CHAPTER 6

General conclusions and discussion
1 Introduction

Pre-service teacher inquiry is increasingly required in teacher education worldwide, largely because research literacy is assumed to constitute an important foundation for teachers’ continuous professional development. In the Netherlands, pre-service teacher inquiry became compulsory in the professional bachelor of primary teacher education about ten years ago, as a result of European agreements in the Bologna Process. However, few empirical studies have explicitly investigated what teacher educators and pre-service teachers perceive as the purpose, value and learning outcomes of such research requirements in teacher education programmes at universities of applied sciences. Furthermore, few studies address the relationship of pre-service teacher inquiry with the quality of pre-service teachers’ teaching practice.

The main aim of this thesis is to gain insight into the contribution of pre-service teacher inquiry to self-reported changes in attitude, knowledge/insight, skills and expertise of pre-service teachers, along with improvements in their professional practice. To achieve these underlying goals, we formulated the following research questions:

1. What is the purpose and value of pre-service teacher inquiry in primary teacher education (in intended, implemented and attained curriculum)?

2. How is the development of pre-service teacher inquiry competences implemented in teacher education programmes?

3. What are the most important perceived and actual learning outcomes from pre-service teacher inquiry?

4. What are the relationships among pre-service teacher’s perceptions, quality of pre-service teacher inquiry and teaching quality?

These research questions guided us along the various perspectives of the teacher education curriculum. The curriculum model of Van den Akker (2003) formed the framework of analysis (see Figure 1.1, p. 11), which also is reflected in the presentation of the main findings. We conducted a document analysis to explore the descriptions of pre-service teacher research and inquiry in the ideal and the formal curriculum of primary teacher education (Chapter 2). To analyse the implemented curriculum, we used perceptions of teacher educators and pre-service teachers in the Netherlands and
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Melbourne, Australia (Chapters 3 and 4). We gained insights into the perceived and actual learning outcomes, as part of the attained curriculum, through questionnaires, focus groups and assessment scores regarding teaching quality and quality of the pre-service teacher inquiry (Chapters 3, 4 and 5).

This final chapter begins with an overview of the main findings and conclusions and then turns to a discussion regarding a selection of these findings and an elaboration of the scientific contribution of this thesis. We continue with the most important limitations and recommendations for future research and end with implications for practice.

2 Main findings

Pre-service teacher inquiry in the curriculum of primary teacher education

The goal of the document analysis of Chapter 2 was to gain insight into the described purpose and value of pre-service teacher research and inquiry in the intended curriculum, divided into ideal and formal curricula, of primary teacher education in the Netherlands. Nineteen institutes (>75%) participated by sharing their vision in policy documents about pre-service teacher research and programme descriptions, including teaching activities and assessment rubrics. The findings show that the main purpose and value of pre-service teacher inquiry is to develop an inquiry stance (in Dutch, onderzoekend vermogen). Through this analysis, we defined an inquiry stance as ‘the ability to conduct practitioner research and to use it to improve one’s own professional practice through the integration of research knowledge, research skills, an inquiry habit of mind, and the ability to apply previous findings in practice’. The initial literature review resulted in four pre-service research competences, but the document analysis brought to light six related inquiry competences these institutes required to develop an inquiry stance: (1) research knowledge (e.g., methodology); (2) knowledge about current research in the discipline; (3) research skills, including analysing problems related to practice, undertaking literature reviews, collecting and analysing data and communicating results; (4) ability to apply findings from previous research to practice; (5) an inquiry habit of mind in conducting research (e.g., being curious about and critical toward previous research) and (6) an inquiry habit of mind in practice (e.g., being curious about and alert to pupils’ change in behaviour, wanting to share experiences of own educational practice). Although the last competence is mentioned as one of the goals of pre-service teacher research in 70% of the policy documents, it is hardly
described in teaching activities or in the assessments regarding pre-service teacher research. Reasons for this omission may include its intangible nature, which makes it difficult to assess, and that it is implemented and assessed in the practical component at primary schools.

Analyses of the formal curriculum show that the implementation of pre-service teacher inquiry, in teaching activities and assessment rubrics, mostly focuses on research skills, though the development of an inquiry stance, including an inquiry habit of mind, is intended. No institute for primary teacher education in the Netherlands intends to educate researchers, but the method of assessment, a research report with a scoring rubric, is not fully aligned with this intention. As a result, pre-service teachers might not associate pre-service teacher inquiry as something that can give them a better understanding of their pupils’ learning and improve their teaching in the classroom, but only as a capstone assignment or a separate activity for researchers.

Perceptions of the purpose, value and implementation of pre-service teacher inquiry
To gain insights into the role of pre-service teacher inquiry in the implemented and experienced curriculum, we investigated perceptions of teacher educators and pre-service students in the Netherlands and Australia (Chapters 3 and 4) using a survey and focus groups. We compared their perceptions about the purpose and value with the intended development of inquiry competences.

The findings show that both pre-service teachers and teacher educators, in the Netherlands as well as in Australia, believe that pre-service teacher research and inquiry leads to better teachers. One of the most important reasons mentioned was the experience that undertaking inquiry empowers pre-service teachers. This empowerment is already apparent during the inquiry project: pre-service teachers specialise in a certain topic and feel the need to share their theoretical and practical findings and to initiate dialogues about education with colleagues. In doing so, they perceive that they are being taken more seriously and treated as a full and professional colleague. After completing the inquiry project, they felt empowered to discuss school policy, using findings of previous research with the aim to improve practice. Pre-service teachers exhibited a positive perception of and attitude toward pre-service teacher inquiry: they believe it is important and interesting and a good way of achieving professionalisation. Most pre-service teachers experienced feelings of frustration during their inquiry project, because for many it was ultimately the most demanding component of teacher education. Nevertheless, all pre-service
teachers noted that they learned how to conduct practitioner inquiry. Teacher educators suggest that the pride, which pre-service teachers express after completing the inquiry project, is partly caused by the difficulties they experienced during the inquiry process. “No friction, no shine!” Despite the positive attitude towards pre-service teacher inquiry, at least one-third of the pre-service teachers do not intend, or expect, to conduct practitioner inquiry in their future jobs as teachers.

Pre-service teachers perceive that the programme focuses on research skills, whereas teacher educators tend to believe it encompasses a broader inquiry habit of mind. Few pre-service teachers in our study were able to identify teaching activities that had stimulated their inquiry habit of mind, though teacher educators mentioned various examples from their own teaching practices. The pre-service teachers indicated some key factors for successful implementation of pre-service teacher inquiry in the programme, such as a clear teaching-learning trajectory and good supervisors. The link to practice and the opportunity to focus on a self-chosen topic during the inquiry project are important motivators.

**Perceived and actual learning outcomes of pre-service teacher inquiry**

The last study from this thesis (Chapter 5) focuses on the relationship among perceptions, teaching quality and the quality of pre-service teacher inquiry. We used the assessment scores on the final internship and the scores on the inquiry project of 650 pre-service teachers as indicators for the quality of teaching and inquiry. Our finding of a significant positive correlation between scores on pre-service teacher practice and scores on pre-service teacher inquiry prompted us to further explore this relationship. To gain deeper insight into the perceived and actual learning outcomes, the attained curriculum, we examined pre-service teacher profiles defined by teaching quality and inquiry quality.

The learning outcomes of pre-service teacher inquiry perceived to be the most important differ for various pre-service teacher profiles (we categorised students in four such profiles): the high achievers report characteristics of an inquiry habit of mind to be the most important learning outcome, the good practitioners mention knowledge of specific subjects, the average students report research skills, and the low achievers mention application of findings in practice. The high achievers understand the purpose and value of pre-service teacher inquiry that is intended in the curriculum. Students in other profiles show less understanding of the recursive nature of the inquiry process—that teaching is a process driven by questions and continuously responsive to the data of practice.
3 General conclusion

Both pre-service teachers and teacher educators endorse the value of pre-service teacher inquiry; in short, for pre-service teachers the added value of pre-service teacher inquiry is empowerment. For many for the first time in their education to become a teacher, they feel empowered in the sense of becoming more aware, having more understanding and control of their teaching practice and a stronger sense of agency. In general, empowered teachers are curious and critical; they have learned not to follow educational fads, methods or school policy slavishly; know how to use and apply research to own educational settings; and want to share findings from practitioner inquiry that aims to improve practice. Moreover, we found a positive correlation between the quality of inquiry and the quality of teaching, which requires further research into underlying factors and processes. Following the curriculum model of Van den Akker (2013), we note room for improvement: the most important purpose of pre-service teacher inquiry in the intended curriculum, an inquiry habit of mind, is only recognised as such by the high achievers. To develop the inquiry stance and produce more inquiry-based working teachers, teacher educators should emphasise the development of an inquiry habit of mind and the alignment between the purpose of pre-service teacher research and teaching activities including assessments in their communications with students.

4 Discussion

For about ten years, pre-service teacher inquiry has been a compulsory component of the curricula of universities of applied sciences in the Netherlands as a result of European agreements. Previously, universities of applied sciences were mainly focused on education, and a research culture was lacking (Geerdink et al., 2015; Griffioen, 2013; Van der Linde et al., 2012). To introduce inquiry in the curricula, the universities of applied sciences copied research teaching activities and forms of assessment from research universities, emphasising the qualification aspect, characterised by assessments of knowledge and skills about conducting research. This approach to pre-service teacher inquiry reached a new height during national accreditation in 2015, which focused on capstone projects. Introducing pre-service inquiry in the teacher education programmes of universities of applied sciences also had downsides, such as a delay in graduation, even for students who showed good teaching skills. Another
problem was that teacher educators had difficulties in supervising pre-service teacher inquiry. During this time, most teacher educators had no experience in conducting or supervising research activities and were recruited because of their teaching qualities (Geerdink et al., 2015). Why pre-service teacher inquiry had become compulsory and if this led to better teachers were not clear.

**Pre-service teacher research or inquiry**
The distinction between research and inquiry (Reid, 2004), as described in the introduction, was quite relevant for primary teacher education in the professional bachelor’s degree programmes. The aim of Dutch primary teacher education programmes is to educate pre-service teachers to become practitioners who use intentional and systematic methods as a learning strategy to inquire into their own practice (Borko et al., 2007; Cochran-Smith et al., 2009). The aim is not to educate them to become researchers. Pre-service teachers should ideally be driven by curiosity and knowledge about an educational problem in a particular context to improve their own educational practice (Jacobs et al., 2015). The use of a variety of quantitative and qualitative research methods and scientific, international literature, as well as a contribution to the knowledge base of educational research, elements of academic research, is not a requirement. Therefore, the professional bachelor's degree programme for primary teacher education should focus on pre-service teacher inquiry, not on research. We insist to use the Dutch term *praktijkonderzoek* as the formal definition for inquiry in documents concerned.

**Developing an inquiry stance**
As mentioned previously, the aim of pre-service teacher research or inquiry in teacher education is to educate teachers with an inquiry stance (Cochran-Smith & Lytle, 2009) to become curious and critical teachers whose work is inquiry based (Baan, Gaikhorst & Volman, 2018; Toom et al., 2010; Uiterwijk-Luijk et al., 2019). Pre-service teacher inquiry represents a professional learning strategy intended to improve the teaching practice by focusing on student learning and systematic adaptations of teaching to students’ needs using scientific knowledge (Dana & Yendol-Hoppey, 2014; Dobber et al., 2012). Introducing the development of *an inquiry stance* in a teacher education programme is much more complicated than teaching and assessing an *inquiry as project*, which treats inquiry as a time-bound activity (Cochran-Smith et al., 2009). By requiring a research report, as capstone, the teacher education programme ensures that pre-service teachers view pre-service teacher inquiry as a project. Therefore,
average pre-service teachers focus on precisely meeting the requirements and rubric of the research project. They are encouraged to gain a procedural understanding of inquiry, rather than making inquiry an integral part of their teaching practice. To develop an inquiry stance, inquiry should be genuinely promoted as a disposition, a way of knowing about teaching and learning, that is integrated into all teaching activities and assignments, including the professional experience period, rather than a procedural activity to complete the programme (Cochran-Smith et al., 2009).

**Developing inquiry competences in primary teacher education**

Although the inquiry competences distinguished herein are intertwined in practice, the distinction among the competences is functional with regard to teaching and learning related to pre-service teacher inquiry and developing an inquiry stance. In Chapter 3 (Figure 3.1, p.37), we adapt Healey and Jenkins's (2009) model with the inquiry competences that emerged in the document analysis, and we describe teaching and learning activities that literature identifies as effective in engaging pre-service teachers in inquiry and developing inquiry competence (e.g., Aspfors & Eklund, 2017; Munthe & Rogne, 2015; Schulz & Mandzuk, 2005; Van der Linde et al., 2015). Teacher educators mentioned examples of their teaching activities, referring to all inquiry competences in all four quadrants of the model. Thus, the intended and implemented curricula contain elements of the four main types of undergraduate engagement with research and inquiry, which is desirable (Healey & Jenkins, 2009).

Pre-service teachers, however, typically do not recognise teaching activities in the research-tutored quadrant that have stimulated or developed their inquiry habit of mind. They were more likely to mention activities in the research-based quadrant (e.g., the capstone inquiry project) but suggested a minor role of teacher educators during these learning activities. Some pre-service teachers mentioned that they experienced a lack of technical and practical training in research methodology (research-tutored and research-oriented activities). All indicated the importance of good supervisors who have research knowledge and experience and skills to motivate during the capstone project.

To stimulate and develop the inquiry habit of mind, pre-service teachers should practice with argumentation, decision making and justification while problem solving (Toom et al., 2010). Working in pairs, with critical friends, or communities of practice improves critical reflection (Dobber et al., 2012; Van der Linden et al., 2010). The use of Lesson Study in pre-service teacher education might contribute to the development of the inquiry habit of mind as well, because it involves collaborative
inquiry (e.g., Bjuland, & Mosvold, 2015; Leavy & Hourigan, 2016; Næsheim-Bjørkvik, Helgevold & Østrem, 2019). The organisation of formal conferences, in which pre-service teachers present their inquiries to peers, teacher educators, teachers and school board members can stimulate sharing of findings and involve schools in inquiry projects (Schulz & Mandzuk, 2005).

**Relationship between quality of pre-service teacher inquiry and teaching**

We found a positive relationship between pre-service teacher inquiry and teaching practice (Chapter 5). Given the correlative nature of this part of the study, any causality remains obscure; however, the qualitative focus group data confirm a relation between pre-service teacher inquiry and teacher quality. In addition, we are aware that we used data only from one university of applied sciences. Nevertheless, the perceived learner outcomes, as connected with the pre-service teacher profiles, show that pre-service teacher inquiry attributes improve educational practice. Because of the complex nature of education and the number and variety of factors influencing professional development of pre-service teachers, a specifically designed study is called for to measure the actual impact of pre-service teacher inquiry on teaching practice. A closer assessment of into this relationship could be beneficial for the improvement of teacher education. In our study, we measured the teaching quality and pre-service teacher inquiry quality using single assessment scores. Relationships between specific teaching competences, such as instructional skills, and specific inquiry competences, such as knowledge about research in the domain or inquiry habit of mind in practice, are not studied. Future research into these specific relationships and networks of factors is highly relevant for a careful evaluation and adaptations of teaching activities in the programme. It would provide deeper insights into the development of an inquiry stance. We advocate a proper experimental setup, across multiple institutes for primary teacher education, in which a sub-set of the most relevant factors identified here is controlled for and assessment scores are specific for each aspect of the teaching and inquiry competences.

**Intended use of inquiry competences in the future profession**

One of the aims of introducing research education in bachelor programmes is that the graduated professional will use the inquiry competences in their future profession (Griffioen, 2018). Although the questionnaires indicated that pre-service teachers were generally positive about the effects of undertaking pre-service teacher inquiry on their future jobs, in the focus groups they admitted that they did not expect to
continue conducting practitioner research. This finding is similar to Griffioen's (2018) study about Dutch students in a professional bachelor's degree programme. Kowalczuk-Wałędziak et al. (2019) and Volk (2010) also found little evidence that learned research skills and knowledge were used in the teaching profession after completing teacher education. Using the data of the focus groups with teacher educators and pre-service teachers in the Netherlands and Australia (Chapters 3 and 4), we unravelled three main reasons for this disconnect:

1. the expectation that newly qualified teachers will focus on teaching—and not on practitioner inquiry—during their induction periods, which is in line with concepts of professional development of early career teachers (e.g., Fuller, 1969; Louws, Van Veen, Meirink & Van Driel, 2017). This focus, however, does not totally contradict an inquiry stance.

2. the formal way pre-service teacher inquiry is taught and assessed (e.g., having to write a literature review, a proposal and a report), which can be time-consuming and demanding (Kowalczuk-Wałędziak et al., 2019; Maaranen, 2009; Reis-Jorge, 2007).

3. the lack of research culture and knowledge in most primary schools (Gitlin, et al., 1999; Yuan & Burns, 2017). Pre-service teacher respondents in our study indicated that they would prefer to work in school contexts in which other colleagues share an inquiry habit of mind. Van den Bergh, Ros, Vermeulen and Rohaan (2017) show a positive relationship between teachers’ inquiry experience during teacher education and the self-assessment of several aspects of their inquiry habit of mind and literature use, which are part of the research culture in primary schools. The growing number of teachers with research or inquiry experience from bachelor's and master's degree programmes might influence this research culture and the teachers' intention to conduct practitioner inquiry in the next decade.

Despite these hurdles to conducting practitioner inquiry in the future profession, newly qualified teachers need not consider them a problem as long as they can use inquiry competences or show an inquiry stance. The research culture in the school will determine the expression and further development of the inquiry stance of newly qualified teachers. Ownership in relation to the teaching approach and the role of the school leader seem to be most important (cf. Baan et al., 2018).
5 Scientific contribution

This dissertation contributes to the existing body of knowledge on pre-service teacher research and inquiry. First, the focus on pre-service teacher inquiry in primary teacher education, that is, a bachelor's degree programme, is unique. Ample research on practitioner research and inquiry in various countries focuses on in-service teachers (e.g., Cochran-Smith & Lytle 2009; Sachs, 2016; So, 2013), teacher educators (e.g., Jacobs et al., 2015; Tack & Vanderlinde, 2014) or pre-service teachers in post-graduate programmes (e.g., Aspfors & Eklund, 2017; Darling-Hammond, 2017; Råde, 2019; Toom et al., 2010). However, few studies focus on teaching pre-service teacher inquiry competences to students in a professional bachelor's degree programme, such as in our context (e.g. Dunn et al., 2008; Munthe & Rogne, 2015). Our findings confirm to a large extant results in post-graduate and in-service contexts.

Second, although practitioner research and inquiry is assumed to constitute an important foundation for teachers’ future professional development (e.g. BERA-RSA, 2014; Sachs, 2016), the relationship between the quality of pre-service teacher inquiry and the quality of the teaching practice has not been explored. Previous research rarely takes the quality of pre-service teacher research assessed by teacher educators or researchers into account; rather, studies are more typically based on self-reporting methods such as questionnaires and interviews (e.g., Aspfors & Eklund, 2017, Kowalczyk-Wałędziak et al., 2019; Niemi & Nevgi, 2014; Van der Linden et al., 2015). In addition, learning outcomes of pre-service teacher research in previous studies are based on self-reports. As mentioned previously, little empirical research on the impact of the specific pedagogies of teacher education, including actual learning outcomes of pre-service teachers, has been conducted (Van Veen, 2013). This dissertation offers additional scientific value by examining the correlation between the quality of inquiry and the quality of teaching and identifying four profiles of pre-service teachers using empirical methods. Third, this dissertation fills a knowledge gap in the perceived and actual learning outcomes of the introduced pre-service teacher inquiry and in the alignment of the purpose and value of it in intended, implemented and attained curriculum.
6 Limitations and suggestions for future research

To foster an accurate interpretation of the presented findings, we acknowledge some limitations of our studies. A first limitation is the generalisability of the results. We focused mainly on teacher education for primary schools in universities of applied sciences in the Dutch context and two samples from Melbourne in Chapter 4. The Dutch universities of applied sciences do not have a long research tradition, which is reflected in the limited research experience of the teacher educators and students. In addition, the Dutch universities of applied sciences focus on practice. Therefore, this study is not meant to be representative for all teacher education institutes, teacher educators or pre-service teachers in general. The generalisability could be enhanced by a comparison of the programme and its learning outcomes of pre-service teacher research and inquiry in secondary teacher education and teacher education in research universities. A curriculum study on the development of an inquiry stance in teacher education at research universities might shed light on the value of pre-service teacher research in academic settings and the learning outcomes. Thus far, studies addressing learning outcomes of pre-service teacher research in Dutch research universities are scarce and are mainly small-scale (e.g., Vrijnsen-de Korte et al., 2012). Although pre-service teachers in Dutch research universities are assumed to have more experience with research in a specific domain, their attitude toward pre-service teacher research appears not to be as positive as our findings (cf. Westbroek & Kaal, 2016). Reasons for this might simply be the time pressure to become a teacher. The teacher education curriculum at research universities is limited to a single year, which can lead to a perceived urgency to focus on teaching skills instead of research.

A second limitation of the studies reported in this thesis is a bias in participation. All pre-service teachers who participated had (almost) completed their capstone inquiry project, and some of those students were delayed due to their inquiry project. Perceptions of students who decided to quit before graduation were, however, not available and therefore could not be included in this study. Although this group is relatively small (<5%) and the reasons to quit vary widely, some members of this group might have quit because of the high demands of the pre-service teacher inquiry project. Their perceptions of pre-service teacher inquiry would not have influenced our main findings, but they could have contributed insights into the implementation of pre-service teacher inquiry and curriculum improvement. Therefore, we suggest involving exit evaluations of students who did not graduate in future research.
The third limitation is that the significant, positive relationship between pre-service teacher inquiry and teaching found in Chapter 4 is small and based on assessment scores from just one university of applied sciences. Repeating this method in other institutes of teacher education or using a proper experimental setup (as described previously) would increase the reliability of the findings.

This research examined a changing system, meaning that we gained insights into existing processes and correlations, while realising that the programmes and implementation of pre-service teacher inquiry are not carved in stone. Since the introduction of pre-service teacher inquiry, universities of applied sciences have evaluated and adapted their teacher education programmes regarding pre-service teacher inquiry. However, although teacher educators have professionalised and obtained more experience with the supervision of pre-service teacher inquiry, teachers with any experience in research or inquiry are still a minority in primary schools. Van den Bergh et al. (2017) nonetheless show that such teachers contribute to a culture of inquiry by their inquiry habit of mind and intention to use literature. Because of a growing number of teachers with pre-service teacher inquiry experience, we expect a change in research culture in primary schools, and possibly an increase of teachers who work in an inquiry-based manner. Perceptions of teachers and teacher educators in primary schools regarding pre-service teacher inquiry and the impact of these perceptions on the professional development of pre-service teachers would be worthwhile to examine as a follow-up study. School leaders and teachers can use several approaches to stimulate inquiry-based working in their schools to influence a research culture (Uiterwijk-Luijk et al., 2019). Continued research related to the impact of pre-service teacher inquiry on inquiry-based work of teachers and the research culture in primary schools should be longitudinal. We recommend future research on the inquiry stance of early career teachers, demonstrated by the application and development of inquiry competences over time.

The question of how to develop an inquiry stance of future professionals is important for not just teacher education but also for other professional bachelor’s degree programmes in the Netherlands, such as nursing education, hotel management or physiotherapy, that are struggling to implement inquiry competences in a meaningful way. Therefore, we also recommend research into curriculum development and implementation of teaching and learning activities regarding an inquiry stance in other institutes of universities of applied sciences.
7 Implications for practice

Pre-service teacher inquiry, a form of practitioner research, which aims to understand and improve practices in the (pre-service) teacher’s (educator’s) own context (Borko et al., 2007), is not only the focus of this study; indeed, this dissertation has a similar focus, in that we examined the first author’s own context (though in a broad sense), who is a teacher educator at one of the participating institutes for primary teacher education. Throughout this study, we have gained a deeper understanding of pre-service teacher inquiry, and our findings suggest three main implications for practice.

The first implication concerns aspects of curriculum design for development of an inquiry stance during teacher education and beyond. The main aspect is coherence in the various components of the programme. Overall constructive alignment among intended learning outcomes, teaching activities and assessment regarding an inquiry stance is important. Assessment should be focused not only on research knowledge and research skills but also and especially on characteristics of an inquiry habit of mind. Other forms of assessment than an inquiry report with a scoring rubric could be designed to show growth in the development of the integrated inquiry competences, the inquiry stance. The development of an inquiry stance should begin in the first year, or even on the first day, of teacher education by encouraging wondering and critical thought about children and educational practice. The inquiry stance provides and captures the lenses through which pre-service teachers learn to view and generate knowledge that guides practice (Cochran-Smith, 2009). Attention to inquiry competences, including an inquiry habit of mind, should be part of every course and all fieldwork experiences. For the development of the inquiry stance, a continuous interaction between existing knowledge and practice is essential; experiences from practice feed intentions and directions to deepen personal and professional knowledge. Increasing knowledge about educational concepts stimulates application of previous findings in practice. Drawing on our insights, we designed a model (Figure 6.1). In this model for curriculum design, improvement of practice and development of an inquiry stance reinforce each other and contribute to the development of personal and professional identity of pre-service teachers. The lemniscate illustrates the infinite nature of continuous professional development that is, lifelong learning (looking forward to being able to improve and looking back to be able to apply insights from others). Improvement of practice, above the ‘waterline’, is more tangible than the development of an inquiry stance and can be measured in various ways, such as observation of teaching skills and assessment of designed lessons. Improvement of
practice corresponds to an increase in task complexity, autonomy and responsibility. Development of an inquiry stance can be visualised by diving deeper. This development is evident in, for example, the type and depth of the questions pre-service teachers pose or the literature they use to substantiate their choices and validate their practice.

![Diagram](6.1.jpg)

**Figure 6.1** The lemniscate model for curriculum design of teacher education, in which improvement of the teaching practice (reaching higher) and development of an inquiry stance (diving deeper) contribute to development of personal and professional identity (PPI) of pre-service teachers by continuous interaction.

The pre-service teacher profiles described in Chapter 5 are visible in the model. High achievers take the largest loops for improvement of practice and development of an inquiry stance. Good practitioners will not reach the same depth ‘beneath the waterline’ as the high achievers but do ultimately take the loop in improvement of practice. Academic pre-service teachers, as described in Baan et al. (2019), have the potential to dive deeper and to show more methodological rigor in their practitioner research or inquiry.

This model may be more widely applicable; for example, we assume the development of personal and professional identity to continue in induction programmes for early-career teachers. Other professional bachelor’s degree programmes at universities of applied sciences in the Netherlands, as well as postgraduate teacher education in research universities, experience the same tension in
the assessment of research projects and the intention to develop an inquiry stance aiming to improve practice and professional development. The model in Figure 6.1 might be transferable to these institutes of higher education. In those cases, specific application and description of levels of required inquiry competences and appropriate indicators for improvement of practice could be designed.

The second implication concerns teacher educators implementing teaching activities to stimulate the development of pre-service teachers’ inquiry stance. Teacher educators should explicitly emphasise the intangible elements of inquiry, such as developing an inquiry habit of mind, in their communications with students more often. They should instigate curiosity, stimulate critical thinking and enable sharing of findings to improve practice. For example, a small-scale inquiry project for pre-service teachers about stimulating the inquiry habit of mind in children could provide the opportunity to deepen the concept of an inquiry habit of mind for these teachers and for them to reflect on the characteristics of their own inquiry habit of mind.

To achieve the intended coherence, all teacher educators must engage in frequent and ongoing dialogue about the purpose and value of pre-service teacher inquiry and its implementation. For appropriate feedback to pre-service teachers on the development of the inquiry competences, teacher educators require an in-depth understanding of inquiry versus research, knowledge about previous steps, about the intended ultimate learning outcomes and about possible next steps. Thus, they need insight into teaching activities to develop the inquiry stance throughout the entire programme, not just their own course. Furthermore, continuous professional development of teacher educators is required in their own inquiry stance and the supervision of pre-service teacher inquiry, including calibration sessions regarding assessment on development of the inquiry stance.

Reinforcing the culture of inquiry in primary schools is the third implication. In the Netherlands, a minority of primary schools were subsidised to combine practitioner research with the education of pre-service teachers for the purpose of school development (so-called academic primary schools). The connections of academic primary schools with teacher education institutes are better and the inquiry culture is more developed than regular primary schools (Van den Bergh et al., 2017). Reinforcement of the culture of inquiry in regular primary schools, and schools under pressure because of educational challenges, might improve the quality of education in the Netherlands. Networks between institutes for teacher education and primary schools focused on professionalisation of (pre-service) teachers, and improvement of
education by conducting practitioner research and inquiry together, might play an important role. The current Dutch policy tends to stimulate networks of universities and primary schools in which pre-service teachers are being educated, which means a widening of the supported target group. These networks can choose their own focus. In these days with many vacancies due to a shortage of teachers, primary schools might choose fast choices and quick solutions to educate pre-service teachers. Instead, a shared vision on the development of an inquiry stance and the culture of inquiry in the school is required for long-term improvement and a shift to inquiry-based working. Most important is the room for curiosity, sharing of findings and dialogue about educational improvement. More structured time for professional development of teachers by practitioner inquiry will increase the status of the profession and will attract more and different types of pre-service teachers. After graduation, the newly qualified teachers should be supported in building practical experience by induction programmes. After three to five years of teaching experience, all teachers should have the opportunity to engage in practitioner research or inquiry in professional learning communities, in which teacher colleagues and teacher educators participate with the aim to improve practice. Primary schools should stimulate teachers who want to continue academic professionalisation (and are capable of doing so) and maybe even obtain a master’s degree. These teachers can be of added value to the professional learning communities and the reinforcement of the culture of inquiry.

The profiles we found indicate that teacher education could focus on a differentiated approach to educating pre-service teachers depending on their capability of and interest in conducting practitioner research and inquiry. ‘Good practitioners’ as well as ‘high achievers’ are necessary; all should be able to develop their inquiry stance in different ways, which can lead to different functions within schools. The combination of high requirements and possibilities for specialisation in teacher education and in primary schools will support lifelong learning and make the profession more attractive, which could in turn lead to a greater and more varied population of students and to more empowered teachers.

To conclude, in contrast to the intuitive expectation that pre-service teachers experience pre-service teacher inquiry as a burden and do not value inquiry, this study showed that most of them feel empowered because it gives them a broader framework and therefore understanding of their own teaching reality. So, as a teacher education pedagogy aimed at educating good and lifelong learning teachers, pre-service teacher inquiry is a very powerful one.