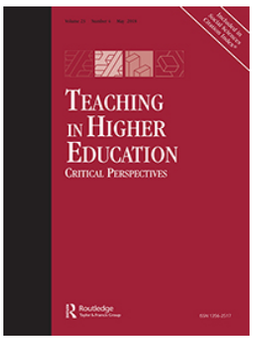

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Novice supervisors' practices and dilemmatic space in supervision of student research projects

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ABSTRACT

Growing interest in student research projects in higher education has led to an emphasis on research supervision. We focus in this study on novice supervisors' approaches to research supervision as they explore their practices and experience difficulties supervising medicalstudents. Teacher noticing was used as a sensitising concept and relations with teacher dilemmas were explored in the research supervision context. To provide in-depth insights into supervisors' practices and pedagogical choices, twelve stimulated recall interviews with supervisors were analysed. The supervisors were involved in individual undergraduate or master degree student research projects at a research-intensive university. Analysis revealed four kinds of dilemmas which may influence research supervision practices, namely questions regarding regulation, student needs, the student-supervisor relationship and supervisors' professional identity. We explain the relationship between novice supervisors' practices and dilemmas in detail. Implications are given to enhance initiatives for professional development of supervisors.

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Research-teaching nexus; undergraduate research; research supervision pedagogy; teacher noticing; mentoring

Introduction

Growing interest in student engagement in research in university education, for example, in student research projects, has led to an emphasis on research supervision. As a result, there has been a push towards studies into research supervision (e.g. Anderson, Day, and McLaughlin 2008; Harwood and Petrić 2017; Maxwell and Smyth 2011; Wichmann-Hansen, Thomsen, and Nordentoft 2015). Recent studies have identified factors in research supervision promoted by experienced supervisors which contribute to student learning, such as responsiveness to students' needs and ways in which supervisor-student relationships are maintained (e.g. de Kleijn et al. 2014; Lee 2008; Mainhard et al. 2009). These factors are useful for fostering supervisors' reflections on their practices

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and for the study of research supervision. Specifically novice supervisors can benefit from support in exploring approaches to supervision, facing challenges and adapting pedagogies (e.g. Turner 2015). Adequate support can enable novice supervisors to deliberately use and learn from their personal supervision experiences (cf. Reflective practice, Schön 1983), both as a student and a supervisor (Amundsen and McAlpine 2009). This study aims to provide input for supervisor development initiatives for novice supervisors by focusing on what novice supervisors do to promote student learning in student research projects and why they do what they do in student-supervisor interaction. Our results will inform supervisors' professional development initiatives in order to foster student learning within student research projects in university education. This study contributes to a body of knowledge about research supervision by using supervisors' reflections on recordings of student-supervisor interactions rather than interview data based on experiences. This study aims to reveal dilemmas that novice supervisors face in interactions with the student and its relation with pedagogical choices in supervision practice.

Supervision of student research projects in higher education

Previous studies have aimed to demystify experienced supervisors' practices and have emphasised student and supervisor characteristics or types (de Kleijn et al. 2014; Grant 2003; Halse 2011). However, adapting supervision to student characteristics or traits in practice may be difficult for novices (e.g. Kandiko and Kinchin 2012). In comparison to experienced doctoral supervisors, novices worry about being taken seriously by students and feel unprepared for working within environments without clear guidelines for most job activities as is usual in academic departments, which can also apply to supervising undergraduates (Amundsen and McAlpine 2009). The term novices is used to indicate that the participating supervisors in this study have relatively few years of supervising experience. In this research we draw on studies into doctoral research supervision pedagogy in which research supervision has been constructed as teaching (Boud and Lee 2005; Manathunga, Lant, and Mellick 2006). An underlying assumption in conceptualising research supervision as a teaching activity is that students are considered as learners and it is assumed that their capabilities will develop when they receive effective feedback (Dixon and Hanks 2010; Walker and Thomson 2010). These findings from literature suggests that, for students to learn from research projects, in addition to a providing them with a research-rich environment, supervisors need to apply a pedagogic approach (Boud and Lee 2005; Manathunga, Lant, and Mellick 2006). This is in line with studies into master's and undergraduates thesis supervision, which emphasise supervisors' reflections on their practices in interaction with students to foster quality in supervision of student research projects (Malcolm 2012; Wichmann-Hansen, Thomsen, and Nordentoft 2015). In addition, interactions between academics and students which help to understand the needs of students are considered pivotal in teaching in higher education and in supervision of student research projects at doctoral, master's and undergraduate level (Ashwin 2012; de Kleijn et al. 2014; Mainhard et al. 2009; Todd, Smith, and Bannister 2006).

In comparison to traditional classroom practice, research supervision can be considered unique because the research projects give students a relative freedom to choose a topic, the duration of student research projects is mostly longer than traditional teaching units and research projects involve mainly one-to-one student-supervisor interactions

(e.g. de Kleijn et al. 2014; Todd, Smith, and Bannister 2006). Furthermore, both student research activities and the nature of supervisors' work as an academic play a central role in doctoral research supervision practices (e.g. Kandiko and Kinchin 2012; Manathunga and Goozée 2007). Supervisors of undergraduate and doctoral student research projects draw on personal experiences gained in other supervision and teaching contexts (Amundsen and McAlpine 2009; Todd, Smith, and Bannister 2006; Turner 2015). Supervisor training focused on eliciting development opportunities through analysis of supervisor behaviour, can contribute to supervisors' professional knowledge and supervision practice (e.g. Emilsson and Johnsson 2007; Lizzio and Wilson 2004; McCulloch and Loeser 2016). In sum, previous findings from literature suggest that supervision of doctoral, master's and undergraduate research projects can be considered a form of teaching (Malcolm 2012; Manathunga, Lant, and Mellick 2006; Wichmann-Hansen, Thomsen, and Nordentoft 2015).

Pedagogical choices in supervision practice

Supervisors have to realise multiple goals at the same time in practical teaching situations in order to foster student learning. For example, supervisors aim to pursue students' sense of agency within a project whilst simultaneously maintaining an effective student-supervisor relationship simultaneously which can result in indirect, although very potent ways of steering (Turner 2015). For instance, supervisors shape master's students' research activities by often implicit and unconscious diagnosis on student characteristics, such as enthusiasm for a topic, motivation and attitude towards the supervisor (de Kleijn et al. 2015).In addition, supervisors should foster student learning in interaction with the student and adapt their pedagogies to student research competencies and to the wider context ofthe institute and department they work in (de Kleijn et al. 2015; Grant 2003; Manathunga and Goozée 2007; Pearson and Brew 2002). Relations between supervisors, students and the context in which they work and learn can introduce supervisors to different, perhaps conflicting, values, responsibilities or goals. Supervisors' intentions to promote their own development in research, for instance, might conflict with strategies to foster a rich learning experience for students (Bruce and Stoodley 2013). Thus, supervisors can have multiple goals simultaneously in supervision practice which can influence their pedagogical choices.

Findings from a previous study into research supervision pedagogy suggest that the supervisors' awareness of alternative options for practice influences their research supervision practices (Bruce and Stoodley 2013). The broader the supervisors' repertoire of approaches to supervision, the more they have to choose from. However, as supervisors can pursue several goals simultaneously choosing an approach may be complex. One reason for this is that human behaviour in complex situations, such as research supervision practice, depends on individual characteristics such as needs, drives, goals and structural aspects or perceptions of the environment (e.g. Shah and Kruglanski 2008; Simon 1957).

Dilemmatic space

Against the background of supervisors' goals and their perceptions of the context, teacher dilemmas can emerge which may influence pedagogical approaches (Jonasson,

Mäkitalo, and Nielsen 2015; Leong 2014). Supervisors might, for instance, experience a dilemma between providing the student with answers and fostering student ownership in research projects. Particular student behaviour could trigger 'spitting out' answers, while that approach might hamper students' independent and reflective thinking (Wichmann-Hansen, Thomsen, and Nordentoft 2015). In teaching, and higher education specifically, teacher dilemmas have been studied within the concept of dilemmatic spaces which are 'social constructions resulting from structural conditions and relational aspects in everyday practices' (Fransson and Grannäs 2013; Leong 2014). According to this view ever present dilemmas are inherent to teaching and specific teaching situations will bring certain considerations more to the fore while leaving others to the background (Fransson and Grannäs 2013; Leong 2014). Every teacher's dilemmas will be evoked, for example, when a policy change requires teachers to change assessment practices after years of doing assessments in a certain way (Leong 2014) or when teachers have to balance the classroom space between the shy and talkative students (Frelin 2010 in Fransson and Grannäs 2013). Practical reasoning in these situations is deeply rooted in the human desire 'to do the right thing in the right place at the right time in the right way' (MacIntyre 2007). What is regarded as 'right' depends on the relationships between a supervisor and others (Fransson and Grannäs 2013). Findings from a study into undergraduate research supervision indicate that the issue of boundaries is apparent in the role of the supervisor in the sense that supervision evokes confusion among supervisors as to what is expected from them (Todd, Smith, and Bannister 2006). Previous research has indicated that teaching dilemmas influence teaching practices. In higher education specifically, teaching dilemmas may depend on teachers' sense of urgency or uncertainty in teaching practice (Scager et al. 2017). Within undergraduate research supervision this uncertainty may occur when supervisors feel they have to defend the student dissertation for a second assessor or when their expertise does not match the students' interest (Malcolm 2012; Wiggins et al. 2016). In this study, we will explore relationships between novice supervisors' practices and dilemmas using the idea of dilemmatic space as an analytical framework.

Novice supervisors' noticing

In teaching in general, novices tend to focus on instructional decisions and student skill performance (Talanquer, Tomanek, and Novodvorsky 2007). It has been argued, therefore, that novices need to learn to use evidence of student learning in student-teacher interaction in order to enable them to assess the effectiveness of their instruction (van Es and Sherin 2008). Teacher noticing is about identifying meaningful patterns in student learning through reflection on classroom practices (Erickson 2011; van Es and Sherin 2008). Teacher noticing means that (1) teachers focus on student understanding in student-teacher interaction, (2) teachers interpret student understanding based on the interaction and (3) teachers decide what pedagogy is appropriate based on the former steps (e.g. Barnhart and van Es 2015). Novices may direct their attention towards superficial characteristics of student-teacher interaction or may generalise their own experience as a student in order to adapt their pedagogies (van den Bogert et al. 2014). In this study, we used teacher noticing to guide our attention towards important aspects and to describe novice supervisors' practices in supervision meetings (cf. Sensitizing concept, Bowen 2006).

The role of discipline

University teaching can depend on discipline specific characteristics, such as a consensus on research paradigms within scientific disciplines or ways in which knowledge is structured (Colbeck 1998; Smeby 2000). This study was conducted within the medical discipline at a research-intensive university, involving both applied and pure study programmes within the discipline, as an example of a hard discipline (e.g. Biglan 1973). A classification of subject matter in disciplines based on a study by Biglan (1973) indicates that disciplines can be classified based on two dimensions. The hard/soft dimension involves the paradigmatic development within a field and the applied/pure dimension the practical applicability of scholarly research (Biglan 1973). Within hard disciplines knowledge construction can be characterised by a relatively high consensus on paradigms and research content (Becher and Trowler 2001; Biglan 1973).

Research aim

The aim of this research is to deepen our understanding of how novice supervisors supervise undergraduate students in practice, exploring supervisors' focus on student understanding in student-supervisor interaction using theconcept of teacher noticing. In this way, we will be able to describe novices' research supervision practices aimed at fostering student learning within university education. Furthermore, we explored relationships between novices' research supervision practices and the dilemmas novices face in supervising student research projects using the concept of a dilemmatic space. The results from this study provide input for supervisors' professional development initiatives regarding student research projects within university teaching. This study aims to contribute to an existing body of knowledge about research supervision by using supervisors' direct observations of student-supervisor interactions and by focusing on novice supervisors.

Educational context

The majority of students in Dutch research intensive universities pursue a master degree after their undergraduate degree. Students conduct an individual student research project at the end of both the undergraduate and the master phase. We use the term 'student research projects' to indicate a context in which research, teaching and student learning are closely related. A central aim of student research projects is to foster student understanding of research and to promote research competencies such as scientific reasoning and critical thinking. Specifically, within graduate and undergraduate medical education, research projects are integrated into curricula internationally to foster students' ability to develop knowledge by doing research and to incorporate research in clinical care by critical appraisal of research findings (GMC 2015; NFU 2009). This means that, in the Dutch context of this study, all students do a mandatory full time research project as part of their medical degree. The supervisors participating in this study supervise students in mandatory research projects towards the end of a undergraduate or master degree in one of the health sciences. To be more precise, student research projects are carried out within a medical, biopharmaceutical or biomedical programme. Arrangements for supervisor support and training in relation to these programmes consist of two to four training

sessions over a short period of time in which supervisors voluntarily participate, which focus on supervision aims, supervisor roles and giving feedback, although this study is not conducted in the context of such training. All three programmes have a three-year undergraduate phase. After that, there is a two-year master phase in biopharmaceutical and biomedical programmes, or a three-year master phase in medicine. Student research projects within the undergraduate and master phase can differ in duration, though the students perform similar research activities (e.g. conducting a literature search, formulating research questions, writing and conducting a research plan and writing a research report). Most student research projects in this study vary in duration from 12 to 16 weeks, although some projects take 40 weeks. The students conduct research projects individually in a setting similar to a fulltime internship either in a laboratory or research department within the health sciences. The projects are worth a minimum of 18 European Credit Transfer and Accumulation Credits (ECTS). At the time of our data collection, all student research projects are about halfway towards completion.

Most supervisors are PhD-students or immediate post doctorates. In a context of three- to four-year PhD programmes, this means that supervisors who are immediately post doctorates or PhD students all have relatively little experience with research supervision. Student-supervisor interactions are typically one-to-one and often face-to-face. Students had chosen or were assigned to a supervisor and chose a topic of their interest to them. The supervisor provides the student with feedback on the research process and preliminary products. The supervisors participating in this study are day-to-day supervisors within the student research projects. A senior researcher monitors the quality of the research projects and has less frequent contact with students. In the case of medicine, the PhD-student in our projects assess the students' research report after which a second, external assessor was consulted. Within the biopharmaceutical and biomedical sciences the students' research reports are assessed by the day-to-day supervisor and an external assessor. We focus in our study on the one-to-one supervision meetings between the student and the day-to-day supervisor.

Method

Participants

All participants were supervisors of student research projects in the same Dutch research intensive university. Eleven supervisors from two departments participated in the study. All were junior researchers within the domain of the health sciences. The health sciences provided an authentic research context, where supervisors were likely to have more similar than different conceptions of research (e.g. Brew 2001). Characteristics of the participating supervisors can be found in Table 1. Most student research projects took place either in the third year of the undergraduate degree or in the subsequent first year of the master degree. One or two students did their research projects in the final year of the master degree. At the time of data collection the eleven supervisors were supervising twelve student research projects. One of the supervisors was supervising two student research projects and preferred to be interviewed twice. In total, there were seven research projects at undergraduate degree and five projects at master degree level. Supervisors were supervising four male and eight female students. All of the students had previous relevant university education within the health sciences domain prior to their student research project.

Table 1. Supervisor background information.

Background	
Discipline[a]	
Biomedical sciences	7
Biopharmaceutical sciences	3
Medicine	4
Gender	
Female	7
Male	4
Age (years)	
Range	25–30
Mean	27.3
Research experience (years)	
0–3	9
3–6	2
Supervising experience (years)	
0–3	9
3–6	2
Teaching experience (years)	
0–3	8
3–6	3

[a]Three supervisors reported supervising students in two of the three categories.

Data collection and instrument

The supervisors were asked to reflect on a one-to-one supervision meeting with their student. All supervision meetings and interviews were in Dutch. In order to elicit supervisors' reflections on supervising student research projects and to promote their reflective thoughts, we used a method similar to the stimulated recall method. In stimulated recall interviews participants select and discuss parts of student-supervisor interactions (Dempsey 2010). In this way we were able to elicit supervisors' cognitions underlying supervision of their students (e.g. Verloop 1989). Prior to the individual interviews a one-to-one research supervision meeting with a student was videotaped. Immediately after this meeting the supervisor selected meaningful fragments. The key question for selection was: 'At what times during the supervision meeting did you feel you needed to guide the student and what were your thoughts?' The supervisors were encouraged in the interviews to explain their practices during a supervision meeting with a student, based on video fragments. Data collection took place during spring 2015 and ethical approval was granted by the ethics research committee of the university's graduate school of teaching. All twelve interviews with the supervisors were audiotaped and lasted an average of 35 min.

Analysis

All interviews were transcribed and coded based on a constant comparison analysis using teacher noticing as a sensitising concept (Bowen 2006). As a starting point an existing coding scheme on teacher noticing was used (van Es and Sherin 2008). Atlas.ti 7 software was used to iteratively analyse the data in several phases. In the first phase, the first author watched the videotape of a supervision meeting in order to interpret supervisors' explanations in the transcripts. After that two transcripts were coded inductively by the first and second author to get a sense of the information in the interviews. Next, the two

authors worked independently through a set of three transcripts to identify what fragments referred to the supervisor noticing student learning and then assigned descriptive codes to the fragments based on van Es and Sherin (2008). After that, the two authors discussed the descriptive codes until consensus was reached on the selection of fragments and descriptive codes. A total of 445 fragments were selected. In the second phase, the authors categorised the descriptive codes to establish a tentative coding scheme that fitted the supervision context in this study. The first author then applied the tentative coding scheme to an additional set of two transcripts until no new codes emerged from the data. Next, a research assistant was brought into the project who coded two transcripts together with the first researcher. After this round of coding and final adjustments, only a few new codes were created. The results were compared until consensus was reached on the code descriptions. As an additional step to foster quality in the analysis, we assessed the inter-rater agreement. The first author and the research assistant both coded one-third of the transcripts independently. In two rounds of independent coding a good agreement between researchers was reached for the ten codes within the coding scheme (kappa = .64; 72.6% agreement) (Fleiss 1981).

In the third phase of the analysis the data was explored with regard to a dilemmatic space. To that end the first author made a selection from the previously analysed fragments. The fragments that reflect supervisors' difficulties in supervising students were selected. As a criterion for selection we used supervisors' expressions such as '… that is difficult for me' and '… that is what I'm most concerned about'. A total of 88 fragments were selected, which the first and second author then discussed. The first author then coded the fragments into four themes that emerged from the data, after which the first and second author interpreted the fragments for each theme and found that formulating questions related to each theme, from the perspective of the supervisor, demarcated a dilemmatic space. In this way a dilemmatic space in which the supervisors negotiated research supervision was established based on the data. The first author wrote a description of the themes and questions. Next, the first author and an independent researcher analysed fragments independently based on the descriptions in order to improve analytical rigour. As a result, the themes were rephrased in order to establish four themes of the same order, all four of which relate to supervisors' difficulties fostering student learning in supervision practice.

In the final phase of the analysis relationships between dilemmatic space and practices were explored in a between-case data matrix (Miles and Huberman 1994, p. 183), displaying the described dilemmatic space and practices. A summary of the between-case data matrix reflecting illustrative fragments and references to other fragments is shown in Appendix 1. The fragments in the data matrix were discussed by the first and second researcher. Examples from the data were chosen to illustrate a relationship between dilemmatic space and practices.

Results

Teacher noticing and dilemmatic space within the data

Five codes concerned the practices supervisors used during undergraduate research supervision meetings. 'Fostering motivation' was about encouraging the student and making

supervision pleasant. 'Giving directions', 'promoting knowledge construction', 'thinking along' and 'creating awareness' were directly related to the students' research process. 'Giving directions' was used to provide feedback, hints or instructions to the student. Checking students' knowledge level was a characteristic of 'promoting knowledge construction'. Through 'thinking along' the supervisor collaborated with the student and 'creating awareness' was about encouraging the student to underpin steps taken in the research process. Full code descriptions are given in Table 2. Fictitious supervisor names are used and all examples from the data have been translated from Dutch.

Three codes emerged for actors involved in the supervision practice, which refer to the person the supervisor was drawing attention to when watching the video: the 'student', the 'supervisor' or 'other'. Two codes referred to excerpts about (1) the supervisor's concerns regarding the planning of the project and (2) the aims of undergraduate research supervision as perceived by the supervisors.

Four codes described the dilemmatic space in which supervisors negotiated pedagogies during the supervision meetings. The codes were illustrated using questions to clarify underlying dilemmas as elicited during the interviews. The first question was about regulation in which supervisors deal with the question 'To what extent can the student regulate the research process?' An example from the data is shown below.

> '[…] On the one hand, he [the student] wants a structured project. On the other hand, he has indicated that he wants to do research independently. That was one of his learning goals for his final student research project. He wants an idea of where to start when he has a research project or research question again. For me, that's seeking a balance between those two.' (Mary)

Mary indicates that she experienced difficulties in structuring the learning process, as the student needed a structured research project and a sense of autonomy at the same time.

The second question, reflected supervisors' difficulties determining student needs ('What are the student needs?'). Supervisors had difficulties in interpreting student behaviour or student learning outcomes; for example, when a supervisor felt that a student did not process the supervisors' feedback in the way that the feedback was intended. That led the supervisor to question her/his own actions. This is illustrated by the fragment below.

> 'And that's what I'm most concerned about. Are the tasks that I propose to her impossible to do? Yes, because she says she can't do it. Well … Is it too difficult for her? Or is she just cutting too many corners?' (Peter)

In this fragment, Peter shared his concerns about the student's actions. Fragments regarding interpretation of student needs reflect instances in which the supervisors might not know how to respond to the student and questioned their actions.

The third question reflected the supervisors expressed concerns about their relationship with the student. Dilemmas regarding the student-supervisor relationship are reflected in the following question 'What should I do to maintain a good supervisor-student relationship?' and is shown in the following fragment.

> 'I wanted her to rephrase the text on her poster into scientific language. It was actually there, although the part about the cholesterol was missing, but I don't want to hurt her. Because she tried her best and made a good sentence and she understands it.' (Vera)

Table 2. Coding scheme and examples of practices, actors and context factors using noticing as sensitising concept.

Code ($N_{fragmetns}$)	Description	Example
Practice/Fostering motivation ($N = 26$)	The supervisor acts at the level of the relationship with the student without reference to the research project. These fragments are about motivating the student and making supervision pleasant.	[About the senior researcher rejecting parts of the student's work]. I'd planned in advance to reflect with him on his experience. That sounds like a big issue, although he'd told me it didn't keep him awake at night. […] I completely understand. The first time that happens it's really disappointing. That's why I got back to him about it. (Brenda).
Practice/Giving directions ($N = 133$)	The supervisor gives the student directions on how to make progress with the research process or product. Examples are providing the student with feedback, using hints and explaining how a task should be done.	Let's just say, here, I impose my vision upon him. Like I would have done it this way. Like giving examples, and explaining that I would do it in a certain way. (Robert).
Practice/Promoting knowledge construction ($N = 119$)	The supervisors checks the student's knowledge construction or interpretations in order to assess the knowledge level, check knowledge reproduction, make student's reasoning explicit, and structure or confirm student's findings.	I try again to check her knowledge about the introduction, whether she knows the rules. Well, rules … I told her before and now I'm checking whether she remembers. (Ryan).
Practice/Thinking along ($N = 6$)	The supervisor thinks along with the student. There is ongoing discussion between the student and the supervisor. This is a collaboration between two researchers.	At this point I'm in doubt about whether I can believe her explanation [for her findings]. It's a nice explanation, which could be true, we can expect this [valid explanation]. (Paul).
Practice/Creating awareness ($N = 13$)	The supervisor makes the student aware that the choices made during the research process need to be underpinned by the researcher. While doing this the supervisor can refer to earlier discussions and choices made in the research project.	She doesn't have a very clear idea yet. I mean, she wrote an introduction, she thought it was a nice story. But I've had to make her aware that writing an introduction is very hard, that there are certain rules for that, and so on. (Ryan).
Actor/supervisor ($N = 50$)	The supervisor mentions him- or herself, without reference to pedagogy. The fragments are about supervisor characteristics, knowledge and experiences.	Because I'm a very positive person. I don't quickly feel that things aren't good enough, we've to leave this part out [of the research report]. I always see the big picture. (Linda).
Actor/student (N = 40)	The supervisor mentions a student, without reference to pedagogy. The supervisor describes personal student characteristics or 'type'.	Yes, she's very shy. That might be inherent in her cultural background […]. (Vera).
Actor/other (N = 6)	The supervisor mentions someone other than her/himself or a student. For example the supervisors' supervisor. No practices are mentioned in these fragments.	I don't want her to present this text on the poster at the conference. […] I'm sure, our boss is going to assess the poster. I already know he wouldn't agree with this. I'll try to change this before it's sent to him. (Vera).
Rest/planning ($N = 42$)	The supervisor is worried that the research project may take too long. Bacause of this, (s)he makes decisions for the student or asks the student to plan the next activities carefully.	Especially since I'm not here next week, so they really need to work independently. That's what I wanted to discuss. What are you going to do next week? (Jacky).
Rest/supervision aim ($N = 10$)	The supervisor explains his/her ideas about good research supervision and undergraduate education. These fragments may also include curriculum goals, content of the educational programme and perceived benefits of undergraduate research.	I had an idea about what he could do in his research project. However, my supervisor didn't feel that had to be done. She says the evidence is convincing, there's no need for another validation. However, I was thinking it would be good for him, because he's learned about this in his undergraduate programme. (Anna).

Fragments involving the student-supervisor relationship illustrate the emotional aspects involved in interaction with the student. The supervisors indicated that it can be hard for them to be clear to the student, as expressed above by Vera not wanting to hurt the student.

The fourth question was 'What is my role as a supervisor as perceived by others?' This concerns the supervisor's professional identity. It is illustrated in the following example.

> 'I have to tell him that I've noticed he's using [a translation engine] to translate and copy text. Yes, I have to tell him, otherwise he'll keep doing this. And his other supervisor at the school [university] is also going to read this'. (Anna).

In the fragment above Anna explains that she has to give the student instructions, since a second supervisor will also assess this research product. These fragments illustrate emerging professional identity as supervisors explore their roles based on their own role perceptions those of others, such as a senior researcher and the student.

Exploring relationships between dilemmatic space and practices

'Promoting knowledge construction' and 'giving the student directions' as practices (see Table 2) were described by the supervisors across the four questions within the concept of dilemmatic space. The practices 'promoting knowledge construction' and 'giving directions' related to all questions within the dilemmatic space. We therefore chose to show examples from the data that illustrate variation regarding relationships between dilemmatic space and practices (see below).

The regulation question and giving directions

Within fostering student agency (Question 1) as dilemmatic space we found that supervisors were mainly giving the student directions (see example below).

> 'What I've noticed is that I'm going to lecture him at a certain point. I often do that. I leave him more or less space to come up with his own things. I've noticed that during the supervision meeting, I've interrupted him once or twice. [Pointing at the video] Look, things like this. I already know he's got ideas about this, we've discussed this before. Despite that I tell him what the aim was and what we're going to do. Then I quietly wonder how that comes across to him, because I am determining the direction.' (Robert).

This example shows that supervisors struggled with the extent to which they should promote student agency. In this case Robert is aware of that, although he felt that giving the student directions was needed at that point.

Fostering motivation within the dilemmatic space

'Fostering motivation' was reflected in fragments in which supervisors indicated that motivating the student and making the supervision process pleasant ('Practice/Fostering motivation') can be related to fostering student agency (Question 1), to the difficulties in interpreting student needs (Question 2) and to the difficulties in maintaining the student-supervisor relationship (Question 3) within their dilemmatic space. Dilemmatic questions regarding professional identity (Question 4) did not reflect 'fostering motivation' as a practice.

The following fragment from the interview with Linda illustrates a relationship between 'fostering motivation' and the relationship between the supervisor and the student (Question 3; see below).

> 'She indicates that she isn't quite calm yet. I try to calm her down. She knows herself, she told me: "Every now and then I can't put my mind to rest. It [the research project] isn't easily out

> of my head." She keeps telling me that. And still this feeling isn't gone, she's trying to ignore it. Now, we're talking about it again.' (Linda).

In this fragment, Linda tries to calm the student and she tries to provide her with clarity, without any reference to issues resulting from the research project. A similar practice is also described by Linda in a situation where she is satisfied with the student's work, although this may relate to difficulties in interpreting students' needs (see next fragment).

> 'Sometimes it's difficult to figure out what more you can do to make someone better. Sometimes it's already sufficient'. Interviewer: 'Did you try to figure out what you could do for her during this meeting?' 'Yes. This time I asked her, like feedback, at the end of the meeting about things that I could do. It's difficult for me to know what she thinks. […] Perhaps I'm doing too much for her?' (Linda).

Anna describes 'fostering motivation' as a practice used in order to stimulate student agency within the research project. This is reflected in the fragment below.

> 'He has to ask me if he gets stuck or when he has a question about the order of the findings in the report. He may try his best regarding his findings, although he needs to ask me when he gets stuck. From my own and others' experiences as students I know this is really difficult.' (Anna).

All these three fragments involving fostering motivation as a practice suggest a supervisor assesses student needs, such as a need for supervisor support.

Supervision aims and the identity question

Finally, fragments about 'supervision aims' were only reflected within the dilemmatic space of professional identity. An example is shown below.

> 'I find it difficult to provide feedback on this kind of rules of engagement [the student being late, the student sending an e-mail to the senior researcher without mentioning the supervisor]. I find it difficult, because it's only about how I like it.' (Mary).

In this fragment, Mary describes one of her supervision aims, namely to promote professional student behaviour. However, she feels unsure about doing this. One reason for this could be that she understands this to be the student acting in accordance with her own personal preferences (' … how I like it') rather than those of the supervisor.

Conclusions and discussion

The aim of this study was to describe novice supervisors' practices in research supervision and to explore relationships between practices and the dilemmatic space which may reflect pedagogical choices in practice. This is based on the idea that research supervision practice can be seen as teaching with the aim of promoting student learning (e.g. Manathunga, Lant, and Mellick 2006). Supervision practice is complex since pedagogical choices in the real world can depend on supervisor characteristics, on structural aspects of the environment and on student understanding in student-supervisor interaction (Barnhart and van Es 2015; Simon 1957). Moreover, as novices are learning to identify patterns in students' cognitive development they may experience difficulties adapting their practices (e.g. van Es and Sherin 2008). In this study the concept of teacher noticing was explored

within the data. The interviews in this study elicited supervisor dilemmas which were conceptualised within the concept of dilemmatic space.

The analysis in this study revealed a dilemmatic space, a decision-making space indicated by four interrelated questions about regulation, student needs, the supervisor-student relationship and supervisors' professional identity. Teacher dilemmas have mainly been explored separately. Amundsen and McAlpine (2009), for example, elicited novice supervisors' concerns about professional identity. With rather similar results to our own, Wichmann-Hansen and colleagues (2015) found that experienced supervisors find it challenging to interpret students' questions and identify and develop their analytical skills. De Kleijn and colleagues (2014) suggested that experienced supervisors struggle with relational aspects and also with their own professional position. Although the themes were quite broadly formulated in our study on novices, previous findings indicate that experienced supervisors negotiate research supervision within a similar dilemmatic space (de Kleijn et al. 2014; Wichmann-Hansen, Thomsen, and Nordentoft 2015).

Five practices were found in this study that aimed to encourage student learning: 1) fostering student motivation, 2) giving directions, 3) promoting knowledge construction, 4) thinking along and 5) creating research awareness. This indicates that novice supervisors partly focused on instructional decisions in practice; for example, in giving directions (cf. Talanquer, Tomanek, and Novodvorsky 2007). Promoting knowledge construction could mean that supervisors interpret student understanding during student-supervisor interaction, although based on the concept of teacher noticing this was expected to be difficult for novice supervisors. These findings indicate that noticing can be a useful concept for understanding novice supervisors' practices, although longitudinal research would be needed to provide insight into adaptation of supervision practices. The supervision practices 'thinking along with the student' and 'creating research awareness' could be specific to a context in which students participate as a researcher (e.g. Healey and Jenkins 2009). The supervision practices found in our study may complement each other in fostering student learning, although relations with student perceptions of research in teaching need to be explored (e.g. van der Rijst et al. 2013). Furthermore, the results show that, besides supervision practices, novice supervisors reflect on actors involved in student research projects, the planning of the project and personal supervision aims.

Relations between supervision practices and themes within a dilemmatic space were found. Dilemmas regarding fostering agency were related to student agency and giving student directions. This could indicate that novices are aware of themselves hindering or fostering student ownership. Fostering student agency might have been a prominent dilemma for the supervisors in this study, as the results indicate that encouraging student agency is related to direct ways of student steering. Motivating students, as a practice to promote student learning, was related to fostering student agency, interpretation of student needs and the supervisor-student relationship. This result suggests that supervisors may encounter difficulties in being clear to the student and maintaining the relationship (e.g. Turner 2015). Besides supervision practices, personal supervision aims seem to play a role in novice supervisors' dilemmatic space. Personal supervision aims were reflected in relation to concerns about professional identity. This could be explained by a potential overlap between supervisors' conceptions of themselves, research and teaching, on the one hand, and supervisors' values and intentions as expressed through a dilemmatic

space, on the other hand (e.g. Brew 2003; Robertson and Bond 2001; Visser-Wijnveen et al. 2010).

Limitations and implications

When interpreting the results the following points should be borne in mind. First, the participating supervisors have explicated their implicit dilemmas after the supervision meetings. In addition, the fact that the supervision meetings were videotaped might have affected student and supervisor behaviour. In the interviews, supervisors were encouraged to reflect on all aspects of the supervision meeting including potential influences of the video recording. The few times that supervisors mentioned to be aware of the recording, they indicated to have forgotten about it soon after the start of the meeting. Altogether, this might raise questions about the validity of the explications. Nevertheless, the interviews took place immediately after a supervision meeting and supervisors have chosen the moments within the meeting to reflect upon themselves. Second, the results were based on a sample of eleven supervisors within one single research-intensive university who voluntarily participated and were interested in improving their research supervision practices. This might affect the generalizability of our findings. Findings from a previous study into data saturation in qualitative studies indicate that the number of supervisors in this study is close to the point at which it has been found that limited new categories emerge from the data (Guest, Bunce, and Johnson 2006). Furthermore, the literature on relations between research and teaching indicates that we need to reckon with potential disciplinary differences with regard to teaching (e.g. Colbeck 1998; Smeby 2000). This study was conducted, including multiple departments within the medical discipline as a hard discipline and this may hamper the generalizability of findings to other disciplines.

This study has three implications for supervisor training practice within higher education institutions. First, based on the findings of this study it can be beneficial to evoke supervisors' reflections on their own practices using video in addition to more implicit ways of using supervisors' experiences to improve supervision practices and in addition to years of supervising experience as an indicator of quality in supervision practices. An example, in the context of a training, would be if novice supervisors select both a positive and challenging fragment from a meeting with a student. Subsequently, the supervisors share their reasons for selecting the video fragments, watch it together with their colleagues, discuss supervisor behaviour and explore alternative practices (cf. Wichmann-Hansen, Thomsen, and Nordentoft 2015). Second, the findings from this study add to findings from earlier studies suggesting that novice supervisors approach research supervision using their previous experiences as both students and supervisors (Amundsen and McAlpine 2009; Turner 2015), by using dilemmas which are inherent to student-supervisor interaction as a starting point for sharing those experiences among colleagues who also supervise students. The questions found in the dilemmatic space can be used as a starting point for sharing ideas about research supervision practice. Third, findings from this study suggest that fostering supervision practices with an influence on student learning in research projects requires an explicit focus from supervisors. This is not always evident, as student research projects are not directly seen as an opportunity to promote student learning by academics (e.g. Brew and Mantai 2017). Supervisor training, therefore,

could focus on relations between concrete supervisor experiences in supervising students, reflections on supervision practices and student learning.

Future studies into research supervision practices and the dilemmatic space of experienced supervisors can provide insights into the role of supervising experience on supervisor learning. For example, how do experienced supervisors reflect on their practices in comparison to novices? Based on findings from previous studies it is to be expected that experienced supervisors can experience similar dilemmas (Amundsen and McAlpine 2009; de Kleijn et al. 2014; Wichmann-Hansen, Thomsen, and Nordentoft 2015).

Conclusions

Promoting student learning in research supervision does not only require supervision experience to draw upon in practice, but also the ability to interpret characteristics of student learning in interaction (e.g. van Es and Sherin 2008). The diversity of concerns that novice supervisors' elicited in this study highlights the importance of supervisor considerations that influence pedagogical choices. Interpreting student understanding is difficult for novices as this is also mentioned as a theme within a dilemmatic space. This study provides in-depth insights into how novice supervisors supervise student research projects. Our results show that, although student research projects are common practice in higher education, stimulating student learning is not straightforward for novice supervisors. The findings suggest that initiatives supporting supervisor development can benefit from explicit supervisor reflections on their practices using video in contrast to more implicit ways of incorporating supervisor experiences in supervisor training. Furthermore, this study has revealed a dilemmatic space, demarcated by four dilemmas, in which research supervision takes place in practice. Based on the findings of this study it is suggested that dilemmas regarding determining the student needs, the extent to which the student can regulate the research process, the student-supervisor relationship and the role of the supervisor as perceived by others influence supervision practices and, therefore, should be addressed in supervision training.

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References

Amundsen, C., and L. McAlpine. 2009. "'Learning Supervision': Trial by Fire." *Innovations in Education and Teaching International* 46 (3): 331–342.

Anderson, C., K. Day, and P. McLaughlin. 2008. "Student Perceptions of the Dissertation Process in a Masters Degree Concerned with Professional Practice." *Studies in Continuing Education* 30 (1): 33–49.

Ashwin, P. 2012. *Analysing Teaching-learning Interactions in Higher Education. Accounting for Structure and Agency*. London: Continuum International Publishing Group.
Barnhart, T., and E. A. van Es. 2015. "Studying Teacher Noticing: Examining the Relationship Among Pre-service Science Teachers' Ability to Attend, Analyze and Respond to Student Thinking." *Teaching and Teacher Education* 45: 83–93.
Becher, T., and P. R. Trowler. 2001. *Academic Tribes and Territories. Intellectual Enquiry and the Culture of Disciplines*. 2nd ed. Suffolk, UK: St Edmundsburry Press.
Biglan, A. 1973. "The Characteristics of Subject Matter in Different Academic Areas." *Journal of Applied Psychology* 57 (3): 195–203.
Boud, D., and A. Lee. 2005. "'Peer Learning' as Pedagogic Discourse for Research Education." *Studies in Higher Education* 30 (5): 501–516.
Bowen, G. A. 2006. "Grounded Theory and Sensitizing Concepts." *International Journal of Qualitative Methods* 5 (3): 12–23.
Brew, A. 2001. "Conceptions of Research: A Phenomenographic Study." *Studies in Higher Education* 26 (3): 271–285.
Brew, A. 2003. "Teaching and Research: New Relationships and their Implications for Inquiry-based Teaching and Learning in Higher Education." *Higher Education Research and Development* 22 (1): 3–18.
Brew, A., and L. Mantai. 2017. "Academics' Perceptions of the Challenges and Barriers to Implementing Research-based Experiences for Undergraduates." *Teaching in Higher Education* 22 (5): 551–568.
Bruce, C., and I. Stoodley. 2013. "Experiencing Higher Degree Research Supervision as Teaching." *Studies in Higher Education* 38 (2): 226–241.
Colbeck, C. 1998. "Merging in a Seamless Blend." *Journal of Higher Education* 69: 647–671.
de Kleijn, R. A. M., P. C. Meijer, M. Brekelmans, and A. Pilot. 2015. "Adaptive Research Supervision: Exploring Expert Thesis Supervisors' Practical Knowledge." *Higher Education Research and Development* 34 (1): 117–130.
de Kleijn, R. A. M., P. C. Meijer, A. Pilot, and M. Brekelmans. 2014. "The Relation between Feedback Perceptions and the Supervisor-student Relationship in Master's Thesis Projects." *Teaching in Higher Education* 19 (4): 336–349.
Dempsey, N. 2010. "Stimulated Recall Interviews in Etnography." *Qualitative Sociology* 33 (3): 349–367.
Dixon, K., and H. Hanks. 2010. "From Poster to PhD." In *The Routledge Doctoral Supervisor's Companion*, edited by M. Walker, and P. Thomson, 51–65. Abingdon: Routledge.
Emilsson, U., and E. Johnsson. 2007. "Supervision of Supervisors: On Developing Supervision in Postgraduate Education." *Higher Education Research and Development* 26 (2): 163–179.
Erickson, F. 2011. "On Noticing Teacher Noticing." In *Mathematics Teacher Noticing: Seeing Through Teachers' Eyes*, edited by M. Sherin, V. Jacobs, and R. Philipp, 17–34. New York: Routledge.
Fleiss, J. L. 1981. *Statistical Methods for Rates and Proportions*. 2nd ed. New York: John Wiley.
Fransson, G., and J. Grannäs. 2013. "Dilemmatic Spaces in Educational Contexts – Towards a Conceptual Framework for Dilemmas in Teachers Work." *Teachers and Teaching* 19 (1): 4–17.
Frelin, A, and . 2010. *Teachers' Relational Practices and Professionality. Dissertation*. Upsala: Uppsala University.
GMC (General Medical Council). 2015. "The Doctor as Scholar and Scientist." In *Outcomes for Graduates*. Accessed September 6, 2017. http://www.gmc-uk.org/education/undergraduate/undergrad_outcomes.asp.
Grant, B. 2003. "Mapping the Pleasures and Risks of Supervision." *Discourse: Studies in the Cultural Politics of Education* 24 (2): 175–190.
Guest, G., A. Bunce, and L. Johnson. 2006. "How Many Interviews are Enough? An Experiment with Data Saturation and Variability." *Field Methods* 18 (1): 59–82.
Halse, C. 2011. "Becoming a Supervisor: The Impact of Doctoral Supervision on Supervisors' Learning." *Studies in Higher Education* 36 (5): 377–392.

Harwood, N., and B. Petrić. 2017. *Experiencing Master's Supervision. Perspectives of International Students and their Supervisors*. Abindon: Routledge.
Healey, M., and A. Jenkins. 2009. *Developing Undergraduate Research and Inquiry*. York: Higher Education Academy.
Jonasson, C., Å Mäkitalo, and K. Nielsen. 2015. "Teachers' Dilemmatic Decision-making: Reconciling Coexisting Policies of Increased Student Retention and Performance." *Teachers and Teaching* 21 (7): 831–842.
Kandiko, C. B., and I. M. Kinchin. 2012. "What is a Doctorate? A Concept-mapped Analysis of Process Versus Product in Lab-based PhD's." *Educational Research* 54 (1): 3–16.
Lee, A. 2008. "How are Doctoral Students Supervised? Concepts of Doctoral Research Supervision." *Studies in Higher Education* 33 (3): 267–281.
Leong, W. S. 2014. "Understanding Classroom Assessment in Dilemmatic Spaces: Case Studies of Singaporean Music Teachers' Conceptions of Classroom Assessment." *Music Education Research* 16 (4): 454–470.
Lizzio, A., and K. Wilson. 2004. "Action Learning in Higher Education: An Investigation of its Potential to Develop Professional Capacity." *Studies in Higher Education* 29 (4): 469–488.
MacIntyre, A. C. 2007. *After Virtue: A Study in Moral Theory*. 3rd ed. Notre Dame: University of Notre Dame Press.
Mainhard, T., R. M. van der Rijst, J. van Tartwijk, and T. Wubbels. 2009. "A Model for the Supervisor-doctoral Relationship." *Higher Education* 58 (3): 359–373.
Malcolm, M. 2012. "Examining the Implications of Learner and Supervisor Perceptions of Undergraduate Dissertation Research in Business and Management." *Teaching in Higher Education* 17 (5): 565–576.
Manathunga, C., and J. Goozée. 2007. "Challenging the Dual Assumption of the 'Always/Already' Autonomous Student and Effective Supervisor." *Teaching in Higher Education* 12 (3): 309–322.
Manathunga, C., P. Lant, and G. Mellick. 2006. "Imagining an Interdisciplinary Doctoral Pedagogy." *Teaching in Higher Education* 11 (3): 365–379.
Maxwell, T., and R. Smyth. 2011. "Higher Degree Research Supervision: From Practice Toward Theory." *Higher Education Research and Development* 30 (2): 219–231.
McCulloch, A., and C. Loeser. 2016. "Does Research Degree Supervisor Training Work? The Impact of a Professional Development Instruction Workshop on Supervision Practice." *Higher Education Research and Development* 35 (5): 968–982.
Miles, M. B., and A. M. Huberman. 1994. "Cross-case Displays: Exploring and Describing." In *Qualitative Data Analysis. An Expanded Sourcebook*, 172–238. Thousand Oaks, CA: Sage Publications. Chap. 7.
NFU (Nederlandse Federatie van Universitair Medische Centra). 2009. "Raamplan Artsopleiding 2009." Accessed September 6, 2017. http://www.nfu.nl/img/pdf/Raamplan_Artsopleiding_2009.pdf.
Pearson, M., and A. Brew. 2002. "Research Training and Supervision Development." *Studies in Higher Education* 27 (2): 135–150.
Robertson, J., and C. Bond. 2001. "Experiences of the Relation between Teaching and Research. What Do Academics Value?" *Higher Education Research and Development* 20 (1): 5–19.
Scager, K., S. F. Akkerman, A. Pilot, and T. Wubbels. 2017. "Teacher Dilemmas in Challenging Students in Higher Education." *Teaching in Higher Education* 22 (3): 318–335.
Schön, D. A. 1983. *The Reflective Practitioner. How Reflective Practitioners Think in Action*. London: Temple Smith.
Shah, J. Y., and A. W. Kruglanski. 2008. "Structural Dynamics. The Challenge of Change in Goal Systems." In *Handbook of Motivation Science*, edited by J. Y. Shah, and W. L. Gardner, 217–229. New York: The Guilford Press.
Simon, H. A. 1957. *Models of Man. Mathematical Essays on Rational Human Behavior in a Social Setting*. New York: John Wiley and Sons, Inc.
Smeby, J. 2000. "Disciplinary Differences in Norwegian Graduate Education." *Studies in Higher Education* 25 (1): 53–67.
Talanquer, V., D. Tomanek, and I. Novodvorsky. 2007. "Revealing Student Teachers' Thinking Through Dilemma Analysis." *Journal of Science Teacher Education* 18 (3): 399–421.

Todd, M., Smith, K., & Bannister, P. 2006. "Supervising a Social Science Undergraduate Dissertation: Staff Experiences and Perceptions." *Teaching in Higher Education* 11 (2): 161–173.
Turner, G. 2015. "Learning to Supervise: Four Journeys." *Innovations in Education and Teaching International* 52 (1): 86–98.
van den Bogert, N., J. van Bruggen, D. Kostons, and W. Jochems. 2014. "Investigating Differences between Novice and Expert Teachers in Classroom Event Detection." *Teaching and Teacher Education* 37: 208–216.
van der Rijst, R., G. J. Visser-Wijnveen, N. Verloop, and J. H. van Driel. 2013. "Undergraduate Science Coursework: Teachers' Goal Statements and How Students Experience Research." *Innovations in Education and Teaching International* 50 (2): 178–190.
van Es, E. A., and M. G. Sherin. 2008. "Mathematics Teachers' 'Learning to Notice' in the Context of a Video Club." *Teaching and Teacher Education* 24 (2): 244–276.
Verloop, N. 1989. "Interactive Cognitions of Student-teachers. An Intervention Study." PhD diss., Leiden University.
Visser-Wijnveen, G. J., J. H. van Driel, R. M. van der Rijst, N. Verloop, and A. Visser. 2010. "The Ideal Research-teaching Nexus in the Eyes of Academics: Building Profiles." *Higher Education Research and Development* 29 (2): 195–210.
Walker, M., and P. Thomson. 2010. *The Routledge Doctoral Supervisor's Companion: Supporting Effective Research in Education and the Social Sciences*. London: Routledge.
Wichmann-Hansen, G., R. Thomsen, and H. M. Nordentoft. 2015. "Challenges in Collective Academic Supervision: Supervisors' Experiences from a Master Programme in Guidance and Counselling." *Higher Education* 70 (1): 19–33.
Wiggins, S., A. Gordon-Finlayson, S. Becker, and C. Sullivan. 2016. "Qualitative Undergraduate Project Supervision in Psychology: Current Practices and Support Needs of Supervisors Across North East England and Scotland." *Qualitative Research in Psychology* 13 (1): 1–19.

Appendix 1. Between case data matrix of fragments reflecting relationships between dilemmatic space and practices.

Code ($N_{fragments}$)	Regulation question ($N = 34$)	Student needs question ($N = 21$)	Relational question ($N = 16$)	Identity question ($N = 17$)
Practice/ Fostering motivation	'He has to ask me if he gets stuck or when he has a question about the order of the findings in the report. He may try his best regarding his findings, although he needs to ask me when he gets stuck. From my own and others experiences as students I know this is really difficult.' (Anna).	'Sometimes it's difficult to figure out what more you can do to make someone better. Sometimes it's already sufficient'. Interviewer: 'Did you try to figure out what you could do for her during this meeting?' 'Yes. This time I asked her, like feedback, at the end of the meeting about things that I could do. I'ts difficult for me to know what she thinks. […] Perhaps I'm doing too much for her?' (Linda).	'She indicates that she isn't quite calm yet. I try to calm her down. She knows herself, she told me: 'Every now and then I can't put my mind to rest. It [the research project] isn't easily out of my head'. She keeps telling me that. And still this feeling isn't gone, she's trying to ignore it. Now, we're talking about it again.' (Linda). + 2 fragments; Peter, Anna.	
Practice/ Giving directions	'What I've noticed is that I'm going to lecture him at a certain point. I often do that. I leave him more or less space	'This project is completely different from what was planned previously. The outcome is just not what we expected. That	'Here we talk about the report. She isn't quite at the level that I expect her to be. I won't beat about the	'Because she doesn't respond with 'oh yeah' right away on my instruction I thought I apparently

(*Continued*)

Continued.

Code ($N_{fragments}$)	Regulation question ($N = 34$)	Student needs question ($N = 21$)	Relational question ($N = 16$)	Identity question ($N = 17$)
	to come up with his own things. I've noticed that during the supervision meeting, I've interrupted him once or twice. [Pointing at the video] Look, things like this. I already know he's got ideas about this, we've discussed this before. Despite that I tell him what the aim was and what we're going to do. Then I quietly wonder how that comes across to him, because I am determining the direction.' (Robert). + 13 fragments; Peter, Vera, Mary, Paul, Jacky, Ricky.	is always difficult, but the most important thing, which is crucial for atherosclerosis is that blood cholesterol level goes down. And that wasn't the case here. She didn't discuss that on the poster. She talks about [concept], but that was something I thought: Isn't that on the poster? That's a bit strange, because that's key. Apparently, I've not explained it well, or she still missed something.' (Vera). + 2 fragments; Jacky.	bush this time. Normally, ehh, I always try to be polite. There's still a lot to be done, there really should be … You're [the student] often unclear. You leave the reader with a whole lot more questions than answers. It still isn't clear what you mean.' (Peter). + 1 fragment; Vera.	needed something else. Perhaps it's better for her to come up with another example. I prefer to, I reckon. I prefer to give hints that she can fill in, over explaining exactly what she has to do. Although I seem to do that every now and then.' (Ricky). + 1 fragment; Paul.
Practice/ Promoting knowledge construction	'That's an example that she figures out herself. That's why we meet often in order for her to check whether she's doing it right. Because when she has to do that many samples and she makes a mistake with the first one, she can go on, but she's to do it again.' (Linda). + 1 fragment; Vera.	'I've asked her 'Did you forget?' Because I expected her to forget this. After that, I explained to her that it's very difficult for me to figure out whether she forgets, she doesn't agree or she can't do it and needs help.' (Vera). + 6 fragments; Brenda, Jacky, Ryan.	'Every now and then you [the student] have a question and you want to hear the right answer. I don't want to ask questions all the time, but confirm his thoughts as well. He's on the right line of reasoning here. He understands.' (Brenda). + 1 fragment; Brenda.	'I doubt whether it came out pretty quickly that I've asked how he's doing. Usually he answers me with specific questions. [video fragment]. Now, I should have let him explain more himself.' (Mary). +1 fragment; Linda.
Practice/ Thinking along	'Here we are discussing vitamin D and [concept], which we didn't find in the data. Do we've to include this? No, we mustn't do that. So, we have discussions about this.' (Peter).			
Practice/ Creating awareness			'Actually, I want to tell him, because he's to be aware of that. He has to try to think about the Dutch words to choose when he reads a piece of English text that he wants to use in his report. That's what I try to tell him.' (Anna).	'I have to tell him that I've noticed he's using [a translation engine] to translate and copy text. Yes, I have to tell him, otherwise he'll keep doing this. And his other supervisor at the school [university] is also going to read this.' (Anna).
Actor/ supervisor	'From my experience with him [not finishing his project before the next	'The other student I supervise … I just don't know what to do to	'I try to keep it friendly and a little directive, but I notice that's	'What's difficult is that I'm not an expert in this literature. So,

(*Continued*)

Continued.

Code ($N_{fragments}$)	Regulation question ($N = 34$)	Student needs question ($N = 21$)	Relational question ($N = 16$)	Identity question ($N = 17$)
	course] … I didn't pose a deadline back then. Like when you don't submit your research proposal by the end of December, you aren't allowed to start your research project. He didn't submit it in time, but there were no consequences for him. I've learned from that.'(Vera). + 7 fragments; Brenda, Mary, Robert.	make it better. It's really annoying when [the student] doesn't respond. If I were the student, I'd go and ask, while I leave the samples in the nitrogen. Now everything is defrosted and ruined. I quietly wonder whether that's my fault, or his, or our interaction? I don't understand. I just don't know … There are so many examples of this.' (Vera). + 3 fragments; Vera, Brenda, Mary.	difficult for me. I don't ask myself how that comes across to the student, so I fin d that hard.' (Robert) + 4 fragments; Robert, Anna, Linda, Mary.	ehh … Basically, he's helping a colleague with his research (Robert). + 5 fragments; Brenda, Vera, Linda.
Actor/student	'[…] On the one hand, he [the student] wants a structured project. On the other hand, he has indicated that he wants to do research independently. That was one of his learning goals for his final student research project. He wants an idea of where to start when he has a research project or research question again. For me, that's seeking a balance between those two.' (Mary) + 1 fragment; Anna.	'And that's what I'm most concerned about. Are the tasks that I propose to her impossible to do? Yes, because she says she can't do it. Well … Is it too difficult for her? Or is she just cutting too many corners?' (Peter) + 5 fragments; Anna, Peter, Vera, Mary, Ricky.	'The previous meeting was with his other supervisor. She simply neglected half of his tables and told him to focus on this. I know that he's interested in that stuff and started from there. I wanted to know if he's OK now.' (Brenda). + 1 fragment; (Linda)	'Eventually he had just few specific questions about this. I really expected him to have questions, such as 'How is this and that done?'. Then I found out he'd already e-mailed his other supervisor without notifying me.' (Mary).
Actor/other				'My supervisor told me that I have to be stricter for students. I don't know. I find that difficult in this case.' (Mary).
Rest/planning	'At the end of the conversation, we discuss whether this planning is realistic. She raises the bar for herself. Too high, I think. But, hey, it's her internship. I keep the option open that this work isn't finished by Friday. And I wouldn't mind. Her assessment is on Monday. So if it's finished before then it's ok. But she raises the bar herself, wanting to		'I see her everyday anyway. I think it's important, I think, that you see people and talk to other colleagues. You know what everyone is doing and you know what their day is really like. I'm not going around talking nonstop for an hour with my cup of coffee, but I'll walk around every morning at nine o'clock. 'How's it	'I've said to her, lets cancel that, because there is enough to do for those other two things. Things have to be completed, because we have to show something to the board of examiners and we need something to publish.' (Peter).

(*Continued*)

Continued.

Code ($N_{fragments}$)	Regulation question ($N = 34$)	Student needs question ($N = 21$)	Relational question ($N = 16$)	Identity question ($N = 17$)
	finish this on Friday.' (Peter). + 5 fragments; Vera, Paul, Linda.		going? Today you did this and this and do this.' That's OK, I think.' (Linda).	
Rest/ supervision aim				'I find it difficult to provide feedback on this kind of rules of engagement [the student being late, the student sending an e-mail to the senior research without mentioning the supervisor]. I find it difficult, because it's only about how I like it.' (Mary). + 2 fragments; Anna.