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Supervisor and Student Perspectives on Undergraduate Thesis Supervision in Higher Education

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ABSTRACT

Diagnosing teachers are teachers who perceive diagnostic information about students' learning process, interpret these aspects, decide how to respond, and act based on this diagnostic decision. During supervision meetings about the undergraduate thesis supervisors make in-the-moment decisions while interacting with their students. We regarded research supervision as a teaching process for the supervisor and a learning process for the student. We tried to grasp supervisors' in-the-moment decisions and students' perceptions of supervisors' actions. Supervisor decisions and student perceptions were measured with video-stimulated recall interviews and coded using a content analysis approach. The results showed that the in-the-moment decisions our supervisors made had a strong focus on student learning. Supervisors often asked questions to empower students or to increase student understanding. These supervising strategies seemed to be adapted to students' needs, as the latter had positive perceptions when their control increased or when they received stimuli to think for themselves.

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student perceptions;
teacher–student interaction;
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Introduction

Diagnosing teachers are teachers who *perceive* relevant diagnostic information about students' learning process, *interpret* these aspects, *decide* how to respond to this diagnostic conclusion, and finally *act* based on this diagnostic decision (Hoth et al., 2016). Diagnostic information gives teachers insight into students' thinking and skills. They can use this information to interpret whether students, for instance, just made a minor mistake or have a deep misunderstanding. As a result, teachers can decide how to intervene (e.g., by means of feedback or prompts) to stimulate students in their learning process. When teachers diagnose students' skills accurately, they can develop and apply more effective and efficient teaching strategies, with consideration of students' needs (Hedin & Gaffney, 2013; Südkamp et al., 2012). Research supervision is a complex and subtle form of teaching. In this study, we regard research supervision as a teaching process for the supervisor and a learning process for the student (Bruce & Stoodley, 2013; Franke & Arvidsson, 2011). Research on academic supervision is

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often focused on master thesis supervision (e.g., de Kleijn et al., 2015) or doctoral supervision (e.g., Lee, 2008). Some studies have focused on the undergraduate thesis (e.g., Todd et al., 2006). This study focuses on the perspectives of supervisors and students on the undergraduate thesis supervision.

When students are writing their undergraduate thesis about a research project, they need several research skills: e.g., they have to write a research plan; review the literature to develop a conceptual framework; determine the aim and focus of their study; and compose the research questions (Wisker, 2009). Diagnosing students' research skills adequately is crucial for the quality of research supervision (de Kleijn et al., 2015). In undergraduate thesis supervision, supervisors' diagnostic skills can be defined as their ability to judge students' research skills (Agricola et al., 2018). Research supervisors need to be sensitive to all the differences between students: the level and amount of supervisor support has to be adapted to students' needs and the nature of the required support will differ from student to student (Engebretson et al., 2008; Shanahan et al., 2015; Todd et al., 2006).

In the context of supervision meetings about the undergraduate thesis, Agricola et al. (2018) showed that teachers were able to ask several diagnostic questions; however, teachers formulated only a few diagnoses, and applied many interventions. Supervisors struggle with the balance between intervening and providing support, on the one hand, and allowing students to find their own ways to develop their own problem solving approaches, on the other hand (Todd et al., 2006; Vehviläinen & Löfström, 2016). Students struggle with a similar balance between working self-directed and autonomous and being dependent and asking for help (Vehviläinen, 2009b). Agricola et al. (2019) showed in a recent study how supervisors and students are co-regulating students' learning processes, and trying to find this balance of collaboration. They showed that some supervisors offered much feedback and many explanations, resulting in students acting quite passively. Other supervisors seemed to be more autonomy-supportive to the students; these students took more responsibility in regulating their learning than other students did. Supervision meetings offer opportunities for supervisor-student interaction; these meetings give supervisors the opportunity to diagnose students' research skills and to adapt their support to students' needs (de Kleijn et al., 2015).

Diagnosing students' learning process is a complex process: teachers either do not use their diagnoses (Klug et al., 2013; Van de Pol et al., 2011), have difficulties in diagnosing students' errors (Stahnke et al., 2016), overestimate student performance (Feinberg & Shapiro, 2009), or intervene immediately (Agricola et al., 2018; Ruiz-Primo & Furtak, 2007). Another challenging aspect of diagnosing students' learning is that this generally takes place during moment-to-moment teaching (Borko et al., 2008). Teachers make *in-the-moment decisions* all the time when they teach and interact with their students, with literally hundreds of decisions a day (Clark, 2005). During interactive teaching, teachers' in-the-moment decisions play an important role in teachers' diagnoses and their acting (Shavelson & Stern, 1981). Teachers perceive what individual students know, they interpret their own observations, make in-the-moment decisions that finally result in a *teaching action* (Hoth et al., 2016). While teachers' actions are observable, their diagnoses and in-the-moment decisions are not and are often hidden (Jacobs et al., 2010).

We argue research supervisors' diagnoses cannot be observed, as they are merely formulated implicitly and stay inside their heads. The cognitive processes of students' perceptions are hidden and unobservable as well. In this study, we aim to look beyond the observable behavior of research supervisors and students and try to reveal supervisors' in-the-moment decisions and students' perceptions. Within the context of research supervision, we aim to investigate the actions and in-the-moment decisions supervisors make, which actions and decisions they have planned, and what perceptions students have on these actions.

Teachers' In-the-moment Decisions and Teaching Actions

In this study, we defined teachers' teaching actions as all information provided to foster students' learning. Teachers carry out a lot of teaching actions during teacher-student interactions: they ask questions, check student understanding, and give feedback. In-the-moment decisions are

defined in many different ways. Some researchers variously defined these decisions as interactive cognitions (Hennissen et al., 2010; Meijer et al., 2002; Schepens et al., 2007), as interactive decisions (Housner & Griffey, 1985; Richards, 1998; Tsang, 2004), as in-the-moment decision-making (Jacobs et al., 2010; Schoenfeld, 2015; Stahnke et al., 2016), or as in-the-moment noticing (Barnhart & van Es, 2015; Sherin et al., 2011). In this study, we use the definition of teachers' *in-the-moment decisions*; we operationalized these decisions as teachers' reasoning for their *teaching actions* (Johnson, 1992; Rich & Hannafin, 2008; Richards, 1998; Tsang, 2004). For example, Rich and Hannafin (2008) observed four pre-service teachers' actions and the in-the-moment decisions they made in the classroom. Their analyses revealed several connections between teachers' in-the-moment decisions and their teaching actions. For example, teachers who aimed for students to take different perspectives (decision) asked questions (action) to prompt this.

Teachers' Aims and Planning of Teaching Actions

Although teachers carry out many teaching actions when interacting with their students, they do not plan many of these actions. In general, teachers think their lesson planning through; they are engaged in making pre-active decisions on what to teach, how to present it, and how to assess student learning (Lai & Lam, 2011). Several researchers focused on teachers' *planning of teaching actions* and the *aims* they have before the teaching situation occurs (Borko et al., 2008; Clark & Peterson, 1986; Eley, 2006; Housner & Griffey, 1985; Kohler et al., 2008; Westerman, 1991). Several researchers determined which of the planned actions and intended decisions were obtained, and how many times teachers had to improvise based on students' cues and inaccurate answers. For example, Kohler et al. (2008) investigated how 150 student teachers modified their planned actions during classroom interactions with their students. These student teachers made 314 in-the-moment adjustments during teaching based on student difficulties. Westerman (1991) studied teachers' decision-making and her expert teachers adapted their teaching actions based on students' cues. The already planned teaching actions were still carried out, and they were not affected by the in-the-moment decision-making.

Students' Perceptions of Teaching Actions

In this study, we defined students' perception as the extent to which students perceive teachers' teaching actions to be supportive of their learning. Many researchers have investigated the perception of feedback. We know teachers and students perceive the feedback process differently (Carless, 2006; Mulliner & Tucker, 2017; Weaver, 2006), and students' understanding of feedback is often not consistent with the intention of the teacher (Van der Schaaf et al., 2011). Dowden et al. (2013) described students who perceived feedback in a negative light, when this was unlikely to have been the intention of the teacher. Students prefer feedback to be specific and timely (Poulos & Mahony, 2008), to be personalized, and with clear guidance on how to improve their work (Ferguson, 2011). However, students often do not find teacher feedback very helpful (Hounsell et al., 2008). Orsmond and Merry (2011) found in their research a misalignment between the feedback giver and receiver; they argued that teachers should adapt their feedback more to students' needs, and apply more variation in their feedback. In this study, we were interested in how students perceived teachers' teaching actions, including teacher feedback.

In-the-moment Decision-making Model for Research Supervision

For this study, we constructed a decision-making model in which the main variables were combined for research supervision. Based on the phases of decision-making, we applied two phases in our model: the pre-active planning phase and the interactive supervising phase (Clark, 2005; Westerman, 1991). The pre-active planning phase consists of two steps: one step in which supervisors plan their

supervising actions (Kohler et al., 2008), e.g., planning in terms of giving feedback, while the other step consists of the aims and objectives supervisors have, e.g., increasing student understanding. The interactive supervising phase of the model consists of four cyclical steps. The emphasis of the cycle is found in step 1 with the perceive-interpret-decide (PID) model that Hoth et al. (2016) used to define the diagnosis. In this first interactive step, supervisors perceive and interpret students' ability, motivation, and behaviour, and make *in-the-moment decisions* on how to act. In step 2, based on the in-the-moment decisions, supervisors carry out *supervising actions*; supervisors give feedback and explanations, and ask questions to, and elicit input from, their students. These supervising actions are performed just as they were planned in the planning phase or were adjusted based on their perception and interpretation in step 1. In step 3, students *perceive* and interpret the supervising actions, and in step 4 they respond and act based on these perceptions. The cycle continues when supervisors perceive and interpret students' responses, and again make in-the-moment decisions on how to act (see Figure 1).

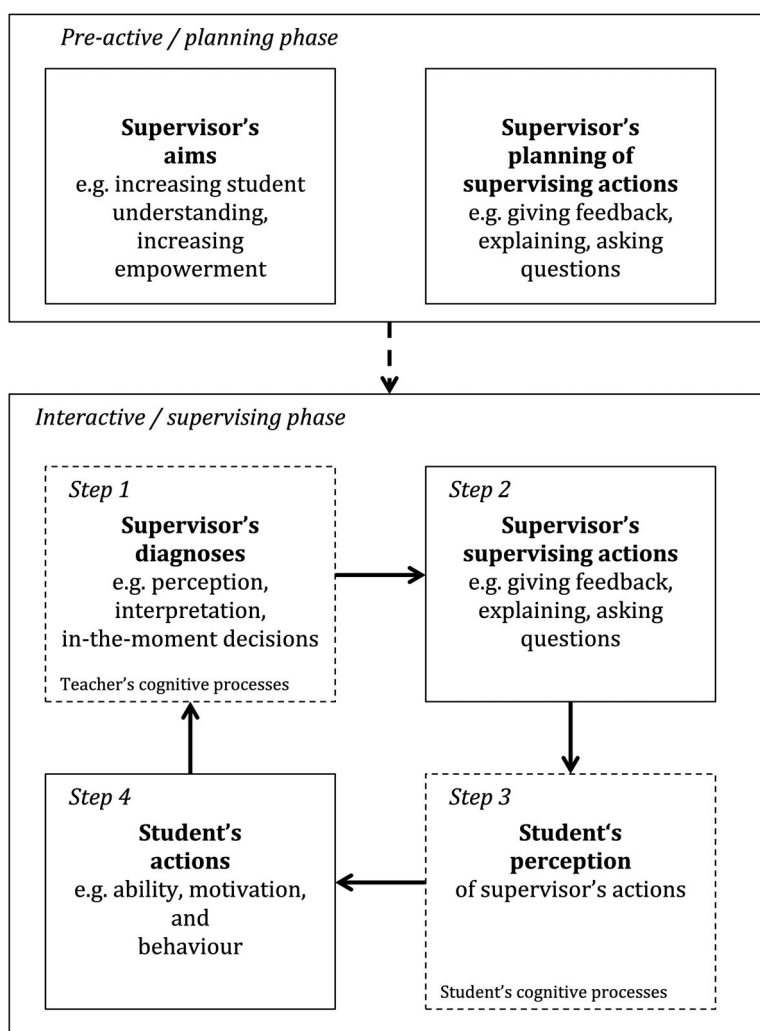


Figure 1. Model with the pre-active/planning phase (aims, objectives, and planning of supervising actions), and the interactive/supervising phase (supervisors' diagnoses and supervising actions, students' perceptions and actions), based on the PID model of Hoth et al. (2016).

Present Study

Supervision meetings give supervisors the opportunity to diagnose students' research skills and to adapt their support to students' needs (de Kleijn et al., 2015). Capturing supervisors' in-the-moment decisions can reveal their diagnosing process and gives insight into why certain supervising actions are performed. Students' feedback perceptions are unobservable as well; what they think remains unclear. This study on supervisor and student thinking will contribute to our understanding of supervisor-student practices; the study aimed to determine which in-the-moment decisions supervisors make when interacting with their students. Based on supervisor planning and student perceptions, we will formulate which decisions are desirable, and give suggestions for supervisors on how to move in this direction. Within the context of supervisor-student interactions and research supervision, we tried to grasp the in-the-moment decisions inside supervisors' heads that lead to supervising actions, and students' perception of these actions. We addressed the following research questions:

- (1) Which different types of in-the-moment decisions do research supervisors report, and how are they connected to supervising actions?
- (2) Which of the reported in-the-moment decisions were already aimed for, and which reported supervising actions were already planned?
- (3) How do students perceive supervisors' supervising actions?

Method

Design

In this exploratory study, a multiple case study design was used (Yin, 2014). The research questions focused on different cases. Research questions 1 and 2 focused on the supervisor as a case; research question 3 focused on the student as a case. We adopted a qualitative approach in the form of interviews with both supervisors and students. This approach was chosen to yield a detailed narrative of supervisors' in-the-moment decisions and students' perceptions.

Context

Students were in the final year of their Bachelor of Health programme at a Dutch university. The students wrote their thesis alone or in pairs and had 20 weeks to conduct their research project and write their thesis (30 ECTS; 840 h). During the course, the students had approximately eight supervision meetings with their supervisor; one of these meetings was selected for data gathering.

Participants

Seven supervisors with a mean age of 39.0 years (SD = 10.0) and mean supervising experience of 9.1 years (SD = 10.7) voluntarily agreed to participate. Nine students with a mean age of 22.6 years (SD = 1.4) agreed to participate in a videotaped observation. Six of these nine students agreed to participate in stimulated recall interviews. Before data collection started, supervisors and students were informed that the study was investigating the interaction between supervisors and students, the support that supervisors provided, and how students perceived the feedback during the supervision meetings. All participants gave informed consent before data collection started (see Table 1).

Stimulated Recall Procedure

A wide range of methodological possibilities is available for researchers studying teacher and student cognition: observations, self-report instruments, verbal commentaries, and reflective writing (Borg,

Table 1. Characteristics of participants.

Meeting	Role	Id	Name	Age	Sex	Education	Supervising
1	Supervisor	R1	Thelma	58	F	MSc	32
	Student	S1	Louise	22	F	PUE	
2	Supervisor	R2	Emilia	34	F	MSc	10
	Student	S2a	Sophie	23	F	VE	
	Student	S2b	Maisie	22	F	HGCE	
3	Supervisor	R3	Lorelai	40	F	MSc	3
	Student	S3	Rory	20	F	HGCE	
4	Supervisor	R4	Mel	45	F	PhD	5
	Student	S4	Kim	24	F	HGCE	
5	Supervisor	R5	Sandra	36	F	MSc	10
	Student	S5	Melissa	24	F	HGCE	
6	Supervisor	R6	Farrah	31	F	MSc	3
	Student	S6a	Jaclyn	23	F	HGCE	
	Student	S6b	Kate	23	F	HGCE	
7	Supervisor	R7	Cagney	29	F	MSc	1
	Student	S7	Lacey	20	F	HGCE	

Note: Education: HGCE = higher general continued education; PUE = pre-university education; VE = vocational education; Supervising = supervising experience in years.

2015; Clark, 2005). Most researchers have used stimulated recall to investigate and measure teachers' in-the-moment decisions (Borko et al., 2008; Eley, 2006; Hennissen et al., 2010; Housner & Griffey, 1985; Johnson, 1992; Meijer et al., 2002; Rich & Hannafin, 2008). Some researchers have used stimulated recall interviews to measure student perceptions (Wiltbank et al., 2018), students' pedagogical thinking (Mylläri et al., 2011), or their long term memories (Stolpe & Björklund, 2013). Stimulated recall involves the use of audiotapes or videotapes of skilled behaviour, which are used to aid a participant's recall of his thought processes at the time of that behaviour (Calderhead, 1981). Video stimuli from fixed cameras are often used, but these are limited as the camera perspective is different from the perspective of the decision-maker (Omodei & McLennan, 1994). A head-mounted camera can overcome this problem: it captures a powerful stimulus to the spontaneous recollection of *in-the-moment decisions* that were made during the recording (Omodei et al., 2012). In this study, a stimulated recall interview (SRI) procedure was used in which the videotape of a supervising episode was replayed to enable the supervisor to recollect their in-the-moment decisions and to enable the students to report on their perceptions.

Procedure and Materials

During our data gathering, we followed the decision-making phases of Westerman (1991) and distinguished – next to the pre-active and interactive phase – a post-active phase.

Pre-active Phase

Pre-active planning interviews took place just before the supervision meeting started. The first author acted as interviewer and asked each supervisor about their background, e.g., their faculty status and how long they had been supervising. Then, the interviewer asked the supervisors about their aims, and about the planning of their supervising actions. The pre-active interviews lasted for a maximum of 10 min. The interviews were videotaped with a fixed camera.

Interactive Phase

Then the supervision meeting took place and was videotaped with a head-mounted camera on the head of the supervisor and a fixed camera. The head-mounted camera was pointed towards the student to measure the supervising actions from the perspective of the supervisor. The fixed camera was used to videotape both participants of the supervision meeting, again to measure the supervising actions (see Figure 2). On the day of the observation, the first author installed and started the



Figure 2. Research supervision meeting between a supervisor (left) with head-mounted camera and a student.

video cameras, but was not present in the observation room during the videotaping of the meeting. The students were used to cameras as they often videotaped their own conversations for assessment and self-reflection. The supervisors reported that they were aware of the camera for the first few minutes but after that forgot its presence.

Post-active Phase

In the post-active phase, an SRI was conducted with each supervisor and each student. Before the SRI started, the first author instructed each participant according to the guidelines that were used by other researchers (Meijer et al., 2002; Schepens et al., 2007): (1) each participant was asked to relive their supervision meeting; (2) the participants were asked to stop the videotape themselves when they remembered a significant moment or observed a significant teaching action; (3) when participants became too involved in watching themselves, the interviewer stopped the video and asked what the participant was thinking at that moment.

Teacher SRI. An SRI was conducted with each supervisor immediately after the supervision meeting. The first 15 min of the supervision meeting were used as a stimulus. The videotape of the head-mounted camera was replayed to enable the supervisor to recollect and report on their supervising actions and recollect their in-the-moment decisions on which the actions were based (see Figure 3).

Student SRI. An SRI was conducted with each student immediately after the SRI with the supervisor. The fixed camera captured the supervising actions that were used as a stimulus for the stimulated



Figure 3. Head-mounted camera view from supervisor's perspective (left), used as a video stimulus during stimulated recall interview between the first author and the supervisor (right).

recall interview on each student's *perception*. The first author used the same instruction for the student as for the supervisor. The videotape of the fixed camera of the supervision meeting was replayed to enable the student to recollect and report on the supervisors' supervising actions. During the interview, the students were asked to stop the videotape themselves when they saw a significant supervising action about which they were asked for their perception.

Measures and Instruments

Aims and Planning of Supervising Actions

We measured supervisors' *aims* and *planning of supervising actions* with a small semi-structured interview guide (see Appendix A). The aims were measured to determine which in-the-moment decisions during the supervision meetings were already aimed for. The planning of supervising actions was measured to determine which supervising actions during the supervision meetings were already planned.

In-the-moment Decisions and Supervising Actions

We measured supervisors' *in-the-moment decisions* and *supervising actions* with a stimulated recall interview protocol. When the video stimulus was stopped, the interviewer used a semi-structured interview guide to ask about the in-the-moment decision and supervising action (see Appendix A).

Students' Perceptions of Supervising Actions

We measured *students' perceptions* of supervisors' supervising actions with a stimulated recall interview protocol. When the video stimulus was stopped, the interviewer used a semi-structured interview guide to ask about each student's perception of the supervising action (see Appendix B). See [Figure 4](#) for an overview of the study.

Data Preparation

Transcripts

Four different transcripts were prepared: (1) the pre-active interview; (2) the supervision meeting; (3) the supervisor SRI; and (4) the student SRI. The videos were transcribed verbatim into simple transcripts: literally, with punctuation, pauses, continuers (e.g., hm, yeah), and turn taking, but without intonation or non-verbal behaviour. In each transcript, a speaker received his/her own paragraph and a blank line was used between speakers. Speech turn taking was used as a segmentation criterion, because it fits with the natural course of the conversation (Chi, 1997).

SRI Episodes

Each interview transcript consisted of several SRI episodes. In these episodes, supervisors addressed their in-the-moment decisions, and students addressed their perceptions. Each SRI episode started with the moment the video was stopped, and the interview started. Each SRI episode ended when the video of the supervision meeting (the stimulus) was restarted. These SRI episodes were considered as the units of analysis during the coding of the in-the-moment decisions and supervising actions, and students' perceptions.

Data Analysis

In-the-moment Decisions and Supervising Actions

The transcripts of the videotaped SRIs consisted of extended text over many pages – not easy to see as a whole. They also included sequential information that made it difficult to look at two variables (e.g., in-the-moment decisions and supervising actions) at once or across cases. To overcome these issues,

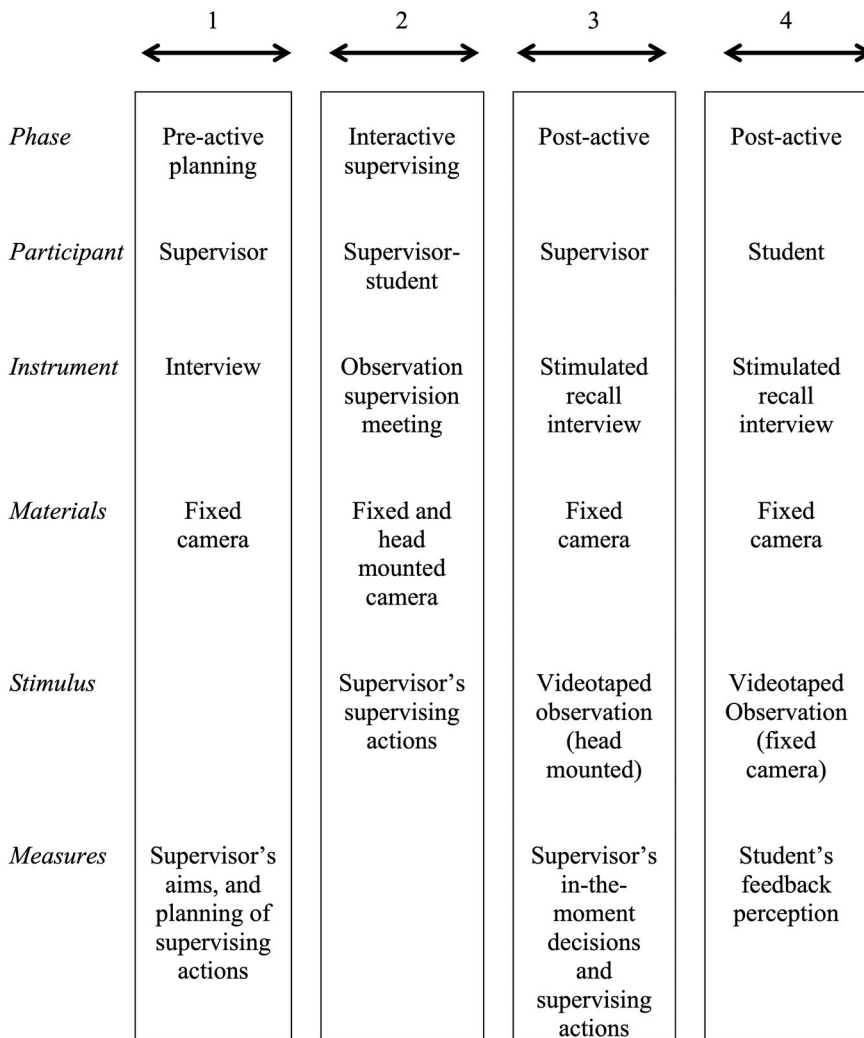


Figure 4. The four phases of the data collection.

we imported all transcripts into the qualitative data analysis software (QDAS) program NVivo® (QSR International Pty Ltd., Version 11, 2016).

Deductive Content Analysis. As we used a relatively structured interview guide with little additional questioning beyond what was specified beforehand, we applied a deductive content analysis (Boeije, 2010). An in-the-moment decision coding system and a supervising action coding system were created (see Appendix C). This coding system was based on the classification schemes of Rich and Hanafin (2008), Johnson (1992), and Richards (1998). This frame of analysis had already been developed in our introduction and we were looking specifically in our data for the supervisors' in-the-moment decisions and supervising actions. Ninety SRI episodes were coded with an in-the-moment decision code and a supervisor's action code. Each in-the-moment decision and supervising action was coded independently in order to classify the underlying in-the-moment decisions guiding specific supervising actions. The transcript part of the supervision meeting also helped us to code a supervising action when supervisors did not address their supervising action explicitly during the interview. When two different supervising actions were addressed by the interviewee within one

SRI episode, this episode was segmented into two units, which were separately coded with two different in-the-moment decisions and supervising actions.

Cross-case Analysis. A cross-case analysis was carried out with the QDAS of NVivo® to determine the decisions and actions across all seven supervisors. A matrix query was run in NVivo®, in which specific pairs of actions and decisions for all SRI episodes were identified. To analyse the data, we applied a combination of a *variable-oriented* strategy and a *case-oriented* strategy. First, the decision-action connections were presented in a predictor-outcome matrix (Miles & Huberman, 1994). The predictor-outcome matrix sorted the cases (the seven supervisors) by degrees of the in-the moment decisions being studied, and the outcome of the supervising actions as a result of this. With the variable-oriented strategy the most frequently coded in-the-moment decisions were determined. Second, we aimed to increase our understanding of the meaning of the in-the-moment decisions. With the case-oriented strategy, we selected several exemplary cases from the most frequently coded decisions in our interview data. These decisions were described in detail and illustrated with an exemplar from the interview transcripts.

Between-case Analysis. Then, a between-case analysis was carried out to gain more insight into the different decision-action connections among the seven supervisors. We determined connection patterns among supervisors, focusing on the decision-action connections that were coded three times or more in the cross-case analysis. To measure the connection between decisions and actions we created connection nodes in NVivo®. We defined the connection between an in-the-moment decision and a supervising action as a one-way connection with a definite direction: an in-the-moment decision evoked a supervisor's supervising action. For example, when a supervisor wanted students to increase understanding, he decided to give feedback. All SRI episodes were coded with a decision-action connection code in the same way as the deductive analysis was performed. Again, a matrix query was run in NVivo®, in which specific connections of actions and decisions among the seven supervisors were identified. These connections were presented in a case-ordered descriptive matrix (Miles & Huberman, 1994).

Supervisors' Aims and Planning Supervising Actions

The transcripts of the videotaped pre-active interviews were also imported into the QDAS program NVivo®. A deductive coding analysis was carried out on the aims and planning of supervising actions with the same in-the-moment decision coding system and supervising action coding system (see Appendix C). In the case-ordered descriptive matrix of the between-case analysis, we determined for our seven supervisors which in-the-moment decisions were already aimed for, and which supervising actions were already planned. These intended decisions and planned actions were described.

Students' Perception of Supervising Actions

First, each SRI episode was coded for a positive perception, a negative perception, or as miscellaneous. Then we performed a conventional content analysis on each positive and negative perception; the coding categories were derived directly and inductively from the transcript data (Hsieh & Shannon, 2005). A student perception coding system was created (see Appendix D). A cross-case analysis was carried out with the QDAS of NVivo® to determine the student perceptions for the six students. A matrix query was run in NVivo®, in which the specific perceptions for each student were identified. These perceptions were presented in a case-ordered descriptive matrix (Miles & Huberman, 1994). The case-ordered descriptive matrix sorted the cases (the six students) by degrees of the perceptions being studied. To increase our understanding of the meaning of students' perceptions, we selected several exemplary cases from our coded interview data (Miles & Huberman, 1994). The most frequently coded perceptions as depicted in the case-ordered matrix were described in detail and illustrated with an exemplar from the interview transcripts.

Audit Trail

To ensure the quality of this study, an audit trail was created (Akkerman et al., 2008). The object of this validation procedure was focused on all the steps of the data gathering and analysis. The auditor verified the research design, the procedure for data gathering and data analysis according to three criteria: visibility, comprehensibility, and acceptability. The first author prepared the procedure and presented all the findings to the auditor, accompanied by a justification of all decisions made. The second author acted as the auditor and conducted a summative audit. This type of audit meant the judgment of the auditor could not be used to improve the study, but merely aimed at validating the results that were reported (de Kleijn & Van Leeuwen, 2018). The auditor reported on the strengths and limitations and gave input to realize a more transparent method section (see Appendix E).

Results

In-the-moment Decisions and Supervising Actions

The supervisors stopped the replayed videos 97 times during the SRIs. These SRI episodes were coded for a supervising action and in-the-moment decision. Eight times a supervising action was coded with a non-verbal supervising code; supervisors reported supervising actions such as nodding, observing, or writing down. Twelve times a supervising action was coded as miscellaneous; supervisors reported on non-relevant topics, or gave a reflection on their own behaviour as shown in the video instead of determining an in-the-moment decision. As we were interested in supervising actions that gave opportunities for supervisor-student interactions, these non-verbal and miscellaneous coded supervising actions were not used, and 77 SRI episodes remained for further analysis.

Deductive Content Analysis

Coding results showed that the seven supervisors made six main in-the-moment decisions: empowerment, encouragement, involvement, social needs, understanding, and instructional management. The instructional management decision had four subcategories: checking student understanding, gathering information, initiating new topic, and planning next step. The social needs decision had three subcategories: emotion, expectation, and motivation. Supervisors reported five main supervising actions that resulted from these decisions: asking questions, eliciting input, explaining, giving feedback, and instructing.

Cross-case Analysis with Exemplars

The decision-action connections were determined by running a matrix query, which resulted in a case-ordered effect matrix. In total, 95 decision-action connections were coded, and 26 different types. With the variable-oriented approach, the matrix showed some clear connection patterns between the in-the-moment decisions and supervising actions. The in-the-moment decisions of encouragement, involvement, and initiating new topics were evidently coded less often than others. Based on the frequency of coding, we chose to describe and illustrate six in-the-moment decisions: the decision of empowerment, checking student understanding, gathering information, planning next step, social needs, and increasing student understanding. With the case-oriented approach, we provide exemplars from the interview data to illustrate these main in-the-moment decisions and how they are related to the supervising actions.

Empowering Students. Supervisors made in-the-moment decisions to *empower* students; these supervisors gave opportunities to their students to express and share the arguments for the choices they made. Supervisors allowed their students to ask some questions about difficulties they encountered.

I am not satisfied with her (student) answer; she is giving a solution, but I would like to hear her framing the problem first, that's why I am asking her some more questions to come up with that. (Mel R4; episode 8, minute 21.07)

To empower these students, supervisors asked their students questions about their own ideas; they elicited them to argue or elicited them to ask their own questions. The result of supervisor's empowerment was not always aligned with the supervisor's intention of the meeting.

I tended to lead our conversation somewhat, but that's not what I want, I want the student to do the work, that's why I ask if they have any questions. And when I do, they (students) ask me about their time schedule ... well that's not interesting at all in my opinion, I want to talk about their research aim, and their research questions. (Emilia R2; episode 6; minute 21.25)

Checking Student Understanding. Supervisors made in-the-moment decisions to *check student understanding*, based on the students' responses. The supervisors perceived and interpreted student understanding; before giving any explanation or feedback, the supervisors asked some questions or elicited input from the students.

See, I am doing it, I am checking verbally which mind switch they made last week ... I am really testing my gut feeling; am I interpreting your non-verbal reaction in the right way, and what have you been adjusting? (Emilia R2; episode 3; minute 08:13)

The students' answers provided new information, and the supervisors obtained confirmation (or not) of their perception and interpretation of the students' understanding.

Gathering Information. Supervisors checked student understanding, but also made in-the-moment decisions to gather more information from the students. They needed more information and asked students questions or elicited input.

I am really interested in the reasons why they did this, but I need some more information before I say anything about it ... I am getting all kinds of thoughts, but the funny thing is, a bit later it seems not relevant anymore, because they are not going to do anything with it. (Farrah R6; episode 3; minute 14:36)

Planning Next Step. Supervisors made the decision to plan a next step. Planning the next step could, for example, mean the supervisor was making deliberate choices on which feedback parts to elaborate further, and which parts to skip because they were less relevant.

I have got some negative feedback to discuss with the student. I already gave some positive feedback, and I don't want to recall all the negative parts, thus I am really trying in my head to focus on what I shall discuss with the student, and what the student can read, what I need to address now. (Sandra R5; episode 13; minute 38:01)

In this example, the supervisor just instructed the student which topic to focus on or not; sometimes it was more of a shared decision. Planning a next step could also mean that the supervisor perceived a topic that could be discussed at that moment, but instead the supervisor deliberately focused on other topics first.

I am writing the frustration down, to discuss it as a topic later on ... but I wanted to wait for that discussion, after we talked about the content of the thesis ... in my opinion it doesn't make sense to deepen this frustration ... I first wanted to stress the positive parts of the research to the student. (Sandra R5; episode 3; minute 10.09)

This did not mean this topic was ignored, but the supervisor planned that the topic would be discussed later during the same meeting.

Increasing Student Understanding. Supervisors made the in-the-moment decisions to *increase student understanding*. Supervisors focused on students' pitfalls, mistakes, and misunderstandings and

tried to increase student understanding. In this example, the supervisor is giving an explanation to increase student understanding.

I am giving the student an explanation because I could see she has not understood it completely yet; the student has her own ideas, my explanation gives her a new perspective, and because of that she is thinking about this new idea I proposed to her that she did not think about before. (Thelma R1; episode 4; minute 19:21)

Supervisors decided to increase understanding by giving explanations or feedback, or asked questions to increase understanding. This strategy stimulated students to present arguments, and in that way increased their own understanding of the subject.

I just asked this open-ended question ... and the students proactively gave arguments as to why they chose a quantitative method of data gathering, and they share quite a lot of opinions ... I think, well, just making these choices is really good for their research project. (Farrah R6; episode 8; minute 38:53).

Social Needs. Supervisors made the decision to pay attention to students' social needs, to their emotions, expectations, or motivation. They paid attention to students' social needs mainly at the beginning of their conversation.

I am asking the student if they were in a rush while writing their discussion section ... with that question I am trying to figure out if they gave more time to some parts than to others, and if those parts are the ones they would like to receive feedback on. (Cagney R7; episode1; minute 03:45)

The decision to pay attention to these social needs is often made based on meetings in the past – moments when certain emotions were discussed, motivation dropped, or expectations were partly met.

Between-case Analysis

For the between-case analysis, we selected from the 26 coded decision-action connections of the cross-case analysis, the connections that were coded three times or more. A case-ordered descriptive matrix was run in NVivo®, resulting in 42 decision-action connections distributed among the seven supervisors.

Intended in-the-moment Decisions and Planned Supervising Actions

The pre-active interviews were coded on the planning of supervising actions and on supervisors' aims. Thirteen decision-action connections were coded in the pre-active interviews. In the between-case ordered matrix, the supervising actions that were already planned and supervisor decisions already aimed for were determined. Six of the 13 decision-action connections were already aimed at/planned for. Three supervisors aimed to check student understanding by asking them questions or eliciting input from them. Two supervisors aimed to increase student understanding by giving them feedback, and one supervisor aimed to empower students by asking them questions. Thirty-six decision-action connections were not aimed at or planned for.

Students' Perceptions of Supervising Actions

The six students stopped the replayed videos 76 times during the stimulated recall interviews. These SRI episodes were first coded with a positive perception ($n = 43$), a negative perception ($n = 15$), or as miscellaneous ($n = 18$). The coding was miscellaneous when the students did not describe their perceptions, but rather reflected on their own behaviour, or described other irrelevant topics.

Inductive Content Analysis with Exemplars

Coding results showed eight positive perceptions: increase of understanding; stimulus to think; student control; personal attention; trigger to investigate; supervisor understanding; shared

understanding; and timing of feedback. Four negative perceptions were found: poor quality of supervisor support; shared misunderstanding; supervisor misunderstanding; and insufficient supervisor control. Three students described only positive perceptions (Kim S4, Melissa S5, and Lacey S7); and the other three students only negative ones (Rory S3, Jaclyn S6a, and Kate S6b). Based on the frequency of coding, we chose to describe and illustrate six student perceptions in more detail.

Increase of Understanding. Students perceived an increase of their own understanding. These perceptions were positive as a result of the supervisors who gave feedback and explanations.

Well, I like it that she (teacher) is saying the text has to be written down more specifically, but also that she is giving examples of where in the text (in the thesis) it should be more specific, or is not specific yet. (Lacey S7; episode 7; min 19:50)

When the supervisor gave an explanation, especially with the help of examples, this seemed to provoke positive student perceptions among different students.

She (the supervisor) is explaining it very clearly and it is really helpful ... she is giving some examples that are clarifying ... and it is really making you think, where we should pay some more attention. (Kim S4; episode 13; min 27:09)

It was not only supervisor feedback and explanations that caused students to have positive perceptions, students also perceived an increase of student understanding due to the supervisor's questioning.

Stimulus to Think. Students also had positive perceptions when they were stimulated to think for themselves. Supervisors provided this stimulus with questions, which prompted students to come up with an answer themselves.

She is just asking again and again, to let me think about why ... what do you want to accomplish, what is the problem, what is the dilemma you are working on ... just to get a clearer picture of what we are aiming for ... I like it this way as it is making you think just in another direction than you did before. (Kim S4; episode 7; min 14:06)

Student Control. Students also reported positive perceptions on receiving student control as a consequence of supervisor questioning. The students described this perceived student control as getting space to argue, receiving the opportunity to share their opinion, or no need to be taken by the hand.

Yes, she is actually ... asking me about what has been going well the last few weeks, she is asking about the feedback I have been taking up, and she is asking me what parts I am unsure of ... thus she is giving me space to point out what my troubles are, what I am unsure of, but also what is going well. (Melissa S5; episode 3; min 14:52)

Personal Attention. Students had a positive perceived personal attention. Often the supervisors asked questions like "how are you doing today?", or "how are you feeling?" With these questions supervisors paid attention to students' emotions, motivation, or expectations.

Well ... I think it is quite logical that she (teacher) is asking about it. She wants to know what we think of it, and what we expect to get feedback on. (Lacey S7; episode 1; min 2.11)

Poor Quality Supervisor Support. Students had negative perceptions when supervisor support was reported to be of poor quality. The students reported poor quality when supervisor feedback or explanations were unclear, unhelpful, or not easy to understand.

I am trying to justify the choices we have made to receive more clarity, but instead she (the supervisor) comes along with our arguments and I am completely lost as a result of it (min 39:21) ... (the feedback) does not have

much value as I do not understand it ... I do believe feedback is very important, but I am not sure what to do with it. (Kate S6a; episode 12; min 42:51)

Shared Misunderstanding. Students reported negative perceptions when they experienced a misunderstanding between the supervisor and themselves: for example, when the supervisor and the student both give an explanation with arguments, but they do not understand each other.

I think it is kind of weird that they (an introduction and the theoretical framework) are the same (min 24:43) ... she (the supervisor) is doing the same as I am, giving the same arguments in exactly the opposite way (min 25:22) ... she does understand me, I do understand her, but there is something we do not share in our understanding. (Rory S3; episode 7; min 25:55)

Discussion

In-the-moment Decisions and Supervising Actions

Our first research question addressed the question “What different types of in-the-moment decisions do research supervisors report, and how are they connected to supervising actions”? The six different decisions extracted from our supervisor data have opened the black box of research supervisors’ interactive thinking. Rich and Hannafin (2008) categorized their teaching decisions into teacher-centred and student-centred decisions. Partly based on the distinction drawn by Rich and Hannafin (2008), we categorized our six supervisor decisions into three different types of decisions: (1) affective student-centred decisions, like empowering students to argue for themselves, and paying attention to students’ social needs; (2) cognitive student-centred decisions, like checking and increasing student understanding; and (3) cognitive supervisor-centred decisions, like gathering information, and planning certain steps to focus on.

Our supervisors frequently reported that asking questions and eliciting input were the result of these three types of decisions. Supervisors often made the in-the-moment decision to empower students or check their understanding by asking questions and eliciting input. These supervising strategies fit the scaffolding principle of adaptive teaching, in which teachers apply less direct regulation, and adapt their support to students’ needs, (de Kleijn et al., 2015; Rasku-Puttonen et al., 2003). By using supervising strategies that typify a form of indirect supervisor regulation, supervisors gave students the opportunity to take control. These indirect regulation findings were partly unexpected as in another study supervisors showed merely direct regulation with a lot of feedback during their research supervision meetings (Agricola et al., 2018). These decisions of empowering students on the one hand, and increasing student understanding on the other, resemble supervisors’ struggle in finding balance between controlling the supervising situation and giving responsibility to the students (Agricola et al., 2019; Todd et al., 2006; Vehviläinen & Löfström, 2016).

Already Planned Actions and Intended Decisions

Our second research question addressed the question “Which of the reported in-the-moment decisions were already aimed for, and which reported supervising actions were already planned”? During our stimulated recall supervisor interviews many different supervising actions were addressed, and many in-the-moment decisions determined. Only six of the 42 decision-action connections were already aimed for/planned, as reported during supervisors’ pre-active interviews. Our supervisors had some aims and plans but needed to be flexible in the way they were attained through their supervising. It seems many new topics were raised during the meetings, and the discussions went into directions supervisors did not plan. These findings fit the results that Westerman (1991) found for her expert teachers, who predicted possible problems and changed their lessons when they did not go as planned. Planning of teaching is a creative skill; experienced teachers do not follow a script, but search for good ideas and

translate them into the classroom (Clark & Peterson, 1986). Novice teachers find it difficult to anticipate the ways in which their plans will unfold during teacher–student interactions (Malachowski, 1996).

Student Perceptions

Our third research question addressed the question “How do students perceive supervisors’ supervising actions”? We answered this question with an inductive content analysis and the coding of students’ perceptions. We described six perceptions in detail and connected these perceptions to the teaching actions students referred to. Three students reported only negative perceptions. Their supervisors used questioning and eliciting input to empower students, or to check understanding. But instead of a positive perceived student control, these students searched for clear guidance from their supervisors, and had negative perceptions when this was not the case. These results fit the findings of Orsmond and Merry (2011): their teachers were only focused on misunderstanding and rarely addressed the development of students’ learning. Their students searched for teacher guidance as well and were only trying to identify what the teacher wanted.

Three other students reported only positive perceptions. These positive perceptions can be explained as being due to supervisors’ questioning; teachers’ questioning can create opportunities for students to experience autonomy and increase their responsibility (Reeve et al., 2012). When the supervisors used the supervising action of asking questions, the students had several positive perceptions of receiving student control, personal attention, or a stimulus to think for themselves. These three perceptions correspond perfectly with the in-the-moment decisions our supervisors made when they decided to empower students to pay attention to social needs, or to increase student understanding. Sometimes, when supervisors empowered students and gave opportunities to students to ask their own questions, it did seem to comply with students’ needs, but it led to topic discussions, which were not always on the supervisor’s agenda. Vehviläinen (2009a) investigated two cases in which supervisors had to address the incompetence of the student. Our supervisors were also positioned in this difficult situation and challenged to overcome student misunderstanding. Misalignment between supervisor and student happened on what was relevant or not and can lead to negative student perceptions. What is important for the success of research supervision is whether supervisors and students share a view on what is relevant; their agendas have to meet (Vehviläinen, 2009a). Our supervisors did not have prescheduled agendas or scripts to follow, but rather improvised based on the students’ questions and answers.

Limitations of Stimulated Recall

No single approach to studying teacher and student cognitions is free of problems. Yinger (1986) doubted the validity of stimulated recall: teachers would rationalize and make up explanations under pressure instead of accurately reporting their interactive thinking. Indeed, some of our participants had difficulties in reliving the meeting during the interview and reflected on their own behavior instead. That is why in further analyses we did not focus on these reported actions, decisions, or perceptions. Furthermore, we have minimized the time delay between supervising event and recall to a minimum, just as Gass and Mackey (2000) argued. With the interview questions and prompts, we tried not to alter the cognitive process being employed at the time of the supervising situation. We stimulated rather than presented new insights, allowed an unstructured response and implied an indirect route to the focus of the research just as Lyle (2003) proposed. The procedure we adopted in this study, in which the respondent has a greater role in selecting the stimulus, and verbalizing their thinking in a free and open-minded manner, is the commonly stimulated recall strategy used today (Borg, 2015). We used a head-mounted camera method that offered a powerful stimulus to the spontaneous recollection of decisions that were made during the recording and captured the participants’ perspective as accurately as possible (Omodei et al., 2012; Pelaccia et al., 2014;

Unsworth, 2005). The stimulus of the head-mounted camera decreased the self-awareness induced by viewing oneself in action that could lead to selective reporting.

Implications

Research on teacher thinking will not make teacher education easier, but it makes teacher preparation more interesting (Clark, 2005). This study does not really answer questions about what novice research supervisors should be taught or deliver a description as to how they should be prepared. But it can provide examples of methods that supervisors can practise and apply while interacting with their students. From our study it can be concluded that empowering students and paying attention to students' social needs, for example, can evoke positive student perceptions. But when this supervising strategy becomes a routine script that is applied to each student, adaptive supervising is not in place and students could get frustrated by supervisors trying to give them control the whole time. Research supervisors should be flexible enough to shift from an indirect regulation strategy with lots of questions to a more direct regulation strategy with clear guidance and feedback when students need it. This flexibility should not only occur between different student meetings: adaptive supervising should be applied within each meeting. Supervisors' planning of their research supervision meetings offers opportunities to be flexible; it is easier to adapt a prepared supervision plan than not having a supervision plan at all. Novice teachers and supervisors, in particular should learn how to plan, and what planning can and cannot achieve (Malachowski, 1996).

Future Research

The different perspectives of our students and supervisors, fit Goffman's theory of framing (Persson, 2015). Persson (2015) has described "nuance shifts" as situations that take place, in which for example teachers and students share the definition of a situation, which can change suddenly and fast. When our supervisors and students were meeting each other in a supervision meeting, they were aiming at the same objectives (e.g., getting feedback on the research questions); they were sharing a situation. When interacting during the meeting, they had different experiences; students did not expect their supervisor to ask their opinion about how they posed the research questions, students expected plain feedback. Supervisors did not expect their students to disagree with their suggestions. Sometimes at the end of the meeting supervisors and students still hadn't found a shared understanding. Goffman's framing theory can be used in future studies to investigate these different perspectives some more. For example, supervisors can be asked to evaluate and reflect on the quality of their supervising actions, their in-the-moment decisions, and their planning of supervising actions.

Conclusion

The in-the-moment decisions our supervisors made were merely student centred and had a strong focus on student learning. Many questions were asked to empower students or to increase their understanding. These supervising strategies often seemed to be adapted to students' needs; students had positive perceptions when student control increased, or when they were stimulated to think for themselves. A delicate balance was found, as the same supervising strategies led to negative student perceptions as well. These students experienced a lack of clear guidance and were not ready for empowerment yet. Research supervisors have to stay sensitive: before applying any intervention they first have to diagnose students' needs.

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