culture in the schools of the teacher-researchers is developing towards a more embedded research culture, lends further credence to the conclusion that teacher research contributes to school development. However, dependence is not the same as causality. We cannot be sure about whether the TR-course was the main or only determinant of the growth in research culture, i.e. whether the TR-course was the 'cause' of changes in the research culture of the school. Many other factors than teacher research might have affected the research culture in the schools as well. Furthermore, it is important to note that there are many alternative external sources of information other than teacher research available to the teacher-researchers, such as professional publications and conversations with colleagues. This study did not go far enough into the research culture situation at the teacher-researchers' schools to be able to unravel causality, since possible changes in the research culture in these schools were formulated in a general sense only. There are many more questions to ask about the position and role of teacher research in the research culture of schools. However, in this study, beginning empirical evidence was found of a relationship between teacher research and a research culture in the school at least as far as the perception of the teacher-researchers is concerned.

Based on the findings of this study, in the following we formulate several recommendations which concern the choice of research theme, collaboration, research training, adequate facilitation, and promotion of teacher research.

Choice of a research theme

In this study, a condition that was found to be important for the success of teacher research was that teacher-researchers' participation in the TR-course was led by real concerns of these teachers in their teaching practice (cf. Zeichner, 2003). This fits the needs of adult learners. Adults have a higher readiness to learn when their learning is related to their everyday situation and prefer to learn how to deal with problems they encounter in this situation (Knowles et al., 2005). Teacher-researchers should thus formulate their research topic in accordance with their concerns. In this way, teacher-researchers pursue their own professional development. It is for this reason that we find compulsory participation in a TR-course not advisable. In addition, it is important to note that results of this study do not provide information about whether all teachers should be offered the opportunity to conduct teacher research. All the teacher-researchers who participated in this study self-selected themselves to attend the TR-course which demonstrates that they were motivated to conduct research. As written in section 6.4, this may have created a bias in the research findings because teachers who did not self-select to participate in the TR-course might develop professionally in a different manner.

Although, the choice for a research topic should be self-motivated, we argue that the school should also have a say in this matter. In coordination with the school, the teacher-researcher should decide which (part of a) research topic to focus on. The topic of their research should originate from problems the teacher-researchers encounter in their own teaching practice, yet be close to relevant school themes. The school and the teacher-researcher need to achieve a balance between an organizational and individual professional focus. When the school has a research agenda (a policy document in which the school's specific research interests are stated), it becomes more transparent for the teacher-researchers which research topics are of interest to the school. By aligning the research topics between teacher-researchers and school,

teacher-researchers are better motivated to conduct research since they are in the end enabled to realize improvements to their own teaching practice. In addition, the schools benefit since the research contributes to improvements in the school rather than to improvements in the teaching practice of one teacher only.

Collaboration

The TR-course was designed in a way that offered teacher-researchers the possibility to engage in collaboration with other teacher-researchers (for at least a year). This collaboration created an opportunity for sharing knowledge and experiences regarding their research and their teaching practice, which are important aspects of adult learning as argued by Knowles et al. (2005). The teacher-researchers provided structured feedback on research content but also engaged in peer support in which they exchanged experiences about the research process. Like Wongsopawiro (2012) and Rust and Meyers (2007), we observed that this collaboration was a good basis for sharing good-practices and building bridges across schools. A collaboration also occurred between the teacher-researchers and colleagues from their own school (e.g. as stakeholders in their study or as critical friends). This collaborative process made the research more than a one teachers' individual endeavor. Rather, the teacher-researchers communicated about the research, spreading out the research through the school and thereby contributing to the creation of a research culture in the school (cf. Vogrinc & Zuljan, 2009).

Research training

The TR-course included consultation of and supervision by academic supervisors. Teacher-researchers had the possibility to receive guidance, via email or individual consultation hours, when they needed it. They benefitted from this external expertise in, for example, meeting the requirements for process validity. Such external supervision is crucial for the successful completion of teachers' research since conducting high-quality research was found to be difficult for the teacher-researchers. Apart from providing individual consultations hours, it was essential to equip teacher-researchers with the knowledge and skills needed to perform teacher research during group meetings. That is, for teacher research to be implemented effectively, it is important that secondary

education teachers receive research skills training. Although teacher-researchers were able to conduct teacher research, they experienced difficulties in meeting the requirements for process validity, specifically formulating research aims and questions, developing research instruments and writing about the research. For supervisors this is a valuable insight as they play an important role in equipping teachers with the required knowledge to conduct research. Supervisors could thus make the teachers extra alert during training meetings of the TR-course to those aspects of research knowledge which were considered difficult for them.

The teacher-researchers not only benefitted from having a supervisor who was able to answer their questions about these and other aspects of conducting research, but also by for example, gaining theoretical knowledge, making practical assignments, and critically discussing with other teacher-researchers. Eventually, the majority of the teacher-researchers, including those with little research experience, were able to adequately conduct research in the setting of the TR-course. This implies that when offering teachers the opportunity to conduct research, their initial research experience does not have to be taken into consideration. However, teacher-researchers should have the opportunity to refine and practice their research knowledge and skills.

At this point, it is important to note that research knowledge and skills training takes time. A long-term duration (e.g. one-year) is preferred over short-term training sessions since research knowledge and skills are not learned by only hearing about them, but have to be put into practice (Clarke & Hollingsworth, 2002). Since teacher research has to meet certain quality standards, we plead for enough training time for teacher-researchers to gain the basic research knowledge and skills. We found that the one-year duration of the TR-course was sufficient for teacher-researchers to conduct teacher research, sufficiently meeting the quality criteria for teacher research. Adhering to the aspects of the quality assessment coding scheme (see chapter 3) in the TR-course, could help elevate the quality of teacher research. The coding scheme can help guide teacher-researchers and supervisors with its information on the requirements for high-quality teacher research.

Adequate facilitation

As written earlier, it is essential that teacher-researchers are offered time to conduct their research. Hence, schools and PDS have to invest time and energy, i.e. money, in realizing teacher research (see also Rust & Meyers, 2007). Since January 2017, this becomes more challenging now that PDS receive less financial support from the Dutch Ministry of Education, Culture and Sciences and from August 2019 no extra financial grants are provided for research related activities. We make a recommendation to the Dutch Ministry of Education, Culture and Sciences to continue their financial support for the realization of PDS and guaranteeing the PDS's research related activities given the added value of teacher research in schools (see also Aarts, Imants & Hulsker, 2019).

School leaders also play a role in assuring teachers that they get training or practice in teacher research by providing facilities and encouraging teachers to become teacher-researchers. They should thus reduce the teaching load so that teacher-researchers can devote time to their research. Regularly, a research project in the TR-course could not be completed successfully because the situation in the school changed, for example a colleague dropped-out and the teacher-researcher had to step in for this colleague leaving no time to conduct the research. We encountered that inadequate facilitation hinders the successful completion of teacher research. Thus, schools must ensure that teachers are enabled to participate in TR-courses. Ideally, teacher-researchers are not only offered time to conduct the research, but also time to implement the research findings in their school practice. In order to ensure that teacher-researchers efficiently spend their time on conducting research, we advocate for gathering outside the school for the group meetings. Being away from school, teacher-researchers cannot be distracted by daily school routines while trying to conduct their research.

To make sure adequate facilitation was provided and pursued during the process of conducting teacher research in the TR-course, we made use of an agreement in which mutual obligations were specified. Before the start of the TR-course, we asked for commitment of the teacher-researcher, the school, and the PDS. In doing so, the successful completion of teacher research became the agreed upon responsibility of all parties.

Promotion

There seems to be general agreement that advocating for the continuous professional development of teachers (OECD, 2017; Onderwijsraad, 2013) includes that teachers should have the opportunity to engage in teacher research. With this study, we have demonstrated that the financial support for conducting teacher research as provided by the Dutch Ministry of Education, Culture, and Sciences is contributing to the professional development of secondary education teachers. Knowing that the continuous professional development of teachers is crucial for improving teacher quality and that teachers have a big influence on student achievement (e.g. Hattie, 2009), the current money spent on teacher research is contributing to the improvement of the quality of education.

The TR-course that is investigated here could serve as an example for realizing teacher research in secondary education schools (and maybe also to educational settings other than secondary education). I therefore recommend that PDS include teacher research in their repertoire of professional development programs for teachers and encourage teachers to participate in TR-courses. They could convince teachers of the added value of teacher research and show them good practices. School leaders in turn should provide teachers with the time to conduct research and encourage the teacher-researchers in their research endeavor. In addition, it might be of value to appoint a research coordinator per school who is a key player in advancing a research culture in the school by stimulating and coordinating research activities. Both PDS in the Dutch province of Noord-Brabant are now in a trial period in working with research coordinators. Our first impression is that appointing research coordinators is a promising approach for establishing a more developed research culture within the school. In future research the added value of these coordinators could be examined in more detail. Teacher-researchers can also take responsibility in encouraging other teachers to perform teacher research by making their research endeavor (even more) visible. They should communicate to others about the improvements realized in their teaching practice. Teacher-researchers should also communicate about their research process as this might lower the threshold for other teachers to participate in the TR-course.

All in all, I do not claim that teacher research will always result in advancing the professional development of teachers, but my experience over the past five years with teacher-researchers has convinced me of the added value of teacher research for teachers and schools. When looking back, I can clearly see the added value of teacher research for teachers' professional development and to an admittedly lesser extent for school development in the results of this study and in the individual stories of the teacher-researchers.

REFERENCES

Aarts, R., Hulsker, J., & Imants, J. (2019). School- en onderzoekspraktijk:

Praktijkonderzoek in de kennisketen. *Script!* Retrieved from https://script-onderzoek.nl

Anderson, G. L., & Herr, K. (1999). The New Paradigm Wars: Is There Room for Rigorous Practitioner Knowledge in Schools and Universities? *Educational Researcher, 28*(5), 12-40. doi:10.3102/0013189X028005012

Berger, J. G., Boles, K. C., & Troen, V. (2005). Teacher research and school change: paradoxes, problems, and possibilities. *Teaching and Teacher Education, 21*(1), 93-105. doi:10.1016/j.tate.2004.11.008

Clarke, D., & Hollingsworth, H. (2002). Elaborating a model of teacher professional growth. *Teaching and Teacher Education, 18*(8), 947–967. doi: 10.1016/S0742-051X(02)00053-7

Cochran-Smith, M., & Boston College Evidence, Team (2009). 'Re-Culturing' Teacher Education: Inquiry, Evidence, and Action. *Journal of Teacher Education, 60*(5), 458-468. doi:10.1177/0022487109347206

Cochran-Smith, M., & Lytle, S. L. (2009). *Inquiry as Stance: Practitioner Research in the Next Generation.* New York: Teachers College Press.

Earl, L., & Katz, S. (2002). Leading Schools in a Data-Rich World. In K.A. Leithwood and P. Hallinger (Eds.), *Second International Handbook of Educational Leadership and Administration* (pp. 1003-1022). Dordrecht: Kluwer Academic Publishers. Retrieved from https://books.google.nl

Edwards, E. (2016). The impact of action research on teachers' continuous professional development. *ELT Research, 31*, 3-6. Retrieved from http://resig.weebly.com

Elliott, J. (2007). Assessing the quality of action research. *Research Papers in Education, 22*(2), 229-246. doi:10.1080/02671520701296205

Hattie, J. (2009). *Visible Learning: A Synthesis of Over 800 Meta-Analyses Relating to Achievement.* Abingdon: Routledge.

Knowles, M. S., Holton III, E. F., & Swanson, R. A. (2005). *The Adult Learner: The Definitive Classic in Adult Education and Human Resource Development.* Burlington: Elsevier. Retrieved from www.ugcascru.org

McLaughlin, C., Black-Hawkins, K., McIntyre, D., & Townsend, A. (2007). *Networking Practitioner Research*. Abingdon: Routlegde. Retrieved from https://books.google.nl

Meyer, J. (2000). Evaluating action research. *Age and Ageing, 29*(2), 8-10. doi: 10.1093/oxfordjournals.ageing.a008104

Mitchell, R. (2013). What is professional development, how does it occur in individuals, and how may it be used by educational leaders and managers for the purpose of school improvement? *Professional Development in Education, 39*(3), 387-400. doi:10.1080/19415257.2012.762721

Newton, P., & Burgess, D. (2008). Exploring Types of Educational Action Research: Implications for Research Validity. *International Journal of Qualitative Methods, 7*(4), 19-30. doi: 10.1177/160940690800700402

Nicholls, A. (1983). *Managing Educational Innovations*. Abingdon: Routlegde. Retrieved from https://www.taylorfrancis.com

OECD. (2009). *Creating Effective Teaching and Learning Environments: First Results from TALIS*. Retrieved from http://www.oecd.org

OECD. (2012). *Does performance-based pay improve teaching?* Retrieved from http://www.oecd.org

OECD. (2017). *The Nature of Problem Solving: Using Research to Inspire 21st Century Learning*. Retrieved from http://www.oecd.org

Ons Middelbaar Onderwijs. (2018). *Jaarverslag 2017*. Retrieved from www.omojaarverslag.nl

Onderwijsraad. (2013). *Een smalle kijk op onderwijskwaliteit*. Retrieved from https://www.onderwijsraad.nl

Onderwijsraad. (2014). *Een onderwijsstelsel met veerkracht*. Retrieved from https://www.onderwijsraad.nl

Onderwijsraad. (2018). *Een krachtige rol voor schoolleiders*. Retrieved from https://www.onderwijsraad.nl

Oolbekkink-Marchand, H. W., van der Steen, J., & Nijveldt, M. (2013). A study of the quality of practitioner research in secondary education: Impact on teacher and school development. *Educational Action Research, 22*(1), 122-139. doi:10.1080/09650792.2013.854175

Ponte, P. (2005). A Critically constructed concept of action research as a tool for the professional development of teachers. *Journal of In-service Education, 31*(2), 273-296. doi:10.1080/13674580500200279

Ros, A., & Keuvelaar-van den Bergh, L. (2016). *Scan onderzoekscultuur in de school & Interventiekaarten*. Retrieved from https://www.platformsamenopleiden.nl

Rust, F., & Meyers, E. (2007). The bright side: teacher research in the context of educational reform and policy-making. *Teachers and Teaching, 12*(1), 69-86. doi:10.1080/13450600500365452

Sharp, C., Eames, A., Sanders, D., & Tomlinson, K. (2006). *Leading a Research-engaged School* Retrieved from http://dera.ioe.ac.uk

Stenhouse, L. (1975). *An introduction to curriculum research and development*. London: Heinemann Educational.

Tack, H., & Vanderlinde, R. (2014). Teacher Educators' Professional Development: Towards a Typology of Teacher Educators' Researcherly Disposition. *British Journal of Educational Studies, 62*(3), 297-315. doi:10.1080/00071005.2014.957639

van den Berg, I., Daemen, J., & Lockhorst, D. (2010). *Expeditie Durven, Delen, Doen: Onderwijs is populair, personeel is trots*. Retrieved from https://dspace.library.uu.nl

van der Linden, W., Bakx, A., Ros, A., Beijaard, D., & van den Bergh, L. (2015). The development of student teachers' research knowledge, beliefs and attitude. *Journal of Education for Teaching, 41*(1), 4-18. doi:10.1080/02607476.2014.992631

van der Rijst, R. M., van Driel, J. H., Kijne, J. W., & Verloop, N. (2008). *Exploring Scientific Research Disposition from the Perspective of Academics*. Paper presented at the National Association of Research in Science Teaching. Retrieved from http://www.ecent.nl

Vogrinc, J., & Zuljan, M. V. (2009). Action research in schools – An important factor in teachers' professional development. *Educational Studies, 35*(1), 53-63. doi:10.1080/03055690802470399

Voion. (2016). *Onderwijsatlas voortgezet onderwijs: De onderwijsarbeidsmarkt in beeld*. Retrieved from https://www.voion.nl

Vrijnsen-de Corte, M. C. W. (2012). *Researching the teacher-researcher* (Doctoral dissertation). Eindhoven: Eindhoven University of Technology. Retrieved from https://pure.tue.nl

Wongsopawiro, D. S. (2012). *Examining science teachers' pedagogical content knowledge in the context of a professional development program* (Doctoral dissertation). Leiden: Leiden University. Retrieved from https://openaccess.leidenuniv.nl

Yin, R. K. (2003). *Case study research: Design and methods.* London: Sage Publications Ltd Retrieved from https://books.google.nl

Zeichner, K. M. (2003). Teacher research as professional development for P–12 educators in the USA[1]. *Educational Action Research, 11*(2), 301-326. doi:10.1080/09650790300200211

Zwart, R. C., Wubbels, T., Bolhuis, S., & Bergen, T. C. M. (2008). Teacher learning through reciprocal peer coaching: An analysis of activity sequences. *Teaching and Teacher Education, 24*(4), 982-1002. doi:10.1016/j.tate.2007.11.003

&

Appendices

APPENDIX 1 - RESEARCH ATTITUDE QUESTIONNAIRE

Note: Items were automatically presented in random order by the online survey software.

#	Categorie	Item
1	1	Ik reflecteer op mijn eigen lessen.
2	1	Ik ben een kritisch lezer.
3	1	Ik bepaal van informatie die ik opneem of het waardevol is.
4	1	Ik stel vragen over de huidige gang van zaken.
5	1	Ik neem zaken snel voor waar aan.
6	2	Ik vraag me af of ik mijn lessen kan verbeteren.
7	2	Ik vind het leuk om nieuwe ideeën te onderzoeken.
8	2	Ik vind het leuk om oplossingen te bedenken voor een probleem.
9	2	Ik vraag me af waarom dingen gaan zoals ze gaan.
10	2	Ik vraag me af of mijn onderwijsaanpak aansluit bij de leerlingen.
11	3	Ik heb de behoefte om mijn onderzoeksresultaten te delen met anderen. / Ik heb de behoefte om datgene wat ik vastgesteld heb te delen met anderen.
12	3	Ik zorg ervoor dat mijn onderzoek bekend raakt bij anderen. / Ik zorg ervoor dat datgene wat ik vastgesteld heb bekend raakt bij anderen.
13	3	Ik praat weinig met anderen over mijn onderzoek. / Ik praat weinig met anderen over mijn lespraktijk.
14	3	Ik enthousiasmeer anderen over mijn onderzoeksthema. / Ik enthousiasmeer anderen voor thema's die ik belangrijk vind.
15	3	Ik heb de wens te publiceren over mijn onderzoek. / Ik heb de wens te publiceren over mijn vak of didactiek.
16	4	Ik volg meestal dezelfde aanpak om leerlingen iets te laten leren.
17	4	Ik merk dat ik vaak sceptisch ben ten opzichte van verandering.
18	4	Ik vind de vertrouwde manier van doen vaak de beste manier.
19	4	Ik vind het leuk om nieuwe ideeën toe te passen.
20	4	Ik vind het stimulerend om in mijn denken en doen origineel te zijn.
21	5	Ik wil globaal begrijpen hoe iets werkt, niet tot in detail.
22	5	Ik wil weten waarom een lesaanpak wel of niet werkt.
23	5	Ik pluis iets uit totdat er geen vragen meer over zijn.

24	5	Ik wil me helemaal verdiepen in een aanpak voordat ik hem gebruik in de les.
25	5	Ik wil inzicht verkrijgen in de effecten van een verandering in mijn lesaanpak.
26	6	Ik bezit doorzettingsvermogen.
27	6	Ik heb de discipline om aan een onderzoek te werken. / Ik heb de discipline om onderzoeksmatig te werken.
28	6	Ik ben gedreven om mijn onderzoek te voltooien. / Ik ben gedreven om datgene waaraan ik begonnen ben te voltooien.
29	6	Ik werk door totdat ik bereikt heb wat ik wil bereiken.
30	6	Ik heb de neiging op te geven als het tegenzit.
31	7	Ik ga na of mijn bronnen goed zijn voordat ik iets beweer.
32	7	Ik zoek alleen globaal uit waarmee leerlingen problemen hebben.
33	7	Ik gebruik meerdere bronnen om zeker van mijn zaak te zijn.
34	7	Ik werk nauwkeurig.
35	7	Ik wil zeker weten of een aanpak bewezen is, voordat ik hem gebruik.
36	8	Ik maak gebruik van bronnen om kennis te vergaren.
37	8	Ik lees vakbladen om ideeën op te doen.
38	8	Ik loop achter met het bijhouden van de nieuwste vakontwikkelingen.
39	8	Ik bouw voort op eerdere opvattingen om zo kennis verder te ontwikkelen.
40	8	Ik weet waar ik vakliteratuur kan vinden.
41	9	Ik sta open voor vernieuwingen.
42	9	Ik heb mijn oordeel snel gemaakt.
43	9	Ik ben me bewust van mijn eigen vooronderstellingen.
44	9	Ik weet van tevoren al hoe iets zit.
45	9	Ik sta open voor feedback.
46	10	Ik houd rekening met het standpunt van mijn collega's.
47	10	Het helpt mij vooruit als ik zaken van verschillende kanten bekijk.
48	10	Ik houd rekening met de mening van mijn leerlingen.
49	10	Ik neem meerdere perspectieven in acht wanneer ik probeer te verbeteren.
50	10	Ik ben me ervan bewust hoe andere mensen over iets denken.

Categorieën *(Categories)*

1. Willen bekritiseren (*Inclination to be critical*)
2. Willen weten *(Inclination to know)*
3. Willen delen *(Willingness to share)*
4. Willen innoveren *(Inclination to be innovative)*
5. Willen begrijpen *(Inclination to understand)*
6. Willen bereiken *(Inclination to achieve)*
7. Gerichtheid op zeker weten *(Inclination to know for sure)*
8. Gerichtheid op bronnen *(Inclination to work evidence-based)*
9. Open houding *(Open mindedness)*
10. Bereidheid tot perspectiefwisseling *(Willingness to change perspective)*

APPENDIX 2 - EVALUATION FORM (DUTCH VERSION)

· Wat zijn je ervaringen met het proces van onderzoek doen?
· Wat heeft het doen van onderzoek jou opgeleverd?
· Wat heeft het doen van onderzoek de school opgeleverd?
· Wat zijn je ervaringen met de inhoud van de groepsbijeenkomsten?
· Wat zijn je ervaringen met de samenwerking in de groep?
· Wat zijn je ervaringen met de spreekuren?
· Wat zouden we de volgende keer anders/beter moeten doen?
· Wat zou je nieuwe docentonderzoekers willen meegeven?
· Ruimte voor opmerkingen

APPENDIX 3 - OUTPUT FACTOR ANALYSIS

Variabelen	Component								
	1	2	3	4	5	6	7	8	9
Ik ben een kritisch lezer.	,656	-,037	,189	,230	,134	,006	,189	-,019	,090
Ik neem zaken snel voor waar aan.	,655	-,016	-,110	,043	,020	,167	,046	,008	,104
Ik vind het leuk om nieuwe ideeën te onderzoeken.	,584	,235	,152	,238	-,017	,010	-,036	,258	,075
Ik bepaal van informatie die ik opneem of het waardevol is.	,557	,313	,066	-,037	,034	-,073	,061	,026	,382
Ik maak gebruik van bronnen om kennis te vergaren.	,511	,160	-,190	,273	,136	-,049	,293	-,290	-,097
Ik houd rekening met de mening van mijn leerlingen.	,505	,376	-,025	-,137	,100	-,164	-,129	-,017	-,153
Ik ben gedreven om mijn onderzoek te voltooien.	,446	,207	,158	,244	,026	,130	-,114	,014	-,014
Ik merk dat ik vaak sceptisch ben ten opzichte van verandering.	,383	,301	-,151	-,138	,016	,217	-,256	-,085	,176
Ik stel vragen over de huidige gang van zaken.	,368	,195	-,058	,142	-,138	-,124	-,413	-,188	,090
Ik houd rekening met het standpunt van mijn collega's.	,302	,187	,292	-,192	,006	,279	,274	,274	-,154
Ik ben me ervan bewust hoe andere mensen over iets denken.	,302	,209	,208	-,232	,265	-,099	,183	,099	,273
Ik vraag me af waarom dingen gaan zoals ze gaan.	,273	,145	,237	,135	,101	,174	-,124	,016	,115
Ik wil inzicht verkrijgen in de effecten van een verandering in mijn lesaanpak.	,147	,664	,160	,079	,004	,284	-,006	,072	-,068
Ik praat weinig met anderen over mijn onderzoek.	,200	,581	-,308	,125	,196	-,073	,049	-,142	,152
Het helpt mij vooruit als ik zaken van verschillende kanten bekijk.	,303	,559	,179	,038	,024	,180	,141	-,112	-,147

Ik heb de behoefte om mijn onderzoeksresultaten te delen met anderen.	-,069	,548	,031	-,004	,066	,006	,089	,055	,204
Ik ben me bewust van mijn eigen vooronderstellingen.	,091	,530	-,169	,049	,067	-,246	-,097	-,040	,006
Ik sta open voor feedback.	,215	,511	-,025	,213	-,238	-,141	-,282	-,173	,102
Ik vind het leuk om nieuwe ideeën toe te passen.	,207	,510	-,275	,238	,280	-,079	-,149	-,041	,202
Ik vind het leuk om oplossingen te bedenken voor een probleem.	,060	,502	,150	,464	-,012	,197	,115	,051	,083
Ik heb de neiging op te geven als het tegenzit.	,293	,405	-,177	,109	-,096	-,058	-,250	-,432	,018
Ik wil zeker weten of een aanpak bewezen is, voordat ik hem gebruik.	,029	-,028	,609	-,092	,073	,064	-,201	,060	,017
Ik wil me helemaal verdiepen in een aanpak voordat ik hem gebruik in de les.	-,139	-,038	,572	,052	-,070	-,126	,043	,130	,165
Ik gebruik meerdere bronnen om zeker van mijn zaak te zijn.	,333	,286	,539	,005	,275	,053	,262	-,027	-,208
Ik werk nauwkeurig.	,305	,007	,536	-,002	-,016	,231	,040	-,320	,299
Ik pluis iets uit totdat er geen vragen meer over zijn.	,009	-,246	,512	,035	,360	,077	,404	,099	-,024
Ik neem meerdere perspectieven in acht wanneer ik probeer te verbeteren.	,107	,065	,397	,315	,215	,210	-,115	-,033	-,025
Ik vraag me af of ik mijn lessen kan verbeteren.	,288	-,115	,388	,308	-,033	-,076	,147	,279	,070
Ik heb de discipline om aan een onderzoek te werken.	,023	,033	,002	,674	,150	-,023	,121	-,278	-,057
Ik reflecteer op mijn eigen lessen.	,218	,027	-,014	,614	-,059	,055	-,037	,240	-,019
Ik wil weten waarom een lesaanpak wel of niet werkt.	,101	,246	-,012	,553	,401	,168	-,102	,181	,113
Ik bezit doorzettingsvermogen.	,208	,242	-,081	,461	,336	-,005	,127	-,271	,105

Ik ga na of mijn bronnen goed zijn voordat ik iets beweer.	,063	,106	-,024	,183	,723	-,003	,050	-,038	-,105
Ik wil globaal begrijpen hoe iets werkt, niet tot in detail.	,011	,043	,136	,018	,710	,010	-,225	,056	,081
Ik heb mijn oordeel snel gemaakt	,042	-,204	,168	-,093	,507	,344	,283	,121	,034
Ik werk door totdat ik bereikt heb wat ik wil bereiken.	,123	,196	,194	,411	,503	,121	,098	-,259	,104
Ik vind de vertrouwde manier van doen vaak de beste manier.	,152	,150	,069	-,027	,111	,698	,095	,252	,157
Ik weet van tevoren al hoe iets zit.	-,110	-,318	,007	,069	,076	,619	,089	,137	-,040
Ik sta open voor vernieuwingen.	,232	,168	,023	,227	-,036	,519	-,125	-,139	-,019
Ik heb de wens te publiceren over mijn onderzoek.	,006	-,206	,399	,126	,137	,415	,156	,159	,287
Ik weet waar ik vakliteratuur kan vinden.	,177	-,035	-,033	,096	,026	,110	,716	-,152	,104
Ik lees vakbladen om ideeën op te doen.	,016	,075	-,032	,023	-,207	-,073	,652	,240	-,043
Ik loop achter met het bijhouden van de nieuwste vakontwikkelingen.	-,103	,114	-,028	,056	,070	,466	,505	,207	,249
Ik volg meestal dezelfde aanpak om leerlingen iets te laten leren.	-,123	-,002	,023	-,009	-,016	,297	,151	,680	,060
Ik vraag me af of mijn onderwijsaanpak aansluit bij de leerlingen.	,326	-,104	,128	,007	,027	,076	,042	,675	,180
Ik enthousiasmeer anderen over mijn onderzoeksthema.	,230	,136	,083	,046	-,125	-,073	,008	,007	,742
Ik zorg ervoor dat mijn onderzoek bekend raakt bij anderen.	,020	,020	,273	-,157	,036	,269	,085	,111	,592
Ik vind het stimulerend om in mijn denken en doen origineel te zijn.	,043	,077	-,214	,164	,321	,207	-,082	,063	,439

Ik bouw voort op eerdere opvattingen om zo kennis verder te ontwikkelen.	-,004	,089	,068	,353	,107	,033	-,026	,374	,429

APPENDIX 4 - RESEARCH KNOWLEDGE QUESTIONNAIRE

Geef bij elke stelling twee keer een antwoord.

	Voorafgaand aan het traject docentonderzoek wist ik:			Na afloop van het traject docentonderzoek weet ik meer over:		
	ja	beetje	nee	ja	beetje	nee
- hoe ik een onderzoek afbaken.						
- hoe ik onderzoeksvragen opstel.						
- wat goed onderzoek doen is. (Ik had weet van de kwaliteitscriteria: betrouwbaarheid en validiteit.)						
- wat de fases zijn die doorlopen worden tijdens het doen van onderzoek.						
- hoe ik een literatuurstudie doe.						
(over) onderzoeksmethoden.						
- hoe ik een onderzoeksinstrument opstel. (enquête, interview, observatielijst, etc.)						
- hoe ik respondenten selecteer.						
- hoe ik onderzoeksdata analyseer.						
- hoe ik conclusies trek.						
- hoe ik bronnen correct vermeld.						
- hoe ik rapporteer over onderzoeksresultaten.						

APPENDIX 5 - RESEARCH KNOWLEDGE ORAL TEST AND INTERVIEW

1. Waarom zouden docenten onderzoek moeten doen?
2. Wat maakt een onderwerp geschikt voor onderzoek?
3. Welke kwaliteitscriteria moet je in acht nemen tijdens het doen van onderzoek?
4. Uit welke fases bestaat het onderzoeksproces?
   a. Waar moet je op letten bij het formuleren van een onderzoeksvraag?
   b. Waar moet je op letten bij het kiezen van een methode voor onderzoek?
   c. Waar moet je op letten bij het verzamelen van data?
   d. Waar moet je op letten bij het analyseren van data?
   e. Waar moet je op letten bij het trekken van conclusies?
5. Waarom rapporteer je over onderzoeksgegevens?
6. Kun je aangeven wat er is veranderd door het doen van onderzoek op het vlak van:
   a. kennis over het doen van onderzoek
   b. vaardigheden in het doen van onderzoek
   c. handelen naar aanleiding van het doen van onderzoek
   d. attitude over het doen van onderzoek

APPENDIX 6 - CHANGE QUESTIONNAIRE

Domain of practice

1. Is je manier van lesgeven veranderd door het uitvoeren van het praktijkonderzoek? + Geef aan om welke redenen je onderwijs (niet) veranderde door het uitvoeren van praktijkonderzoek.
2. Geef (in trefwoorden) concrete voorbeelden van verandering(en) in je manier van lesgeven door het uitvoeren van praktijkonderzoek.

Mogelijk is er toch iets veranderd in jouw manier van lesgeven na het uitvoeren van praktijkonderzoek waar je niet direct aan gedacht hebt. Dat willen we m.b.v. de volgende stellingen nagaan. Het gaat er nu om dat je de situatie van voor het uitvoeren van praktijkonderzoek vergelijkt met de situatie van na het uitvoeren van praktijkonderzoek. Geef per stelling aan of er een verandering in de manier van lesgeven is opgetreden.

Door het uitvoeren van praktijkonderzoek is mijn manier van lesgeven veranderd op het gebied van:

3. Het creëren van een veilig en stimulerend leerklimaat in mijn klas. (ja/nee)
4. Het efficiënt organiseren van mijn lessen. (ja/nee)
5. Het geven van duidelijke en gestructureerde instructie. (ja/nee)
6. Het geven van intensieve en activerende lessen. (ja/nee)
7. Het differentiëren in de les. (ja/nee)
8. Leerlingen leerstrategieën aanleren. (ja/nee)
9. Leerlingen betrekken bij de les. (ja/nee)

Domain of consequences

10. Wat is het effect van de verandering(en) in je manier van lesgeven?
    · voor jezelf
    · voor leerlingen
    · voor collega's
    · voor de school
11. Heeft (het uitvoeren van) praktijkonderzoek producten of projecten opgeleverd (lesmateriaal, beleidsdocument, checklist, stappenplan, voorbeeldlessen, samenwerkingsproject, uitwisseling …) + Geef aan om welke redenen het (uitvoeren van) praktijkonderzoek (geen) producten of projecten heeft opgeleverd.

12. Welke producten of projecten?

13. Op welke manier heb je wat aan deze producten of projecten gehad?

Change environment

In dit laatste gedeelte van de enquête volgen nog acht vragen over de schoolcontext. Vul de vragen in voor het jaar en de school waar je werkzaam was toen je het AOS praktijkonderzoek hebt uitgevoerd. Probeer je dus de situatie van toen voor de geest te halen. Je kiest telkens uit een van de vijf aangegeven fases. In fase 1 moet onderzoek in de school nog starten en in fase 5 is onderzoek volledig geïntegreerd in de school. De fases bouwen dus voort op elkaar. In de vragen wordt dit aangegeven met het + teken. Denk niet te lang na over het antwoord, vaak is de eerste ingeving het beste. Let op! De beschrijvingen zullen wellicht niet precies passen bij jouw school. Het gaat erom de fase te kiezen die volgens jou het beste de situatie weergeeft op jouw school tijdens het uitvoeren van je praktijkonderzoek.

14. Hoe is onderzoek in de school georganiseerd? (Kies één antwoord.)
   1. Er vindt geen onderzoek plaats door docentonderzoekers.
   2. Er wordt onderzoek uitgevoerd. De docentonderzoekers zijn gefaciliteerd.
   3. Als fase 2 + Het onderzoek wordt uitgevoerd door een onderzoeksgroep.
   4. Als fase 3 + De onderzoeksgroep voelt zich verantwoordelijk voor het onderzoek.
   5. Als fase 4 + De onderzoeksgroep zorgt voor draagvlak in de school en implementeert onderzoeksresultaten.

15. Hoe worden onderzoeksthema's gekozen? (Kies één antwoord.)
   1. Onderzoeksthema's worden bepaald door de docentonderzoeker.
   2. Oderzoeksthema's worden bepaald door de docentonderzoeker, samen met de schoolleider.

   3. Als fase 2 + Er is nagegaan of de thema's aansluiten bij de behoefte van docenten.

4. Als fase 3 + Het onderzoek sluit aan bij eerder onderzoek in de school.

5. Als fase 4 + De onderzoeksthema's dragen bij aan het realiseren van beleidsspeerpunten. Er is bovendien sprake van een onderzoeksagenda.

16. Hoe is het gesteld met de betrokkenheid van docenten? (Kies één antwoord.)

1. Docenten zijn niet betrokken bij onderzoek.

2. Docenten worden geïnformeerd over onderzoek.

3. Docenten worden regelmatig geïnformeerd en gehoord over onderzoek.

4. Als fase 3 + Docenten tonen belangstelling voor onderzoek.

5. Als fase 4 + Docenten leren gezamenlijk van onderzoek en ondernemen actie.

17. Wat is de rol van de schoolleider? (Kies één antwoord.)

1. De schoolleider heeft weinig bemoeienis met het onderzoek.

2. De schoolleider zorgt ervoor dat de faciliteiten voor onderzoek in de school zijn geregeld.

3. Als fase 2 + Hij/zij straalt uit dat hij/zij onderzoek belangrijk vindt voor de schoolontwikkeling.

4. Als fase 3 + Hij/zij stimuleert het onderzoek door vragen te stellen en waardering uit te spreken.

5. Als fase 4 + Hij/zij heeft onderzoek opgenomen in het schoolbeleid.

18. Hoe is het gesteld met kennisbenutting op het niveau van de leraar: onderzoekende houding? (Kies één antwoord.)

1. Het grootste deel van de docenten reflecteert niet op het onderwijs.

2. Het grootste deel van de docenten reflecteert op het onderwijs.

3. Als fase 2 + Docenten passen nieuwe kennis toe in de eigen praktijk.

4. Als fase 3 + Docenten gaan actief op zoek naar nieuwe kennis.

5. Als fase 4 + Docenten doen onderzoek in de eigen klas.

19. Hoe is het gesteld met kennisbenutting op schoolniveau: onderbouwd beleid? (Kies één antwoord.)

1. Het onderzoek wordt niet gebruikt om het onderwijs te verbeteren.
2. Vooraf is helder wat het doel van het onderzoek is en hoe resultaten zullen worden gebruikt.
3. Als fase 2 + Onderzoeksresultaten leiden tot een actieplan.
4. Als fase 3 + Beleidskeuzes worden mede gebaseerd op eigen onderzoeksresultaten. Ad hoc keuzes worden hierdoor vermeden.
5. Als fase 4 + Onderzoek heeft een vaste plek in het schoolbeleid.

20. Hoe is het gesteld met de professionele dialoog? (Kies één antwoord.)
1. Docenten voeren geen professionele dialoog.
2. Incidenteel voeren docenten een professionele dialoog.
3. Structureel voeren docenten een professionele dialoog.
4. Als fase 3 + De dialoog wordt gevoed door onderzoeksresultaten.
5. Als fase 4 + Docenten spreken elkaar aan op professioneel gedrag dat verbeterd kan worden.

21. Hoe is het gesteld met visie van de school en kennisdeling? (Kies één antwoord.)
1. Er is geen visie op leren.
2. Er is een visie op leren. Die visie is in grote lijnen bekend bij de docenten.
3. Er is een visie op leren, die bekend is bij en gedragen wordt door de docenten.
4. Als fase 3 + De visie wordt vertaald in concreet gedrag.
5. Als fase 4 + De school treedt naar buiten met de visie.

22. Is de situatie op school m.b.t. onderzoek veranderd? Het gaat om een verandering in situatie tussen nu en toen je praktijkonderzoek uitvoerde. Denk daarbij aan de acht vragen die je net beantwoord hebt. Herinner je dat in fase 1 onderzoek in de school nog moet starten en in fase 5 onderzoek volledig is geïntegreerd in de school. Ja/Nee, toelichting:

APPENDIX - 7 PERSONAL DOMAIN QUESTIONNAIRE

Geef aan in hoeverre je het eens met de volgende stellingen:
1. helemaal mee oneens
2. mee oneens
3. neutraal
4. mee eens
5. helemaal mee eens

		vind ik leuk	ben ik goed in	vind ik belangrijk
1.	Aanleiding tot onderzoek formuleren			
2.	Praktijkprobleem beschrijven			
3.	Onderzoeksdoel formuleren			
4.	Onderzoeksvragen opstellen			
5.	Zoeken van literatuur en bruikbaarheid ervan bepalen			
6.	Methode van onderzoek bepalen			
7.	Onderzoeksactiviteiten bepalen en plannen			
8.	Gegevens verzamelen			
9.	Gegevens analyseren			
10.	Onderzoeksverslag schrijven			
11.	Presenteren van bevindingen			
12.	Onderzoeksresultaten toepassen in de praktijk			

13. Blijf je onderzoek gebruiken in je werk? Zo ja, op welke manier ga je dat doen?

SUMMARY IN DUTCH

Docentonderzoek in het voortgezet onderwijs
Een empirisch onderzoek naar docentonderzoek als middel voor professionele ontwikkeling en schoolontwikkeling.

De docent wordt in toenemende mate gezien als de centrale factor in de kwaliteit van het onderwijs (o.a. Hattie, 2009; Marzano, 2003). Professionalisering van docenten is dan ook een speerpunt in het onderwijsbeleid (Ministerie van Onderwijs, Cultuur en Wetenschap, 2013; Onderwijsraad, 2013). Er wordt ingezet op academisering van docenten, waarbij onderzoek een kernbegrip vormt (OECD, 2009). Docenten zouden in staat moeten zijn om hun eigen manier van werken te onderzoeken en inzichten uit onderzoek te gebruiken voor innovatie (OECD, 2012; Onderwijsraad, 2013). Daarbij is de veronderstelling dat het doen van onderzoek een effectieve manier is om het onderwijs te verbeteren (o.a. Cochran-Smith & Lytle, 1990; Ponte, Ax, Beijaard, & Wubbels, 2004; Zeichner, 1993). Het uitvoeren van praktijkonderzoek zou een bijdrage leveren aan de professionalisering van de docent door het versterken van zijn/haar onderzoekend vermogen en onderzoekende houding. Het doen van onderzoek zou moeten leiden tot meer inzicht in vraagstukken in de praktijk, dat vervolgens gebruikt kan worden om de eigen onderwijspraktijk (van de eigen klas en de eigen school) te ontwikkelen en verbeteren. De evidentie voor deze veronderstelling is echter nog beperkt; we weten feitelijk nog niet wat de meerwaarde is van een onderzoekende houding van docenten en wat het doen van onderzoek door docenten betekent voor de kwaliteit van het onderwijs.

De termen die worden gebruikt voor onderzoek uitgevoerd door docenten zijn 'praktijkonderzoek', 'actie-onderzoek' en 'docentonderzoek' (Admiraal, Ben, & Zwart, 2013). Voor ons onderzoek hanteren we de term 'docentonderzoek', dat wil zeggen "Onderzoek dat wordt uitgevoerd door docenten (…), waarbij op een systematische wijze in interactie met de omgeving antwoorden verkregen worden op vragen die ontstaan in de eigen onderwijspraktijk en gericht zijn op verbetering van deze praktijk" (van der Donk & van Lanen, 2012, p. 17).

In Nederland wordt het uitvoeren van docentonderzoek op scholen voor voortgezet onderwijs de laatste jaren sterk gestimuleerd (Oolbekkink-Marchand, van der Steen, & Nijveldt, 2013; Ponte, 2005). Het ministerie van Onderwijs, Cultuur en Wetenschap heeft financiële middelen beschikbaar gesteld om zogeheten Academische Opleidingsscholen (AOS) op te zetten. Een AOS staat ten dienste van de professionalisering van docenten en van onderwijsontwikkeling. In dit onderzoek staan twee van deze AOS centraal: AOS Midden-Brabant en AOS West-Brabant. Deze AOS zijn een samenwerkingsverband tussen scholen voor voortgezet onderwijs van de overkoepelende vereniging *Ons Middelbaar Onderwijs* en lerarenopleidingen. Binnen deze AOS is een traject Docentonderzoek opgezet waarin docenten scholing krijgen in onderzoeksvaardigheden en ze in hun eigen praktijk onderzoek opzetten en uitvoeren. De docenten, die we in het vervolg aanduiden als docentonderzoekers, werken daarbij samen in een professionele leergemeenschap en ze worden begeleid door docenten van de Universitaire Lerarenopleiding van Tilburg University. Het traject Docentonderzoek loopt gedurende een schooljaar.

Enkele voorbeelden van onderzoek dat is uitgevoerd door de docentonderzoekers van AOS Midden-Brabant en West-Brabant zijn de volgende: een docent (vrouw, 30 jaar, vak: Spaans) onderzocht hoe formatief toetsen kon worden ingezet bij Spaans; een team van twee docenten (vrouw, 52 jaar, vak: Nederlands; man, 39 jaar, vak: tekenen en CKV) ontwikkelde en implementeerde een curriculum voor wetenschapslessen; een docent (man, 52 jaar, vak: M&O) ontwikkelde vakoverstijgende uniforme rekenoplostechnieken opdat de rekenmethodes bij elk vak hetzelfde zouden zijn; een docent (vrouw, 27 jaar, vak: CKV en muziek) ging na hoe de participatie van leerlingen bij buitenschoolse activiteiten kon worden verhoogd.

Ons onderzoek had betrekking op de uitvoering en de opbrengsten van het traject Docentonderzoek. We willen daarmee een bijdrage leveren aan de kennis over de relatie tussen docentonderzoek, docentprofessionalisering en de kwaliteit van het onderwijs. Daarnaast willen we met ons onderzoek aanbevelingen doen voor een effectieve inzet van docentonderzoek ter verbetering van het onderwijs.

De vraag die centraal staat in het onderzoek is: *Wat is de impact van het uitvoeren van docentonderzoek op scholen voor voortgezet onderwijs op de professionele ontwikkeling van docenten en op schoolontwikkeling?* Om deze vraag te beantwoorden zijn vier deelstudies uitgevoerd, elk gericht op een aspect van de professionele ontwikkeling van docenten en schoolontwikkeling: attitude, vaardigheden, kennis, en handelen (zie o.a. Fraser, Kennedy, Reid, & McKinney, 2007). In de eerste studie ligt de focus op de ontwikkeling van een onderzoekende houding bij docenten die docentonderzoek uitvoeren. In de tweede studie wordt de kwaliteit van het uitgevoerde docentonderzoek onderzocht en wordt nagegaan of docenten de vaardigheden hebben om docentonderzoek uit te voeren. De derde studie is uitgevoerd om de kennisontwikkeling van de docentonderzoekers in kaart te brengen. Met de vierde studie wordt onderzocht of docenten hun handelwijze op school aanpassen nadat ze docentonderzoek hebben uitgevoerd en of deze aanpassingen impact hebben op schoolontwikkeling. Ook is nagegaan welke factoren van invloed zijn op eventuele veranderingen in de handelwijze van de docenten.

In het onderzoek is gebruikgemaakt van een gemengde methodologie. Dat houdt in dat zowel kwantitatieve (zoals vragenlijsten en evaluatiemodellen) als kwalitatieve onderzoeksinstrumenten (zoals interviews en observaties) werden toegepast bij de dataverzameling. Dit onderzoek is uitgevoerd gedurende vijf jaar met per jaar één traject Docentonderzoek. In totaal hebben 102 verschillende docenten van 27 scholen voor voortgezet onderwijs van de AOS Midden-Brabant en West-Brabant deelgenomen. Alle docenten die hebben deelgenomen aan het traject Docentonderzoek waren participanten in het onderzoek. In wat volgt worden de resultaten per deelstudie beknopt beschreven.

Deelstudie 1: onderzoeksattitude

De eerste deelstudie, beschreven in hoofdstuk 2 van dit proefschrift, is uitgevoerd om de ontwikkeling van een onderzoekende houding bij de deelnemers aan het traject Docentonderzoek in kaart te brengen. De aanname is dat het uitvoeren van praktijkonderzoek door docenten een bijdrage levert aan hun attitude ten aanzien van onderzoek. Deze attitude ten aanzien van onderzoek stelden wij gelijk aan de 'onderzoekende houding'. Bij de onderzoekende houding gaat het om een gerichtheid

op onderzoek (Bruggink & Harinck, 2012) en de wil om onderzoek uit te voeren (Tack & Vanderlinde, 2014). Het was echter nog onduidelijk wat er precies onder deze onderzoekende houding verstaan kan worden en hoe ze vastgesteld kan worden. Verschillende onderzoekers (o.a. Bruggink & Harinck, 2012; van der Rijst, van Driel, Kijne, & Verloop, 2008) hebben getracht de term 'onderzoekende houding' te operationaliseren. Hun werk vormde het startpunt om een antwoord te formuleren op de vraag of de onderzoekende houding van docentonderzoekers zich ontwikkelt door hun deelname aan het traject Docentonderzoek.

Vanuit literatuurstudie hebben we tien aspecten van een onderzoekende houding gedefinieerd:

1. Willen weten
2. Open houding
3. Willen bekritiseren
4. Willen begrijpen
5. Bereidheid tot perspectiefwisseling
6. Willen innoveren
7. Gerichtheid op bronnen
8. Gerichtheid op zeker weten
9. Willen delen
10. Willen bereiken

Deze tien aspecten zijn verwerkt in een vragenlijst (met per aspect vijf stellingen). 29 docentonderzoekers hebben de vragenlijst ingevuld aan het begin en aan het einde van het schooljaar. Hun antwoorden zijn vergeleken met die van 97 docenten die niet deelnamen aan het traject Docentonderzoek. De docentonderzoekers hebben daarnaast op evaluatieformulieren aan het einde van het schooljaar gereflecteerd op de ontwikkeling van hun onderzoekende houding. De analyse van de resultaten op de door ons ontwikkelde vragenlijst leidde tot een alternatieve categorisering van de onderzoekende houding in de volgende negen aspecten:

1. Neiging tot heroriënteren
2. Wil om nieuwe ideeën toe te passen in de onderwijspraktijk
3. Wetenschappelijke werkwijze

4. Continue observatie
5. Continue verificatie
6. Gerichtheid op nieuwe ideeën
7. Focus op de onderwijspraktijk
8. Gericht op leerlingen
9. Wil om te kennis te delen

Onze analyse liet zien dat de eerste twee aspecten de kern vormen van een onderzoekende houding.

De uitkomsten van deze deelstudie laten zien dat de docentonderzoekers op zes van de negen aspecten hoger scoorden na deelname aan het traject Docentonderzoek. Deze ontwikkeling kwam ook naar voren uit de evaluatieformulieren. Docentonderzoekers gaven aan dat ze zich sterker oriënteerden op de onderwijspraktijk, een meer wetenschappelijke werkwijze hanteerden en meer zaken verifieerden dan voorheen. Bovendien gaven ze aan dat ze meer gericht waren op nieuwe ideeën, hun onderwijspraktijk en de leerlingen. De gevonden verschillen zijn echter niet significant, waardoor we niet kunnen stellen dat er een ontwikkeling van een onderzoekende houding plaatsvindt bij docenten die deelnemen aan het traject Docentonderzoek. De docenten zelf gaven aan dat ze wel degelijk een ontwikkeling van hun onderzoekende houding ervaarden na deelname aan het traject.

Bovendien lieten de uitkomsten van dit deelonderzoek zien dat de docentonderzoekers na deelname aan het traject Docentonderzoek een statistisch significant sterkere onderzoekende houding hadden dan docenten die niet deelnamen aan het traject.. Het significante verschil werd onder andere gevonden op de twee kernaspecten van een onderzoekende houding, te weten de neiging tot heroriënteren en de wil om nieuwe ideeën toe te passen in de onderwijspraktijk. Hieruit leiden we af dat deelname aan het traject Docentonderzoek ertoe leidt dat docentonderzoekers een sterkere onderzoekende houding hebben dan niet-docentonderzoekers.

Deelstudie 2: vaardigheden voor het uitvoeren van onderzoek
In de tweede deelstudie staan de onderzoeksvaardigheden van docentonderzoekers centraal. Deze onderzoeksvaardigheden hebben

we gemeten door de kwaliteit van de door docenten uitgevoerde onderzoeken vast te stellen. Een dergelijke kwaliteitsmeting bleek niet vanzelfsprekend. Het belang van docentonderzoek wordt wel onderstreept in verschillende publicaties (Admiraal et al., 2013; Zeichner & Noffke, 2001) maar desondanks worden er vraagtekens geplaatst bij de kwaliteit van docentonderzoek (Leeman & Wardekker, 2010; Snoek, 2012). Er zijn nog geen algemene richtlijnen voor onderzoek door docenten, omdat er geen overeenstemming is over de doelstellingen, het proces en de mogelijke opbrengsten. Ook zijn er nog geen algemeen geldende criteria aan de hand waarvan docentonderzoek beoordeeld kan worden (Oolbekkink-Marchand et al., 2013). In het traject Docentonderzoek hadden we met dit gegeven te maken. Het traject werd opgezet en uitgevoerd zonder dat er duidelijke beoordelingscriteria voor het docentonderzoek voorhanden waren.

Door middel van een literatuurstudie hebben we de specifieke kenmerken van docentonderzoek in kaart gebracht.. Dit leidde tot de vaststelling dat de kwaliteit kon worden bepaald door een beoordeling van verschillende soorten validiteit. De soorten validiteit voor docentonderzoek, zoals beschreven door Anderson en Herr (1999) en nader uitgewerkt en toegepast door Newton en Burgess (2008), Oolbekkink-Marchand et al. (2013) en Aarts en Mathijsen (2014), zijn de volgende:

· Uitkomstvaliditeit: de mate waarin het onderzoek leidt tot een oplossing van het probleem.
· Procesvaliditeit: de methode van onderzoek, waarbij het erom gaat dat het onderzoek consistent, controleerbaar en betrouwbaar is uitgevoerd (bijvoorbeeld door gebruik te maken van triangulatie zoals het meenemen van perspectieven van meerdere betrokkenen of het gebruik van verschillende methoden).
· Democratische validiteit: de mate waarin het onderzoek is uitgevoerd in samenwerking met alle relevante partijen.
· Katalytische validiteit: de mate waarin het onderzoek ertoe leidt dat actoren in de praktijk zich heroriënteren op hun rol, nieuwe kennis opdoen over hun onderwijspraktijk en tot verandering in hun praktijk komen.

· Dialogische validiteit: de mate waarin er sprake is van een constructieve dialoog met 'critical friends' over het onderzoek en kennisdeling.

Om beoordeling van het docentonderzoek op basis van de verschillende soorten validiteit mogelijk te maken, zijn de soorten validiteit geoperationaliseerd. Wij hebben de indicatoren per validiteit uitgewerkt tot een scoringsschema dat gebruikt kan worden om de onderzoeksverslagen te beoordelen. Om te bepalen of er voldaan is aan de verschillende validiteiteisen (en daarmee na te gaan of docenten vaardig zijn in het uitvoeren van onderzoek) is gebruikgemaakt van de onderzoeksverslagen geschreven door de docentonderzoekers en een evaluatieformulier dat werd ingevuld door de docentonderzoekers aan het einde van het onderzoeksjaar. 80 docentonderzoekers namen deel aan deze deelstudie. In totaal schreven zij 68 onderzoeksrapporten (sommige onderzoeksrapporten werden geschreven door een team van twee docentonderzoekers).

De uitkomsten van deze deelstudie laten zien dat de onderzoeksrapporten het beste beoordeeld worden op de uitkomstvaliditeit. Docenten zijn in staat een antwoord te geven op de hoofdvraag van het onderzoek en om nieuwe vragen voor onderzoek te genereren. De laagste scores worden behaald op procesvaliditeit. Docentonderzoekers lijken het opzetten van een coherent en transparant onderzoek een van de lastigste onderdelen te vinden van het uitvoeren van docentonderzoek. Alle docentonderzoekers hebben in enige vorm belanghebbenden betrokken in hun onderzoek en voldoen daarmee aan de eis van democratische validiteit. Uit de evaluaties is op te maken dat er op elk onderdeel van de katalytische validiteit (handelen, kennis, attitude en vaardigheden) bij een of meer docenten een verandering is opgetreden. Voor wat de dialogische validiteit betreft gaven de docentonderzoekers aan dat de dialoog met *critical friends* voornamelijk bestond uit het delen van ervaringen. Het kritisch volgen van elkaars onderzoek werd bemoeilijkt door de uiteenlopende onderwerpen van de onderzoeken.

Op basis van deze deelstudie concludeerden wij dat het door ons ontwikkelde beoordelingsschema met indicatoren per validiteit geschikt is voor de beoordeling van docentonderzoek. Uit de analyse van de

onderzoeksverslagen bleek het belang van procesvaliditeit. Wanneer er niet wordt voldaan aan procesvaliditeit komt de kwaliteit van het gehele onderzoek in het geding. Wij stellen daarom dat het voldoen aan procesvaliditeit een voorwaarde is voor goed docentonderzoek. Wanneer de algehele kwaliteit van het onderzoek goed was, bleek het onderzoek bij te dragen aan een verandering in de onderwijspraktijk. Docentonderzoek is daarmee een veelbelovende strategie voor de professionele ontwikkeling van de docent en, hoewel in minder concrete mate, voor schoolontwikkeling.

Deelstudie 3: kennisontwikkeling

In deze deelstudie staat de ontwikkeling van onderzoekskennis van de deelnemers aan het traject Docentonderzoek centraal. Onderzoekskennis omvat kennis van alle fases van de onderzoekscyclus (van der Linden, Bakx, Ros, Beijaard, & van den Bergh, 2015); zie Figuur A.
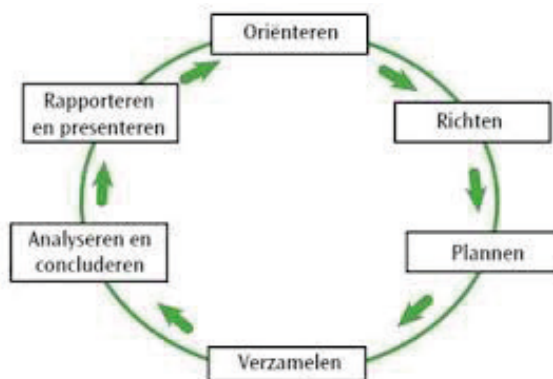
Figuur A Cyclus van het docentonderzoek (van der Donk & van Lanen, 2012)

Om onderzoek te kunnen uitvoeren moeten docentonderzoekers weten wat geschikte onderzoeksthema's en -vragen zijn (fase: oriënteren). Ze moeten weten hoe ze een literatuurstudie kunnen uitvoeren (fase: richten) en ze moeten kennis hebben van onderzoeksmethoden (fase: plannen). Ook moeten ze kennis hebben van onderzoeksrespondenten en -instrumenten (fase: verzamelen) en van data-analyse en het trekken van conclusies (fase: analyseren en concluderen). Als laatste moeten de docentonderzoekers weten hoe bronnen te vermelden en hoe te rapporteren over onderzoeksgegevens (fase: rapporteren en presenteren).

Om de kennisontwikkeling van de 26 deelnemende docentonderzoekers te kunnen bepalen, is gebruikgemaakt van verschillende onderzoeksinstrumenten: een vragenlijst, een interview, mondelinge kennistoetsen, *concept maps* en een logboek. De vragenlijst en het interview, waarin docentonderzoekers reflecteerden op hun eigen kennisontwikkeling, werden aan het einde van het traject Docentonderzoek afgenomen. De mondelinge kennistoetsen en *concept maps* werden zowel aan het begin als aan het einde van het traject afgenomen om kennisontwikkeling te kunnen meten. In de kennistoetsen werden feitenvragen gesteld. Bij de *concept maps* maakten de docentonderzoekers een visuele weergave van hun kennis over het doen van onderzoek. In het logboek werden alle vragen genoteerd die de docentonderzoekers stelden aan hun begeleider gedurende het traject.

De resultaten van deze deelstudie laten zien dat de docentonderzoekers positief zijn over hun eigen kennisontwikkeling. In de vragenlijst en in het interview gaven ze aan dat ze een groei in kennis over alle fases van de onderzoekscyclus ervaarden. Een dergelijke kennisontwikkeling was niet direct zichtbaar in de *concept maps*, maar de docentonderzoekers zelf gaven aan dat ze hun tweede *concept map* (getekend aan het einde van traject) beter vonden dan hun eerste *concept map* (getekend aan het begin van het traject). Uit de mondelinge kennistoets bleek bovendien dat de docentonderzoekers meer kennis over onderzoek hadden opgedaan gedurende het traject dan uit hun *concept maps* bleek. Uit het logboek werd duidelijk welke fases uit de onderzoekscyclus lastig waren voor de docentonderzoekers. Docentonderzoekers hadden de meeste moeite met oriënteren, data verzamelen en rapporteren over onderzoeksgegevens.

Al met al kan op basis van de bevindingen uit deze deelstudie worden gesteld dat het uitvoeren van docentonderzoek bijdraagt aan de ontwikkeling van kennis over het doen van onderzoek.

Deelstudie 4: veranderingen in professioneel handelen
Het doel van deze deelstudie is het in kaart brengen van veranderingen in het professionele handelen van docenten als gevolg van het uitvoeren van docentonderzoek. Om na te gaan of dergelijke veranderingen plaatsvinden, is het noodzakelijk om processen van verandering te

begrijpen en te weten welke condities verandering stimuleren. We maakten gebruik van het 'Interconnected Model of Teacher Professional Growth' (IMTPG) van Clarke en Hollingsworth (2002) om de veranderingen in het professioneel handelen van de docentonderzoekers in kaart te brengen. Het model is afgebeeld in Figuur B.
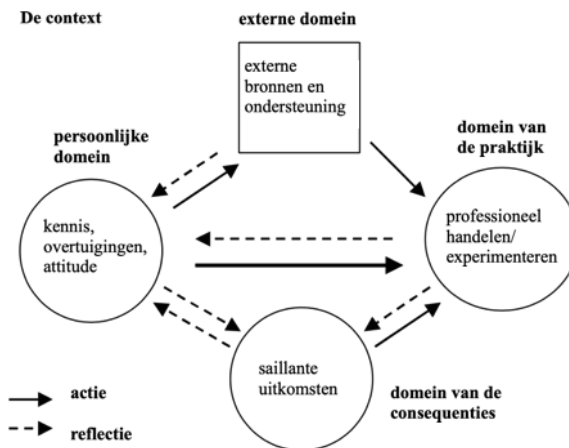
Figuur B Het 'Interconnected Model of Teacher Professional Growth' (Clarke & Hollingsworth, 2002); vertaald naar het Nederlands

Het IMTPG bestaat uit vier domeinen en een omgevingscomponent:

1. Het externe domein (ED) dat alle mogelijke informatiebronnen en ondersteuning omvat
2. Het domein van de praktijk (DP) dat alle vormen van professioneel experimenteren omvat
3. Het domein van de consequenties (DC) waarin zich alle ervaren uitkomsten van het experimenteren bevinden
4. Het persoonlijke domein (PD) waar de kennis, overtuigingen en attitude van docenten thuishoren
5. De omgevingscomponent die de context omvat waarin de veranderingen plaatsvinden.

Clarke en Hollingsworth (2002) geven aan dat een verandering in het ene domein een verandering in het andere domein teweegbrengt.

Het externe domein, oftewel de bron van ondersteuning, was in deze studie het traject Docentonderzoek. Het persoonlijke domein werd in kaart gebracht door vragenlijsten af te nemen bij 102 docentonderzoekers. Docentonderzoekers werd gevraagd aan te geven hoe goed ze onderzoek kunnen doen, hoe belangrijk onderzoek doen volgens hen is, hoe leuk ze onderzoek doen vinden, en of ze de intentie hebben om onderzoek te blijven uitvoeren. De context, ook in kaart gebracht met een vragenlijst, omvat de onderzoekscultuur op school die uit acht aspecten bestaat (zie Ros & Keuvelaar-van den Bergh, 2016) waaronder het gebruik van onderzoekskennis in de school en de mate waarin een professionele dialoog plaatsvindt tussen collega's op school. De docentonderzoekers werden gevraagd naar hun perceptie met betrekking tot de onderzoekscultuur op hun school. In het domein van de praktijk werden, door middel van lesobservaties aan het begin en einde van het traject Docentonderzoek, veranderingen in het professioneel handelen in kaart gebracht. Naast de observaties die we uitvoerden vroegen we ook leerlingen om een vragenlijst in te vullen over het professioneel handelen van de docent. Tot slot vroegen we in een vragenlijst aan de docentonderzoekers naar de consequenties van eventuele veranderingen in hun professioneel handelen.

De resultaten van de observaties laten zien dat het professioneel handelen van de docentonderzoekers op bepaalde vlakken verandert. De docentonderzoekers blijken beter in het creëren van een veilige leeromgeving en in het activeren van de leerlingen. De gevonden verschillen zijn echter niet statistisch significant. De leerlingen merken geen noemenswaardige verschillen op in het professioneel handelen van de docenten, terwijl de meerderheid van de docentonderzoekers wel degelijk vindt dat hun handelen veranderd is door het uitvoeren van praktijkonderzoek. De consequenties van deze veranderingen liggen voornamelijk op het vlak van kennisvermeerdering en nieuwe projecten/producten die zijn ontstaan. Ook zijn docentonderzoekers, naar eigen zeggen, meer enthousiast en meer betrokken in hun lesgeven.

De resultaten van deze studie laten ook zien dat de docentonderzoekers zeer positief reageren op alle aspecten van het persoonlijke domein. Ze schatten hun eigen onderzoeksvaardigheden hoog in, ze geven aan dat ze het doen van onderzoek leuk en belangrijk vinden en ze

uiten de intentie om onderzoek te blijven uitvoeren. Wanneer gekeken wordt naar de resultaten met betrekking tot de context, blijkt dat de onderzoekscultuur op scholen zich gemiddeld genomen nog in een beginstadium bevindt. De docentonderzoekers merken echter op dat de onderzoekscultuur op hun school in ontwikkeling is. Er worden bijvoorbeeld meer beleidsbeslissingen genomen op basis van onderzoeksresultaten, er zijn steeds meer docenten die onderzoek uitvoeren, en er wordt in toenemende mate gereflecteerd op de lessen door docenten.

Al met al lijkt het docentonderzoek het professioneel handelen van de docent te beïnvloeden. Ook lijkt docentonderzoek schoolontwikkeling te bewerkstelligen in die zin dat er sprake is van een (verdere) ontwikkeling van een onderzoekscultuur op de scholen.

Professionele ontwikkeling en schoolontwikkeling
De achterliggende gedachte van het traject Docentonderzoek is dat het doen van onderzoek op school zou bijdragen aan de professionele ontwikkeling van de docent en aan schoolontwikkeling. De resultaten van dit onderzoek ondersteunen deze uitgangspunten. Zeker met het oog op docentprofessionalisering is het uitvoeren van docentonderzoek binnen het traject Docentonderzoek een geschikte aanpak gebleken. De resultaten van ons onderzoek laten zien dat docenten hun onderzoekende houding verder ontwikkelen, dat ze de benodigde kennis en vaardigheden opdoen voor het uitvoeren van docentonderzoek en dat hun professionele gedrag verandert. Een uitdaging is het nog om de voorwaarden te scheppen waaronder docentonderzoek kan bijdragen aan schoolontwikkeling. Ons onderzoek geeft echter eerste indicaties van een dergelijke ontwikkeling, zoals bijvoorbeeld de onderzoekscultuur die zich op veel scholen verder heeft ontwikkeld.

Op basis van deze resultaten kunnen we een aantal aanbevelingen doen voor een effectieve inzet van docentonderzoek voor onderwijsontwikkeling:

· Keuze van onderzoeksthema's: Het onderzoeksthema van de docent moet voortkomen uit een praktijkprobleem dat hij of zij ervaart. Het is van belang dat dit thema past binnen de speerpunten van

de school aangezien het docentonderzoek ook moet bijdragen aan schoolontwikkeling. Een onderzoeksagenda is een geschikt middel om speerpunten per school te formuleren.

· Samenwerking: Het uitvoeren van docentonderzoek is geen individuele aangelegenheid. Het uitwisselen van ervaringen en ontvangen van feedback van collega-onderzoekers en collega's binnen de school bleek waardevol in de succesvolle afronding van het docentonderzoek.

· Cursus onderzoeksvaardigheden: Het is belangrijk dat de docenten scholing ontvangen in het uitvoeren van onderzoek. De begeleiding door externe coaches bleek nodig om te voldoen aan de vereisten voor procesvaliditeit. Een cursus geeft docentonderzoekers bovendien de mogelijkheid om samen te werken.

· Facilitering: Docenten moeten de tijd krijgen om aan het onderzoek te werken. In het traject Docentonderzoek kregen de docenten een lesvrije middag om aan het onderzoek te besteden. Deze afspraak werd vastgelegd in een overeenkomst tussen docent, schoolleiding en AOS.

Al met al hebben de uitkomsten van dit onderzoek en mijn ervaringen gedurende het vijf jaar begeleiden van docentonderzoekers ertoe geleid dat ik overtuigd ben van de meerwaarde van docentonderzoek voor de professionele ontwikkeling van de docent en, hoewel in mindere mate, voor schoolontwikkeling.

BIBLIOGRAFIE

Aarts, R., & Mathijsen, I. (2014). Praktijkonderzoek in de school: Kwaliteit en dilemma's. *Script!*

Admiraal, W., Ben, S., & Zwart, R. (2013). *Academisch docentschap in het basis- en voortgezet onderwijs: Aard en betekenis van onderzoek van docenten naar hun onderwijspraktijk* (411.11.691). Retrieved from https://www.nro.nl/

Anderson, G. L., & Herr, K. (1999). The New Paradigm Wars: Is There Room for Rigorous Practitioner Knowledge in Schools and Universities? *Educational Researcher, 28*(5), 12-40. doi:10.3102/0013189X028005012

Bruggink, M., & Harinck, F. (2012). De onderzoekende houding van leraren: wat wordt daaronder verstaan? *Tijdschrift voor Lerarenopleiders, 33*(3), 46-53.

Clarke, D., & Hollingsworth, H. (2002). Elaborating a model of teacher professional growth. *Teaching and Teacher Education, 18*(8), 947–967. doi:10.1016/S0742-051X(02)00053-7

Cochran-Smith, M., & Lytle, S. L. (1990). Research on Teaching and Teacher Research: The Issues That Divide. *Educational Researcher, 19*(2), 2-11. doi:10.3102/0013189X019002002

Fraser, C., Kennedy, A., Reid, L., & McKinney, S. (2007). Teachers' continuing professional development: contested concepts, understandings and models. *Journal of In-service Education, 33*(2), 153-169. doi:10.1080/13674580701292913

Hattie, J. (2009). *Visible Learning: A Synthesis of Over 800 Meta-Analyses Relating to Achievement*. Abingdon, UK: Routledge.

Leeman, Y., & Wardekker, W. (2010). Verbetert onderzoek het onderwijs? *Tijdschrift voor Lerarenopleiders, 31*(1).

Marzano, R. J. (2003). *What Works in Schools: Translating Research into Action*. Alexandria, USA: Association for Supervision and Curriculum Development

Ministerie van Onderwijs, Cultuur en Wetenschap (2013). *Lerarenagenda 2013-2020: de leraar maakt het verschil*. Retrieved from Den Haag: https://www.delerarenagenda.nl/

Newton, P., & Burgess, D. (2008). Exploring Types of Educational Action Research: Implications for Research Validity. *International Journal of Qualitative Methods, 7*(4), 19-30. doi:10.1177/160940690800700402

OECD. (2009). *Creating Effective Teaching and Learning Environments: First Results from TALIS* Retrieved from http://www.oecd.org/

OECD. (2012). *Does performance-based pay improve teaching?* Retrieved from https://www.oecd-ilibrary.org/

Onderwijsraad. (2013). *Een smalle kijk op onderwijskwaliteit*. Retrieved from https://www.onderwijsraad.nl/

Oolbekkink-Marchand, H. W., van der Steen, J., & Nijveldt, M. (2013). A study of the quality of practitioner research in secondary education: Impact on teacher and school development. *Educational Action Research, 22*(1), 122-139. doi:10.1080/09650792.2013.854175

Ponte, P. (2005). A Critically constructed concept of action research as a tool for the professional development of teachers. *Journal of In-service Education, 31*(2), 273-296. doi:10.1080/13674580500200279

Ponte, P., Ax, J., Beijaard, D., & Wubbels, T. (2004). Teachers' development of professional knowledge through action research and the facilitation of this by teacher educators. *Teaching and Teacher Education, 20*(6), 571-588. doi:10.1016/j.tate.2004.06.003

Ros, A., & Keuvelaar-van den Bergh, L. (2016). *Scan onderzoekscultuur in de school & Interventiekaarten*. Retrieved from

Snoek, M. (2012). Praktijkonderzoek door leraren: Kwaliteit van doel en middel. In R. C. Zwart, K. van Veen, & J. A. Meirink (Eds.), *Onderzoek in de school ter discussie: doelen, criteria en dilemma's* (pp. 19-29). Leiden: Expertisecentrum Leren van Docenten.

Tack, H., & Vanderlinde, R. (2014). Teacher Educators' Professional Development: Towards a Typology of Teacher Educators' Researcherly Disposition. *British Journal of Educational Studies, 62*(3), 297-315. doi:10.1080/00071005.2014.957639

van der Donk, C., & van Lanen, B. (2012). *Prakijkonderzoek in de school*. Bussum: Coutinho.

van der Linden, W., Bakx, A., Ros, A., Beijaard, D., & van den Bergh, L. (2015). The development of student teachers' research knowledge, beliefs and attitude. *Journal of Education for Teaching, 41*(1), 4-18. doi: 10.1080/02607476.2014.992631

van der Rijst, R. M., van Driel, J. H., Kijne, J. W., & Verloop, N. (2008). *Exploring Scientific Research Disposition from the Perspective of Academics*. Paper presented at the National Association of Research in Science Teaching. http://www.ecent.nl/

Zeichner, K. M. (1993). Action Research: Personal renewal and social reconstruction. *Educational Action Research, 1*(2), 199-219. doi:10.1080/0965079930010202

Zeichner, K. M., & Noffke, S. (2001). Practitioner Research. In V. Richardson (Ed.), *Handbook of Research on Teaching* (4 ed., pp. 298-332). Washington, D.C.: American Educational Research Association.

TILBURG DISSERTATIONS IN CULTURE STUDIES

This list includes the doctoral dissertations that through their authors and/or supervisors are related to the Department of Culture Studies at the Tilburg University School of Humanities. The dissertations cover the broad field of contemporary sociocultural change in domains such as language and communication, performing arts, social and spiritual ritualization, media and politics.

1. Sander Bax. *De taak van de schrijver. Het poëticale debat in de Nederlandse literatuur (1968-1985).* Supervisors: Jaap Goedegebuure and Odile Heynders, 23 May 2007.

2. Tamara van Schilt-Mol. *Differential item functioning en itembias in de cito-eindtoets basisonderwijs. Oorzaken van onbedoelde moeilijkheden in toetsopgaven voor leerlingen van Turkse en Marokkaanse afkomst.* Supervisors: Ton Vallen and Henny Uiterwijk, 20 June 2007.

3. Mustafa Güleç. *Differences in similarities: A comparative study on Turkish language achievement and proficiency in a Dutch migration context.* Supervisors: Guus Extra and Kutlay Yağmur, 25 June 2007.

4. Massimiliano Spotti. *Developing identities: Identity construction in multicultural primary classrooms in The Netherlands and Flanders.* Supervisors: Sjaak Kroon and Guus Extra, 23 November 2007.

5. A. Seza Doğruöz. *Synchronic variation and diachronic change in Dutch Turkish: A corpus based analysis.* Supervisors: Guus Extra and Ad Backus, 12 December 2007.

6. Daan van Bel. *Het verklaren van leesgedrag met een impliciete attitudemeting.* Supervisors: Hugo Verdaasdonk, Helma van Lierop and Mia Stokmans, 28 March 2008.

7. Sharda Roelsma-Somer. *De kwaliteit van Hindoescholen.* Supervisors: Ruben Gowricharn and Sjaak Braster, 17 September 2008.

8. Yonas Mesfun Asfaha. *Literacy acquisition in multilingual Eritrea: A comparative study of reading across languages and scripts.* Supervisors: Sjaak Kroon and Jeanne Kurvers, 4 November 2009.

9. Dong Jie. *The making of migrant identities in Beijing: Scale, discourse, and diversity.* Supervisors: Jan Blommaert and Sjaak Kroon, 4 November 2009.

10. Elma Nap-Kolhoff. *Second language acquisition in early childhood: A longitudinal multiple case study of Turkish-Dutch children.* Supervisors: Guus Extra and Kutlay Yağmur, 12 May 2010.

11. Maria Mos. *Complex lexical items.* Supervisors: Antal van den Bosch, Ad Backus and Anne Vermeer, 12 May 2010.

12. António da Graça. *Etnische zelforganisaties in het integratieproces. Een case study in de Kaapverdische gemeenschap in Rotterdam.* Supervisor: Ruben Gowricharn, 8 October 2010.

13. Kasper Juffermans. *Local languaging: Literacy products and practices in Gambian society.* Supervisors: Jan Blommaert and Sjaak Kroon, 13 October 2010.

14. Marja van Knippenberg. *Nederlands in het Middelbaar Beroepsonderwijs. Een casestudy in de opleiding Helpende Zorg.* Supervisors: Sjaak Kroon, Ton Vallen and Jeanne Kurvers, 14 December 2010.

15. Coosje van der Pol. *Prentenboeken lezen* als literatuur. *Een structuralistische benadering van het concept 'literaire competentie' voor kleuters.* Supervisor: Helma van Lierop, 17 December 2010.

16. Nadia Eversteijn-Kluijtmans. *"All at once" – Language choice and codeswitching by Turkish-Dutch teenagers.* Supervisors: Guus Extra and Ad Backus, 14 January 2011.

17. Mohammadi Laghzaoui. *Emergent academic language at home and at school: A longitudinal study of 3- to 6-year-old Moroccan Berber children in the Netherlands.* Supervisors: Sjaak Kroon, Ton Vallen, Abderrahman El Aissati and Jeanne Kurvers, 9 September 2011.

18. Sinan Çankaya. *Buiten veiliger dan binnen. In- en uitsluiting van etnische minderheden binnen de politieorganisatie.* Supervisors: Ruben Gowricharn and Frank Bovenkerk, 24 October 2011.

19. Femke Nijland. *Mirroring interaction: An exploratory study into student interaction in independent working.* Supervisors: Sjaak Kroon, Sanneke Bolhuis, Piet-Hein van de Ven and Olav Severijnen, 20 December 2011.

20. Youssef Boutachekourt. *Exploring cultural diversity. Concurrentie-voordelen uit multiculturele strategieën.* Supervisors: Ruben Gowricharn and Slawek Magala, 14 March 2012.

21. Jef Van der Aa. *Ethnographic monitoring: Language, narrative and voice in a Carribbean classroom.* Supervisors: Jan Blommaert and Sjaak Kroon, 8 June 2012.

22. Özel Bağcı. *Acculturation orientations of Turkish immigrants in Germany.* Supervisors: Guus Extra and Kutlay Yağmur, 3 October 2012.

23. Arnold Pannenborg. *Big men playing football: Money, politics and foul play in the African game.* Supervisor: Wouter van Beek, 12 October 2012.

24. Ico Maly, *N-VA. Analyse van een politieke ideologie.* Supervisors: Jan Blommaert and Sjaak Kroon, 23 October 2012.

25. Daniela Stoica. *Dutch and Romanian muslim women converts: Inward and outward transformations, new knowledge perspectives and community rooted narratives.* Supervisors: Enikö Vincze and Jan Jaap de Ruiter, 30 October 2012.

26. Mary Scott. *A chronicle of learning: Voicing the text.* Supervisors: Jan Blommaert, Sjaak Kroon and Jef Van der Aa, 27 May 2013.

27. Stasja Koot. *Dwelling in tourism: Power and myth amongst Bushmen in Southern Africa.* Supervisor: Wouter van Beek, 23 October 2013.

28. Miranda Vroon-van Vugt. *Dead man walking in Endor: Narrative mental spaces and conceptual blending in 1 Samuel 28.* Supervisor: Ellen van Wolde, 19 December 2013.

29. Sarali Gintsburg. *Formulaicity in Jbala poetry.* Supervisors: Ad Backus, Sjaak Kroon and Jan Jaap de Ruiter, 11 February 2014.

30. Pascal Touoyem. *Dynamiques de l'ethnicité en Afrique. Éléments pour une théorie de l'État multinational.* Supervisors: Wouter van Beek and Wim van Binsbergen, 18 February 2014.

31. Behrooz Moradi Kakesh. *Het islamitisch fundamentalisme als tegenbeweging. Iran als case study.* Supervisors: Herman Beck and Wouter van Beek, 6 June 2014.

32. Elina Westinen. *The discursive construction of authenticity: Resources, scales and polycentricity in Finnish hip hop culture.* Supervisors: Sirpa Leppänen and Jan Blommaert, 15 June 2014.

33. Alice Leri. *Who is Turkish American? Investigating contemporary discourses on Turkish Americanness.* Supervisors: Odile Heynders and Piia Varis, 9 September 2014.

34. Jaswina Elahi. *Etnische websites, behoeften en netwerken. Over het gebruik van internet door jongeren.* Supervisors: Ruben Gowricharn and Sjaak Kroon, 10 September 2014.

35. Bert Danckaert. *Simple present.* Supervisors: Jan Blommaert and Odile Heynders, 29 October 2014.

36. Fie Velghe. *'This is almost like writing': Mobile phones, learning and literacy in a South African township.* Supervisors: Jan Blommaert, Sjaak Kroon and Piia Varis, 3 December 2014.

37. Nico de Vos. *Lichamelijke verbondenheid in beweging. Een filosofisch onderzoek naar intercorporaliteit in de hedendaagse danskunst.* Supervisors: Odile Heynders and Frans van Peperstraten, 16 December 2014.

38. Danielle Boon. *Adult literacy education in a multilingual context: Teaching, learning and using written language in Timor-Leste.* Supervisors: Sjaak Kroon and Jeanne Kurvers, 17 December 2014.

39. Liesbeth Hoeven. *Een boek om in te wonen. De verhaalcultuur na Auschwitz.* Supervisors: Erik Borgman and Maaike de Haardt, 21 January 2015.

40. Laurie Faro. *Postponed monuments in the Netherlands: Manifestation, context, and meaning.* Supervisors: Paul Post and Rien van Uden, 28 January 2015.

41. Snezana Stupar. *Immigrants regulate emotions in the same way as majority members in the Netherlands.* Supervisors: Fons van de Vijver and Johnny Fontaine, 30 January 2015.

42. Jia He. *The general response style from a cross-cultural perspective.* Supervisors: Fons van de Vijver and Alejandra del Carmen Dominguez Espinosa, 4 February 2015.

43. Dorina Veldhuis. *Effects of literacy, typology and frequency on children's language segmentation and processing units*. Supervisors: Ad Backus, Jeanne Kurvers and Anne Vermeer, 1 April 2015.

44. Harrie Leijten. *From idol to art. African objects-with-power: A challenge for missionaries, anthropologists and museum curators*. Supervisors: Wouter van Beek and Paul Post, 15 April 2015.

45. Pelin Onar Valk. *Transformation in Dutch Turkish subordination? Converging evidence of change regarding finiteness and word order in complex clauses*. Supervisors: Ad Backus, Kutlay Yağmur and Massimiliano Spotti, 27 May 2015.

46. Paul Mutsaers. *A public anthropology of policing: Law enforcement and migrants in the Netherlands*. Supervisors: Arie de Ruijter and Jan Blommaert, 12 June 2015.

47. Geertjan de Vugt. *The polit-dandy: On the emergence of a political paradigm*. Supervisors: Odile Heynders and Sander Bax, 23 June 2015.

48. Amit B. Bhansali. *Samkit: Faith - practice - liberation*. Supervisors: John Rijsman and Tineke Nugteren, 1 September 2015.

49. Neema Clementia Murembe. *Women's empowerment and decision-making at the household level: A case study of Ankore families in Uganda*. Supervisors: Sjaak Kroon, Veerle Draulans and Jef Van der Aa, 6 October 2015.

50. Sunarwoto. *Contesting religious authority: A case study on Dakwah radio in Surakarta, Indonesia*. Supervisors: Herman Beck and Jan Blommaert, 10 November 2015.

51. Bryan Monte. *Tiny Zion: Harvest Hills, an intentional Zionic community*. Supervisors: Wouter van Beek and Paul Post, 2 December 2015.

52. Filiz Künüroğlu. *Turkish return migration from Western Europe: Going home from home*. Supervisors: Kutlay Yağmur, Fons van de Vijver and Sjaak Kroon, 10 December 2015.

53. Inez Schippers. *Sacred places in the suburbs: Casual sacrality in the Dutch Vinex-district Leidsche Rijn*. Supervisors: Paul Post and Maaike de Haardt, 14 December 2015.

54. Edegar da Conceição Savio. *Studi sosiolinguistik bahasa Fataluku di Lautém*. Supervisors: Kees van Dijk, Sjaak Kroon and Aone van Engelenhoven, 28 January 2016.

55. Pius Maija Mosima. *Philosophic sagacity and intercultural philosophy: Beyond Henry Odera Oruka*. Supervisors: Wim van Binsbergen and Wouter van Beek, 16 February 2016.

56. Pia Zeinoun. *Personality and culture in the Arab-levant*. Supervisors: Fons van de Vijver and Lina Daouk-Oÿry, 19 February 2016.

57. Primrose Nakazibwe. *'A home without millet is not a home': Women's agency in the maize and millet commodity chains in Mbarara District, Uganda*. Supervisors: Mirjam van Reisen and Francien van Driel, 18 April 2016.

58. Jinling Li. *Chineseness as a moving target: Changing infrastructures of the Chinese diaspora in the Netherlands*. Supervisors: Jan Blommaert, Sjaak Kroon and Kasper Juffermans, 12 September 2016.

59. Lieke Wijnia. *Making sense through music: Perceptions of the sacred at Festival Musica Sacra Maastricht*. Supervisors: Paul Post and Martin Hoondert, 12 September 2016.

60. Caixia Du. *The birth of social class online: The Chinese precariat on the Internet*. Supervisors: Jan Blommaert, Sjaak Kroon and Piia Varis, 12 September 2016.

61. Martijn de Ruijter. *Confining frailty: Making place for ritual in rest and nursing homes*. Supervisors: Paul Post and Wouter van Beek, 16 November 2016.

62. Maria van der Aalsvoort. *Vensters op vakontwikkeling. De betwiste invoering van taalkunde in het examenprogramma Nederlands havo/vwo (1988-2008)*. Supervisors: Sjaak Kroon and Piet-Hein van de Ven, 14 December 2016.

63. Yevgen Matusevych. *Learning constructions from bilingual exposure: Computational studies of argument structure acquisition*. Supervisors: Ad Backus and Afra Alishahi, 19 December 2016.

64. Tom van Nuenen. *Scripted journeys: A study on interfaced travel writing*. Supervisors: Odile Heynders, Ruud Welten and Piia Varis, 21 December 2016.

65. Leonie van der Valk. *Steun zoeken bij Allah. Religiositeit, bidden en religieuze coping van Nederlandse, hoogopgeleide moslima's van Marokkaanse afkomst*. Supervisors: Rien van Uden and Jos Pieper, 21 December 2016.

66. Sandra Wagemakers. *Brabant is here: Making sense of regional identification*. Supervisors: Jos Swanenberg and Arnoud-Jan Bijsterveld, 9 June 2017.

67. Tekalign Nega Angore. *Reconstructing Ethiopia's collective memory by rewriting its history: The politics of Islam*. Supervisors: Herman Beck and Jenny-Louise Van der Aa, 4 December 2017.

68. Maksimus Regus. *Understanding human rights culture in Indonesia: A case study of the Ahmadiyya Minority Group*. Supervisors: Herman Beck and Mirjam van Reisen, 18 December 2017.

69. Derya Demirçay. *Connected languages: Effects of intensifying contact between Turkish and Dutch*. Supervisors: Ad Backus and Jan Blommaert, 21 December 2017.

70. Xuan Wang. *Online and offline margins in China: Globalization, language and identity*. Supervisors: Sjaak Kroon and Ad Backus, 22 December 2017.

71. Merijn Oudenampsen. *The conservative embrace of progressive values: On the intellectual origins of the swing to the right in Dutch politics*. Supervisors: Odile Heynders and Piia Varis, 12 January 2018.

72. Kunming Li. *Capitalization of feminine beauty on Chinese social media*. Supervisors: Jan Blommaert, Sjaak Kroon and Massimiliano Spotti, 7 March 2018.

73. Youssef Azghari. *Participation of young Moroccan-Dutch and the role of social workers*. Supervisors: Fons van de Vijver and Erna Hooghiemstra, 11 April 2018.

74. Mingyi Hou. *Social media celebrity: An investigation into the latest metamorphosis of fame*. Supervisors: Jan Blommaert, Sjaak Kroon and Piia Varis, 23 May 2018.

75. Hua Nie. *Memes, communities and continuous change: Chinese internet vernacular explained*. Supervisors: Jan Blommaert, Ad Backus and Piia Varis, 18 June 2018.

76. Suzanne van der Beek. *New pilgrim stories: Narratives – identities – authenticity*. Supervisors: Paul Post and Jan Blommaert, 18 June 2018.

77. Claudia Carvalho. *Women who run with the wolves: Online stories and roles of Spanish-speaking jihadist women*. Supervisors: Herman Beck and Wouter van Beek, 19 June 2018.

78. Anthony Ong'ayo. *Diaspora organisations, transnational practices and development: Ghanaians in the Netherlands*. Supervisors: Mirjam van Reisen and M. Mawere, 6 February 2019.

79. Esin Aksay Aksezer. *Turkish outbound exchange students' intercultural competencies at different stages of the international sojourn*. Supervisors: Fons van de Vijver and Kutlay Yağmur, 27 February 2019.

80. Jan Verhagen. *Psychiatry and religion: Controversies and consensus*. Supervisors: Rien van Uden and G. Glas, 17 April 2019.

81. Gözde Demirel. *The relationship between acculturation and language development of Turkish immigrant children*. Supervisors: Kutlay Yağmur and Fons van de Vijver, 3 May 2019.

82. Leon Jackson. *Diversity management in the new South Africa: An acculturation approach*. Supervisors: Fons van de Vijver and Kutlay Yağmur, 19 June 2019.

83. Gerrie Strik. *Een plantaardig ademen. Nieuw materialisme in het vroege werk van Hella S. Haasse*. Supervisors: Odile Heynders and Sander Bax, 26 June 2019.

84. İrem Bezcioğlu-Göktolga. *Family language policy among second-generation Turkish families in the Netherlands*. Supervisors: Kutlay Yağmur and Ad Backus, 3 September 2019.

85. Kitty Regina Leuverink. *Teacher research in secondary education*. Supervisors: Sjaak Kroon and Rian Aarts, 26 November 2019.