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Research assignments in teacher education - Norwegian undergraduate student teachers' experiences of the writing process

Abstract
The aim of Norway's reformed teacher education programme is to educate research-literate teachers who are able to integrate research-based knowledge into classroom experiences. Based on this, the aim of the present study was to gain deeper insight into student teachers' experiences of working on their research and development (R&D) assignments in order to obtain a better understanding of the process from their perspective. More specifically, their experiences of working on the R&D assignments before, during and after the writing process were investigated through essays. Data were collected from 59 informants from two teacher education institutions, and 137 essays were analysed in line with a thematic analytical approach. The student teachers' experiences of working on the R&D assignments were related to two themes: a positive and challenging process, and research and teacher relevance. In line with these themes, the R&D assignments should be organised so as to provide enough support for student teachers alongside the appropriate tools for managing the research task. Furthermore, R&D assignments within teacher education can be seen as a route towards connecting research and practice and further developing research-literate teachers.

Keywords: Teacher education, research-based teacher qualification, research and development assignment, student teachers' experiences

Forsknings- och utvecklingsarbete inom lärarutbildning – Lärarstuderanders erfarenheter av skrivprocessen

Sammendrag
Målet med den reformerade lärarutbildningen i Norge är att utbilda forskningskunniga lärare som kan integrera forskningsbaserad kunskap med klassrumserfarenheter.

Utgående från detta är syftet med denna studie att identifiera sätt att utforma Forsknings- och utvecklingsarbetet (FoU oppgave) på så att det upplevs som värdefullt av lärarstuderande och förbereder dem på att vara forskningskunniga deltagare i de lärandegemenskaper de möter som professionella lärare. Mer specifikt undersöks lärarstuderandes erfarenheter av Forsknings- och utvecklingsarbetet före, under och efter skrivprocessen utgående från deras skrivna essäer. Data insamlades från totalt 59 lärarstuderande från två olika lärarutbildningsinstitutioner och deras skrivna essäer (totalt 137 texter) analyserades med en tematiskt analys. Lärarstuderandes erfarenheter av Forsknings- och utvecklingsarbetet kunde beskrivas med två övergripande teman; en positiv och utmanande process, samt forsknings- och lärarrelevans. Studiens resultat visar betydelsen av att lärarutbildningen ger tillräckligt stöd till lärarstuderande under skrivandet av Forsknings- och utvecklingsarbetet samt användbara redskap för att klara av forskningsuppgiften. Vidare kan Forsknings- och utvecklingsarbetet inom lärarutbildningen ses som en möjlighet att koppla samman forskning och praktik i syfte att utbilda forskningskunniga lärare.

Nøkkelord: Lärarutbildning, forskningsbaserad kvalifikation, forsknings- och utvecklingsarbete, lärarstuderandes erfarenheter

Introduction

In recent years, the importance of developing high-quality teacher education and educating professional teachers who are able to meet current requirements and change their roles in accordance with the circumstances has been highlighted (Darling-Hammond & Hyler, 2020). The relationship between theory, research and practice in teacher education has been widely discussed in the international literature. For example, a recent special issue of the *European Journal of Teacher Education* brought the themes together in order to consider their interconnections and the tensions among them (Menter & Flores, 2020). Regarding the relationship between research and practice, attention has been drawn to research-based teacher education, although it is still somewhat unclear what this means in different contexts and countries (Alvunger & Wahlström, 2018; Baan et al., 2019, 2020; Puustinen et al., 2018; Steele, 2018).

In one Norwegian study, teacher educators and student teachers defined a research-based teacher education as the degree to which teacher educators are involved in research and have first-hand research experience (Munthe & Rogne, 2015). They also included other aspects, such as the student teachers' academic reading and writing, their learning and discussion of the research literature, their learning about research methods and their ability to apply these methods to their own projects. The ongoing discussion on research-based teacher education (Cordingley, 2015; Darling-Hammond, 2016) and our interest in educating highly professional science teachers is the background of this article, which is part of the TRELIS project (Teachers' Research Literacy for Science teaching). The project aims to prepare research-literate science teachers who are able to integrate

research-based knowledge with classroom experience to develop rich science learning opportunities for pupils.

Research-based teacher education can be characterised by both implicit and explicit aspects (Aspfors & Eklund, 2017). The implicit aspect encourages the development of student teachers' critical reflection abilities and the systematic scrutiny of their daily work. The explicit aspect refers to specific research activities in teacher education programmes, whereby they conduct independent studies using scholarly methods for scientific theses and participate in research methodology courses and activities (Eklund et al., 2019). Along similar lines, Tatto and Furlong (2015) suggested that research can contribute to teacher education in four ways: (1) the content can be informed by research-based knowledge, (2) the design and structure can be informed by research, (3) teachers and teacher educators can be equipped to engage with and become consumers of research, and (4) teachers and teacher educators can be educated to do their own research. Furthermore, they propose that schools could become research-rich environments, which means that researchers and teachers would work in partnership rather than conducting their work as entirely separate entities.

Aim of the study

This article focuses on the explicit aspect of research-based science teacher education (Aspfors & Eklund, 2017) and, more specifically, on a research assignment in an undergraduate teacher education programme. Student teachers undertake their own research through a research and development (R&D) assignment, which relates to the fourth aspect outlined by Tatto and Furlong (2015). The overall aim of this article is to gain a deeper insight into their experiences with working on their R&D assignments to obtain a better understanding of the process from their perspective. Three research questions were addressed:

1. How do student teachers view working on their R&D assignments?
2. What do they learn from writing their R&D assignments?
3. How do they perceive the relevance of their R&D assignments?

Theoretical background

In this study, the concept of research-based teacher education is used to refer to the scientifically designed teacher education in Norway (Aspfors et al., 2021). Teacher education in Norway has undergone several fundamental reforms during the last few decades, changing from an experience-based approach to a research-based approach. These changes concern education as a whole, and the importance and place of research have been widely discussed (Menter & Flores, 2020). The integration of a research-based approach demands time, since developing an

inquiring attitude and skills for using and conducting research is a complex and time-consuming process (Afdal & Spernes, 2018; Ulvik & Riese, 2016). Thus, the extent and depth of research focus varies in the teacher education programmes and there may also be limited systematic planning at the programme level (Munthe & Rogne, 2015).

The change from an experience-based tradition to a stronger focus on research, as well as the change from more contextual to conceptual teacher education (Afdal & Nerland, 2014), can be understood as a paradigm shift (Stølen, 2016). This shift has mainly been implemented through two reforms: the first (in 2010) involved a strong focus on R&D, and the second (in 2017) encompassed a five-year educational programme at the master's level. R&D is far-reaching and seen as a key factor in school development in Norway (Norwegian Ministry of Education and Research, 2017) and as largely influencing teacher education.

Master's based teacher education builds on national guidelines, and a central aim is to strengthen student teachers' R&D competence. They are to gain insight into research and learn how to analyse and understand research methods and results. Additionally, they are to use research-based teaching methods and undertake their own research projects, including a master's thesis, as the most advanced one (Norwegian Ministry of Education and Research, 2016a, 2016b). Based on the R&D competence gained in teacher education, the ambition is that newly qualified teachers can use and further develop their professional competence (Bjørndal et al., 2020; Hermansen & Mausethagen, 2016). The combination of research-based knowledge and experience-based knowledge from the practice field will thus enhance teachers' ability to continuously analyse and develop their own practice in a systematic and reflective way (Lillejord & Børte, 2017).

Different views of research-based teacher education exist and there is also general confusion concerning research-related concepts and distinctions between them (Burn & Mutton, 2015; Cochran-Smith & Fries, 2008). The inquiry and research concepts are referred to in the field, although the distinction between them is often quite unclear. In line with BERA-RSA (2014), inquiry can be described as evidence-based practice; it does not aim to produce results for the larger research community but can be systematic and involve the study of research literature. Research, in contrast, builds on research literature, uses research methodology and is open to the research community. Consequently, inquiry takes a more investigative stance, while research applies to the broader publishing context (Munthe & Rogne, 2015).

To further specify the meaning of research related to teacher education, Griffiths (2004) suggests four well-known distinctions between research and teaching: research-led, research-based, research-oriented, and research-informed concepts, with the latter modified by Healey (2005) into a research-tutored concept. The concepts are organised along a horizontal and vertical axis, where the horizontal axis moves from an emphasis on research content to research

processes and problems, while the vertical axis moves from teacher- to student-focused activities (Griffiths, 2004; Healey, 2005). These four dimensions characterise the complexity of defining research in teacher education, and concurrently, different teacher education programmes place the emphasis differently. In Norwegian teacher education, the four dimensions emerge to various degrees. The research-based concept was used prior to the 2017 reform, and placed emphasis on the research-led and research-oriented dimensions, which are both teacher-focused activities with the students as an audience (Munthe & Rogne, 2015). However, the R&D assignment with its focus on student teachers' own research activity belongs to the research-based dimension in the model (Griffiths, 2004; Healey, 2005).

Within research-based teacher education in Norway, the concept of research literacy is also used and referred to by the national expert group on the teacher's role (Dahl et al., 2016), as well as in a report on teacher education (Lillejord & Børte, 2017). Research literacy is defined as follows: 'To be research literate is to "get" research – to understand why it is important and what might be learnt from it, and to maintain a sense of critical appreciation and healthy scepticism throughout' (Furlong et al., 2014, p. 40). Teachers' research literacy is seen as the ability to apply and develop research as an integral part of their daily teaching, and not as something that is externally driven or focused on separate projects. Research-literate teachers develop their own research based practice, and their professional development is enhanced through research knowledge, theoretical insights, and their involvement in research work (Evans et al., 2017).

Several factors influence teachers' research literacy. Evans et al. (2017) refer to factors such as policy, collaboration, and professional development. Furthermore, teacher education plays a vital role in enhancing their research literacy, although collaboration with schools needs to be on equal terms for the partnership to be successful (Lillejord & Børte, 2016). Research-based knowledge should be integrated into teachers' experiential knowledge (Burn & Mutton, 2013), and their understanding of the relevance of research must be addressed to support their research literacy. A close connection between research and practical actions in the school context is essential, and both parties should have something at stake in the collaboration (Olin & Ingerman, 2016).

Student teachers' motivation for research-based activities can thus be enhanced by connecting their research projects to educational practices (Baan et al., 2019). The advantage of doing so lies in the possibility of trying things out in a secure and supported situation with limited responsibility (Ulvik & Riese, 2016). Furthermore, research in practice develops student teachers' integrated views of theory and practices and supports their ability to change their practice in a systematic and reflective way based on their theoretical knowledge and insights (Lillejord & Børte, 2017). Making this work, however, requires good cooperation with schools, in which an inquiry-based approach to teaching is accepted and embraced (Dimmock, 2016) in teacher education. Partnerships between schools

and teacher education need to be fostered and more collaborative forms of inquiry enacted (BERA-RSA, 2014; Flores, 2018). However, connecting research projects with practice is more than merely developing a curriculum. It entails new perspectives and new qualities on the part of student teachers, teacher educators on campus and teachers in the schools (Flores, 2018).

Although research-based teacher education is well recognised in the academic context, few studies have focused on the research activities within the approach (Spernes & Afdal, 2021). However, in Finnish teacher education with a long tradition of research-based approaches (Tirri, 2014), some studies have been done (Eklund et al., 2019; Jyrhämä et al., 2008; Maaranen, 2010; Niemi, 2011). These studies show that student teachers appreciate the research-based approach, find it valuable in terms of methodological studies and the master's level of education, and envision it as a way to improve their professional development. However, they argue that research-based studies should be developed with wider relevance to the teaching profession. These findings are confirmed by other studies showing that student teachers find it difficult to relate their research-based activities to the knowledge and skills they need for teaching practice (Afdal & Spernes, 2018; Baan et al., 2020; Puustinen et al., 2018). In a study by Afdal and Spernes (2018), it was further evident that the ones who did saw it as a shift in their way of thinking rather than in their transferable knowledge and skills. Recent evaluations of research-based learning activities from an international perspective found that student teachers considered research projects to be quite irrelevant for their future teaching profession. However, ratings were more positive when they were active and had the freedom to investigate their own teaching and topics of personal interest to them (Nikolov et al., 2020).

In the Norwegian context, some studies have been carried out on how to organise courses and activities within research-based teacher education. For example, in a study by Spernes and Afdal (2021), student teachers work with a scientific method assignment during a school placement was investigated. The results showed that the assignment could qualify as a profession-oriented, inquiry-based learning approach, although further support from both teacher educators and teachers in schools was needed. In another study by Jakhelln and Pörn (2018), action research projects related to their bachelor theses were investigated. In line with the results, there was a lack of communication and tripartite collaboration among student teachers, teacher educators on campus and teachers in the schools. To succeed, such research projects thus require tight collaboration between research-based studies and practice. The R&D assignment in Norwegian teacher education offers an opportunity to create a fruitful connection between research and practice and will be further elaborated on in this study.

Method

Context of the study

Teacher education for primary and lower secondary schools in Norway is divided into two programmes: teacher education for primary school (grades 1–7) and teacher education for middle school and lower secondary school (grades 5–10) (Norwegian Ministry of Education and Research, 2016a, 2016b). In the first three years in the programme for grades 1–7, the student teachers study 30 ECTS credits in three different subjects and 60 ECTS credits in a fourth subject, and they write their master's theses in the latter subject. Similarly, in the programme for grades 5–10, the student teachers study 30 ECTS credits in one subject and 60 ECTS credits in two other subjects, and they can choose to write their master's theses in one of the two latter subjects.

According to Norwegian academic regulations (Norwegian Ministry of Education and Research, 2016a, 2016b), student teachers in both teacher education programmes are supposed to write an R&D assignment in their third year, which is a combination of a teaching subject and pedagogy. The assignment involves independent research work based on a research question, and it aims to provide a consistent presentation of and reflection on central issues that they will meet in the teaching profession. In addition, several institutions include a smaller R&D assignment in the second year of the teacher education programme for grades 5–10 to ensure that the student teachers have written an R&D assignment in the subject in which they are going to write their master's theses (since they can write about two different subjects).

Student teachers at two teacher education institutions in Norway participated in the study. The informants from Institution 1 were in their second year in the programme for grades 5–10 and wrote an assignment that comprised about 4000 words. The assignment was a literature study and followed the structure of a research assignment, including an introduction, method, results and discussion (i.e., IMRaD). The participants from Institution 2 were in their third year and wrote an R&D assignment that comprised about 7000 words. Six of them were from the programme for grades 1–7, and the remaining 25 were from the programme for grades 5–10. The informants from the grade 5–10 programme had written a smaller version of an R&D assignment (either in groups or individually) the previous year, while those from grades 1–7 had not. The assignment in Institution 2 was an empirical study that followed the IMRaD structure, and except for one, who conducted a literature review, the participants collected data from schools or analysed textbooks.

The amount of supervision was quite similar in the two institutions; the student teachers were supervised on the research question and a draft of the assignment and had a seminar where they presented their assignments to peers and their supervisor. However, the two institutions had different amounts of scaffolding during the working process. In Institution 2, there were lectures and workshops

supporting the student teachers throughout the semester, and these were developed by experienced teacher educators and had also been used the previous year, allowing for further development. In contrast, Institution 1 had two lectures about literature search strategies and data analysis, but otherwise, the amount of scaffolding in class was less and the teacher educators responsible for the process had less experience with educational research.

Informants and data collection

Data were collected as essays that the student teachers wrote before, during and after they had written their R&D assignments. In these essays, the informants reflected on the following topics:

- Expectations (before) and experiences (during and after)
- Learning outcomes (before, during and after)
- Relevance (before and after)

Table 1 provides an overview of the number of participants and essays per institution. The essays were written at approximately the same time (in August, October, and November/December), but since the student teachers worked at different paces, the essays written *during* the assignment represent different phases of the writing process (i.e., some were nearly finished with their assignments, while others had barely begun).

Table 1. Number of informants and essays

	Informants (M = male, F = female)	**Essays**	**Essays before assignment**	**Essays during assignment**	**Essays after assignment**
Institution 1	28 (10 M, 18 F)	56	26	17	13
Institution 2	31 (14 M, 17 F)	81	30	22	29
Total	59	137	56	39	42

Analysis

The analysis is inductive and follows the six steps of thematic analysis proposed by Braun and Clarke (2006). First, all authors familiarised themselves with the data by reading and re-reading the essays several times. Second, the essays were coded by two of the authors using NVivo 12 software. In this process, the two authors first did a separate analysis, and thereafter compared their codes and discussed disagreements. Third, all authors discussed the codes and agreed on preliminary categories related to the three research questions. These categories were revised and defined in steps four and five. In step four, the authors discussed them in groups and adjusted them to work in relation to each other and the data material. In step five, the categories were further defined and named. Sixth and last, a detailed description of the data was written, following the research

questions and categories. Authentic extracts from the essays were included to increase the trustworthiness of the study (Angen, 2000). The analysis of the data was conducted in Norwegian, while the extracts were translated into English for the results section of this paper. The study follows the general ethical standards approved by the Norwegian National Research Ethics Committees (2016). The informants included in the study provided written consent that their essays could be included in the study.

Findings

The findings are presented according to the categories identified in relation to the three research questions. The category order is based on the number of essays that include utterances within the category. The categories are described and illustrated with original excerpts from the essays, and the participants are identified by institution (1 or 2), which essay (before, during or after) and number (e.g., 2-B14).

Student teachers' views on working on their R&D assignments

All student teachers expressed both *expectations* and *experiences* when writing about their work on the R&D assignments, and these were sorted into five categories: *stressful and overwhelming, difficulty and uncertainty, feeling of mastery, interesting and exciting,* and *mixed experiences.*

In many of the essays (n = 68), the student teachers described the assignment as *stressful* and *overwhelming*. Before the assignment, they were worried about the size of the task and the writing process. Furthermore, during the process, they found it stressful to write the assignment while simultaneously attending classes: 'It has been difficult to focus one hundred percent on the assignment, given that there have been a lot of other things that have happened at the same time' (2-A25). These concerns were more often expressed by student teachers from Institution 2, who suggested that the semester should be organised differently. Moreover, some argued that the task felt so large that they had problems getting started and that much of the work was done in the last stressful days just before the deadline.

During the writing process, many expressed *difficulty* and *uncertainty* when writing their essays (n = 63). Before starting, they were worried that it would be difficult, especially in terms of writing high-quality texts. In particular, some informants from Institution 1 expressed uncertainty about what they were supposed to do. During the writing process, they articulated the uncertainty more specifically, relating it to how to formulate a problem and find relevant literature for their literature reviews: 'What was most difficult was to find appropriate literature, since there was little that was about just what I was looking for' (1-D27). Besides these challenges, participants from both institutions pointed out difficult aspects of the research process, such as reading the research literature

and writing academically with a coherent structure. This led to a lack of motivation and also to periods with little progress.

Another emotion expressed in many essays (n = 63) was the *feeling of mastery*. The informants emphasised the pride and the positive feeling of progress when mastering something that they had previously found challenging: 'It is nice when you feel that you understand things and when it goes well when putting down the words. When you feel the progression' (2-D8). Many informants described the process as learningful with regard to their future profession as teachers and their upcoming work on their master's theses.

In several essays (n = 42), the student teachers articulated how they found the writing process *interesting* and *exciting*. The positive expectations before writing were mainly expressed in general terms, and they were looking forward to the task. A few of them even expressed a positive attitude towards getting deeper into a topic that they had chosen themselves. The ownership they felt regarding the task was more explicit and was frequently pointed out in the essays during and after the writing process. This concerned reading, analysing, finding answers, and discussing: 'I found it fun to be able to discuss my own results' (2-A18).

Interestingly, in almost half of the essays (n = 43), the participants expressed *mixed expectations* and *experiences* regarding the assignment; they expected it to be both demanding and interesting at the same time. Typically, these 'mixed feelings' were stated in the same sentence, indicating that these participants were ambivalent about the assignment, such as in this essay written before the process: 'I think I will experience the writing of the assignment to be both an exciting and informative process, but also challenging and difficult' (1-B20). Mixed feelings were also expressed during and after the task, where the student teachers argued that they found it demanding and frustrating, but still meaningful and exciting, often dependent on their feeling of mastery. Some also stated that they went through different phases of inspiration and frustration during the process: 'Some days, I'm extremely positive [and] some days, I'm negative. Some days, I touch upon emotions within the entire emotional spectrum' (1-D10).

Student teachers' views of their learning outcomes from writing the R&D assignments

When investigating the participants' views of their learning outcomes from writing the R&D assignments, four categories could be identified among the 128 essays addressing this issue: *research competence, writing competence, science education knowledge* and *working habits.* These categories were identified in all three types of essays, but in the essays written before the assignment, the informants naturally reflected on what they expected to learn during the writing process. Overall, what they expected to learn (as articulated in the essays written before the assignment) was quite similar to what they expressed that they had learnt (as written in the essays after the assignment).

In many of the essays (n = 87), the student teachers argued that they had developed their *research competence* through the process of writing the R&D assignments. This included aspects such as how to work as a researcher, and knowledge about how to choose and present appropriate topics, literature, and methods: 'Now, I know more about what an academic assignment should contain, and how I should analyse articles and present findings systematically' (1-D7). Closely related to research competence, several pointed out that they had improved their *writing competence*, with respect to both how to write in a scientific way and their writing skills in general (n = 69 essays). They noted that they had learnt how to plan the writing process, write the assignment in line with the IMRaD structure and write in a reflective and analytical way: 'I have learnt much from the writing process of academic assignments, where it has been clearer [to me] what belongs to the different parts [of the IMRaD structure], and the purpose of each part' (2-A32).

Many informants further stated in their essays (n = 56) that writing the assignment developed their *science education knowledge*, especially in the essays written before and during the process. They typically expressed an interest in the topic they had chosen and were looking forward to getting a deeper insight into it: 'In addition, I learnt a lot about the topic I chose to write about when searching for international articles that shed light on the issue' (2-D27). In contrast, fewer mentioned the development of their science education knowledge as something they had learnt in the essays after the writing process.

Finally, in 17 essays from both institutions, the participants noted that they had developed their *working habits* and their ability to work independently during the process of writing their assignments. They felt a lot of responsibility for structuring the process and setting their own goals, and they had to learn how to be selective and motivate themselves: 'Here, the entire work is on yourself alone, and you are "forced" to both find a structure and working habit that works and motivate oneself for the task' (1-A4). The student teachers reflected on their working habits in the essays written both during and after the R&D assignments.

Student teachers' perceived relevance of their R&D assignments

In 108 of the essays, the student teachers addressed how they perceived the relevance of their R&D assignments. In analysing these essays, four categories were identified: *teacher profession, master's thesis, research knowledge* and *little or no relevance.* These categories were identified in all three types of essays.

In general, many participants perceived the R&D assignment as relevant to their *teaching profession* (n = 66 essays). They viewed it as relevant in two ways: they expressed that the educational knowledge gained from the task would be useful for their profession and that they would get tools for their future development as teachers: 'Teachers are in a way always in a kind of analytical role or researcher role to interpret pupils and academic topics. To take on such a mentality can be easier after working on the R&D assignment' (2-B17). Along similar lines, some student teachers mentioned that they had gained *research knowledge*. The focus

was on research, and in the essays (n = 34), they mentioned examples such as conducting different kinds of research projects in the classroom. Some also connected research to their future profession. However, in contrast to the previous category, in this category, the informants related research knowledge to the use of research in general in the profession: 'I have learnt much about educational approaches and how to keep updated on the field of research within the specific topic' (2-B19).

Many student teachers also articulated in their essays (n = 43) that the assignment was relevant for their future studies, particularly as preparation for writing their *master's theses*. They noted that writing the R&D assignment gave them good insights into the writing process and a basis for the advanced master's thesis later in their studies: 'We get insight into how it will be to write a master's thesis in a few years, and I have experienced the feeling that I actually can accomplish it' (1-D9).

Although most student teachers found the assignment to be relevant for their future studies and the teaching profession, nine of them found it to be of *little or no relevance*. They argued that the assignment was remote from the daily work of teachers, and hence, except for acquainting oneself with a specific topic, of little relevance. They typically claimed that more school placements or subject knowledge would be a better use of their time: 'I see it as a research assignment designed to educate researchers, not teachers. I will admit that I cannot see why one cannot become a good teacher without writing an R&D assignment' (2-B16). This category was more prominent in the essays from Institution 2 (n = 9) compared to Institution 1 (n = 1).

Discussion

This study focused on student teachers' experiences of working on their R&D assignments as a component of their teacher education programme. In order to educate professional teachers for today's society (Darling-Hammond & Hyler, 2020), we want to emphasise the necessity of teachers' research literacy (Evans et al., 2017; Furlong et al., 2014). Teacher education plays an important role in enhancing research-literate teachers; thus, the R&D assignment within research-based teacher education is highly relevant (Lillejord & Børte, 2016). The R&D assignment is an example of a specific research activity (Aspfors & Eklund, 2017), focusing on student teachers' own research activity (Tatto & Furlong, 2015) and aiming to develop their R&D competence (Norwegian Ministry of Education and Research, 2016a, 2016b, 2017). In line with Griffith's (2004) and Healey's (2005) model of defining research in teacher education, the R&D assignment thus belongs to the research-based dimension.

In the following, we will discuss two aspects permeating the informants' experiences of writing their R&D assignments: *a positive and challenging process*

and *the relevance for their master's theses versus their future teaching profession.* The R&D assignments were framed in slightly different ways at the two institutions, which may have affected the results, and this will therefore be discussed. We suggest implications for teacher education and elaborate further on the strengths and weaknesses of the study.

The reformed teacher education programme in Norway, with its research-based approach, has led to a discussion on the importance and place of research in the programme (Menter & Flores, 2020). The student teachers' essays about working on the R&D assignment also show that they had a mixed opinions about including research in teacher education (Afdal & Spernes, 2018; Ulvik & Riese, 2016). They expressed diverse expectations and experiences of the R&D assignment and found the task to be both positive and challenging. Before the task, some were hesitant about the R&D assignment, but this changed for many of them when they started, and their writing was progressing well. In general, they had positive thoughts about the task; they found it rewarding and felt proud of their own research work. These results are confirmed by previous studies in Finland with its long tradition of a research-based approach, where student teachers show appreciation of the methodological studies and master's degree level of education (Eklund et al., 2019; Jyrhämä et al., 2008; Maaranen, 2010; Niemi, 2011).

At the same time, the student teachers also struggled with a number of challenges. The challenging experiences were mainly related to the writing process, but also to difficulties in finding and using relevant literature. In a similar way, the student teachers in the study by Jyrhämä et al. (2008), expected more support in the supervision and completion of the master's thesis. Time management was another challenge; the R&D assignment was scheduled at the same time as other courses in the teacher education programme, which meant that the student teachers had to handle several tasks at the same time. This led to the feeling of time pressure for some of them, and they had difficulties focusing on and felt unmotivated about writing the assignment. Even though research-based teacher education is well recognised in the Norwegian context, more effort has thus to be put on how to organise courses and research activities within the approach (Spernes & Afdal, 2021).

However, the challenges were not merely viewed as negative. The student teachers also expressed positive comments about their struggles, indicating that they embraced some of the challenges. In some instances, they viewed the challenges as developing and educative, and they appreciated that they had learnt to work in an independent manner. Thus, a possible interpretation is that these student teachers viewed demanding aspects of the task and frustrating periods as aspects of their learning and competence development. Similarly, Maaranen (2010) found that student teachers had a positive attitude towards inquiry and reflection and saw educational research as a way to improve their professional development. Furthermore, Hammann (2005) found that student teachers'

enjoyment of writing academic texts was related to their belief that writing was learnable. This might explain why our participants embraced demanding aspects, bearing in mind that so many of them expected and experienced different learning outcomes by working on the task. Still, the feeling of uncertainty was most obvious among those who had little or no previous experience writing this kind of research assignment. This accentuates the importance of scaffolding student teachers throughout their writing process.

Within Norwegian teacher education, a central aim is to strengthen student teachers' R&D competence (Jakhelln et al., 2019) and based on this competence, enhance their development as professional teachers (Hermansen & Mausethagen, 2016). The change from experience-based teacher education to an emphasis on R&D (Afdal & Nerland, 2014) can, however, be quite difficult for the student teachers (Stølen, 2016). The challenges the informants experienced in this study show that the conditions for working on the R&D assignment are important for their motivation and involvement in the task. Therefore, we argue that it is important to ensure that the way in which the R&D assignment is organised means that there is enough support for the student teachers, as well as the appropriate tools for managing the research tasks within the education programme (Spernes & Afdal, 2021). Since the R&D assignment is supposed to be preparation for writing their master's theses, we emphasise the importance of using experienced teachers and supervisors with competence in educational research for teaching and supervising the R&D assignment in order to provide the student teachers with a good foundation upon which to build. Furthermore, high competence in R&D throughout the education process (Evans et al., 2017) enhances the development of research-literate teachers (Furlong et al., 2014).

Regarding the relevance of the R&D assignment, the student teachers found that the writing process developed their knowledge and competence in different ways. Many of them viewed the assignment as preparation for their future studies and specifically for writing their master's theses (cf. Norwegian Ministry of Education and Research, 2016a, 2016b). In line with previous research (Munthe & Rogne, 2015), the student teachers pointed out that they had learnt about the research work and emphasised specific parts of the research process, such as choosing relevant topics and the appropriate literature and methods. Doing the R&D assignment also developed their writing skills, as they learnt to write with a reflective approach and in line with the IMRaD structure (Munthe & Rogne, 2015). Finally, some mentioned that they had changed their working habits and learning styles during the process, i.e., the research assignment had led to personal development. This kind of personal development was also evident in the study by Afdal and Spernes (2018), finding changes in student teachers' thinking rather than knowledge and skills. Overall, most student teachers perceived the R&D assignment as relevant to the teaching profession. They had a personal interest in the chosen topic, gained deeper insight into it and developed their knowledge in science education (Nikolov et al., 2020). Furthermore, they found the educational

knowledge and tools gained from the task to be useful for their future work as teachers and their professional development, which relates to the aim of teachers using and developing their R&D competence in the profession (Hermansen & Mausethagen, 2016).

Despite the overall positive view, some student teachers perceived the R&D assignment to be of little or no relevance. They argued that the assignment was remote from teachers' daily work and, hence, of little relevance for the profession. This perspective can be related to previous research on student teachers' challenges in connecting research-based activities gained in teacher education to teaching and classroom activities (Afdal & Spernes, 2018; Baan et al., 2020; Puustinen et al., 2018). However, studies have also shown that student teachers' motivation for research-based activities can be enhanced by connecting their research projects to educational practices (Baan et al., 2019; Ulvik & Riese, 2016). By giving them opportunities to do their research in practice, collaboration between teacher education and schools will develop (Dimmock, 2016), and, at the same time, their R&D competence will develop (Lillejord & Børte, 2017). Though, in order to succeed, facilitation of research assignments requires tight partnership between teacher education and schools (Jakhelln & Pörn, 2018; Spernes & Afdal, 2021) as well as more collaborative forms of inquiry (BERA-RSA, 2014; Flores, 2018). Thus, we find it important to view the R&D assignment within teacher education as a possibility to connect research and practice to a larger extent and to further develop research-literate teachers.

Strengths and weaknesses

This study is quite small, and the data collected for the study has its limitations. Student teachers from two teacher education institutions in Norway participated in the study, and the total number of informants was 59. The written assignments were based on the same national guidelines (National Council for Teacher Education, 2016), but differed to some extent due to contextual factors. The assignments were conducted at different points in time (i.e., in the second or third year), and most student teachers at one of the institutions had previous experience writing a small R&D assignment. These differences notwithstanding, the essays were written during the same phases of the writing process for all participants and thus represented their experiences of working on their R&D assignments before, during and after the process. The total number of essays written was 137, which means that the final amount of data was quite extensive. In the essays, the student teachers reflected on three issues, each related to one of the posed research questions. Their responses to the three research questions were comprehensive, as were the total number of statements obtained. However, to get a broader view of their experiences of working on R&D assignments, more issues could have been included in the essays. The aim of the study was to gain a deeper insight into student teachers' experiences of working on their R&D assignments and to obtain a better understanding of the process from their perspective. Despite the

limitations mentioned, the collected data and analysis contribute to interesting insights into the phenomena in accordance with the ambition of qualitative studies (Larsson, 2009).

Conclusions

The overall aim of the study was to gain a deeper insight into student teachers' experiences of working on their R&D assignments and to obtain a better understanding of the process from their perspective. In line with the results, the student teachers experienced the writing process as challenging and demanding, but at the same time as exciting, interesting, and educative. They often expressed this mixed experience in the same sentence, indicating that they experienced the challenges in a positive way. The student teachers viewed the development of their research competence and preparation for their master's theses as central learning outcomes. Furthermore, they considered the R&D assignment to be relevant both in relation to their master's theses and future teaching profession. Thus, the R&D assignment has its role and importance in research-based teacher education and in enhancing the development of research-literate teachers. In sum, this study contributes to an understanding of student teachers' views on research-related activities and is relevant in discussions on the development of teacher education for primary and lower secondary schools.

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