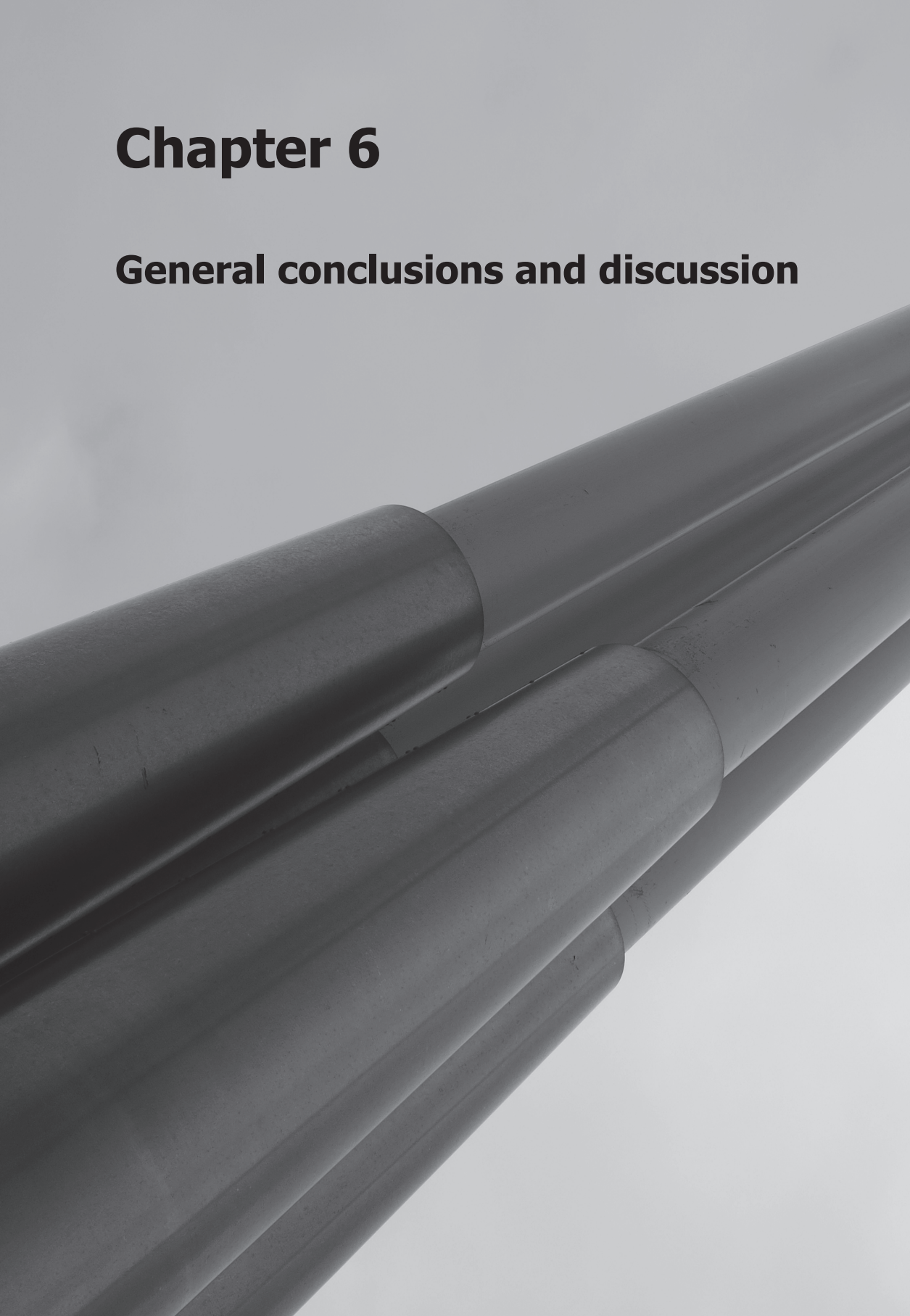
Chapter 6

General conclusions and discussion



6. General conclusions and discussion

6.1 Brief overview

The central aim of this thesis was to provide insights into student engagement within research in medical education which specifically aims to foster knowledge development through conducting research and to use of research findings to enhance patient care. Student engagement in research was purposefully chosen in order to reflect students' active involvement in a diversity of ways in which research is integrated into teaching. Student engagement in research in this dissertation is conceptualised as promoting student learning through research practices, which is facilitated by how students perceive research to be integrated into teaching, as well as student beliefs regarding the value of research for both learning and professional practice (cf. Trowler, 2010). To identify good practices and areas in need of improvement within the learning environment, student engagement in higher education in general has been considered an appropriate focus (e.g., Coates, 2010). Indeed, student perceptions of the learning environment provide a reliable picture of the integration of research into teaching (e.g., Visser-Wijnveen, van Driel, van der Rijst, Visser, & Verloop, 2016) and they play a crucial role in promoting student learning outcomes (Biggs, 1985; Prosser & Trigwell, 1999). Student perceptions of research integration are related to student beliefs regarding research and learning, in the sense that beliefs filter student perceptions of the learning environment (Pajares, 1992).

Given that the concepts of student perceptions and student beliefs are often used in close relation to each other (Pajares, 1992), both were carefully operationalised and contextualised in this study (see Chapter 1). The concept of student perceptions refers to ways in which students experience elements of research through teaching activities. Student beliefs regarding the relevance of research actually refer to two types of beliefs. First, to the belief about the extent to which research stimulates student learning, (i.e., beliefs regarding the relevance of research to learning). Second, to the belief about the extent to which students emphasise the role of research in their future professional practice (i.e., beliefs regarding the relevance of research to practice). Student perceptions and beliefs were examined in relation to teaching practices including supervision practices within students' research projects and an undergraduate programme in medicine striving to strengthen the role of research within teaching.

Four studies were conducted in order to address the central theme of the dissertation, namely: Strengthening the role of research integration in order to promote student engagement in research. The central aim of the studies presented in Chapters 2 and 3 was to improve our understanding of student research practices integrated into the study programme in the context of a curriculum change. The study presented in Chapter 4 was designed to explore student learning outcomes. The interview study presented in Chapter 5 reported on how novice supervisors stimulate student learning during students' research projects.

In this chapter, the main findings of the four studies are combined so as to draw general conclusions about student engagement in research in higher education. These general conclusions can be categorised into conclusions concerning: a) the role of the study programme in student perceptions of the integration of research into teaching and student beliefs regarding the relevance of research and learning outcomes; b) relations between perceptions, beliefs and learning outcomes; c) associations between student learning outcomes and research integration; and d) teaching practices stimulating student learning. The strengths and limitations of this thesis are considered and suggestions are offered for further studies into the integration of research into university teaching in general. This chapter concludes with recommendations for three key stakeholders in higher education, namely educational directors, academic developers and teachers.

6.2 Main findings

6.2.1 First study

What is the influence of authentic research practices, integrated into the study programme in the context of a curriculum change, on student perceptions of research in teaching and on student beliefs regarding the relevance of research for practice and learning during the course of undergraduate medical education?

A longitudinal study was conducted in order to investigate student perceptions of research integration within the study programme and their beliefs regarding the relevance of research to both practice and learning. The context of the study was a curriculum change that aimed to strengthen research integration. Authentic research practices involved in every year of the study programme in the previous and the changed curricula were described using a framework for authentic learning (Rule, 2006). The description of the authentic elements within research practices particularly highlighted student engagement with professional practice within student research practices. In order to understand the role of such authentic aspects within student research practices three successive cohorts of undergraduates participated in this study. In total, 941 medical students completed the Student Perceptions of Research Questionnaire (adapted from Visser-Wijnveen, et al., 2016 also see Appendices 1 and 2). Over the course of the undergraduate programme, the students perceived stronger participation in research, stronger motivation for research and a more critical reflection on research findings, especially after the curriculum change. In addition, the data indicated that students' familiarity with staff research increased over their years of study. This was explained by authentic research practices that not only demonstrated tangible aspects of research integration to students (i.e., student participation), but also provided scope for modelling intangible aspects such as creating enthusiasm for research and promoting reflection on research findings (e.g., Neumann, 1994). The description of the research practices suggests that student learning could benefit from the fostering of discourse among learners and promoting student choice in terms of research practices. The findings suggest that the perceived relevance of research to practice is less strongly related to the curriculum than student perceptions of research within teaching. In the previous curriculum student beliefs regarding the relevance of research to learning decreased slightly over time, while when following the changed curriculum students found research to be more stimulating towards the end of the undergraduate programme.

6.2.2 Second study

What is the influence of a curriculum change placing a strong emphasis on research integration into the first-year medical study programme on student learning outcomes, especially student products and test scores within the domain of research?

This study built upon the first study by comparing both student perceptions of research and student learning outcomes between two curricula, namely a changed curriculum that aimed to strengthen research integration and a previous curriculum. A focus on the first undergraduate year was chosen, since studying in a research environment within a university was a relatively new experience for first-year students, while it was thought that teachers may consider undergraduates to not yet be ready yet to engage in research (Brew, 2010; Zamorski, 2002). Within the changed curriculum, the first-year students participated as researchers in a student research project related to an early clinical experience in nursing homes. Within both the changed and the previous curricula, the first-year undergraduates also participated in an ECG-practical in which they collected data, conducted statistical analysis and wrote a research report. For the purpose of this study two batches of 50 reports per curriculum were rated blindly and anonymously by six trained raters using a scoring rubric. In order to understand the effect of the curriculum change on student research-related learning outcomes, the students' research reports from both curricula were compared. In addition to the reports, data were collected concerning the students' scores on the research-related items in a national progress test. The difference in the scores for the research reports as well as the research-related items on the progress test were statistically significant in favour of the changed curriculum, since the students who followed the changed curriculum wrote better research reports. The results of this study hence suggest that strengthening research integration had a positive effect on first-year students' research-related learning outcomes, particularly on their written research reports and items on a national progress test.

What is the influence of a curriculum change placing a strong emphasis on research integration into the first-year medical study programme on student perceptions of research in teaching and on student beliefs regarding the relevance of research for practice and learning?

In this study, the perceptions of research integration of 261 students who followed the previous curriculum and 485 students who followed the changed curriculum were collected using a questionnaire (the SPRIQ). In line with the findings from the first study, the students who followed the changed curriculum perceived stronger participation in research, stronger motivation for research, a more critical reflection on research as well as being more familiar with staff research. No differences were found between the two curricula with regards to student beliefs regarding the value of research for future practice and the perceived quality of the learning environment. A critical reflection on research was experienced the most strongly in both curricula, followed by familiarity with current research and motivation for research. The perception scores concerning participation in research were the lowest of all the scales for both the previous and the changed curricula. The results from this study suggest that a curriculum change that aims to strengthen research integration on a large scale not only contributes to stronger perceptions of research in various ways, but also to specific, research-related learning outcomes, especially during the first year of medical education.

6.2.3 Third study

To what extent are student achievement, specifically grade point average, and student beliefs regarding the importance of research related to ways in which students perceive research in the first year of undergraduate medical education?

This study, which only involved students who followed the previous curriculum, used the SPRIQ to examine the relationship between student achievement and student perceptions of the integration of research into medical education SPRIQ. The students' grade point average (GPA) was chosen to reflect student achievement and provide an insight into the extent to which students' GPA reflects the research intensity of a study programme. The respondent group consisted of 261 first-year students. All the first-year students have participated in an ECG-practical in which they collected data, conducted statistical analyses and wrote a research report. The data suggests that student beliefs regarding the value of research for future practice are more strongly related to student achievement than perceptions of research within teaching and beliefs regarding research promoting current learning. The student perceptions of research integration were closely related to each other, indicating that the adapted version of SPRIQ used measures several aspects of perceived research integration as a concept within medical education. The students clearly recognised research throughout their courses and find it stimulating for their learning and important for professional practice. Student motivation for research within teaching was strongly related to their familiarity with current research and their beliefs regarding the value of research for both learning and future practice. A moderate correlation was found between student achievement and first-year students' motivation for research.

6.2.4 Fourth study

How do supervisors foster student learning in students' research projects in medical bachelor and master education and what is the relation between research supervision practices and the dilemmatic space in which novice supervisors negotiate research supervision?

This study focused on novice supervisors' approaches to research supervision as they explored their practices and experienced difficulties when supervising students. Twelve stimulated recall interviews were conducted with supervisors of students' research projects in the health sciences, either in the bachelor's or master's phases. The interviews took place immediately after an individual student-supervisor meeting. The analyses of the interview transcripts revealed five practices used by novice supervisors to stimulate student learning: (1) fostering motivation; (2) giving directions; (3) promoting knowledge construction; (4) thinking along; and (5) creating student awareness (see Appendix 5). In addition to supervision practices, the supervisors mentioned the actors involved in the student research project, namely themselves, the student and others. Further, the supervisors mentioned their concerns regarding the planning of the project as well as the aims of research supervision. An additional analysis was conducted, using the interview transcripts in order to explore the concept of a dilemmatic space within the data. This additional analysis revealed four kinds of dilemmas that may influence research supervision practices, namely questions regarding regulation,

student needs, the student-supervisor relationship and supervisors' professional identity (see Appendix 4). The practices that promote knowledge construction and giving the student directions were described by the supervisors across the four kinds of dilemmas. Within fostering student regulation as a dilemmatic space it was found that supervisors were mainly giving the student directions. Fostering motivation was reflected in fragments in which the supervisors indicated that they experienced dilemmas with regard to student regulation, the difficulties of interpreting student needs and the difficulties of maintaining the student-supervisor relationship. Dilemmas regarding the supervisors' professional identity were related to their aims when they are supervising students.

6.3 General conclusions

The studies presented in this dissertation were concerned with improving student engagement in research. Chapters 2 and 3 presented studies concerning student perceptions of research integration and their beliefs regarding the relevance of research in relation to the study programme. Chapters 2 and 3 both related to student engagement by providing insights into how relevant the students found the integration of research into the study programme to be (cf. Trowler, 2010). Chapter 3 also focused on improving student learning outcomes as an aim of student engagement in general (Pascarella, Seifert, & Blaich, 2010). Chapters 3 and 4 present findings regarding the learning outcomes that are directly (i.e., test items, student products) and indirectly (i.e., student achievement) related to student engagement in research. Findings from previous studies suggest that student achievement is strongly related to student engagement in learning activities in general (Kuh, Kinzie, Schuh, & Whitt, 2005; Pascarella & Terenzini, 2005). Student engagement is generally based on the assumption that learning is influenced by participation in purposeful learning activities (e.g., Coates, 2005). In line with this notion, Chapter 2 reported on research integration practices within study programmes, while Chapter 5 described novice supervisors' supervision practices. Chapters 4 and 5 focused on student engagement in research at the level of teaching and learning. As a result, partial conclusions can be drawn from each chapter. The general conclusions are categorised into conclusions in relation to the study programme, teaching practice, student beliefs and perceptions, and student learning outcomes, with a view to gaining a comprehensive understanding of the fostering of student engagement in research within university teaching at the meso and micro levels. Further, the general conclusions are presented and related to results from previous studies.

6.3.1 Study programme

A study programme that places a stronger emphasis on research integration, incorporating student research practices in professional contexts, can promote various aspects of student engagement in research: (1) critical reflection on research findings; (2) familiarity with staff research; (3) student motivation for research; (4) student participation in research; and (5) research-related student learning outcomes (Chapter 2 and 3). Student perceptions of research integration depend more on the study programme than student beliefs regarding the relevance of research do, particularly student beliefs regarding the relevance of research to professional practice (Chapters 2 and 3). When the study programmes were compared, it was found that students who followed a study programme with a stronger emphasis on research integration held stronger beliefs about the relevance of research to student learning (Chapters 2 and 3). In general, students may perceive stronger research integration towards the end of their undergraduate education, for instance, in individual undergraduate research projects (e.g., Healey, et al., 2010). Previous studies concerning research integration have identified various factors that influence student perceptions of research, emphasising the nature of disciplines, research cultures within institutes, course characteristics, ways in which teachers shape relations between research and teaching and students' abilities and motivation (Levy & Petrulis, 2012; Lindsay, Breen, & Jenkins, 2002; Neumann, 1994; van der Rijst, et al., 2013; Visser-Wijnveen, et al., 2010). Findings from previous studies indicate that the effective integration of research into the curriculum is based on factors such as students' roles in learning activities, the breadth and depth in of the promotion

of student understanding of research, current research practices within institutes and the expected learning outcomes (Healey & Jenkins, 2009; Zimbardi & Myatt, 2014). The findings discussed in Chapters 2 and 3 suggest that the study programme contributes to student engagement in research from the first year onwards. Furthermore, the findings from the studies presented in Chapters 2 and 3 indicate that student engagement in research is promoted through the connections made between research, teaching and professional practice within the study programme.

6.3.2 Teaching practices stimulating student learning

The academic staff's support of students during the conducting of research projects (Chapter 5) as well as in the learning activities related to (1) internships in nursing homes, (2) the ECG-practical, (3) the critical appraisal of drug advertisements, and (4) the critical appraisal of patient problems all shared similar characteristics a certain extent. Findings from a previous study indicate that course characteristics, such as the use of staff research, a focus on the researcher's dispositions, students conducting research projects, students following in the teacher's footsteps and student participation in the teacher's research all contribute to student knowledge about research, as well as their research skills, dispositions and awareness (Visser-Wijnveen, et al., 2012). To illustrate this point, we used a characterisation of different ways in which academic staff link research and teaching within courses as described in a recent publication by Visser-Wijnveen et al. (2012). The students' research projects and the learning activities related to professional settings both shared a focus on the teachers' research disposition, since both aimed for the students to deepen their understanding of the medical discipline by teaching them to be critical and to adopt an independent stance in a debate. For example, the supervisors of students' research projects thought along with the student and created awareness on the part of the students about what underpinned researchers' decisions (Chapter 5). Likewise, the students were taught to be critical regarding how claims are made in drug advertisements (Chapter 2). In addition, both of the students' research projects, for example, the ECG-practical, provided opportunities for the students to practise their research

skills (Chapter 4 and 5). The students' research projects, unlike the other learning activities, provided the students with an environment in which they can follow in the footsteps of a researcher participate in the teacher's research (e.g., Visser-Wijnveen, et al., 2012). Despite the differences between the students' research projects and the learning activities related to professional practice, both focus on the students as learners and it is assumed that students' research capabilities will develop as they progress through the teaching they receive. The findings from the studies presented in this thesis suggest that teaching practices that make the relevance of research explicit to students mainly focused on the use of staff research, reflections on previous research findings and fostering motivation for research (Chapters 4 and 5). The findings from Chapters 4 and 5 particularly emphasise the importance of intangible aspects of research integration (in this case, critical reflection on research, student motivation for research and familiarity with staff research) rather than tangible aspects (i.e., participation in research) (e.g., Neumann, 1994) in terms of fostering student engagement in research, although the learning activities within the study programme were particularly designed to actively involve students as participants in research. On the matter of student engagement in research, the findings presented in Chapters 4 and 5 support the assumption that research integration should focus on both tangible and intangible aspects of research integration in order to benefit student learning within medical education.

6.3.3 Student perceptions and beliefs

Findings from previous studies concerning student perceptions of research suggest that students perceive both benefits and disadvantages of research integration (e.g., Healey, et al., 2010; Neumann, 1994). On the one hand, a strong focus on staff research may lead to a narrow representation of the field at the expense of the students' own interests (Healey, et al., 2010; Lindsay, Breen, & Jenkins, 2002; Neumann, 1994). On the other hand, students appreciate the staff's enthusiasm for their research, intellectually challenging research assignments and being taught up-to-date information (Healey, et al., 2010; Neumann, 1994; Robertson & Blacker, 2006). Several studies have drawn attention to student perceptions

of the benefits of research integration, including student participation in research, student motivation for research, familiarity with current research and reflection on research findings (Neumann, 1994; Robertson & Blackler, 2006; Turner, et al., 2008; Visser-Wijnveen, et al., 2016). However, previous studies have mainly focused on students in a range of disciplines from various years of study (Neumann, 1994; Robertson & Blackler, 2006; Turner, et al., 2008; van der Rijst, 2013; Visser-Wijnveen, et al., 2016), while integrating research into teaching in a way that is accessible to first-year students in particular can prove challenging (Robertson & Bond, 2001; Turner, et al., 2008). The results from the study presented in Chapter 4 suggest that first-year student perceptions of research integration within medical education mainly involve a critical reflection on research findings, motivation for research and familiarity with staff research. Student participation was less strongly perceived by first-year students. These results add to the findings of previous studies concerning hard-pure and soft-pure disciplines, indicating that students mainly familiarise themselves with the research interests of their own teachers (Biglan, 1973; van der Rijst, Visser-Wijnveen, Verloop, & van Driel, 2013; Visser-Wijnveen, van Driel, van der Rijst, Verloop, & Visser, 2010). Student perceptions of research integration can be influenced by their beliefs regarding the relevance of research to both learning and practice (Robertson & Blacker, 2006). The findings of the studies in this dissertation suggest that student beliefs regarding the relevance of research to learning are more strongly related to their perceptions of research integration than their beliefs regarding the relevance of research to practice (Chapters 2, 3 and 4). This finding adds to the findings of a seminal paper on beliefs regarding teaching and learning, which indicates that general beliefs regarding teaching and learning are closely related to perceptions of teaching and learning (Pajares, 1992). Previous research findings indicate that students consider research stimulating for their learning (Healey, et al., 2010; Neumann, 1994; Robertson & Blackler, 2006; Turner, et al., 2008). In addition to student beliefs regarding the relevance of research to learning, the studies presented in Chapters 2, 3 and 4 place an emphasis on student beliefs regarding the relevance of research for practice in the context of hard-applied sciences. The findings presented in Chapters 2 to 4 indicate that students did not place more importance on research in relation to practice after participating in research practices that are closely connected to research, teaching, and professional practices, and which stressed the relevance of various approaches used to engage students in research.

6.3.4 Student learning outcomes

Student engagement in research was chosen as the focus of this thesis in order to emphasise the variety of ways used to actively involve students in disciplinary research through teaching. The concept of student engagement in general can be used to monitor good practices within institutes as well as to identify opportunities for improvement (Coates, 2010; Kuh, 2009). Student engagement in higher education research in general correlates positively with student learning outcomes as represented by their grade point average (GPA) and retention rates (Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008). In this dissertation, student engagement in research was explored by investigating student perceptions of research in relation to the curriculum, student beliefs regarding the relevance of research and student learning outcomes (Chapters 3 and 4). A comparison was made between a previous curriculum and a changed curriculum using specific research-related learning outcomes (i.e., test items and student research reports; Chapter 3). The findings from the studies presented in Chapters 3 and 4 indicate that students' context- and discipline-specific student learning outcomes, including student research products and research-related test items, were a stronger indicator of student engagement in research within a study programme than generic student achievement (e.g., GPA; Chapters 3 and 4). The results reported in Chapter 4 suggest weak correlations between student perceptions of research integration and their GPA, whereas a changed curriculum intended to strengthen research integration into teaching contributed to specific research-related student learning outcomes (Chapter 3).

6.4 Strengths and limitations

6.4.1 Strengths

6.4.1.1 Various research designs and instruments

The first three studies included in this dissertation extend insights derived from previous studies into student perceptions, beliefs and learning outcomes in the particular context of a curriculum change. This combination of variables in two comparative studies (Chapters 3 and 4) provided insights into the influence of a curriculum change on both the perceived and the learned curriculum (e.g., van den Akker, 2006). Furthermore, the longitudinal design used in the study presented in Chapter 2 provided an opportunity to describe multiple research practices during the course of an undergraduate programme. Most importantly, a longitudinal study design was more likely to capture any changes in student beliefs regarding the relevance of research to learning and practice than a design focused on a one-off data collection, due to the robust, though not unchangeable, nature of beliefs (Mezirow, 1997; Pajares, 1992).

In contrast to the quantitative instruments used in the first few chapters, the study presented in Chapter 5 used interviews to provide an example of how ideas derived from research into teaching apply into the context of higher education within the medical domain. The use of several instruments serves to enhance the quality of research into higher education, since every instrument has its own biases and strengths, which complement each other and contribute to an understanding of complex phenomena such as student engagement in research and ways to foster student engagement in research (e.g., Miles & Huberman, 1994). In the study reported in Chapter 5, stimulated recall interviews were conducted in which supervisors described the practices they use in order to stimulate student learning. Using this technique, the researcher elicited the supervisors' reflections on their supervision practices in supervisor-student interactions. These interviews therefore helped novice supervisors to reflect on their supervision practices (e.g., reflective practice; Schön, 1987).

The variety of variables and instruments used in the studies presented in this dissertation originated from a desire to look beyond the boundaries of fields or disciplines when investigating student engagement in research. The findings of previous studies suggest that research into higher education could benefit from an interdisciplinary approach to investigating complex phenomena from various perspectives using a variety of instruments (Kandlbinder, 2013; Tight, 2014). The studies presented in this thesis provide examples of how ideas derived from higher education, medical education and teacher education can improve our understanding of student engagement in research.

6.4.2 Limitations

6.4.2.1 Nature of data collection

Some issues might limit the conclusions derived from the studies in this dissertation. These limitations particularly concern the nature of the data collection. The studies presented in Chapters 2, 3 and 4 relied partly on student perceptions of the learning environment and their beliefs regarding the relevance of research. The questionnaire used in this thesis explicitly asked students to report on their motivation for research, the quality of the learning environment and the extent to which they believed research to be relevant to learning and practice, which left little room for the researcher to probe or explore the student perceptions of research in specific teaching units.

In order to obtain more in-depth findings regarding student perceptions, beliefs, learning outcomes and practices, it is fruitful to triangulate the student data with information concerning teaching practices in contexts in which research is explicitly integrated. Chapter 5 reports on information obtained from stimulated recall interviews conducted with novice supervisors. Generally speaking stimulated recall techniques can prove valuable for tasks that are relatively new to teachers, since it can be expected that not much routinisation has taken place (e.g., Verloop, 1989). After the interviews, two supervisors indicated that it was difficult for them to reflect on their actions when the researcher seemed reticent, which could have hampered the verbalisation of their thoughts.

6.4.2.2 Generalisability

The studies in this dissertation were conducted within a single research-intensive

university medical centre, which may limit the generalisability of the findings. Nevertheless, the results from the questionnaire data are partly based on student perceptions of research integration in multiple teaching units taught by multiple teachers. In addition, all Dutch medical university study programmes are based on the same set of standards and learning goals (NFU, 2009). Furthermore, both medical and biomedical departments of Leiden University and the Leiden University Medical Centre participated in the interview study. The conclusions therefore primarily concern the medical discipline in research intensive universities in the Netherlands.

The sample included in the interview study was relatively small, which is typical of most qualitative studies. The results were based on a sample of eleven supervisors who voluntarily participated and who were interested in improving their research supervision practices. The number of supervisors involved in the study described in Chapter 5 is close to the point at which it can be assumed that limited new categories would emerge from the data (Guest, Bunce, & Johnson, 2006).

6.5 Implications

6.5.1 Recommendations for future research

6.5.1.1 Engagement in research in professional practice

The studies included in this thesis were based on the ultimate goal of student engagement in research in medical education, namely the integration of research into professional practice in order to improve patient care. The focus on student perceptions and learning outcomes in Chapters 3 and 4 was chosen in line with national and international frameworks for medical education which define knowledge about research and a positive research attitude as desirable learning goals (AAMC, 1998; GMC, 2015; NFU, 2009). Furthermore, both perceptions and learning outcomes can promote long-term outcomes, particularly when connections are made between prior and current learning experiences through teaching (e.g., Ashwin & Trigwell, 2012). The student perceptions and beliefs

regarding research presented in Chapter 2 were obtained at three particular moments in time, all within the undergraduate programme. Hence, the study does not provide insight into how engagement in research develops across the transition to professional practice. For example, how do novice medical doctors integrate research into their professional role? How and why do beliefs regarding the relevance of research to professional practice change during and after the transition to professional practice? An identity perspective would prove helpful in answering these questions (e.g., Kluijtmans, de Haan, Akkerman, & van Tartwijk, 2017). An example of this would be a longitudinal study following the participants of the studies included in this dissertation into clinical practice. It is important to obtain insights into relations between medical professionals' engagement in research and patient care, by means of exploring factors that could support successful integration of research into the clinical profession. Examples of these factors include academics' professional identities, their teaching activities and their beliefs regarding fostering engagement in research within professional practice (Law, Wright, & Mylopoulos, 2016; van Lankveld, et al., 2017).

6.5.1.2 Student engagement in research in other disciplines

This section summarises the most relevant suggestions for further research on student engagement in research in other disciplines. First, student engagement in research in this thesis consisted of student perceptions of the integration of research into teaching in medicine. Student perceptions of research integration in the humanities, sciences and medicine can be understood in terms of student motivation for research, their familiarity with staff research, a critical reflection on research products and their participation in research in relation to university teachers' intentions and courses (van der Rijst, Visser-Wijnveen, Verloop, & van Driel, 2013; Vereijken, van der Rijst, de Beaufort, van Driel, & Dekker, 2016; Visser-Wijnveen, van der Rijst, & van Driel, 2016). To deepen our understanding of student engagement in research, a next step would be to explore relations between the actual time, effort and other resources invested by both students and teachers in research integration activities and student perceptions of research integration in various disciplines, preferably measured in terms of observations and logbooks (e.g., Trowler, 2010).

Second, the studies described in Chapters 2, 3 and 5 provide us with a sense of how research integration activities are organised within study programmes and show that research integration involves multiple disciplines within the medical domain. After all, the undergraduate research practices required the collaboration of academics from various departments. The studies in this dissertation focused on student outcomes stemming from the way in which research integration activities are organised rather than from the design and implementation processes themselves. Still, based on the notion that there are several ways for teachers to collaborate and engage in professional learning which influence the effectiveness of teaching approaches and study programmes, it could be important to focus further studies on learning processes that result from university teachers' collaborations in promoting student engagement in research (Harden, 2000; Kwakman, 2003; Steinert, et al., 2008). For example, how do university teachers learn from and with each other in the design and implementation of courses that aim to foster student engagement in research? What are relations between outcomes of professional learning, in terms of course implementation and design, and student engagement in research? It would be interesting to study these issues in the context of curriculum development within medicine and other disciplines, using instruments that facilitate teachers' critical reflection on both collaboration and professional learning (e.g., Schön, 1983).

6.5.2 Practical implications

6.5.2.1 Implications and recommendations for study programmes

A well-considered design of the study programme is needed to foster student engagement in research. Throughout undergraduate education, research integration practices can be designed in such a way that students obtain as many learning opportunities as possible and become acquainted with a broad variety of research practices during their studies. The examples described in Chapters 2, 3 and 4 of this thesis present a variety of ways of strengthening research integration within the study programme, with the aim being that students gradually develop individual competencies in conducting research. For student engagement in research to be fostered, the students need to experience a variety

of research activities, modelled and guided by the teachers. These include student participation in research, their critical reflection on research findings, the staff creating enthusiasm for research and familiarising their students with their own research. The findings of a recent study suggest that this is also the case for hard-pure and soft-pure disciplines (Visser-Wijnveen, van der Rijst, & van Driel, 2016), which indicates that educational directors and programme managers in higher education institutions, should strive to facilitate a broad variety of research within their institutions. They should aim to incorporate this research into teaching in order to provide students with ample opportunities to engage in a wide variety of research approaches within their discipline and to prevent the study programme from only showing students a narrow representation of the field.

A next step in curriculum development in order to take student engagement in research further would be to promote coherence in curriculum design. The findings from the study presented in Chapter 2 suggest the importance of focusing development initiatives on fostering student beliefs regarding the relevance of research to future practice. This requires the design of study programmes to facilitate students' integrative experiences in research in addition to the rather fragmented student research practices contained within courses. In designing a curriculum, attention should be paid to helping students relate their learning experiences gained from research practices to the use of research in professional settings. This could be achieved, for example, by fostering students' reflections on prior learning experiences at the beginning of each student research project and by using a portfolio or blogs for students to promote their reflections and strengthen connections between learning experiences in research and learning experiences in clinical settings (e.g., Howitt & Wilson, 2016).

The findings from the studies presented in Chapters 2, 3 and 4 indicate that student perceptions of research integration, context- and discipline-specific student learning outcomes can be used to provide an indication of the research-intensiveness of a study programme. For example, a tangible aspect of research such as students' perceived participation in research can be reliably measured using the SPRIQ and then sensibly interpreted in relation to a study programme. In addition to student perceptions, the findings from the studies reported in

Chapters 3 and 4 indicate that, compared to student achievement (GPA), student products and research-related test items can be a helpful source of information for decision-making. The implication of this is that dialogues within higher education institutes concerning student engagement in research in study programmes should be based on student perceptions of research in teaching in combination with specific research-related learning outcomes rather than on the GPA. Examples of specific research-related learning outcomes include student products such as reports and essays. A next step would be to adapt the learning activities towards the desired and specific learning outcomes, for example, by thinking about the student in the role of a researcher. As a starting point, the descriptions of student research practices given in Chapters 2 and 3 could be used.

6.5.2.2 Implications and recommendations for teaching

The findings from the studies presented in Chapters 2 and 3 indicate that student beliefs regarding the importance of research are rather stable but not unchangeable over time. This puts the emphasis on the idea of challenging students' beliefs regarding the relevance of research in order for student engagement in research to reach its full potential. This could be achieved by encouraging students to develop integrated ideas about the value of research for practice. Teaching could hence focus on encouraging students to reflect on their consciously and unconsciously held beliefs regarding the importance of research at the beginning of research-intensive courses. Encouraging students to make their ideas about research within the discipline explicit and compare their ideas to explanations given by researchers and professionals would be a practical way for teachers and supervisors to take students' presuppositions about the use of research in professional practice into account. Furthermore, doing so would inform teachers about how to guide their students towards the desired learning outcomes in research-intensive courses.

The findings of the studies presented in this thesis indicate that components of student engagement in research are related to the study programme (Chapters 2 and 3), to each other (Chapters 3 and 4) and to a dilemmatic space experienced by academics when attempting to stimulate student learning in research practices (Chapter 5). For this reason, it might prove profitable to gear professional development initiatives for teachers and supervisors during the process of curriculum change towards promoting student engagement in research. In order to strengthen student engagement in research through supervision, professional development initiatives should focus on both experienced and novice supervisors as well as on concrete experiences when supervising students, so as to foster reflections on teaching practices, desired learning outcomes and student perceptions and beliefs regarding research. It might be beneficial to design professional development initiatives to help supervisors make connections between specific situations and broader principles of research supervision. Such initiatives could also help supervisors to learn from student understanding by looking at supervisor-student interactions. In practice, this could be done in a series of training sessions in which supervisors reflect on their practices using video recordings of student-supervisor interactions that compel them to discuss difficulties and alternatives for action. In addition, the study programme should be involved in research supervision training. For example, by encouraging supervisors to analyse the learning goals of courses within the undergraduate curriculum that are intended to prepare students for their research projects, which should improve their understanding of students' learning paths.

6.6 Final comments

Student engagement in research in medical education aims to foster two main outcomes, namely to teach students how to conduct research aimed at developing knowledge and to teach students how to incorporate research into clinical care by means of the critical appraisal of research findings. The findings from the studies in this thesis suggest that the promotion of positive outcomes, such as student beliefs regarding the relevance of research to professional practice, mainly involves using staff research, reflections on previous research products and fostering motivation for research. The results indicate that student engagement in research in medical education is promoted through a diversity of approaches to integrating research into the medical study programme, including promoting

student participation in research, familiarity with staff research, motivation for research and critical reflection on research findings within undergraduate education. These approaches serve to improve specific, research-related student learning outcomes. It is generally assumed in higher education that strong connections between research and teaching are a valuable means of preparing students to function well as professionals as well as enabling them to appraise the role of academic research in complex, professional practices (e.g., Brew, 2003; 2010). The findings from the studies presented in this dissertation support this notion, indicating that integrating actual research into learning activities promotes student engagement in research during their undergraduate education. Particularly in medical education, it is not yet evident how connections between medical research and patient care can be strengthened (e.g., Roberts, Fischhoff, Sakowski, & Feldman, 2012). Student research practices in undergraduate medical education provide a starting point for promoting student engagement in research, although these research practices need to be continued during later phases of their medical education (i.e., specialist training). Further research is needed to investigate how beliefs regarding research and research competencies develop during both medical education and the transition to medical professional practice.