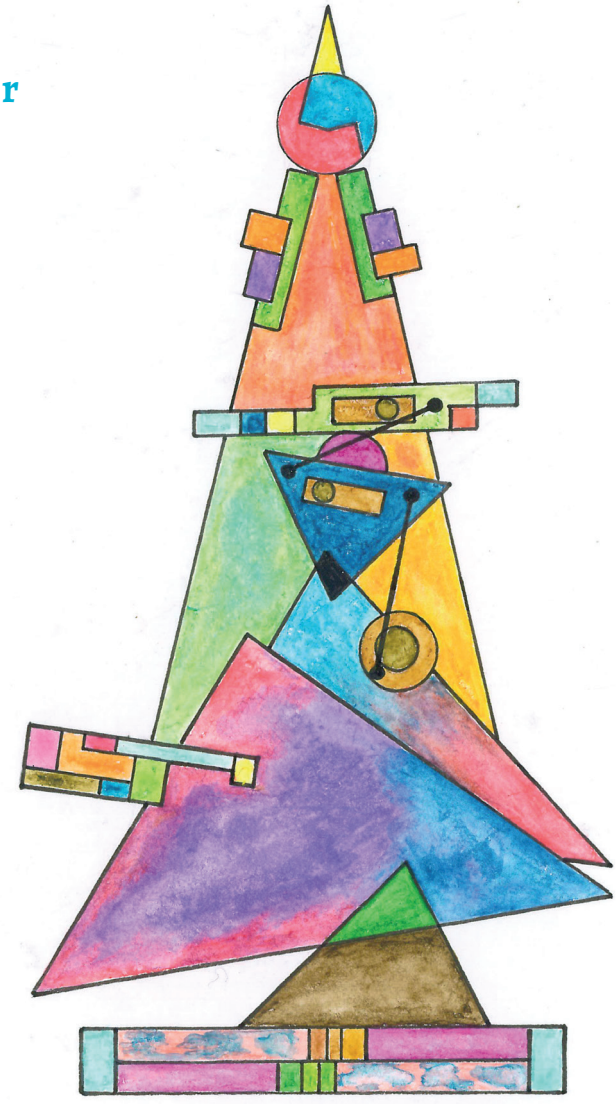
Secondary school teachers' instructional adaptations: Perceiving and addressing students' various learner characteristics in daily practice

Lieke Jager



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Secondary school teachers' instructional adaptations: Perceiving and addressing students' various learner characteristics in daily practice

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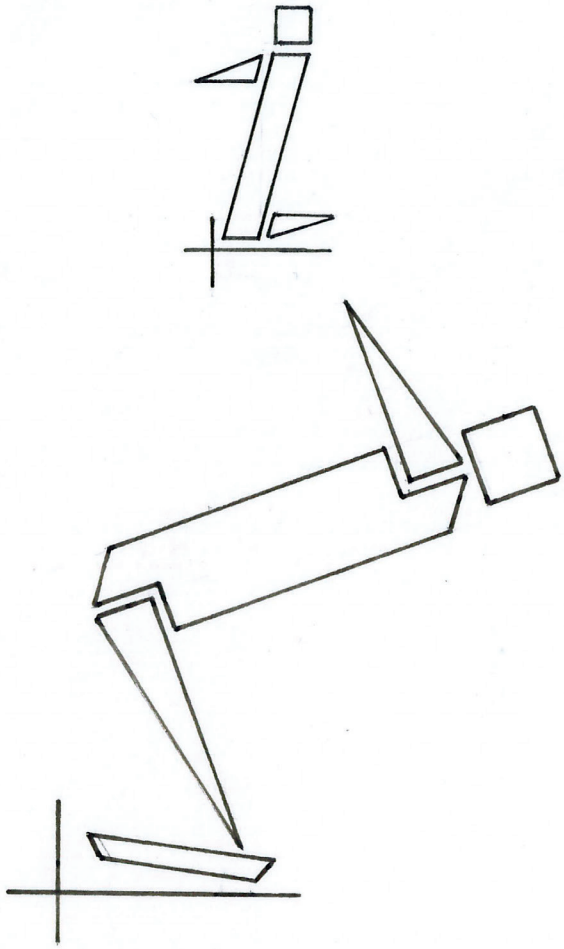

CHAPTER 1

General introduction

1.1 Introduction

De leraar is vakdidactisch bekwaam wat betreft kennis, indien hij tenminste:

'Verschillende manieren kent om binnen een methode te differentiëren en recht te doen aan verschillen
tussen leerlingen'

De leraar is vakdidactisch bekwaam wat betreft kunde indien de leraar of docent ten minste:

'De leerlingen met gerichte activiteiten de leerstof kan laten verwerken, daarbij variatie aanbrengen en bij instructie en verwerking differentiëren naar niveau en kenmerken van zijn leerlingen'

(Uit: Wet bekwaamheidseisen onderwijspersoneel, Staatsblad van het Koninkrijk der Nederlanden, 2017).

The two excerpts above are from the Dutch law in which the minimal requirements for teachers to receive their degree are stipulated (Staatsblad, 2017). This law states that teachers are proficient in the domain of pedagogical content knowledge and skills provided that they know different ways to respond appropriately to differences between students, providing them with various planned activities with which to study the subject matter, and can differentiate instruction and learning activities according to the level and characteristics of their students. In the Netherlands teachers are required to adapt their teaching to students' learner characteristics by law.

Illustrated by this law, adapting instructional elements – such as learning objectives, content, instruction, learning activities, and teaching style to students' learner characteristics – is widely accepted as a practice that teachers should strive for (Corno, 2008; Onderwijsraad, 2017; Parsons et al., 2017; Tomlinson et al., 2003). Instructional adaptations are assumed to enhance student learning and increase equal learning opportunities (Subban, 2006; Tomlinson et al., 2003; Valiandes, 2015). For example, to stimulate student engagement or increase learning, teachers can provide students with assignments that match their interest, or use examples from students' own life experiences. Despite the decades of attention that the concept of instructional

adaptation has received in research, policy, and practice, such adaptations are still observed to occur infrequently (Inspectie van het Onderwijs, 2022; Schleiger, 2016), and teachers express confusion and discomfort regarding them (Anthonissen et al., 2015; Mills, et al., 2014; van Casteren et al., 2017; Whitley et al., 2019). For example, they state that they do not know what exactly is expected of them, how to execute instructional adaptations in contexts with standardised testing, or what to do in classrooms with students who are unmotivated or lack self-regulation skills (cf. Van Casteren et al., 2017; Whitley et al., 2019). This is problematic because instructional adaptations are assumed to be beneficial for student learning. If these adaptations indeed are scarce, teachers risk not meeting each student's learning needs.

Although teachers are expected to adapt their teaching to students' learner characteristics, making these instructional adaptations has been described, and proven, to be complex. This complexity is often attributed to the various skills and the extensive knowledge teachers need to make these adaptions (NRO, 2014; Tomlinson et al., 2003; van Geel et al., 2018; van der Lans et al., 2017). In addition, several authors have discussed that nor how teachers develop instructional adaptations as how adaptations might affect student learning, is well understood. Research methods do not do justice to the complexity of the concept, resulting in potentially inaccurate representations of instructional adaptations in research (NRO, 2014; Prud'homme et al., 2006; Smale-Jacobse et al., 2019; Smets & Struyven, 2018; Snow, 1994). It has been argued that what is missing in educational research is a deep understanding of instructional adaptation in terms of the complexity of teachers' daily practice (Deunk et al., 2015; Smets & Struyven; 2018), and that research should come closer to 'how teachers take into account differences between students in daily classroom practice'. (Deunk et al., 2015, p. 52).

Many teachers in formal educational settings teach multiple students simultaneously. These students, who are taught together, differ from one another in terms of their achievements, knowledge, preferences, personality, social skills, cultural backgrounds, abilities, and more. Moreover, each student is a unique composition of all these characteristics. Teachers cannot adapt their instructions to each individual student, or take all learner characteristics into account within a classroom context. Instructional adaptations require that teachers make decisions on what to adapt, for whom, when, and how (Brimijoin et al., 2003; Brinkworth & Gehlbach, 2015; Snow, 1994; Smets & Struyven, 2018). However, how teachers make these choices is seldom studied, and not well understood as a consequence. To better understand them, we need to know more about how teachers come to their instructional adaptations in their daily practice.

1.2 Research focus and relevance of this dissertation

Instructional adaptations do not just happen; rather they can be understood as the result of the cognitive work of teachers (Brimijoin et al., 2003; Parsons et al., 2017; Rubie-Davies et al., 2012). In this dissertation, teachers are seen as actors, and teaching is as an act of a teacher, a professional, who needs to make decisions regarding what to do in particular situations (Gholami & Husu, 2010; Loughran, 2019; Shavelson & Stern, 1981). An understanding of teaching, namely the work of a teacher, depends both on insight into the teachers' thoughts, and knowledge and judgement of how their cognitions are translated into action (Borko & Shavelson, 1990; Loughran, 2019). Following this premise, to gain an understanding of teachers' instructional adaptations, the underlying cognitive work should be made visible. To understand how teachers take into account differences between students' learner characteristics in their daily classroom practice, I set out to gain insight into teachers' thoughts, judgements, and decisions in relation to their students' learner characteristics, and how these are taken into account in their instructional adaptations.

Currently, instructional adaptations are studied from the different perspectives of the thoughts, judgements, and decisions that underlie teachers' instructional adaptations in diverse ways. There does not seem to be a consensus on the language and methodology by which teachers' daily instructional adaptations can be best understood (Nurmi, 2012; Smets & Struyven, 2018). Thus, it seems important to explore how to gain insight into their cognitive processes. This dissertation may be seen as part of this exploratory process to illuminate teachers' daily instructional adaptations and the thoughts, judgements, and decisions that underlie these.

This dissertation explores teachers' perceptions of the variations of students' characteristics, and the thinking by which teachers take these into account in their instructional adaptations. I set out to study these perceptions and adaptations in teachers' daily practice, and to reflect on what these processes teach us about how to study and understand instructional adaptations. This dissertation has two focal points of inquiry that are elaborated upon in the theoretical framework:

1. Teachers' perceptions of their students' learner characteristics.

2. The thinking by which teachers take their students' learner characteristics into account in their instructional adaptations.

Relevance

A better understanding of how teachers in secondary school come to their instructional adaptations is important for the further development of educational science, as well as for educational practice. First, a better understanding of the thoughts, judgements, and decisions of teachers that underlie their daily actions could help to further develop educational theory and models of instructional adaptations. There are several models that portray how instructional adaptations come about (cf. Brimijoin et al., 2003; Prast et al., 2015; Tomlinson et al., 2003). However, these models do not seem to align with teachers' daily practice because they overlook the complexity of their daily work; for example that it is situational, that teachers have multiple goals underlying their actions, and the subjectivity of teachers' assessment of students' learner characteristics (Corno, 2008; de Graaf et al., 2018; Smets & Struyven, 2018; Snow, 1994). Such an alignment is necessary to increase the relevance of models and theories, so they can become more explanatory of, and be of use for, educational practice (Biesta & Burbules, 2003). A thorough analysis of teachers' perceptions and instructional adaptations as they occur in daily practice can potentially enrich these models. Such an enrichment – for example, how instructional adaptations are affected by multiple goals that teachers may have – could lead to a better alignment between models and daily practice.

Second, insight into the cognitive work of teachers that underlies their instructional adaptations might help to support teachers to better grasp the complexity of instructional adaptations. As discussed, many teachers still express confusion and discomfort regarding instructional adaptations (Mills, et al., 2014; van Casteren et al., 2017; Whitley et al., 2019). There is a pressing need for the development of programmes that can support teachers in developing instructional adaptations (NRO, 2014). The premise of this dissertation is that teachers' actions can be partly understood as the result of their thinking. The development of instructional adaptions requires congruent development in the teachers' thinking that underlies these adaptations (Bulterman-Bos, 2004; Corno, 2008; Deunk et al., 2015; Kelchtermans, 2009). Programmes aimed at professional development of teachers' instructional adaptations should not only focus on their actions, but also address teachers' reasoning regarding what they understand by instructional adaptations, as well as the how and why of these adaptations (cf. Kennedy, 2016; Loughran, 2019; Van Casteren et al., 2017). To support teachers in the development of their thinking we first need to gain insight into their thinking that underlies instructional adaptations, namely the knowledge, perceptions, beliefs, and ideas that affect these practices. These insights might inform teachers, teacher educators, and others in the field of professional development on the cognitions that need to be addressed.

Third, a better understanding of how teachers come to their instructional adaptations seems important for supporting teachers in order to create and realise valuable opportunities for learning through these adaptations. Results of teachers' instructional adaptations reveal that they can both enhance and hinder learning (Denessen, 2017; Mills et al., 2014; Rubie-Davies, 2007). Scholars have warned of watered-down curricula, where students who are perceived as lacking abilities and/or are failing in class have less opportunities to develop higher order thinking skills (Babad, 1993; Rubie-Davies, 2007). Moreover, divergent approaches to instructional adaptations could lead to a decrease in equal learning opportunities (Johnston et al., 2016; Mills et al., 2014). Apparently, not all ways in which students' learner characteristics affect instructional adaptation enhance student learning. Insight into the work of teachers may help to better understand the diverse ways by which teachers' perceptions of students' learner characteristics affect their instructional adaptations, and support teachers in providing adaptations that create classroom environments that enhance student learning and development.

Fourth, the studies in this dissertation focus on secondary education teachers. Research on teachers' perceptions of student learning characteristics and instructional adaptions within this context are scarce compared to research on these topics in primary education (Smale-Jacobsen et al., 2019). However, insights from studies in primary education might not always be generalisable to secondary education, due to contextual differences. In general, teachers in secondary education teach more students, as they teach multiple groups in a day, and they see these students less often than teachers in primary education. Teachers in secondary education have fewer opportunities to get to know their students, as well as to adapt their teaching accordingly (NRO, 2014; de Graaf et al., 2018). In addition, teachers in secondary education are predominantly subject matter specialists, which seems to affect the learning goals teachers aim for, and the learner characteristics they perceive to be relevant to reach these learning goals (Withley et al., 2019). More insight into teachers' perceptions of students' learner characteristics is thus important, as well as how these are taken into account in their instructional adaptations within the context of secondary education

1.3 Theoretical framework

The concept of instructional adaptations – teachers' adaptations in the light of differences between students within a classrooms – has been a topic of scholarly interest for the past decades (Norwich et al., 1994; Smale-Jacobsen et al., 2019;

Prud'homme et al., 2006). Across the field, there is a wide variety of definitions and concepts used to explore these adaptations. This dissertation is built on the premise that instructional adaptations, namely instructional actions that are affected by specific students' learner characteristics, are an educational reality happening every day. Regardless of whether teachers are expected to make adaptations, students' learner characteristics, such as their academic performance, motivations, engagement, and social-emotional or background characteristics, impact teachers' instruction (Babad, 1993; Nurmi, 2012). For example, studies have shown that students who are perceived by their teachers as being more motivated are given more autonomy and receive higher levels of teacher involvement (Patrick et al.; 2008; Sarrazin et al., 2006; Skinner & Belmont, 1993). Another example of research showing how teachers teach different students differentially can be found in scholarly fields examining the effect of teachers' attributions of students' performance on teacher behaviour (Georgiou et al., 2006; Poulou & Norwich; 2000). These studies indicate that teachers are more likely to react to low-performing students with anger when students are perceived to be failing due to a lack of effort. Conversely, they pity students, and give up helping them, when students are perceived to be low performing due to characteristics like their abilities and family circumstances (Georgiou et al. 2006; Wang & Hall, 2018). Students' learner characteristics influence teachers' instructional actions in various ways. However, it is not easily understood how learner characteristics, such as their academic performance, motivations, engagement, socio-emotional features, or background characteristics impact teachers' instructional adaptations.

There are at least three distinct research perspectives on how students' learning characteristics lead to instructional adaptations. Below I will provide a short overview of these perspectives and discuss how from each perspective: 1) the nature of teachers' instructional adaptations in response to students' learner characteristics is conceptualised, 2) the instructional adaptations and students' learner characteristics are the focus of inquiry in empirical studies, 3) how instructional adaptations are operationalised in empirical studies, and 4) the main findings pertaining the valence of instructional adaptations. The purpose of this overview of three perspectives as presented in Table 1.1 is to clearly communicate how the studies in this dissertation relate to and build upon existing research. This overview is general in nature; it does not take into account the many nuances of study within the research perspective, and is not meant to be an extensive literature overview.

Three Perspectives on Instructional Adaptation

The first research perspective examines instructional adaptations as a *conscious, proactive, and rational decision-making process* (cf. Anthonissen et al., 2015; Smit &

Humpert, 2012; Tomlinson et al., 2003). Studies that take this perspective suggest that teachers objectively diagnose their students' learning needs and make data-informed decisions in order to adapt to those needs (Brimijoin et al., 2003; Inspectie van het onderwijs, 2015a, 2015b; Park & Datnow, 2017). These studies focus on instructional strategies, such as grouping, tracking, curricular compacting, extended instruction, or differentiated assignments. In this tradition, the most used term to describe how teachers teach different students differently is *instructional differentiation*. This is described as a complex teaching approach, and it requires specific skills, as well as knowledge of the students and the content that is taught (Van Geel et al., 2018; Vogt & Rogalla, 2009). Within this perspective, the research methodology commonly used to study instructional differentiation is classroom observations, sometimes accompanied by teacher interviews and questionnaires in which teachers self-report the strategies they use. Instructional differentiation strategies are observed to occur infrequently in teachers' daily practice, and teachers are reported to struggle with how to implement such strategies in their practice (Schleiger, 2006; Smale-Jacobsen et al., 2018; Van de Grift; 2014).

The second research perspective examines teachers' adaptations as *a process that teachers might be unaware of*. Studies in this tradition have shown that teachers constantly differentiate their teaching, and that they may not be aware of how they perceive and treat students differently (Consuegra et al., 2016; Good & Brophy, 1974; Babad, 1993). Studies within this tradition use terms like *differentiated teaching*, or *teacher's differential behaviours*, to describe how teachers behave differently towards different students. Studies in this tradition typically shed light on the unplanned teacher actions, and have explored patterns of instructional behaviours regarding specific students, such as questioning and feedback (Babad, 2005; Brophy & Good, 1970; Rubie-Davies, 2009). Studies within this perspectives have mainly used observations of teacher–student dyadic interactions. Differential teaching is not perceived as a desirable practice, because implicit biases may guide teachers' perceptions and behaviours that as a consequence could lead to unequal learning opportunities for students (Peterson et al., 2016; Rubie-Davies, 2007).

The third research perspective that can help to better understand teachers' instructional adaptations, focusses on teachers' *in-the-moment or reactive adaptations*, and the term 'adaptive teaching' is used to describe such teaching moments (Corno, 2008; Parsons et al., 2017). Research within this perspective aims to understand how teachers make adaptations in their teaching during lessons in response to what they see happening (among individuals or subgroups of students). These adaptations are studied as being thoughtful and reflective processes which teachers are aware of

(Fairbanks et al., 2010; Johnston et al., 2016; Parsons et al., 2017). Studies that take this perspective often use teacher interviews about specific lessons or classroom situations. From these studies it follows that teachers' instructional adaptations are based on observations of student learning, student motivation, and/or student behaviour, and that teachers, among other things, adapt to student differences in the way they question, encourage, give feedback, explain, and challenge students (Parsons et al., 2017). Within this scholarly field, adaptive teachers are highly regarded, although their number seems scarce (Fairbanks et al., 2010; Hoffman & Duffy, 2016). Thoughtful and reflective adaptive moments do not seem to occur often.

Table 1.1 Overview of three perspectives examining teachers' instructional adaptations

Perspective	Instructional differentiation	Differential teaching	Adaptive teaching
Nature of the adaptive process	Conscious, proactive, rational	Unplanned, intuitive, unconscious	Reactive, thoughtful
Students' learner characteristics	Objectively determined learner characteristics (ability, interest, learning profile)	Subjective perceptions of learner characteristics (expectations, attributions, biases)	Interpretations of students' 'live' classroom behaviours (motivation, learning)
Instructional elements adapted	Learning objectives, learning activities, teaching approach	Student–teacher interactions, questioning and feedback	Questioning, feedback, explanations
Operationalisation in research	Characteristic of teachers' instructional actions, studied through: -Lesson observations -Teacher self-reports	Interpersonal teacher behaviours, studied through: -Observations of teacher behaviour regarding specific students	Characteristics of teachers' thinking and action, studied through: -Interviews inquiring after teacher thinking underlying specific actions
Findings regarding instructional adaptations	Complex and uncommon	Frequently occurring, some teachers more than others	Complex and uncommon
	Desirable; potentially enhances learning	Undesirable; potentially hinders learning	Desirable: potentially enhances learning

Each perspective explains in a different way how students' learner characteristics may affect teachers' instructional adaptations. Together, they represent a variety of instructional adaptations and the various processes that are involved. However, in teachers' daily practice all these processes and adaptations may happen simultaneously (Denessen & Douglas, 2015; Glock & Kovacs, 2013; Strack & Deutsch, 2015). For example, as I will discuss in Chapter 4 of this dissertation, observing a teacher providing different instructions for different groups of students could be

a consequence of either of the three perspectives, and is most probably a mixture. Although the three perspectives can be distinguished from one another in theory, in teachers' daily practice they may all occur together at the same time. To gain an understanding of the cognitive work by which teachers develop instructional adaptions in their daily practice it seems that we must take more than one research perspective into account.

I have portrayed the three perspectives as having four elements: the nature of the adaptive process, students' learner characteristics, the instructional elements adapted, and operationalisation in research. These four elements can be found in the first Colum of Table 1. Below, I will briefly elaborate on how these elements vary between the perspectives, and how the studies in this dissertation are inspired by, and relate to, this variety.

The nature of the adaptive process. The nature of the instructional adaptations across the perspectives vary – namely, the psychological mechanism via which students' learner characteristics impact teachers' instructional adaptations. They vary in terms of whether these mechanisms are proactive (perspective 1), reactive (perspectives 2 and 3), intentional and within teachers' awareness (perspective 1 and 3), or more automatic and outside teachers' awareness (perspective 2). Supported by several empirical studies regarding teachers' instructional adaptations (cf. Consuegra et al., 2006; Good & Brophy, 1974; Savage & Desforges, 1995), teachers thus might be more or less aware of their perceptions, judgements, and decisions that affect their instructional adaptations.

To shed light on teachers' perceptions, thoughts, and judgements it is important to use research methods that grasp them. Given the different degrees of teachers' awareness, it does not seem appropriate to only rely on teachers' self-reports (Winkielman & Schooler, 2012). Moreover, in their daily practice, teachers do not frequently have to explicate the thinking underlying their teaching. The need to support teachers to explicate the knowledge, beliefs, and reasoning underlying their practice has also been highlighted by the research tradition examining teacher thinking (Loughran, 2012). To make the cognitive work underlying instructional adaptations visible, the studies in this area therefore strived to use methodology that supports teachers to explicate their thinking underlying their daily practice.

Students' learner characteristics. Across the perspectives, there are different ideas about the students' learner characteristics that teachers consider, and also about how teachers gain insight into these characteristics. Besides a variation in the learner characteristics that are focal in the studies within them, perspectives vary as to

whether students' learner characteristics are based on some sort of formal 'objective assessment' (perspective 1) or whether teachers use informal, ongoing experiences to get to know their students' learner characteristics (perspectives 2 and 3). However, in teachers' daily practice, students differ from another in terms of various characteristics, while simultaneously, each student is a unique composition of all these characteristics (Waite et al., 2010). Studies investigating the knowledge that teachers have of their students or the differences between their students have shown that teachers differ in the characteristics they consider relevant (cf. Blease, 1995; Civitillo et al., 2016; Kagan & Tippins, 1991; Paine, 1990; Savage & Desforges, 1995). Students' learner characteristics, and the diversity teachers perceive and might adapt to, seem constructed by individual teachers and are likely to vary between teachers.

To understand how teachers adapt their instruction and the cognitions that affect these adaptations, it is important to shed light on the students' learner characteristics that individual teachers perceive. Teachers' perceptions of their students involve an amalgam of teachers cognition, interpretations, knowledge, and beliefs relating to their students (Brinksworth & Gehlbach, 2015; Fiske, 1993; Kenny, 2004).

Instructional adaptations. As can be concluded from Table 1, the three perspectives all focus on adaptations of teachers in terms of instructional elements. These elements generally contain learning goals, content, learning activities, materials and resource, grouping, assessment, pace, and teaching approach (cf. Van den Akker, 2003; Rubie-Davies, 2009; Shavelson & Stern, 1981; Tomlinson et el., 2003). Perspectives thus align in their focus on these instructional elements, as opposed to teachers' adaptations in socio-emotional elements of the classroom, such as classroom management and/or the building of student–teacher relations (Rubie-Davies, 2009). By aligning with a focus on instructional adaptations, this dissertation is set up to connect with the current focus on teachers' instructional adaptations.

Depending on the particular instructional framework used by researchers, specific instructional elements are or are not included in studies (cf. Cassady et al., 2004; Rubie-Davies et al., 2006; Tomlinson et al., 2003). In this dissertation, the definition of Reigeluth and Carr-Chellman (2009) is followed. They operationalised 'instruction' as '*anything that is done purposely to facilitate learning*' (p. 6). Instructional adaptations could refer to anything that is adapted purposely to facilitate the learning of students within a class, independent of what that learning is. Such a broad definition provides the opportunity to gain insight into the instructional elements teachers perceive as relevant to adapt, as well as into the potentially broad range of educational goals that may underlie their instructional adaptations.

Operationalisation in research. In this dissertation the work of the teacher is central. As we want to closely explore how teachers adapt instruction in their practice to the perceptions of their students, we aim for research methods that have a high ecological validity. These methods support teachers in explicating their thinking, and provide the opportunity to explore differences between teachers. Given the variety of research methods used to study diverse learner characteristics and the lack of consensus of how to best study instructional adaptations in ecologically valid ways in relation to these learner characteristics, this project set out to explore appropriate research methods, and to reflect on the value of these approaches in Chapter 6.

1.4 Research questions and outline of the dissertation

The goal of the research in this dissertation is to shed light on teachers' perceptions of their students' learner characteristics and how teachers take these perceptions into account in their instructional adaptations.

The research questions central to this dissertation are:

1. What variations do teachers perceive in students' learner characteristics, and how can these perceptions be understood? (Chapters 2, 3, and 4).

2. How do teachers take these perceptions of their students various learner characteristics into account in their instructional adaptations? (Chapters 4 and 5)

Chapter 2 studies the variation in the content and nature of teachers' perceptions of learner characteristics of students within a single classroom. Seven teachers were individually interviewed about the students in a second-year school class they were teaching. To support teachers in explicating their knowledge and perceptions, in the interview a teacher was given a minute to describe each student using a profile photo of each of them as a prompt. This study reports on the differences between teachers as well as among them in terms of the learner characteristics they perceived of their students.

Chapter 3 examines differences in teachers' interpretations of achievements of their low-performing students. Data were collected by means of a questionnaire of the attributions of 64 teachers to three of their own low-performing students. This study aimed to provide insight into the intrapersonal (i.e. within-teacher) variation of teachers' attributions with regard to their low-achieving students. Therefore, both between teacher as well as within-teacher variance is studied.

Chapter 4 investigates how students' learner characteristics were taken into account by teachers in their proactive instructional adaptations. Ten teachers were interviewed about (1) the instructional adaptations of one of their lessons, (2) the students' learner characteristics that they took into account, and (3) the reasoning underlying these instructional adaptations.

Chapter 5 reports on the conceptual and methodological lessons learnt from an empirical study in which we aimed to determine whether and how teachers purposefully made their lessons more adaptive to their students' diverse learner characteristics. The chapter starts with a discussion of several definitions and operationalisations of the concept of instructional differentiation. This discussion is followed by an analysis of the congruence between conceptualisations and operationalisation, and provides methodological suggestions that would increase this congruence.

Chapter 6 provides a summary of the study's main results. Furthermore, it discusses these results and implications for future research and educational practice in the light of the overarching research objective to better understand how teachers teach in light of differences between students and how this affects student learning and development.

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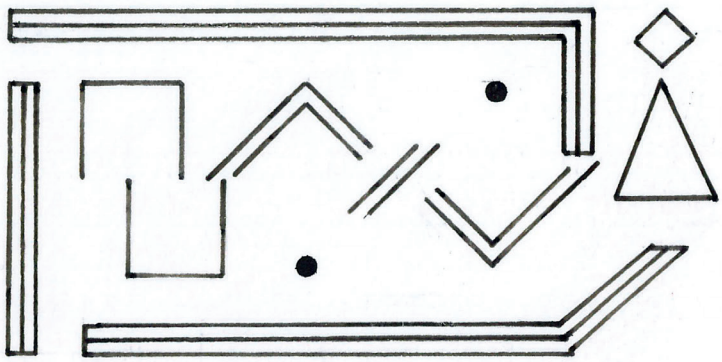

CHAPTER 2

Sixty seconds about each student - Studying qualitative and quantitative differences in teachers' knowledge and perceptions of their students

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Abstract

This study explored the content and nature of teachers' knowledge and perceptions of their students. The knowledge and perceptions of seven Dutch secondary school teachers regarding the same 33 students in one second-year school class were studied. Each teacher was invited to tell (in 60 seconds per student) how he/she perceived and what he/she knew about, each individual student. Interview data were analysed using both qualitative and quantitative methods. Results showed within- and between-teacher differences in the content, amount and evaluative nature of their knowledge and perceptions. In addition, there were within- and between-student differences in how their teachers knew and perceived them. The results suggest that teachers' knowledge and perceptions of their students varies per teacher-student combination and substantiate an interpersonal nature of teachers' knowledge and perceptions. To understand the function of teachers' knowledge and perceptions of students for teaching, future research should focus on how different knowledge and perceptions lead to differential educational trajectories for individual or specific groups of students.

2.1 Introduction

Internationally, there is an increasing plea that education should become more learner-centered (Reigeluth and Carr-Chellman, 2012; Watson and Reigeluth, 2008). More than two decades ago, McCombs and Whisler (1997) described learner-centred education as

> a perspective that couples a focus on individual learners (their heredity, experiences, perspectives, backgrounds, talents, interests, capacities, and needs) with a focus on learning (the best available knowledge about learning and how it occurs and about teaching practices that are most effective in promoting the highest levels of motivation, learning and achievement for all learners). (p.8)

Many scholars (e.g., Corno, 2008; Parsons et al., 2017; Tomlinson et al., 2003) have followed this perspective, stating that learners are distinct and unique and that their individual differences must be taken into account to provide them with the necessary challenges and opportunities for learning. For their own part, schools and educators turned to this perspective and are currently transforming their practices into more learner-centred forms of education. Accordingly, teachers are expected to adapt their instructional practices to the needs of individual students (Mills et al., 2014; Onderwijsraad, 2017; Prud'homme, Dolbec, Monique, Presseau, and Martineau, 2006). However, adapting teaching in response to the uniqueness of students has proved to be complex and not without controversy (Deunk et al., 2018; Peterson, Rubie-Davies, Osborne, and Sibley, 2016; Van Geel et al., 2018). Teachers could use more support in how to teach adaptively (Parsons et al., 2019). Therefore, more insight is necessary into how teachers connect individual learner characteristics with specific teaching practices.

Teachers' knowledge of their students is seen as a prerequisite for making adequate instructional adaptations (Corno, 2008; Tomlinson et al., 2003) and as an important domain of their whole knowledge base (Woolfolk, 2013). It is assumed that teachers must know their students well before they can adjust and personalise their instruction. However, opinions about what knowledge teachers should have about their students differ. Studies with different conceptual and methodological backgrounds have provided different insights into the student characteristics that are salient for teaching and how such characteristics become meaningful for teachers. For example, there are different views on whether and why knowing and adapting to students' learning styles is important (Gregory and Chapman, 2007; Hall and Moseley, 2005) or whether and how teachers take students' cultural backgrounds into account (Glock, 2016; Hachfeld, Hahn,

Schroeder, Anders, and Kunter, 2015). In addition, it has been argued that determining which student characteristics are relevant for teaching is connected to teachers' individual approaches to instruction and their classroom context (Cochran-Smith et al., 2016; Mayer and Marland, 1997). These insights raise the question of whether the meaningfulness of specific student characteristics can be determined outside the particular context of a teacher and his or her class. However, the personal or contextual nature of teachers' knowledge and perceptions of their students has not yet been well studied.

Understanding the nature of teachers' knowledge and perceptions is also important for helping teachers identify a) what they need to know about their students and b) what is relevant to adapt their teaching to. These questions seem especially important in secondary education, where teachers see students only for a limited time (a few lessons per week) and teach many students (multiple school classes). In these settings, teachers are restricted in getting to know individual students and responding to their unique characteristics. To further explore the personal and contextual nature of teachers' knowledge and perceptions, this study examines the knowledge and perceptions of seven teachers of the same students from a secondary school class.

2.2 Theoretical framework

2.2.1 Adaptive teaching and teachers' knowledge of their students

Adaptive teaching is conceptualized as teaching in which teachers use their knowledge of their students to make instructional decisions (Corno, 2008; Hoffman and Duffy, 2016; van de Grift, Helms-Lorenz, and Maulana, 2014; Vogt and Rogalla, 2009). Such decisions can lead to instructional variations between students within a lesson. Teachers have been seen to vary their questions and assignments to match a student's abilities, interests and personality (Parsons et al., 2017; Peterson, Rubie-Davies, Osborne, and Sibley, 2016). However, adaptive teaching is complex (Corno, 2008; Mills et al., 2014; van Geel et al., 2018). To respond adequately to differences across students, teachers need to have sufficient subject-matter knowledge and a variety of teaching skills (van der Lans, van de Grift, and van Veen, 2017; van Geel et al., 2018). In addition, teachers need to know their students and, further, how to link this knowledge with teaching strategies that will positively affect student learning (Banks, 2005; Corno, 2008; Deunk, Smale-Jacobse, de Boer, Doolaard, and Bosker, 2018; Watson and Reigeluth, 2008). For example, there are several ways to help struggling students. In order to choose an adequate strategy, the teacher needs to know why a student is struggling and connect this with specific strategies adequate for the situation.

Teachers make adaptive decisions based on their knowledge of their students. However, the educational literature regarding the knowledge and perceptions of students that teachers have, and how this relates to practice, is diffuse. Using the framework of Fenstermacher (1994), we distinguish three different research approaches in this paper. These approaches vary in their epistemological backgrounds, methodologies used, and conclusions drawn about teachers' knowledge and perceptions of students. The first approach values what is known (by scholars) about what teachers should know of their students. It is mostly prescriptive and is often described to generate *knowledge for teachers.* The second approach values what teachers express about what they know and believe is important to know about students. It is mostly descriptive and sheds light on the *knowledge of teachers*, or practical knowledge. The third approach values the knowledge teachers have of their students that can be inferred by studying teachers' actions in response to a given student. Studies using this approach produce *knowledge about teachers and teaching*. Across these approaches, one finds different views on the content and nature of teachers' knowledge and perceptions of their students, that is, which student characteristics are important to know and why those attributes are salient.

Approach 1:** Knowledge for teachers **regarding meaningful student characteristics

Studies using this approach shed light on the knowledge teachers should have, that is, they discuss knowledge *for* teachers. For example, there are several conceptual frameworks and educational theories designed to help teachers adapt their instruction to individual students' needs. Most frameworks focus on several specific student characteristics that teachers should address in their adaptive practices. Banks (2005) emphasised the importance for teachers to know about their students: '*who they are*', '*what they care about*', '*what languages they speak*' and '*what customs and traditions are valued at their homes*' (p. 264). Other authors have endorsed the importance of acting on students' sociocultural and socioeconomic backgrounds (George, 2005), readiness, interest, and learning profile (Tomlinson et al., 2003), achievements on standardised tests (Prast, van de Weijer-Bergsma, Kroesbergen, and van Luit, 2015) or learning preferences (Tulbure, 2011). Underlying these conceptual frameworks are both ideological arguments and empirical research. Investigations from within this framework shed light on specific student characteristics (i.e., ability, motivation) that can influence their learning. Because such characteristics differ among students, they should be taken into account when teaching students. Examples of such characteristics are student personality (Poropat, 2009) and emotion regulation skills (Camacho-Morles, Slemp, Oades, Morrish, and Scoular, 2019); metacognitive abilities; and psychosocial factors such as self-esteem, reading habits, gender and other characteristics (Woolfolk, 2013). These characteristics stem from various

disciplinary backgrounds such as sociology, social and instructional psychology, and pedagogy, and reflect a broad range of student attributes. Taken together, the studies in this approach imply that teachers' knowledge about their students should be breadth, i.e. teachers should know and take into account many aspects of their students. Such prescriptive frameworks imply that what is important or relevant to know for teachers is rather universal and alike for all teachers.

Approach 2:** Knowledge of teachers **regarding meaningful student characteristics
The second research approach studies the knowledge base that teachers possess regarding their own students. It sheds light on the knowledge and perceptions instructors have and use in their adaptive practices by studying those student characteristics they regard as important. Mayer and Marland (1997) studied such knowledge, as found in 'experienced and highly effective' primary school teachers, by interviewing them. These teachers expressed knowledge of their students' work habits/attitudes, abilities, previous schooling, personalities, family/home background, playground behaviour, and peer relationships. In addition, these teachers experienced their knowledge as critical to functioning effectively in the classroom. Other researchers (Blease, 1995; Kagan and Tippins, 1991; Paterson, 2007), applying the same kind of approach, came to similar conclusions: teachers are knowledgeable of a variety of student characteristics and this knowledge enables them to optimise student learning by tailoring educational programmes. Although these studies are somewhat dated, they show that teachers have and value knowledge about a variety of student-characteristics.

The range and breadth of teachers' knowledge of their students seems aligned with the suggested breadth by the '*knowledge for teachers*' research approach. However, there have been both commonalities and differences in the student characteristics that various teachers have identified as meaningful for their teaching. Such differences have been both within studies and between studies. This variety (or even, at times, discrepancy) across teachers has not been well explored. Mayer and Marland (1997) described qualitative differences in teachers' knowledge bases. For example, one teacher focused more on students' (inter)dependence whereas another teacher focused more on students' family backgrounds. Kagan and Tippins (1991), studying the knowledge of student-teachers about their pupils, concluded that there were quantitative differences between the student-teachers participating in their study, that is, some student-teachers knew more about their students than others.

In addition, such differences among teachers have been interpreted in different ways. For example, Calderhead (1983) argued they could be explained in terms of teacher

experience, with beginning teachers having broad knowledge and expert teachers having more selective understanding of their students. Kagan and Tippins (1991) attributed the differences they found to teacher quality, with student-teachers who did show meager professional growth knowing less about their students than those who showed greater professional development. However, in the study of Mayer and Marland (1997), all teachers were highly experienced and effective, yet still differed in their knowledge bases. These authors concluded that what is relevant for teachers to know might be context-specific and connected with individual approaches to teaching; thus, teachers must identify which features of their students are personally and situationally relevant.

Approach 3: *Knowledge about teachers and teaching* ***regarding meaningful student characteristics***

The third research approach considers the association between teachers' adaptive practices and student characteristics, separate and apart from the teachers' own perspectives. This approach produces knowledge *about teachers and teaching*. In these studies, classroom observations of instructional behaviours or assessments of student learning were associated with information about specific student characteristics. Studies using this approach have demonstrated that teachers can have knowledge of their students' characteristics yet still fail to use this knowledge to (observably) adapt their practices (Savage and Desforges, 1995). Moreover, teachers have shown to be adaptive to student characteristics of which they were not aware (Consuegra, Engels, and Willegems, 2016; Good and Brophy, 1974). Studies within this third approach have examined 'teacher perceptions of their students', rather than 'teacher knowledge of their students'. For example, Rubie-Davies (2010) studied the association between teacher expectations and perceptions of student attributes such as motivation, cognitive engagement, and self-esteem. Although knowledge and perceptions are different constructs, they both focus on student characteristics that are important for teachers' adaptive practices. It has been shown that teachers' perceptions of students' study behaviour, (disruptive) classroom behaviours, and academic abilities are related to student characteristics such as sex or socioeconomic and cultural background (Consuegra et al., 2016; Ready and Chu, 2015; Timmermans, de Boer, and van der Werf, 2016; Walters, 2007). Student characteristics thus can be relevant for adaptive practices without teachers' awareness; as well, not all student characteristics expressed as relevant by teachers themselves might actually influence their teaching.

Similar to studies using the second approach, studies applying this third approach (Rubie-Davies, 2010; Timmermans et al., 2016) have found differences across teachers in how student characteristics affect their practices. For example, teachers have been

found to differ in the extent to which students' cultural-ethnic background influence their perceptions of ability (McKown and Weinstein, 2008). Not all teachers take all student characteristics into account; further, the meaning attributed to a given student characteristic, in terms of instructional approach, differ widely across teachers.

2.2.2 Teachers' knowledge and perceptions of their students

It has been argued (Moon, 2005; Tomlinson et al., 2003) that teachers should base their adaptive practices solely on formal assessments of student characteristics, because this would lead to more reliable and valid knowledge. However, teachers' knowledge of their students is often based on a mix of formal and informal assessments (Corno, 2008; Mayer and Marland, 1997). Moreover, teachers' knowledge of their students is often not objective; rather, their knowledge reflects subjective interpretations of students (Walters, 2007). For example, teacher utterances about students, such as 'always achieves high grades', 'is very smart', 'rather works alone', or 'is a bit autistic' all reveal what teachers know and perceive about their students. However, this knowledge ranges from objective facts to subjective interpretations. Altogether, then, the adaptive practices of teachers are not based on the objective characteristics of students alone, but also on teachers' subjective knowledge and perceptions of students' characteristics. To emphasise this subjective nature, what teachers know about their students' characteristics is referred to in this study as *teachers' knowledge and perceptions of their students*.

2.2.3 The present study: Exploring differences in teachers' knowledge and perceptions of their students

From the perspective of adaptive teaching, teachers are often urged to make educational decisions with a focus on individual students and their unique characteristics. However, it remains unclear which student characteristics are important to take into account in adaptive teaching and, as well, what determines this importance. On the one hand, several frameworks prescribe important student characteristics that seem universal, in that they are equally important for all teachers and all students. On the other hand, other studies (*cf.* Mayer and Marland, 1997; Rubie-Davies, 2010) shed light on differences among teachers and emphasise the personal and contextual nature of teachers' knowledge and perceptions of their students. In yet other studies (*cf.* Banks et al., 2005; Kagan and Tippins, 1991) differences among teachers are associated with better or worse teaching qualities and subsequent student learning. Empirically, however, the function of teachers' knowledge and perceptions of their students remains underexplored.

It is important to gain insight into the student characteristics that teachers take into account – and, further, how these characteristics become meaningful. Teaching various students differently can lead to more optimal learning opportunities for all. However, teachers who let student characteristics influence their practices and who teach individual students differently have also been shown to decrease opportunities for some students, rather than increasing them for everyone (Rubie-Davies, 2010). Thus, adapting education to the unique characteristics of individual students per se is not desirable. Also, insufficient and/or inadequate knowledge can produce inadequate teaching practices (van Geel et al., 2018). To support teachers in making adequate adaptions, it is important to shed light on: a) their knowledge and perceptions of their students, and b) how those perceptions came about and how they affect the person's teaching style. This is especially salient in secondary education, in which teachers have to get to know over 100 individual students, teach multiple students simultaneous, and see their students for a limited amount of time each week.

To understand how specific student characteristics become meaningful, and whether and how this is registered across teachers, we wanted to systematically map differences in teachers' knowledge and perceptions of their students. To gain further insight in the personal nature of this content, we strived to study differences among teachers who instruct in similar situations (cf. Verloop, van Driel and Meijer, 2001). Therefore, in this study, the knowledge and perceptions of several teachers of the same group of students were studied. Specifically, teachers' knowledge and perceptions of all *individual* students in one classroom were explored. In earlier studies, teachers' knowledge and perceptions of their whole class were explored, with teachers portraying some students very deeply, while other students were not or scarcely addressed (Blease, 1995; Civitillo et al., 2016; Kagan and Tippins, 1991; Mayer and Marland, 1997). The design of this study is unique in that the knowledge and perceptions of several teachers teaching the same classroom of students were investigated. This research context made it possible to study differences across teachers in how they perceived the same students and, as well, differences among students in how they were perceived by several of their teachers.

The central research question was: *How do teachers' knowledge and perceptions of their students vary between teachers and between students?* To answer this question and map the variety of responses among both teachers and students, the following sub-questions were formulated: a) How do the knowledge and perceptions that teachers have of their students vary within and between teachers? b) How do the knowledge and perceptions that teachers have of their students vary within and between students? Because earlier studies suggest that teachers' knowledge and perceptions of students differ in both in content and amount, we also focused on both.

2.3 Method

To answer the research questions, a research methodology was used in which qualitatively gathered data were analyzed both quantitatively and qualitatively. Teachers' knowledge and perceptions of their students were assumed to be contingent on teachers' personal frameworks (Mayer and Marland, 1997). Sensitivity to the personal context is a strength of qualitative research because it allows participants to think from their own personal framework without being influenced or prompted by external input (Bryman, 2006). However, to also shed light on quantitative differences and be able to compare teachers' knowledge and perceptions systematically, a quantitative approach was needed. Quantitative approaches yield results that can be related to data from other samples. Therefore, data from the interviews were handled in a two-fold process. First, they were analyzed qualitatively. Second, the data were transformed to quantitative data in order to perform quantitative data-analysis and to explore quantitative differences between and within teachers. Third, a qualitative data-analysis strategy was used to deepen the findings.

2.3.1 Research context and participants

This study was part of a project that aimed to develop, and shed light on, the adaptive practices of eight secondary school teachers. The school in which these teachers worked was making a shift towards '*personalised learning*'. Personalised learning is an educational approach that aims to adapt teaching to the learning needs of individual students or subgroups of students (Murphy, 2016). There were between 900–1000 students enrolled in the school that (located in a small town in the Netherlands). The teachers in the research project participated in a professional learning community (PLC) in which they discussed how to best personalise their lessons for the students. The teachers all taught the same group of students in their second year of secondary education; their discussions within the PLC focused on this particular group. Ethical approval was given by the Ethics Committee of the Radboud Teachers Academy.

The study started with eight teachers. One teacher stopped teaching before all data were collected. The investigation thus reports on the data of seven teachers, teachers A–G. The teachers varied in age ($M = 40.14$, $SD = 10.21$), years of experience ($M = 13.57$, $SD = 8.06$) and sex (one male, six female). Each teacher taught a different curriculum subject. The subjects were mathematics, science, history, Dutch, French, German, and English. The school class consisted of 34 students, 19 boys and 15 girls, ranging from 12 to 14 years old. We removed all data from a student with family ties to one of the researchers participating in the larger research project but not involved with the data collection of this study, leaving 33 students for data analyses. The group

was a mixed-level school class of the upper two levels of general education in the Netherlands, that is, 'HAVO' (higher general education, comparable with O-levels) and 'VWO' (pre-university track, comparable with A-levels). The class followed bilingual education, meaning that science, history, math, and English were taught in English. The subjects Dutch, French, and German were taught in the subjects' language.

We aimed to study the differences in teachers' knowledge and perceptions of their students among those teaching in a similar context. However, there were some contextual differences that may have impacted teachers' knowledge and perceptions of their students. First, depending on the subject, the teachers taught the class for two to four 50-minute lessons a week. Second, four teachers had already taught the class the year before. Table 2.1 presents an overview of the teachers, their subjects and both contextual factors. Because it has been suggested that teachers' experience impacts their knowledge and perceptions (Calderhead, 1983), this information is provided in the table as well.

Table 2.1. Per teacher, the subject, years of experience (Y/Experience) working as a teacher, years of experience teaching these specific students (Y/students), and the number of lessons a week teaching these students (Lessons/week)*.

	Teacher A	**Teacher B**	**Teacher C**	**Teacher D**	**Teacher E**	**Teacher F**	**Teacher G**
Subject	Science	French	Dutch	History	Math	German	English
Y/experience	11	30	5	11	22	5	12
Y/students	1	1	2	2	2	1	2
Lessons/week*	3	2	4	2	4	2	4

*one lesson has a duration of 50 minutes

2.3.2 Data collection and procedure

To elicit teachers' knowledge and perceptions about their classes, we interviewed each teacher individually about each individual student. All interviews took place at the end of November and beginning of December 2017. This period was chosen for two reasons. First, all teachers had taught the class for at least two months and were expected to have started 'personalising' their lessons towards individual or subgroups of students. Second, the results of the first summative assessments of each subject were known. The teachers thus had opportunities to interact with all students and were expected to make decisions based on their knowledge and perceptions of their students.

As mentioned, the interview was part of a larger project. One aim of the project was to – together with the teachers – filter out important factors when adapting lessons for individual students. Learning which student characteristics were important for

such decisions was an important part of the project; the interview served as one of the tools to achieve this. To ensure confidentiality interviews, were held in a quiet and private conference room. The researcher who collected the data for this study also observed one or two lessons by each teacher and interviewed the teachers about these lessons. The researcher and teachers thus were familiar with each other; as well, the researcher had observed the students for several lessons.

2.3.3 The instrument

Although the interview procedure was highly structured, the content of the interview was left open to be responsive to teachers' personal frameworks. The goal of the interview was to elicit each teacher's knowledge and perceptions of their students that was most likely to be relevant for their adaptive teaching. However, as indicated above, teachers are not always aware of the student characteristics that are relevant for their teaching practices (Consuegra et al., 2016; Good and Brophy, 1974; Savage and Desforges, 1995). Interviewing teachers explicitly about the knowledge they perceive as relevant might therefore not be appropriate to elicit salient student characteristics. Interviewing assumes that relevance is subjectively experienced and available for report and intentional use (Winkielman and Schooler, 2012). Therefore, the teachers were not asked directly about their knowledge perceptions of their students that they experienced as relevant.

Teachers were asked three general questions that were aimed to elicit their own knowledge and perceptions of a student. These questions were '*Describe this student, what image do you have of him/her?*' '*What do you know about this student?*' and '*What does this student need in order to achieve important goals?*'. At the start of the interviews, the interviewer stated the aim of the research (to learn which student characteristics are relevant for adaptive teaching, according to teachers). This statement was followed by emphasising that what was relevant probably was very personal; and, for this reason, the interview had an open procedure. Next, the interview procedure was explained and the three questions were presented. The questions were printed on a paper and placed in front of the teacher during the interview. Pertaining to the last question, the interviewer indicated that 'important goals' could be both subject related and, as well, more pedagogical in nature. The interviewer did not repeat the questions during the interview and did not ask any follow-up questions. The questions were meant to elicit teachers' most salient knowledge and perceptions about their students; teachers were not asked to answer each question separately.

To prompt the teachers, a profile photo of each student was used. The image of each student was placed in front of the teacher and, while placing the photo, the

researcher stated the first and last name of the student. The teachers had exactly one minute to elaborate on each student. After each minute, a timer rang. The teacher could finish the sentence he or she had started, after which the profile photo was removed and a new student was presented. In all interviews, the students were presented in the same order.

From a pilot version of the interview, we had learned that interviewing teachers without this highly structured format was both time consuming and ineffective. Teachers revealed very detailed information about some students and were often anecdotal. Many parts of the interviews became redundant because teachers gave several different examples of the same student characteristic. In addition, some of the information seemed not relevant for teachers' daily practice. Therefore, we set a time constraint of 1 minute per student. This constraint urged teachers to express their first associations and to lower the probability of disclosing knowledge and perceptions that were not relevant for their daily practices or that were redundant.

Most interviews took less time than the planned 45 minutes because teachers did not need the full minute for several students. Teachers did not use anecdotes and were less repetitive in their knowledge and perceptions of individual students than the teachers in the pilot version. After discussing half the students, there was a short break, during which the interviewer asked the teacher how he/she experienced the interview procedure. Almost all teachers stated that they were surprised either how well, or in most instances how poorly, they knew their students. For example, while Teacher D said, "*Fine. And I think I am not doing too bad of a job in knowing the students*", Teacher G expressed that she became aware of her lack of knowledge. She stated, "*I experience the class as lovely. However, I do notice that being so specific about what you know of them, it disappoints me.*' The teachers did not experience the interview as unnatural or restrictive. The researcher, who was familiar with the teachers, experienced no differences in interaction with the teachers during this interview (compared to the interviews about teachers' lessons). This 'sixty-seconds about your student' interview method seemed an appropriate means of eliciting teachers' knowledge and perceptions of their students.

2.3.4 Data analysis

The data analysis was performed in two steps. The first step was the development of a coding scheme (Miles, Huberman, and Saldana, 2014) and coding of the data. In the second step, the data were transformed to quantitative data followed by quantitative analyses of variance and qualitative compare-and-contrast analyses to explore the variability in teachers' knowledge and perceptions of their students.

Step 1: Development of the coding scheme
All interviews were transcribed and anonymised by providing each teacher with a letter (A–G) and each student with a number (1–33). All anonymised transcripts were uploaded in Atlas.ti (Version 7).

For development of the coding scheme and the transcripts, the first researcher worked together with a research assistant who was not involved in the data collection. To develop the coding scheme, both deductive as well as inductive coding were performed on the interview transcripts of three teachers. In the deductive round, the codes were derived from earlier empirical studies on teachers' knowledge of students. Next, the index list of the Twelfth edition of *Educational Psychology* (Woolfolk, 2013) was scanned for student characteristics. The first author and the research assistant went through the index and selected all entries that were related to learner characteristics (e.g., ability, behaviour, motivation, learning preferences). Related items were grouped (for example: attention, work attitude and task involved learners were grouped into work behaviours/attitudes). This resulted in a coding scheme including 29 student characteristics. After the coding of the transcripts of three teachers, the coding scheme was revised by deleting codes that were not used by the teachers. To further develop the coding scheme and to establish intercoder reliability and agreement the three-phase procedure described by Campbell, Quincy, Osserman, and Pedersen (2013) was used.

In the first phase, all interview fragments that could not be coded with the existing code list were discussed. Many students were described with affective remarks such as 'sweet' or 'nice'. These do not refer to specific learner characteristics but, instead, address the affection of the teacher for a student. The code *'affective evaluation'* was added to the coding scheme. In addition, many teachers stated that they did not know a student very well or did not know specific information about a student or 'I do not really know this student', or 'Actually, I have no idea what his/her current grade is'. Therefore, we supplemented the coding schemewith the subcode *'visibility'*. Similar to the affective evaluations of students, this information seemed to reveal more information about the teacher and his or her relation with the specific student. Therefore, we named this category '*teacher-student relationship characteristics*'.

Moreover, during this phase, the evaluative codes '*positive*' and '*negative*' were added to the coding scheme. Teachers often were outspokenly positive or negative in their statements about students. The evaluative nature of teacher perceptions has been shown to affect teachers' expectations and adaptive practices (Rubie-Davies, 2010; Timmermans et al., 2016). Important information about the knowledge and

perceptions of teachers seemed to be lost if this distinction was not included. In a positive statement a teacher indicated that a student had much of a quality or was good at something, for example, 'very smart student'(positive abilities), 'very motivated' (positive motivation) or 'has a good study approach' (positive work behaviours/attitudes). In the same way, a negative statement indicated that a student was lacking in a characteristic, for example, 'is very insecure' (low self-esteem), or reflects a negative evaluation of a specific characteristic, for example, 'has bad working behaviour' (negative work behaviour/attitude).

After the development of the coding scheme on the full transcripts of three teachers, we drew a random sample of interview fragments from all teachers' transcripts. A fragment included one teacher describing one student. Independently, the two researchers coded the same sample of 10% of the total of 212 fragments. Using the framework of Campbell et al., we first focused on increasing inter-coder agreement by thoroughly discussing fragments that were coded differently. The interpretation of the data was complex because teachers described students with both a high level of abstraction and very specific behaviours. What became apparent during the discussion was that, when interpreting the data, complete teacher-student quotations should be taken into account when coding the statements. Within the discussion, the need for a new code, that is, 'domain-specific abilities', emerged. For example, "She is a very bright student, writing and reading French is not a real problem for her. However, she always struggles with the listening exercises" (Teacher B) was a fragment that could not be coded correctly with the term 'student ability' because the fragment revealed not just information about general ability (bright student), but also about the domain-specific abilities. At the end of the meeting, the coding scheme was finalised by adding the code 'domain-specific abilities'.

After the meeting, a new random sample of 10% of fragments was drawn and coded interdependently. Based on the coding of these fragments, intercoder reliability was calculated using Cohen's kappa. Reliability was $\kappa = .71$ for the content codes and $\kappa = .69$ for the evaluative codes. This values meet general guidelines for sufficient reliability (Landis and Koch, 1977; McHugh, 2012). Therefore, the dataset was divided among the researchers to be coded. The full coding scheme is in Appendix 2.1.

Step 2: Data transformation and further analyses

Further data analyses were aimed at exploring the variability of teachers' knowledge and perceptions. First differences between and within teachers were analysed. Second, differences between students were explored. To do so, the qualitative data were transformed into quantitative data. Each code was given a number (1–23)

followed by a second number referring to the evaluative nature. All *neutral* statements were coded with the number of the code following '.1', *positive* statements were coded with '.2' and *negative* statements with '.0'. For example, '*very intelligent student*' received the code '1.2', i.e., 'abilities.positive'. An illustrative example of the coding can be found in Table 2.2.

Table 2.2. Part of teachers' quotations, and their subsequent codes, about Student 32.

Teacher	Part of quotes about Student 32	Codes
A	"Very intelligent, or at least I think he is a very intelligent boy. Um, he knows a lot, and he is able to organise his own work. Working together is somewhat difficult for him, because he is a perfectionist."	A1.2, A3.2, A4.1, A5.2, B19.0, B11.1
B	"He struggles with French. He has his own way of studying, which is fine, but…yeah…when I discussed the test with him, after handing it back, he admitted that "yes, I have to pay more attention to this and that". Apart from that, um, he's a strange boy, very stubborn."	A7.0, A4.1, A5.2, C22.1, B11,1
D	"[Student 32], um, I think [student 32] is a smart boy. A bit of a loner, possibly slightly autistic. He knows a lot about history, lots of facts mainly. I think he learned that from gaming, because he's a gamer and he plays a lot of games with a historical setting. He is a typical nerd, works hard, um, keeps to himself…you know the type. "	A1.2, B8.0, B13.1, A3.2, B16.1, B15.2.
E	"A very introverted student, I suspect he has autism, or Asperger's maybe, based on his disposition and lack of communicative skills. Very smart boy, really into computers. Um, also a little lazy, it's very difficult to get him to start working. He is under the impression that he can manage things himself, but that doesn't work as well in practice."	B11.1, B13.1, A1.2, B16.1, B15.0, B17.0
G	"Well, [student 32] has fascinated me from the start…But beneath the surface there are a lot of layers with him…He really goes the extra mile, so I give him extra time for literary assignments, book reports and tasks and such. He never disappoints, always goes for straight A's. He perceives himself as a good student, but that means he can be very disappointed and sad when he doesn't do so well. He's willing to help others, but not when he suspects that they're just trying to freeload."	C22.1, B17.1, A2.2, B10.1, B8.1

Next, a matrix was created. Each row represented a teacher-student combination and the columns contained all codes. The first analysis was quantitative and shed light on both between-teacher and between-student variability. Since we aimed to identify the variability between and within teachers, we calculated intraclass correlation coefficients for each code. For the calculation of intraclass correlations

(r)[1], we applied analyses of variance as suggested by Kenny, Kashy, and Cook (2006). To study the variance within and between teachers and students, both the intraclass correlation (ICC) of the teachers (r_{tchr}) and the students (r_{stdnt}) were relevant. To further analyse differences between teachers and students these quantitative findings were examined in more detail in a qualitative analysis that included both a compare and contrast strategy and extreme-case analysis (Miles, Huberman, and Saldana, 2014).

2.4 Results

This study aimed to answer the question: *How do teachers' knowledge and perceptions of their students vary between teachers and between students?* During the development of the coding scheme, two new attributes of teachers' knowledge and perceptions emerged, that is, the evaluative nature and the category 'teacher-student relationship'.As can been seen in Table 2.3, the frequencies of the category 'teacher-student relationship' were among the highest. Teachers' knowledge and perceptions of their students seemed closely bound with their affection for a student and the visibility of a student for the teacher. Therefore, in addition to analysing differences in teachers' knowledge and perceptions of their students, differences in the evaluative nature and the teacher-student relationship characteristics were analysed as well. Throughout the results, teachers' knowledge and perceptions (codes from categories A and B in the coding scheme, i.e., codes 1–21) are discussed separately from the teacher-student relationship characteristics (the codes from category C, i.e., codes 22 and 23).

2.4.1 Variability in teachers' knowledge and perceptions of their students

Table 2.3 and Table 2.4 show the results of teachers' knowledge and perceptions of their students. In Table 2.3, the content of teachers' knowledge and perceptions are presented. Results show that the teachers expressed knowledge and perceptions about students' cognitive characteristics and noncognitive characteristics. The student characteristics expressed the most were: abilities (code1, f=95), personality (code11, f=67), work behaviour/attitudes (code17, f=66), achievements (code2, f=57), and effort (code15, f=46). In general, students' abilities, personalities and their work mentality were the most salient student characteristics for teachers.

1 r_{tchr} can be estimated by $(MS_b\text{-}MS_w)/(MS_b+(k'\text{-}1)MS_w)$ using teacher as a factor and where k' is the corrected number of students rated per teacher, because we gathered ratings of 33 students for 6 teachers and ratings of 14 students for 1 teacher, k' = 30,71, see Kenny et al. (2006, p. 276). R_{stdnt}can be estimated by $(MS_b\text{-}MS_w)/(MS_b+(k'\text{-}1)MS_w)$ using student as a factor and where k' is the corrected number of teachers that rated the student because we gathered ratings of 6 teachers of 14 students and 7 teachers of 19 students, k' = 6.38, see Kenny et al. (2006, p. 276).

Table 2.3. Teachers' knowledge and perceptions of students (n=7 teachers and n=33 students), per code the frequency (f), variance between teachers (r1tchr) and variance between students (r1stdnt) and, per teacher, the proportion of students in the classroom that were described using the code***

					Teacher						
		f	r_{tchr}	r_{stdnt}	A	B	C	D	E	F	G
A. Cognitive characteristics											
1	Abilities	95	.16**	.09	.55	.27	.42	.58	.73	.09	.57
2	Achievements	57	.17**	-.07	.18	.12	.64	.09	.18	.12	.93
3	Knowledge	6	.01	.04	.09	.00	.00	.03	.00	.03	.07
4	Learning preference	13	.16**	.06	.27	.03	.06	.00	.00	.00	.07
5	Metacognition/Self-regulation	33	.08*	.03	.30	.09	.27	.03	.18	.09	.07
6	Learning difficulties	6	.03	.16**	.00	.09	.06	.03	.00	.00	.00
7	Domain-specific abilities	30	.06*	-.01	.15	.03	.33	.03	.15	.03	.43
B. Noncognitive characteristics											
	B1 Social-emotional characteristics										
8	Psychosocial	29	.04	.09	.06	.03	.27	.12	.18	.06	**.36**
9	Emotional maturity	9	.02	.00	.06	.00	.00	.09	.09	.00	.07
10	Self-concept/self-esteem	43	.16**	.05	.42	.15	.09	.03	.36	.00	.57
11	Personality	67	.13**	.07	.15	.15	.27	.52	.46	.42	.14
12	Wellbeing	11	.10**	-.01	.00	.00	.03	.03	.03	.21	.07
13	Soc.-emot[1] and behavioural difficulties	13	.06*	.18**	.09	.03	.00	.09	.18	.00	.00
	B2 Motivational and behavioural characteristics										
14	Motivation/goal orientation	35	.02	-.03	.09	.09	.18	.12	.30	.09	.43
15	Effort	46	.01	.11*	.12	.21	.24	.30	.21	.06	.57
16	Interests	23	.06	.03	.27	.03	.03	.12	.06	.06	.29
17	Work behaviours/attitudes	66	.06*	-.06	.46	.12	.42	.12	.33	.30	.57
18	Classroom behaviours	44	.02	.16*	.15	.09	.18	.15	.27	.33	.36
19	Collaborative abilities	4	.04	-.01	.03	.00	.09	.00	.00	.00	.00
	B3 Background characteristics										
20	Home environment	5	-.01	.06	.00	.03	.00	.00	.03	.06	.07
21	Background information	12	.05	.13	.00	.00	.06	.03	.03	.06	.43
C. Teacher-student relationship characteristics											
22	Affective evaluations	90	.15**	.04	.18	.39	.70	.39	.30	.58	.44
23	Visibility	74	.24**	.15*	.24	.49	.15	.49	.06	.70	.29

** $p < .001$, * $p < .01$, *** For Teachers A–F, $n_{students} = 33$, for Teacher G, $n_{students} = 14$

[1] Social-emotional

Although all teachers expressed knowledge and perceptions of students' personality, academic ability, and their work mentality, they did not do so about all individual students. Many student characteristics, such as students' learning preferences, wellbeing or background, were only used by some teachers. The student characteristics that were mentioned least were: 1) collaborative abilities (code19, *f*=4), 2) home environment (Code 20, *f*=5), and 3) knowledge (code3, *f*=6) and learning difficulties (code6, *f*=6). These characteristics were mentioned only by some teachers regarding only a few students. These results indicate that there are differences between teachers in what they know and perceive of their students. Teachers seemed to focus on different student characteristics while thinking about their students. These results also indicate that there are differences within teachers in what they know and perceive of different students. The characteristics that were salient in teachers' knowledge and perceptions differed within teachers and across different students. Teachers thus seemed to have an eye for students' uniqueness.

This variation between and within teachers was indicated by the two ICC scores for each characteristic, presented in Table 2.3. A high ICC (r_1) indicates that a code was used consistently. In general, the ICC scores that indicated the consistency between teachers (r_{1tchr}) were relatively low and the variance among teachers pertaining to all codes was high. The student characteristics *abilities, achievements, learning preference, self-concept, personality,* and *wellbeing* showed the highest commonality and seemed similarly meaningful for all teachers. However, for most characteristics, teachers seemed to differ in how meaningful the characteristic was for them. These results thus confirm that there are differences among teachers in what they know and perceive regarding students. They also suggest that there are differences within teachers in what they know and perceive of different students. To further explore this variability, we compared and contrasted the knowledge and perceptions of the individual teachers.

2.4.2 Differences between teachers in their knowledge and perceptions

In Table 2.4, per teacher, results are presented on the number of characteristics and the diversity of categories used. With regard to the differences between the teachers, the results show that there is large variation in the amount of knowledge and perceptions the teachers expressed. The teacher who expressed the most knowledge and perceptions, Teacher E, expressed over two times more characteristics as did the teacher who expressed the fewest characteristics (Teacher B). The number of categories used, that is, how diverse teachers' knowledge and perceptions were, ranged from 16 to 18 different characteristics. All teachers thus used a variety of different characteristics in describing their students and did not differ from each other in this respect.

To explore differences between teachers in their knowledge and perceptions, the data were compared and contrasted. First, differences between teachers were analysed by making horizontal comparisons between the data from the individual teachers presented in Table 2.3. For example, Teacher A described her students' abilities (55% of the students), work behaviours/attitudes (46% of the students) and self-concept/self-esteem (46% of the students) the most. Compared with the other teachers, she expressed knowledge and perceptions about her students' metacognition/self-regulation (30%) and interests (27%) more often. In contrast, Teacher F described the student personality (42%) and classroom behaviours (33%) the most. Thus, the relative importance of specific student characteristics differed between teachers.

Because teachers differed in the total number of characteristics expressed, to explore differences between teachers, relative scores were compared. That is, the frequencies were divided by the total number of codes used by a teacher. From this between-teacher analysis it became clear that teachers' knowledge and perceptions differed in their relative focus. Teachers A, B, and C were relatively more focused on students' cognitive characteristics than the other teachers. Teachers D and E, compared to the other teachers, were more focused on students' social-emotional characteristics. For these teachers, students' social-emotional characteristics seemed more salient than for the other teachers. Teacher F was more strongly focused on students' motivational and behavioural characteristics. Of all teachers, she focused the least on students' cognitive characteristics. Teacher G did not seem to have a particular focus. She used all categories about equally often. Teachers' knowledge and perceptions thus differed in their overall focus.

2.4.3 Differences among teachers in the evaluative nature of their knowledge and perceptions

Figure 2.1 shows the evaluative nature of teachers' knowledge and perceptions. Most knowledge and perceptions of students were neutral (48%), followed by slightly more positive (30%) and negative (22%) statements. As can been seen in Figure 2.1, some characteristics did not have a positive-negative dimension. The number of positive and negative statements thus cannot be compared with the number of neutral statements. Results showed that teachers' knowledge and perceptions concerned both whether a student was able to do something and whether he/she was weak in, or lacked, an attribute.

In Table 2.4, the evaluative nature of teachers' knowledge and perceptions per teacher is displayed. As can be seen, knowledge and perceptions differed in their evaluative nature. Teachers D and F focused more on students' positive characteristics, while

Teacher B was more negative. In addition, teachers were not all very outspoken in their evaluative nature. Teacher C seemed more outspokenly judgmental; she described her students' most often either outspokenly positive or negative. Teachers A and E were more balanced in their assessments. We will further discuss these findings in relation with the findings for teacher-student relationships.

Table 2.4. Per teacher, the amount of codes and categories used, and the distribution between the positive and negative evaluative nature of their knowledge and perceptions of their students

	Teacher A	Teacher B	Teacher C	Teacher D	Teacher E	Teacher F	Teacher G
Codes	111	52	121	83	125	67	85
Categories	18	16	18	18	17	16	17
% Positive	23	15	45	35	23	34	24
% Negative	22	35	30	7	23	5	25

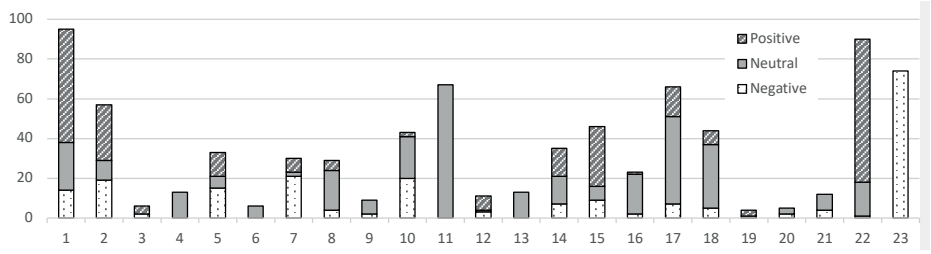

Figure 2.1. The evaluative nature per Code

2.4.4 Exploring the variability between students in how they are known by their teachers

As can be derived from the ICC scores in Table 2.3, there was much variance across students (r_{stdnt}) regarding the characteristics used to describe them. Some characteristics (for example, 'achievements') had consistencies close to zero or negative consistencies. This indicates that whether or not a student was described on his/her achievements did not predict whether he/she would be described on this characteristic by other teachers. However, some characteristics were used more consistently, that is, were used by multiple teachers to describe the same student. The characteristics used most consistently were: 'learning difficulties' and 'social/emotional and behavioural difficulties'. If a student was known and perceived to have difficulties, this was salient for several teachers. For example, Student 9 was described by three teachers as 'dyslexic', for example, by Teacher C: "Very weak. I think he doesn't realize this. Dyslexic". However, even with more consistently-used characteristics such as 'learning difficulties', there was variance among the teachers.

Teacher A, for example, did not use the characteristic 'learning difficulties' at all. She described Student 9 as "Yeah, [STDNT 9]. [STDNT 9] does need, I'd say, a bit of structure. Kind of what I just said about [STDNT 12] and [STDNT 14]. He knows it all, but if you ask him something it all stays really superficial. He won't go more in depth. He really needs guidance to reach those deeper layers."Students' learning difficulties, social/emotional and behavioural difficulties, effort and classroom behaviour seemed more consistently relevant for some teachers. However, even these consistencies were relatively low, indicating that such characteristics were not relevant for all teachers pertaining a given student.

Important factors that varied among teachers were the number of characteristics used as well as the evaluative nature of their knowledge and perceptions. Exploring these factors among students showed differences on these factors as well. Most students were described with 22 codes. On average, students were described with 31% positive characteristics and 19% negative characteristics. However, among all factors the variance was high. The student described with the fewest codes only received 9 codes, four times less than the student described with the most codes (38). The student described most negatively had both the largest percentage of negative codes (58%) and the fewest positive codes (0.03%). Other students were not described with negative codes at all. The student described most positively received 64% positive codes. Different students thus were perceived differently by their teachers. To further explore the differences between students, we will describe some extreme cases in more detail.

Student 32 (see also Table 2.2) was the student described with the most codes. Although there were some commonalities across teachers in what they knew and perceived of this student, teachers also differed in the characteristics they used. Student 32 was perceived as highly intelligent by Teachers A, D, and E. Teacher G described him as a high-achieving student who did well. Teacher B did not make general statements; she only described that he was very weak in her subject (French). Teacher C did not mention his abilities nor achievements. Almost all teachers commented that there was something special about this student in the way he learned. Teacher C said: "[STDNT 32] learns differently when compared to the other students". She observed that he learned by listening to other students or the teacher and by doing rather than reading. Teachers A, B, D, and E also described him as having his own way of working, however not always specifying what was particular about this. For example, Teacher A: "He [STDNT 32] knows how to organise his work so it works for him". Teacher E also perceived that this student knew how to organise his work; however, he was the only teacher who stated this organisation was flawed, he stated: "He believes that he can organise his work really well, but what he does is

not always sufficient". Moreover, Teacher A perceived the student as hard working, whereas Teacher D described the student as lazy and hard to motivate. In addition, teachers differed in their interpretation of his work behaviour and whether this was perceived as a personality trait, originating from social or behavioural difficulties, or due to weak collaborative abilities. Some teachers seemed to attribute this to the student's personality, for example describing him as an 'einzelganger' (Teacher D), an 'introvert' (Teacher E), and being (slightly) autistic (Teachers D and E). Teacher A, in contrast, interpreted his behaviour as stemming from being a perfectionist and therefore having difficulties with collaboration. While most teachers observed similar behaviours, their interpretations differed.

This was alike for Student 14, an extreme case in that he was described both most negatively (64%) and least positively (0.03%). Teachers varied in their interpretation of this student. He was depicted as struggling by all teachers, with insufficient achievements to pass the year. Teachers B and C described this student as having low abilities and not putting in effort. Teacher A perceived this student as lazy and attributed his disruptive behaviours to puberty. She did not comment on his abilities. Teacher C attributed his disruptive behaviours to being bothered by his own low achievements and masking this by being funny and laughing about it. In contrast, Teacher D described the student as very quiet and lacking presence. She also perceived the student as weak; however, she thought this might be more due to frequent gaming than to than his abilities. Teacher E perceived the student as lazy and unmotivated for school in general. Teacher E stated: "[STDNT 33] is a lazy oaf…Yeah, that's the first thing that springs to mind. [STDNT 33] is quite clever, that's clear to me based on everything he does. But I…the boy just doesn't have any motivation". In contrast, Teacher F perceived this student as a nice person whom she hardly had to address. She also said that she did not really know him well. Teacher G perceived this student as struggling due to his concentration. She stated that his achievements were very low and was not sure whether this was due to his abilities or his gaming.

Both examples make clear that teachers use their knowledge and perceptions to interpret student behaviour. Teachers differ in their interpretations of the origins of student behaviour occurs and attribute this behaviour to different student characteristics.

2.4.5 Variability in the teacher-student relationship characteristics

The variability among teachers in their teacher-student relationship characteristics can be derived from Table 2.3. All teachers used affective evaluations, but not for all students. Teacher C expressed the most affective evaluations of her students; 70% of

her students were described with an affective statement. Teachers A and E expressed the fewest affective evaluations. This ranking seems in accordance with the variety of the evaluative nature of teachers' knowledge and perceptions. The knowledge and perceptions of Teacher C were more outspokenly evaluative and those of Teachers A and E the most balanced.

The code 'visibility' indicated whether a teacher reported not knowing a student at all or not knowing specific information about a student. The code 'visibility' was the only code that showed consistency across both teachers (r_{tchr}=.24) and students (r_{stdnt}=.15). This indicated that some students were more consistently experienced as scarcely known by their teachers than other students, and that some teachers expressed more often that they did not know a student than did other teachers.

Previous research on teachers' knowledge and perceptions did not report on teachers indicating their not knowing students. To better understand the code 'visibility' and this expressed lack of knowledge, we discuss some contrasting teachers and a student in more detail and relate these findings with those on teachers' knowledge and perceptions.

Contrasting the teachers with the highest and lowest frequencies of the code 'visibility', it seems that experiencing a lack of knowledge was related to naming fewer student characteristics. Teachers A, C, and E were least likely to say that did not know a student and expressed the most student characteristics. Teachers B and F named the fewest characteristics (Table 2.4), and were most likely to say they did not know a student. Teacher B hardly knew 49% of her students and expressed the most that she experienced a lack of knowledge of her students. Teacher F named 67 characteristics and indicated for 70% of her students that she hardly knew them. Although there seemed to be an association between the number of characteristics expressed by teachers and the number of students they experienced as not knowing, this association was not straightforward. Teacher F named more characteristics than Teacher B. However, she indicated for more students that she did not know them. Teacher D did not know the same number of students as Teacher B (49%), but named more characteristics (83) and thus had more knowledge and perceptions of her students.

There were two students that none of the teachers felt they knew. The student that was least known was Student 18. This person was described with the fewest characteristics: only 9 codes. He was described by his teachers with the following statements. Teacher A: '[Student 18] is a boy I just can't seem to figure out. I really

can't. Yeah. He'll be in my class…doesn't ask questions, he just sits there. He pays attention, because he realises he needs to. But no, no, I really don't understand him. Not at all. That also makes it hard for me to determine what he needs. He's just one of those quiet ones, you know, a quiet student.' Teacher B: 'I don't have anything yet…um, no.' Teacher C: 'This is a tough one. Can't make heads or tails of Student 18'. Teacher D: '[STDNT 18]. Sits at the front on the left. Uhm. Quiet boy. I think he is doing a fine job, but the kind of boy that doesn't show much of himself, a nice chap, but a bit of a blind spot to me'. Teacher E: 'Yes, nice boy, spontaneous. Does not need much help. Just goes about it and does a stellar job. I think he is ok with how we are currently working. He is fine with it when I explain things to the entire group, but when I let him work by himself, he does fine as well. I just cannot say a lot about him. He does not ask a lot of questions'. Teacher F: 'He sits in front of STDNT 14, that I know. But I don't have that clear a picture of STDNT 18. He is a nice boy, friendly, participates, I hardly ever have to correct him. The combination of him and STDNT 1 doesn't work that well, because STDNT 1 is very outgoing. But uhm, a good boy.' Although all teachers stated they did not know this student, these statements show that he was described by his teachers on some characteristics, such as affective remarks, personality, and classroom behaviours. It seemed this knowledge was not sufficient for these teachers to feel that they 'knew' him.

What this case shows is that how well a student is known is perceived as a mutual responsibility. In this case, teachers blamed themselves ('*I cannot seem to know him*') as well as the student ('*he does not let himself be known*'). Such an explicitly-stated shared responsibility in knowing a student was not always present in the data. When students were described as not or hardly known, most of the time they were good achievers who did not show disruptive behaviours and were motivated to work. In some cases, teachers were very explicit about this. For example, Teacher F about Student 22: "I don't have that clear of a picture of her. Yeah. I think she is a very nice girl. She is doing a fine job in my opinion. But if I am being honest, to me she is still pretty invisible. This often means students are doing fine and participate well in class. I don't really dare to say anything else about her". In some cases, teachers were more implicit about the association between 'being a good student' and 'not being known'. For example, Teacher E about Student 15: "Quiet, diligent, well-behaved boy, I do not know him". What is interesting is that not all students who were perceived as 'hard working good achievers' were also explicitly described as not being known. For example, Student 12 was described by Teacher B: "Nice spontaneous girl. She speaks up regularly. She is doing a fine job. She sits next to [Student3]". Teacher D said: "[STDNT 12] … she sits next to [STDNT 3]. [STDNT 12] she's a darling girl. Always happy and glowing, has those rosy cheeks. Yes….". Only one teacher reported not

knowing this student. What teacher should know about a student to feel they know the student sufficiently seems to differ across teachers as well as across students.

2.4.6 Differences among teachers in their knowledge and perceptions and contextual differences

Teachers' knowledge and perceptions differed in content, amount, and evaluative nature. To explore the origins of such differences, we related the findings of these differences with the contextual differences across teachers described in Table 2.1, that is, teachers' years of experience being a teacher and teaching these particular students. The years of experience teachers had in teaching seemed not related to their knowledge and perceptions. Teachers B and E were most experienced (30 and 22 years, respectively). However, Teacher B named the fewest characteristics and Teacher E the most. Teachers C and F were the least experienced (both 5 years), Teacher C was one of the teachers who expressed the most characteristics, while Teacher F was one of the teachers who expressed the fewest.

A different tendency appeared when relating findings regarding teachers who taught the students the most. The teachers who had started with the students that year were Teacher A, B, and F. These teachers also saw their students less than Teachers C, E, and H, who had started teaching these students the previous year. Teachers B and F named the fewest characteristics and had the highest number of students that, in their regard, they did not know very well. Teachers C and E named the most characteristics and the fewest students that they did not know well. This could lead to the conclusion that how well teachers know their students is influenced by the amount of time they teach them. This is a very logical hypothesis. However, Teacher D already had taught the class the year before and named fewer characteristics than Teacher A, for whom it was the first year. Teacher D was teaching these students for the second year but named the same number of students that she did not know well as Teacher B (for whom these students were new). Thus, although there was a tendency for teachers who had taught the students the most to know them the most, this tendency was not a given and should be further explored.

2.5 Discussion of findings and limitations of the study

This study explored the variability of teachers' knowledge and perceptions of students by studying the knowledge and perceptions of seven teachers teaching the same class. The central research question was: *How do teachers' knowledge and perceptions of their students vary between teachers and between students?* In this discussion, we will

first reflect on our findings regarding teachers' knowledge and perceptions. This study revealed three sources that contribute to the variety of teachers' knowledge and perceptions of their students: differences across teachers, differences within teachers, and differences in how students are perceived by individual teachers. These three sources will be discussed below. Second, the findings regarding students who were hardly known is a finding of major interest that needs further exploration. We will elaborate on this finding as well as suggestions for future research. Third, we reflect on both the potential and limitations of our research methodology and discuss implications for further research.

2.5.1 Discussion of the results

Differences among teachers in their knowledge and perceptions of students

The results showed that teachers' knowledge and perceptions varied in their focus. Some teachers were more concerned with students' cognitive characteristics such as their abilities or achievements, while others focused more on social-emotional characteristics. Teachers also differed in the extent to which specific student characteristics were salient for them. For example, the learning preference of a student was salient for some teachers, but others did not describe this student characteristic at all. Such findings confirm the idea that teachers' knowledge and perceptions are personal in nature and connected to teachers' individual approaches to teaching (Mayer and Marland, 1997). Although this study did not map teachers' adaptive practices, this finding suggests that different teachers might be adaptive to different student characteristics, even regarding the same student. Future research could shed light on the different adaptive strategies of different teachers.

In addition to differences in the content of teachers' knowledge and perceptions, teachers differed in the number of characteristics expressed and the evaluative nature of their knowledge and perceptions. Regarding the evaluative nature, some teachers were more focused on negative student characteristics while others focused on positive characteristics. These differences seemed implicit. They were derived from the analysis of how teachers spoke about their students' characteristics. Teachers might not be aware of the evaluative nature of their knowledge and perceptions. In their explicit affective evaluations of their students, teachers were only positive. The findings of this study indicated a connection between teachers' affective statements and the evaluative nature of their knowledge and perceptions. It would be interesting to further explore the association between teachers' attitude regarding students, the evaluative nature of their knowledge and perceptions and their adaptive practices regarding students perceived either in predominantly positive or predominantly negative terms (especially because studies have shown that perceptions, attitudes,

and subsequent teaching actions seem closely connected). Moreover, negative attitudes might hinder providing students with optimal learning opportunities (Glock, Krolak-Schwerdt, KIapproth and Bohmer, 2013; Peterson et al., 2016).

Differences within teachers in their knowledge and perceptions of their students

The aim of this study was to shed light on differences between teachers' knowledge and perceptions to explore the personal nature of teachers' knowledge and perceptions. Teachers differed in the knowledge and perceptions they expressed about individual students. It seemed that they had an eye for the uniqueness of their students. The results of this study suggest that teachers' knowledge and perceptions are not only contingent on the personal interpretative framework of a teacher but also on the teacher-student combination. On the one hand, the teachers perceived their students by their personal interpretative frames. They differed in the student characteristics that are meaningful for them in understanding their students. On the other hand, the students affected what the teachers knew and perceived about them (since the teachers did not describe all their students using the same student characteristics). Indeed, different students were known and perceived differently by different teachers. These findings indicate that the nature of teachers' knowledge and perceptions of their students may be interpersonal. Information with an interpersonal nature does not refer to a single person (the teacher or the student) but rather to multiple persons embedded within a social context (Kenny, Kashy, and Cook, 2006, p. 1). The literature review in the introduction led to the conclusion that teachers' knowledge and perceptions are personal. It has been suggested (Peterson et al., 2016) that future research should focus on differences across teachers. Results from this study suggest that teachers' knowledge and perceptions are not only personal, but also interpersonal. Future research that aims to develop insights into how student characteristics are related to adaptive practices could benefit from designs that shed light on this interpersonal nature (i.e., by analysing the interaction between teacher and student).

Differences across students in how they are known

The third source of variance of teachers' knowledge and perceptions were differences between students in how well they were known. It is often assumed that detailed knowledge about individual students allows teachers to give meaning to their behaviours and to accurately interpret students' states and needs (so they can optimise the learning and development of their students by tailoring processes, opportunities, and educational programmes to suit individual learners; Corno, 2008; Mayer and Marland, 1991; Tomlinson et al., 2003). This study indicated that the teacher participants differentially understood the origins, causes, and meaning

of a single student's behaviours. There are several points to consider, based on this finding. First, is seems to challenge the 'accuracy' of teachers' knowledge and perceptions and lays open to question how to determine such accuracy. For teachers, it could be important to share and discuss their knowledge and perceptions regarding individual students. It could help them keep an open mind and, further, question the accuracy of their own knowledge and perceptions. Second, it has been shown that the attributions teachers make about students affect subsequent teaching behaviours (Georgiou, Christou, Stavrinides, and Panaoura, 2002; Lucas, Collins, and Langdon, 2009). When events were attributed to uncontrollable factors such as puberty or inherent abilities, for example, teachers seemed more likely to help the student. When events were attributed to controllable factors such as effort or motivation, teachers reacted more with anger and less helping behaviours (Georgiou et al., 2002; Lucas et al., 2009). It might be that such different interpretations lead to different ways of teaching a single student. Future empirical studies should investigate how different knowledge and perceptions lead to differential educational trajectories for individual students.

The invisibility of students

An interesting difference between the current results and those of earlier studies regarding teachers' knowledge and perceptions of students was the emergence of the category 'student-teacher relationship' and the finding that some students seemed invisible to their teachers. Our research procedure, in which teachers were asked to express their knowledge and perceptions of individual students, could explain the emergence of the lack of visibility of some students for the participants. In previous investigations, teachers could disguise a lack of knowledge of some students more easily because they were not asked to discuss each individual student. It would be interesting to further explore how and when teachers experience their knowledge as adequate and sufficient in contrast to when they experience their knowledge as lacking – especially since the qualitative data analysis showed different patterns in how and when teachers made their lack of knowledge explicit. Some students were described on multiple characteristics and teachers still experienced insufficient knowledge, while others were described using only a few characteristics (without an explication of an experienced lack of knowledge). Future research could shed light on the processes by which teachers get to know their students and how they evaluate and give meaning to the knowledge gained about particular youngsters.

In addition, results showed that some students were known less to the teachers than others. Besides exploring teacher factors that impact their knowledge, it is important to explore student factors that may influence how well they are known. Students

are not passive recipients of education; they play a role in 'letting themselves be known' by their teachers. This is particularly true for students in highly personalised or adaptive teaching contexts, since they have more responsibility for their own educational course (Davis, 2016). Given the finding that some students were not known by the majority of their teachers, it seems that some students might need support to let themselves be known.

Moreover, it is important to explore the implications of such an experienced lack of knowledge for a student (especially since our results showed that an expressed lack of knowledge related to the extent of teachers' knowledge and perceptions). In general, teachers who experienced insufficient knowledge about more students expressed fewer student characteristics. Teachers not only experienced a lack of knowledge, they also seemed to know less and perceived little of some students. Such a lack of knowledge seems problematic in a context in which teachers are expected to adapt their teaching to individual students' characteristics.

2.5.2 Evaluation of the research methodology and limitations of the study

To explore teachers' knowledge and perceptions of their students, the interview methodology used appears to have been quite fruitful. Our methodology captured different aspects of teachers' knowledge and perceptions. The open interview made it likely that results reflected the personal interpretative framework of a teacher when compared with pre-structured questionnaires for specific student characteristics. The ecological validity of the interview seemed high. The set-up of 1 minute per student made the interview feasible and the amount of material to be transcribed and analysed workable.

A limitation of the interview methodology was that it remained unclear whether the knowledge and perceptions teachers expressed affected their teaching practices. On the one hand, based on the premise that teachers try to make sense of their students in order to guide their own actions and interactions, it can be assumed that the information teachers expressed was relevant for their practices. This premise stems from the central notion of theories of social cognition and social perception that people are accurate perceivers for current purposes and that, as such, their perceptions are strongly related to people's goals, sets, motives, and needs (Fiske, 1993).

On the other hand, future research should connect teachers' knowledge and perceptions of their students to their teaching to better understand how student characteristics play a role in adaptive teaching. However, the complexity of the research being suggested should not be underestimated. Empirical investigations

that shed light on the association between knowledge and teaching indicate that the association between the knowledge teachers possess about their students, and their subsequent teaching decisions, is not easily understood. Some researchers (Black-Hawkin and Florian, 2011; Paterson et al., 2002) have argued that this association is strong and that knowledge always affects practice (although this is mostly unobservable). Others (Babad, 1993; Good and Brophy, 1974; Savage and Desforge, 1995) have argued that not all knowledge and perceptions serve to guide teachers' instructional decisions and that the way knowledge and perceptions affect practice is not always obvious. The association between teacher knowledge and their adaptive practices is not unambiguously observable; it calls for complex research designs that combine exploring the deliberate practices of teachers in combination with classroom interactions.

Based on the results of this study, we conclude that this research method is a fruitful way to explore the content and nature of teachers' knowledge and perceptions. The approach lays the foundation for a further exploration of the relative importance and nature of teachers' knowledge and perceptions. The sample in this study was small. Such a small sample made it possible to explore this method and include qualitative data-analysis strategies to deepen the variability between teachers and between students. However, findings regarding the content and nature of the knowledge and perceptions teachers have of their students are not automatically generalisable beyond the context of this study. Further research could include more cases – a case being a group of students and their teachers – to disclose insights in contextual influences that might explain variance in teachers' knowledge and perceptions between teachers, within teachers, and between students (as subjects of teachers' perceptions). Specific characteristics of the context in this study for example might be the upper educational track and the absence of cultural-ethnic diversity among the students. Conducting this research in culturally diverse classrooms or in schools using other pedagogical or didactical methods might lead to different conclusions about the relative importance of specific knowledge and perceptions.

2.6 Conclusion

In the context of learner-centred education, it is often argued that teachers need to know their students well on a variety of characteristics and should also know them individually. Understanding the nature of teachers' knowledge and perceptions is important to support teachers to identify the student characteristics that are most meaningful – especially in secondary education where large groups of students create

teaching contexts in which teachers are restricted in getting to know individual students and respond to their unique characteristics.

The contribution of this study to research on teachers' knowledge and perceptions of their students is that it showed that these differed between teachers as well as within teachers, between students. The student characteristics salient for teachers are different for teachers as well as for the individual learner. Based on the results of this study, teachers' knowledge and perceptions thus seem interpersonal in nature and it is important for future research to explore interpersonal factors that may influence teachers' knowledge and perceptions of their students. More research is needed to understand how student characteristics become meaningful for teachers and how, in turn, they develop adaptive practices according to their knowledge and perceptions of those pupils.

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Appendix 2.1. Overview of the coding scheme consisting of four main categories, accompanying sub codes, descriptions and interview examples.

	Code	Description	Related terminology/cue's	Examples of interview quotes, negative (.0), neutral (.1) and positive (.2).
A	**Cognitive learner characteristics** Terms that directly relate to, or describe, characteristics of the students (mental) process of acquiring, remembering and using knowledge.			
1	Abilities	Ability or abilities to acquire and use knowledge for solving problems and adapting to the world (p.119[1]).	Intelligence/IQ Disposition Understanding	.0 'Very weak' .1 'I think he is smart' .2 'Very intelligent'
2	Achievements	Performance of a student on an assessment/test or an academic task.	Test scores Performance	.0 'His test scores are low' .1 'If she works hard, she does fine on the test' .2 'She always achieves highly'
3	Knowledge	Information that is useful in many different kinds of tasks; information that applies to many situations (p.284).		.0 'His knowledgebase is very weak' .2 'He just knows a lot'
4	Learning preference	Characteristic approaches to learning and studying / preferred ways of studying and learning (p. 128).	Learn. preferences Learn. Strategies Learn. Styles	.1 'He has his own way of studying'
5	Metacognition/ Self-regulation	Knowledge about students' own thinking and learning processes. Knowledge and skills to activate and sustain thoughts, behaviours and emotions to reach goals. Focus on how to approach, plan or execute assignments/ tests. Knowing weaknesses and strengths of one self (p. 318, p.410).	Planning Monitoring Evaluating	.0 'With respect to planning, he always ends up having to do all his assignments at the latest moment' .2 'She knows how to deal with the freedom she is given, she knows when to stay in class and listen to instruction when she needs it'
6	Learning difficulties	Problems with acquisition and use of language; may show up as difficulty with reading, writing, reasoning and mathematics (p.136)	Dyslexia Dyscalculia	.1 'I think dyslectic'
7	Domain specific abilities	Information of students' knowledge, abilities or achievements regarding domain specific skills (p.284).		.0 'She is very weak in French' .1 'She really has grown in my subject' .2 'He is really strong in English'
B1	**Social-emotional learner characteristics** Terms that directly relate to, or describe, characteristics of the students personality, emotional (in relation with self) and social (in relation with others) needs.			

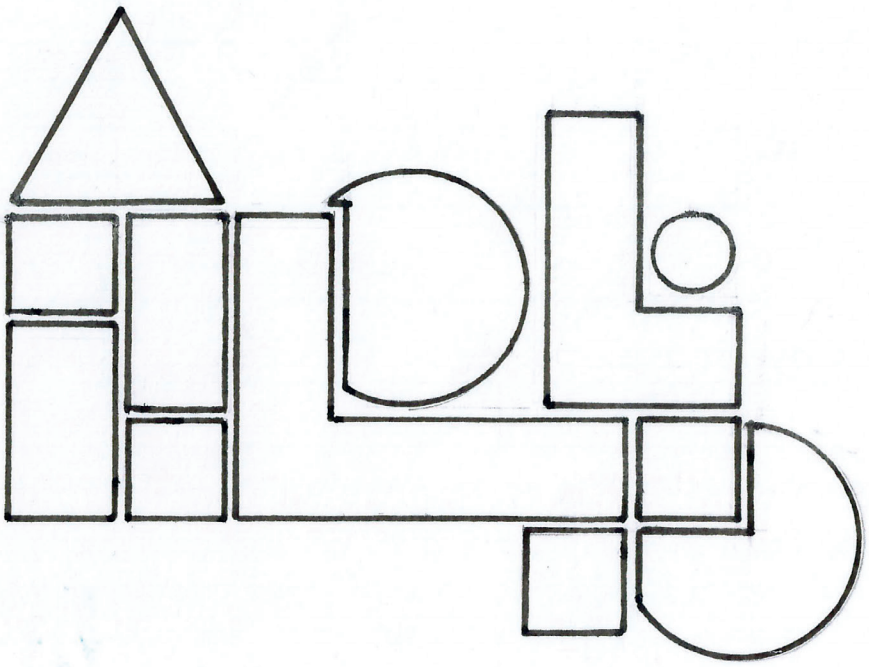
Appendix 2.1. Continued

8	Psychosocial	The students' individual needs in relation with (and place in) the social environment (p.87)	Peers Bullying	.1 'Whenever there is bullying, she seems involved'.
9	Emotional maturity	The emotional readiness of a student to perform at the expected level (Tollefson et al., 1990)	Childish	.0 'She really behaved like a childish girl' .1 'Emotionally he seems younger than the rest'
10	Self-concept/ self-esteem	The students' knowledge, beliefs and values, about themselves- their ideas, feelings, attitudes and expectations (p.95, p.97).	Self-esteem Overestimation Insecurity	.0 'Very insecure' .1 'She needs much assurance before she knows she can do something' .2 'He is really good in knowing what his strengths and weaknesses are'
11	Personality	The students' personality; description of how a student is. In terms of a student is… (not behavioural description, but only in terms of personality)	Neuroticism (stability), openness, extraversion, agreeableness, conscientiousness.	.1 'He is a perfectionist', 'very introvert', 'is friendly'
12	Wellbeing	Students' evaluation of life in terms of satisfaction and balance of positive and negative affect (Keyes, Smothkin, & Ryff, 2002).		.0 'A boy who is really is experiencing some struggles, with himself with life' .2 'He is very content with who he is and in life'
13	Social/ emotional and behavioural difficulties	Behaviours or emotions that deviate so much from the norm that they interfere with the students' growth and development and/or the life of others – inappropriate behaviours, unhappiness or depressions, fears and anxiety in relationships (p.144).	ADHD, Autism, Depression.	.1 'Is diagnosed with some form of ADHD or ADD', 'seems autistic'.
B2	**Motivational and behavioural characteristics** Terms that directly relate to, or describe, characteristics of the students motivation, task related effort, classroom behaviour and interest.			
14	Motivation/goal orientation	The tendency to find academic activities meaningful and worthwhile and to try to benefit from them. Patterns of beliefs about goals related to achievement in schools. NB. No behavioural descriptions. (p. 439).	Intrinsic, extrinsic, failure-avoiding learners, ego-involved learners, work-avoidant learners	.0 'Just does not want to do anything' .1 'Wants to do well in school' .2 'Really wants to do everything at her best'

Appendix 2.1. Continued

15	Effort	An internal state that arouses, directs and maintains behaviour (p.430). Task-specific motivation of a student to work on and succeed in (Tollefson et al., 1990). NB. Behavioural descriptions	Effort, Laziness.	.0 'Does not put in the effort' .1 'Does the work' .2 'He works very hard'
16	Interests	Information where a student finds enjoyment in, within and outside school (p. 457).		.1 'Very into sports', 'Games a lot'
17	Work behaviour/ attitude	Description of typical work behaviour of the student. How a student accomplishes academic task, including content covered, mental operations required. NB. Behaviour during or pertaining the execution of tasks in lessons/homework.	Questions Attentiveness Pace of working	.0 'Always is late with his assignments' .1 'Sits in class without asking questions' .2 'she always participates in class'
18	Classroom behaviour	General classroom behaviour, not task specific.	Disruptiveness, Talkative	.0 'complaining a lot' .1 'shares personal stories' .2 'tells a lot of funny jokes'
19	Collaboration	Working together and in parallel with others to reach a shared goal (p. 372). NB. Specific focus on collaboration regarding assignments.		.0 'Collaboration is very hard for him'
B3	**Background characteristics** Terms that directly relate to, or describe, characteristics of the students home environment or social/ cultural background			
20	Home environment	Influence from the home-environment (family) on the student.	Parental style, Family composition, social-economic status, culture.	.0 'her family-situation is complex' .1 'has a lot of freedom at home'
21	Background information	Influence of other (not home-environment) external factors on the student	Physical illness	.1 'is ill a lot'
C	**Teacher-student relationship characteristics** Terms that directly relate to, or describe, characteristics of the relation between the teacher and student.			
22	Affective/ evaluative remarks	Evaluative or affective remarks of the teacher about the student, describing or indicating sympathy/ affection/attitude towards, or evaluation of the student. NB. No personality statements.	Kind/sweet, special	.1 'special chap', 'kind of positive' .2 'sweet' 'nice' 'such a funny boy'
23	Visibility	Remarks or description about how well the teacher knows the student.	Invisible, Don't know him/her.	.1 'I do not know him', 'I really do not know how she is doing at the moment'

[1]Descriptions are derived from Woolfolk (2013), unless stated otherwise.



CHAPTER 3

Within-teacher variation of causal attributions of low achieving students

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Abstract

In teacher research, causal attributions of low achievement have been proven to be predictive of teachers' efforts to provide optimal learning contexts for all students. In most studies, however, attributions have been studied as a between-teacher variable rather than a within-teacher variable assuming that teachers' responses to low achievement are stable for different students in one classroom. To understand teachers' variation of their behaviour towards different low achieving students it would seem worthwhile to identify within-teacher variation of causal attributions. In this study, we analysed the within-teacher variance of attributions of 64 secondary school teachers. Analyses of attribution ratings for three low performing students per teacher showed that, in general, the amount of within-teacher variance was very large, although the within-teacher variance differed among attributions. It can be concluded that teachers' causal attributions of low performance should be investigated as within-teacher variables because they vary between low achieving students.

3.1 Introduction

In every classroom, students differ from each other in many aspects, such as their abilities, interests, learning styles, motivation and work attitude (Rubie-Davies, 2009; Tomlinson et al., 2003). Students also have diverse backgrounds in terms of their socio-cultural and socio-economic family contexts (George, 2005; Ginsberg, 2005). In their daily practice, teachers face diverse groups of students for whom they are expected to provide optimal learning opportunities (Rubie-Davies, 2009; Tomlinson et al., 2003). However, in every classroom students differ in the extent to which they succeed in reaching the learning goals set by their teacher. The 'failing student' is a common type of student for every teacher.

Research on teachers' behaviour towards low performing students has shown that how teachers respond varies; teachers may behave punitively and with anger, show empathy, express their pity with low achieving students, persevere in attempts to help their low achieving students, or they may give up helping the student (Georgiou, Christou, Stavrinides, and Panaoura, 2002; Poulou and Norwich, 2000; Reyna and Weiner, 2001). In explaining this student-directed teacher behaviour it is assumed that teacher behaviour is shaped by the perceptions teachers have of the causes of their students' low level of performance (Pajares, 1992; Rolinson and Medway, 1985**).** The human tendency to use causal explanations to give meaning to events is a well-known and thoroughly researched phenomenon within the field of behavioural psychology and is conceptualised in attribution theory (Weiner, 1985). Attribution theory has proved its value in explaining behaviour in educational settings and has provided insight into the behaviour of teachers towards their low performing students (Cooper and Burger, 1980; Georgiou et al., 2002; Weiner, 1985).

3.1.1 Teacher attributions

According to the attribution theory, the attribution of a cause does not influence subsequent behaviour on its own, but it is how a cause is evaluated that affects the response to an event (Weiner, 1985). Attribution theory states that causes are evaluated on three dimensions. The first dimension is locus of causality and describes whether the cause is perceived as internal (e.g., effort) or external (e.g., family) to the student. The second dimension evaluates the stability of a cause over time. The third dimension is the dimension of control or intent; causes can be perceived as controllable by the student (e.g., effort), or uncontrollable (e.g., luck) (Weiner, 1985). The evaluation of the ascribed cause of these dimensions is important, because how a cause is perceived influences the response to the observed event (Kelley and Michela, 1980; Weiner, 1985). When a student performs poorly, teachers can ascribe this failure to different causes

(Cooper and Burger, 1980; Georgiou et al., 2002; Medway, 1979). How teachers evaluate the attributed cause(s) of a students' failure influences their behaviour towards the student. Cooper and Burger (1980) concluded, for example, that underachieving students perceived as lacking motivation, which is a presumed controllable cause, were criticised more often by their teachers than underachieving students perceived as lacking ability, a presumed uncontrollable cause. The attributions teachers make, that is, the explanations they have for the failure of their low achieving students, thus seem to affect their student directed teacher behaviour.

Cooper and Burger (1980) were among the first to explore the causal attributions teachers use to explain students' success and failure. They studied the responses of 43 primary and secondary teachers to open-ended questions about why they thought students performed well or poorly in school. The teachers' free responses were analysed and transformed into a categorisation scheme. Ten years later, Tollefson, Melvin, and Thippavaijala (1990) validated this categorisation scheme and specified it for students' poor performance. After the analysis of 44 teachers' free responses concerning the causes for one of their low achieving students, Tollefson et al. slightly remodelled the categorisation scheme of Cooper and Burger into a scheme including the following causes for achievement: (1) motivation (typical effort), (2) family (support from the home environment), (3) acquired study skills, (4) previous experience (academic background/experience), (5) interest in subject (attitude towards subject), (6) attention (concentration in class), (7) other students (interference or help from other students), (8) attendance (presence in class) (9) quality of instruction (teacher quality), (10) (immediate) effort, (11) task difficulty and (12) physiological state (mood, health). From the studies of Cooper and Burger and Tollefson et al., it appeared that teachers mention 'motivation' and 'family' most frequently as causes for students' low achievement. Motivation was mentioned by 50% of the teachers in the Tollefson et al. (1990) study and family by 30% of the teachers. Of the teachers 90.9% indicated that student characteristics were the most important factor in explaining students' low achievement (Tollefson et al., 1990).

More recently, Georgiou et al. (2002) studied the effects of teacher attributions on the helping behaviour of teachers directed at their low achieving students in a sample of 277 Cypriot elementary school teachers. They found results that supported the findings of Cooper and Burger (1980), Medway (1979) and Weiner (1985). When teachers attributed student failure to uncontrollable factors internal to the student (e.g., insufficient ability), teachers reported reacting more often out of empathy and less often out of anger. When student failure was attributed to factors perceived as controllable by the student (e.g., effort) teachers were more likely to respond with

anger and were more likely to give up helping the student (Georgiou et al., 2002). Lucas, Collins, and Langdon (2009) reported within their sample of 60 teachers in England the same behavioural tendency towards students who show challenging behaviour or display intellectual disabilities. They concluded that teachers who believed that students had control over their behaviour showed more anger and less sympathy, optimism, and helping behaviour.

3.1.2 Within-teacher variance of attributions

Various conclusions on the teacher level have been drawn in research on teacher attributions and their effects on teacher behaviour. For example, Georgiou et al. (2002) concluded that '*There are teachers who respond to low-achieving students with pity… and others who feel upset and express anger*' (p. 592). That some teachers put more effort than others into trying to support their low achieving students is discussed and supported by other studies (cf. Jordan, Glenn, and McGhie-Richmond, 2010; Lucas et al., 2009; Poulou and Norwich, 2002). In these studies claims are made about how teachers respond to their 'low achieving students', 'students at risk' or other types of students (see also Jordan, Lindsay, and Stanovich, 1997; Kerry and Kerry, 1997). In studies on teacher attributions, teacher attribution is thus commonly researched on the teacher level (i.e., a between-teacher variable). This implies that it is assumed that teachers' ascribe identical causes to all their low-achieving students. In this study we tested this assumption, because it may well be the case that teachers attribute different causes to the low achievement of different students. As early as 1989, Hoge and Coladarci indicated in their review of teacher-based judgements that it would be worthwhile investigating the intrapersonal aspect of teacher judgment; whether all teachers judge the same and judge every student the same. A within-teacher approach to gain insight in teacher attributions complements existing between-teacher research and could be used to do justice to the differences in teacher perception at the student level.

In this study, we focus on the attributions of mainstream secondary education teachers and their low achieving students. In contrast to many of the more recent studies on the teacher attributions that are done either within the context of special education or with regard to attributions of behavioural problems, learning disabilities, misbehaviour or exceptional or high ability students, we focus on the attributions of mainstream secondary education teachers regarding their low achieving students. As Brady and Woolfson (2008) compared the attributions of mainstream and special education teachers and found differences in attributions of regular and special education teachers, findings in special educational settings cannot be assumed to be valid for mainstream education.

In addition, vignettes are often used in studies of teachers' perceptions, attributions and feelings to present standardized case descriptions that enable between-teacher differences in attribution styles (*cf.* Lucas et al., 2009; Poulou and Norwich, 2002). Although vignettes do have the advantage of comparing teachers on standardized cases, they suffer from some severe limitations, especially related to the ecological validity of research findings (Lucas et al., 2009; Poulou, 2001). Teaching takes place in a context wherein personal and specific contextual factors play a substantial role that cannot be taken into account when teachers are asked about hypothetical students with whom they do not have a personal connection.

In this study we aimed to address the question about the extent to which secondary school teachers attribute the same causes to different students' low achievement. The focal point of this study is thus to assess to what extent teachers vary in their attributions among their own low achieving students.

3.1.3 Research questions

The aim of this study is to provide insight into the intrapersonal (i.e., within-teacher) variance of teachers' attributions of their low achieving students. The research question addressed in this study is: *To what extent do attributions of achievements of different low achieving students vary within teachers?* The results of this study may have implications for research on teacher attributions and resulting teacher behaviour because this approach of teacher attributions has not been used in earlier research on teacher attributions and their effect on student directed teacher behaviour.

3.2 Method

To answer the research question an online questionnaire was designed in which teachers were asked to describe three of their own low achieving students and to respond to statements about the causes of those individual students' low achievement. We chose to ask teachers about three students to obtain sufficient data to calculate within-teacher variance while keeping the questionnaire at an acceptable length.

3.2.1 Participants and procedure

Teachers from 15 randomly selected secondary schools received an email with an invitation to participate in a study about teacher perceptions of low achieving students and the hyperlink which led them to the online questionnaire. The schools were spread across the Netherlands and were of different size and profile. We approached teachers both directly, by sending them a mail, and indirectly by

approaching heads of department with a request to forward the questionnaire to the teachers. Of the approximately 900 teachers who worked at the selected schools and received the invitation directly or indirectly, 172 teachers visited the online questionnaire. Of these 172 teachers only 64 provided sufficient data to be included in the analyses. Teachers who stopped the questionnaire before finishing the questions about the second student were not included in the analyses.

The total number of teachers was 64 (62 provided ratings for three students and two teachers provided responses for two students) and the total number of students for whom ratings were provided was 190. Of the teachers in the sample 60.9% were female and 39.1% male. The age of the participating teachers ranged from 22 to 64 years old (M=42.89, sd = 12.18), their teaching experience ranged from 1 to 42 years (M=15.28, sd = 10.60). Compared with the percentage of female teachers in the total secondary school teacher population in the Netherlands (48.6%, DUO, 2013), female teachers in the sample were slightly overrepresented ((1) =3.887, p=.049) The mean age of the sample did not deviate significantly from the population mean (44.26 years; t(63)=-0.899, p=.372). The teachers taught various subjects; 34.4% were language teachers (Dutch, English, French, German or Latin), 26.6% of the teachers taught science subjects (mathematics, physics or biology), 18.8% taught a subject within the social sciences (geography, history, sociology or economics), 20.3% taught 'other' subjects such as physical education, technology or art. The students described by the teachers in the data set were spread across different years or grade levels (1st year[1]: 22.6%; 2nd year: 23.2%; 3rd year: 23.2%; 4th year: 25.3%; 5th year: 4.2%; and 6th year: 1.6%). As, in the Netherlands, lower secondary school takes four years and senior secondary school five or six, the percentages of 5th and 6th year students are relatively small.

3.2.2 Instrument

To collect the data a questionnaire was developed. The questionnaire was aimed at teacher attributions of individual low achieving students. Teachers were asked to describe and assess three of their own low achieving students, one by one and in two consecutive stages. After responding to all questions for one student, the same questions in the same order were asked about a second and a third student.

The first stage was designed to enhance the teachers' visualisation of the students they had chosen as focal student for the questionnaire. To enhance visualisation teachers were asked to write in an open text box a short description of how that particular student behaved in the classroom and performed academically. For

1 The years referred to are the six years of Dutch secondary school. Students in the 1st year are 12-13 years old.

example, a 34-year-old female English teacher filled in the questionnaire about a student in her first year lower secondary vocational class. The description she gave was: *'This student hangs around passively and clearly does not cooperate. He does not say or ask anything. He seems indifferent. Outside the classroom he is a tough guy. He is often in detention because of unacceptable behaviour, such as throwing eggs at passing people and drinking before school. Pretty boy.'*

In the second phase, the teacher attributions for the described student's low achievement were to be rated along a five point scale ranging from 1, totally disagree, to 5, totally agree. Teachers were presented with 13 factors and asked to what extent they thought the stated factor was a cause for that particular student's low achievement. These factors were based on previous studies of Cooper and Burger (1980) and Tollefson et al. (1990) as discussed in paragraph 1.1. Compared with the scheme of Tollefson et al. (1990) two factors were omitted and three factors were added. The omitted factors were task difficulty and physiological state. These factors were deleted for two reasons. On the one hand, for this research design, teachers are not questioned about their explanation for specific achievement, but for a student's 'average' achievement during a year. The explanatory value of these highly unstable constructs is likely to be negligible with regards to performances across longer periods (Cooper, and Burger, 1980). Secondly, Tollefson et al. (1990) concluded that these two factors were seldom given as an explanation of student failure by the teachers.

The first added factor was 'ability'. Tollefson et al. (1990) classified ability as a 'student characteristic' and not as an 'explanation for achievement'. Because this classification is not used in this study, ability has been reclassified as 'an explanation for student achievement'. This is in line with the categories of Cooper and Burger (1980) and Weiner (1985). In addition, we included 'difficulty of the lessons' and 'adaptation of assignments to the learning needs of the student' as potential attributions to provide more factors related to teachers' internal attributions. 'Difficulty of the lessons' can be seen as an internal and more general substitute for the deleted factor 'task difficulty'. The factor 'adaptation of assignments to the learning needs of the student' was chosen because it relates to the context of this research, i.e., that of addressing individual differences between students.

3.2.4 Data Analysis

Data analyses were aimed at estimating the extent to which attributions ascribed by teachers to their low achieving students vary within and between teachers. Before examining the variability we first computed the descriptive statistics of the causal

factors and their intercorrelations. Since we aimed to identify the extent of variability within teachers for each causal attribution, we then calculated intra-class correlation coefficients per causal attribution. For the calculation of intra-class correlations (r_1)[2], we applied analyses of variance as suggested by Kenny, Kashy and Cook (2006). The intra-class correlations indicate the extent to which teachers are consistent in their attributions among their low achieving students. The formula $(1\text{-}r_1)$ gives an indication of the extent to which attributions vary within teachers (Bartko, 1976; Levin, Jacobs, Ainsworth, Richardson, and Leon, 1999). We tested the intra-class correlations for statistical significance with a set level of significance of .05[3].

3.3 Results

In this study we asked the question whether, and to what extent, causal attributions of low student achievement vary within secondary school teachers. Before focusing on teacher variability in paragraph 3.2 we will first present and discuss some descriptive statistics of the teacher attributions and the correlations among the teacher attributions in paragraph 3.1.

3.3.1 Descriptive statistics of teacher attributions

The mean scores of teacher attributions are presented in Table 3.1. These mean scores show that teachers attributed low performance to causes related to student characteristics to a relatively large extent (attention, M=3.61, sd=1.30; effort, M=3.58, sd=1.26; and motivation, M=3.56, sd=1.26). The factor 'acquired study skills' was also attributed frequently as a cause for low achievement. The lowest rated attributes were 'attendance' and 'quality of instruction'. The low mean scores of teacher internal attributions (quality of instruction and difficulty of the lessons) and high mean scores of student related attributions (attention, effort and motivation) suggest that teachers predominantly used student-related causal attributions to account for low achievement of their students.

2 $r1$ can be estimated by $(MS_b\text{-}MS_w)/(MS_b+(k'\text{-}1)MS_w)$, where k' is the corrected number of students rated per teacher. Because we gathered ratings of 3 students for 62 teachers and ratings of 2 students for 2 teachers, k' = 2.97, see Kenny et al. (2006, p. 276).

3 Statistical significance for $r1$ was tested with an F-test ($F = MS_b/MS_w$) with $df_1 = 63$ ($n_{teachers}$-1) and $df_2 = 126$ ($n_{students} - n_{teachers}$).

Table 3.1. Mean (range 1-5), standard deviation, mean squares between and within teachers and intraclass correlation (r_1) and 1-r_1 values of teachers' causal attributions (N=64).

Causal attributions	*Mean*	*SD*	MS_b	MS_w	r_1	$(1-r_1)$
Attention	3.61	1.30	1.74	1.68	.011	.989
Effort	3.58	1.26	1.70	1.52	.040	.960
Motivation	3.56	1.26	2.02	1.36	.141*	.859
Acquired study skills	3.54	1.19	1.81	1.23	.136*	.864
Interest in subject	3.46	1.19	1.51	1.36	.036	.964
Other students	3.44	1.30	2.20	1.43	.152*	.848
Adaptation to student needs	2.99	1.12	1.61	1.06	.150*	.850
Family	2.96	1.26	2.35	1.17	.255*	.745
Ability	2.83	1.28	2.52	1.18	.278*	.722
Previous experience	2.71	1.08	1.44	1.02	.123	.877
Difficulty of the lessons	2.51	1.10	1.94	0.84	.309*	.691
Attendance	2.38	1.26	2.47	1.53	.170*	.830
Quality of instruction	2.31	0.89	1.73	0.33	.585*	.415

* $p < .05$

Table 3.2 presents the correlations among the causal factors. Results show many significant correlations among the attributions. Although it is not within the scope of this article to elaborate thoroughly on the interrelations, we will report and discuss some of the significant correlations. First, the relative highly rated student-factors 'effort', 'motivation', 'attention' and 'subject interest' were strongly interrelated. It seems that teachers tended to rate these student-factors as an interlinked set of causal attributions for students' low achievement. Secondly, there are a few significant negative correlations, mostly with the cause 'ability' and the above-mentioned student factors. These negative correlations suggest that teachers tended to ascribe 'ability' and its negatively correlated factors more exclusively than in combination. Teachers may thus have perceived hard-working students who perform poorly as lacking ability. Thirdly, there appeared to be a positive significant correlation of 'difficulty of the lessons' with 'ability'. This suggests that, when teachers ascribed poor performance to student ability, they tended to rate the difficulty of their lessons as too high for that specific student. Teachers may thus have been aware of the fact that they assigned work that is too difficult for their low ability students, but persevered in assigning these difficult tasks. Finally, student attendance was positively related to the students' family. This indicates that teachers who perceived student absenteeism as a cause for poor performance were likely to perceive the students' family background as a cause too, which suggests that teachers may have held parents accountable for student absenteeism.

Table 3.2. Correlation Coefficients of Teacher Attributions (N=190)

Factors	1	2	3	4	5	6	7	8	9	10	11	12
1 Effort												
2 Motivation	.68*											
3 Attention	.65*	.66*										
4 Interest in subject	.43*	.55*	.50*									
5 Other students	.33*	.44*	.58*	.37*								
6 Attendance	.17*	.23*	.17*	.18*	.15*							
7 Family	.30*	.24*	.24*	.10	.17*	.41*						
8 Ability	-.25*	-.19*	-.15*	-.01	-.17*	-.09	-.08					
9 Previous experience	-.18*	-.11	-.00	.05	.04	.10	.14	.44*				
10 Acquired study skills	.07	.09	.11	.15*	.08	.07	.06	.18*	.24*			
11 Adaptation to student needs	.07	.13	.15*	.27*	.03	.09	.10	.16*	.26*	.27*		
12 Difficulty of the lessons	-.23*	-.10	-.10	.07	-.05	-.12	-.03	.49*	.29*	.14	.33*	
13 Quality of instruction	-.12	.02	.05	.09*	-.01	.03	.03	.14	.21*	.16*	.40*	.27*

*$p < .05$

3.3.2 Within-teacher variance

The extent to which teachers have been consistent in their attributions was analysed in order to answer the research questions about the variability of attributions within teachers among low achieving students. Table 3.1 shows the intra-class correlations (r_1) of each cause. The intra-class correlations show that there was a considerable variability in teachers' attributions for student low achievement. As the table shows, many intra-class correlations were low, especially those related to student-internal factors such as 'attention', 'effort' and 'interest in the subject', indicating high levels of within-teacher variation of these causal attributions. The highest level of within-teacher variation of attributions was observed for 'attention', with a within-teacher variance of 98.9%. ANOVA *F*-tests of the intra-class correlations showed that there was significant consistency for nine of the thirteen causal attributions. The highest intra-class correlations (i.e., the lowest within-teacher variance) were observed for the factors 'family', 'ability', 'difficulty of the lessons' and 'quality of instruction'. Apparently teachers tended to rate these factors as causes for low achievement consistently high or low for their low performing students, although intra-class correlations indicate the presence of some within-teacher variation of attributions for different students.

3.4 Discussion and conclusion

3.4.1 Disussions and implications for research on attributions

The research question of this study is to what extent attributions of achievement of different low achieving students varied within teachers. Before we discuss our findings regarding the research question we will first briefly discuss the between-teacher results presented above. Based on the mean scores presented in Table 3.1, we concluded that teachers predominantly use student-related causal attributions to account for their students' low achievement. This finding is in line with the study of Tollefson et al., (1990), who reported that 90.9% of the teachers indicated student characteristics as the most important factor in explaining student's low achievement. We also presented the interrelations among the causal attributions. There were many significant correlations between attributions and, although some were low, it might be interesting to further investigate when and how teachers attributed distinctive attributions.

Results of the within-teacher variance analysis showed that the amount of within-teacher variation was considerably high, although the amount differed per causal factor. Student factors that seem controllable for students, like attention, effort and interest in the subject matter, were ascribed inconsistently for different low achieving students. While teachers may ascribe a lack of attention, effort or interest in the subject to low achievement of some students, these factors are not automatically ascribed to the low achievement of other low achieving students.

The relatively high consistencies of difficulty of the lessons, quality of instruction, family background and student ability indicate that teachers perceive these causes consistently for all their low achieving students. This might suggest that some teachers are more inclined to use those attributions as explanations for student failure than other teachers. These results could support, or be supported by, studies that examined the differing perspectives that teachers hold about their responsibilities in dealing with low achieving students, the effect on the attributions they use and behaviour they show (Jordan, Kircaali-Iftar, and Diamond, 1993; Jordan, Lindsay, and Stanovich, 1997). In these studies it has been concluded that some teachers, are more likely to attribute failure to student ability and/or their families, than other teachers.

The causal attribution 'quality of instruction' showed the lowest within-teacher variance. It seems that if teachers ascribe their instructional quality as a cause for the low achievement of one student, they are likely to ascribe their quality for the low achievement of other students as well. Although this may be explained because

teacher quality is actually the same for all students because it is inherent to the teacher. It should be noted that, based on the low mean score of 'instructional quality' (see Table 3.1), we concluded that teachers, in general, are not inclined to ascribe their instructional quality as a cause for their students' low achievement. This finding is in line with research about personal teacher efficacy beliefs (i.e., the confidence of a teacher in his or her own capabilities to influence student learning, (cf. Tschannen-Moran and Hoy, 2001) in relation with teaching low achieving students. Some studies have discussed that teachers, in order to preserve their self-image, are not likely to attribute failure to factors under their control (Hoge and Coladarci, 1989; Mavroupoulou and Padeliadu, 2002).

As discussed in the introduction paragraph 1.2, teachers' attributions have often been presented as a 'teacher variable'; stable within a teacher for different low achieving students. The focal point of this study was to examine whether teachers attribute the same causes to the failure of all of their low achieving students or whether they account for individual differences among their low achieving students. The results of our study indicate that there is quite some within-teacher variation in causal attributions for low achievement. These results imply that attributions are not mere teacher variables and that they should be studied with multi-level models in which teacher attributions are included at the lowest (i.e., student) level.

It would be interesting for future research to explore the student and teacher characteristics that affect teachers' attributions and, for example, to investigate to what extent different teachers differ in their ascription of causes of poor performance of the same (low achieving) student. Also, in future research, cultural factors could be taken into account. Cultural factors may influence how teachers' perceive and ascribe their students' low achievement and what their perceptions are of the remediation possibilities of poor performance, as suggested by Salili and Hau (1994). It would be interesting to investigate to what extent cultural characteristics of either teachers or students affect the prevalence as well as the between-teacher and within-teacher variance of causal attributions.

Past research has sought to gain insight into the cognitive and emotional processes that influence student directed teacher behaviour by focusing on the perceptions teachers have of their students (Georgiou et al., 2002; Pajares, 1992; Rolinson and Medway, 1985). Teacher perceptions and expectations of their students determine, to a large extent, teacher behaviour and teacher interaction patterns with their students (Brophy and Good, 1970; Rubie-Davies, 2009). Only teacher perceptions have been studied in this research, future research could integrate preceding studies and the

results of the present research by investigating observable emotional and behavioural teacher responses to individual (low) achieving students. It would also be of great value to include the effects that teacher responses have on their students, since the consequences of specific teacher behaviour seem to be disputable (*cf.* Georgiou et al., 2002).

3.4.2 Limitations

The findings in this study should be interpreted with caution because of some limitations in the research design. The first limitation is the low response rate of teachers in this study. Low response rates are not, however, uncommon in online teacher research (Mertler, 2003). Mertler (2003) researched causes of low response rate among teachers. The main cause found was that teachers 'simply didn't want to take the time to respond',predominantly because they are too busy to participate in 'extra' activities. Because the questionnaire for this study was rather lengthy (the estimated time for filling in the questionnaire was 15 to 20 minutes) and less than 50% of teachers who started the questionnaire finished it, time constraints may partly explain the low response rate. Future research could use a questionnaire design that features a 'save and continue' option. Such an option might increase the response rate because teachers can then spread the time spent on the questionnaire. The low response in this study might have affected the generalisability of the results, especially when response selectivity is related to specific teacher characteristics. Future research can address this issue, preferably by studying teacher attributions in more controlled settings.

A second limitation of the study that may have affected the external validity of this research is related to the selection of students by the teachers. Teachers were free to choose three low achieving students for whom they provided their causal attributions. This selection might lead to some bias, because teachers may have selected three particularly different low achieving students or failing students who were salient, for example because they were particularly difficult to teach. This selection bias might lead to either under- or overestimations of within-teacher variance. To minimise the risk of selection bias, teachers could be asked to provide attributions for each student in their classroom. This would, however, be too time-consuming to consider it a feasible method of data collection.

3.4.3 Conclusion

In earlier research, teacher attributions have shown to be predictive of student-directed teacher behaviour towards failing students (Georgiou et al., 2002; Poulou and Norwich, 2000; Reyna and Weiner, 2001). This behaviour may or may not

enhance student learning. In light of providing each student with an optimal learning environment it seems important that teachers are aware of the attributions they make for individual students and the consequences of these attributions for their student-directed behaviour. Teacher awareness of the learning needs of individual students is important (Tomlinson et al., 2003; Jordan, Lindsay, and Stanovich, 1997), especially within the current educational climate of inclusion and the accompanying demand on teachers to address all individual students' learning needs (Ferguson, 2008). This is even more important with regard to the needs of low achieving students who are struggling in class and who are most in need of adequate adaptation of student-directed teacher behaviour.

This study has provided insight into the within-teacher variation of causal attributions and suggests that attributions are not mere teacher variables and that they should be studied at the student-level. It would be interesting to study how teachers' interactions with their students can be understood from these attributions. Effects of attributions on teacher behaviour are relevant to study as Rubie-Davies, Flint and McDonald (2012, p. 286) stated: *'Instructional practices do not just happen. They are predicated on beliefs and hence further exploration in this area could result in understandings about teachers of which we are not currently cognisant'*. Teacher attribution is a belief system that has been used in explaining and predicting teacher behaviour and, because of its promising results, will probably be used in future research. To study the effects of attributions on teacher-student interactions, research on teacher attributions could be expanded with additional classroom observations. With this knowledge teachers can be supported to be more attentive and adaptive to their individual students' learning needs.

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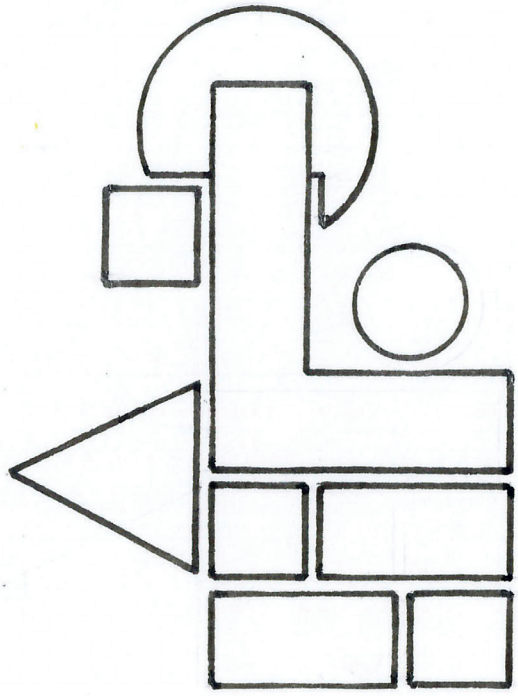

CHAPTER 4

Instructional differentiation in secondary education: Teachers' actions and reasoning

This chapter is in preparation for publication.
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Abstract

Instructional differentiation is a teaching approach in which teachers make instructional adaptations to be responsive to their students' diverse learner characteristics. How teachers do so in their daily practice is not well understood. To reach such an understanding it is crucial to gain insight into teachers' reasoning underlying their instructional adaptations.

Using an instrumental multiple-case study design, this study explores teachers' reasoning underlying their instructional differentiation strategies. The reasoning of seven teachers underlying their instructional adaptations within one of their lessons were explored. These teachers regularly made instructional adaptations and valued these practices.

Instructional differentiation strategies were discerned based on the instructional elements adapted by the teachers, how these were adapted and in response to which students' learner characteristics. Teacher reasoning was analysed with regard to the purposes that teachers attached to these strategies as well as the situational characteristics that teachers took into account.

We found these teachers used a variety of differentiation strategies, each being a unique combination of the instructional elements adapted and the students' learner characteristics they were adapted to. Findings suggest that in daily practice, teachers' differentiation strategies seem multifaceted, including the simultaneous adaptations of several instructional elements in response to various students' learner characteristics, with multiple underlying goals.

Studying teacher reasoning proved to be crucial to understanding their instructional differentiation strategies. To gain a deeper understanding of instructional differentiation, this reasoning along with the multifacetedness of the adaptations should be further explored and taken into account both in future research as well as in teachers' professional development programmes.

4.1 Introduction

Students within a classroom differ from one another in various ways. They have different interests, motivations, capabilities, backgrounds, aspirations, and so forth. It is often argued that teachers should employ instructional differentiation to provide different students with optimal learning opportunities (Corno, 2008; Subban, 2006; Tomlinson et al., 2003). Instructional differentiation is a teaching approach in which teachers *proactively* and *deliberately* plan and execute instructional adaptions to address the diverse learner characteristics within a classroom (Smale-Jacobse et al., 2019; Suprayogi et al., 2017; Tomlinson et al., 2003; Whitley et al., 2019).

Instructional differentiation has been the object of a long and rich research field (Jager et al., 2022; Norwich, 1994). This field has shed light on the many different forms and manifestations of instructional differentiation in classrooms. To provide different students with optimal learning opportunities teachers can, for example, adapt the learning goals, activities, content and difficulty of exercises and they can make these adaptations in response to a large number of different learner characteristics (Coubergs et al., 2013; Jager et al., 2021; Tomlinson et al., 2003;). It seems that teachers can choose between a vast variety of differentiation strategies to employ in their practice. Moreover, teachers generally indicate that they do want to address student differences in their lessons (Tomlinson et al., 2003; van Casteren et al., 2017). In actual practice, however, observational studies show that teachers only scarcely seem to employ instructional differentiation (Schleiger, 2016; Van der Lans et al., 2017). Despite the multiple decades of scholarly attention to instructional differentiation and the fact that most teachers indicate they see and want to address differences in students' learner characteristics, instructional differentiation still seems an uncommon practice.

That instructional differentiation is observed as infrequently practised is often attributed to the complexity of this teaching approach, which prevents teachers from applying it (Smale-Jacobse et al., 2019; Tomlinson et al., 2003; van Casteren et al., 2017; van der Lans, et al., 2017). Studies have shown that instructional differentiation requires teachers to have a range of specific knowledge, beliefs and skills (van de Grift, 2014; van Geel et al., 2018). For example, teachers need sufficient knowledge about their students' learner characteristics, subject matter and strategies to support student learning. Additionally, the literature dealing with differentiation has provided models and ideas about how teachers, based on their knowledge of their students, can differentiate their instruction. Scholars have developed and tested models of instructional differentiation, focusing on step-by-step decision-making (cf. Prast

et al., 2015; van Geel et al., 2018). These models typically address specific learner characteristics that should be addressed, such as different levels of performance, motivation or interests, and focus on the realization of specific cognitive learning outcomes (Brimijoin et al., 2003; Eijsink et al., 2017; Prast et al., 2015; Smale-Jacobse et al., 2019; Van Geel et al., 2018). These studies have provided insight into instructional differentiation but they tend to be too one-dimensional and to overlook the complexity of instructional differentiation in teachers' daily practice.

In the multidimensional complex daily practice, instructional differentiation is part of a broad educational reality. In this educational reality, teachers face many different learner characteristics (Civitillio et al., 2016; Jager et al., 2021) and strive for multiple goals simultaneously (Biesta, 2007; Lampert et al., 1985; Shavelson & Stern, 1981). A teacher may, for example, want to help students master specific content, aim to promote students' well-being and increase students' co-operative learning skills while maintaining a positive learning climate. At any given moment, it may be relevant to adapt to several learner characteristics (such as students' performance, insecurity and social-emotional characteristics) in light of these various aims and conditions. How teachers decide on their instructional differentiation strategies in the complexity of everyday practice needs further investigation.

To gain a better understanding of instructional differentiation in teachers' daily practice, we studied how teachers come to their specific instructional differentiation strategies. In this study we conceptualize teaching as a cognitive act in which teachers' actions and thinking are interwoven. Following, to understand what teachers do and how they do so, it is important to shed light on teachers' thinking underlying their actions and to study the reasoning that has led teachers to these actions (Cochran-Smith et al., 2016; Loughran, 2015). Studying teacher reasoning offers a unique insight into the complexity of teaching, making the complex cognitive work of teaching visible (Loughran, 2015). Thus, to understand how teachers decide on their differentiation strategies it seems important to not only study how they differentiate, but also why teachers use specific differentiation strategies. Although there seems a general consensus that teachers' choices in terms of *what* to adapt, *how* to adapt and *for whom* to adapt are at the core of instructional differentiation (Jager et al., 2022; Smets & Struyven, 2018), the reasoning of teachers underlying these choices (*why* they adapt *what, how and for whom*) is rarely explored. By using a qualitative research design in which we closely study teachers' reasoning underlying their instructional differentiation strategies, we aim to shed light on the differentiation strategies these teachers use and why they use them.

4.2 Theoretical framework

4.2.1 Instructional differentiation

Instructional differentiation is a teaching approach in which teachers proactively and deliberately plan and execute instructional adaptions to better meet the diverse learner characteristics of students within a classroom (Smale-Jacobse et al., 2019; Suprayogi et al., 2017; Tomlinson et al., 2003; Whitley et al., 2019). In the literature, several instructional differentiation strategies have been described, such as homogeneous ability grouping, heterogeneous ability grouping, mastery learning, flipped classrooms, or individualized instruction (Smale-Jacobse et al., 2019). In the seminal work by Tomlinson et al. (2003), three differentiation strategies are described: differentiation in response to students' readiness; differentiation in response to students' interest; and differentiation in response to students' learning profile. In line with Tomlinson's work, Maeng and Bell (2015) studied differentiation strategies of secondary education science teachers and studied their implementation of strategies, such as setting a learning menu, giving students choice, tiering and flexible grouping, based on formative assessment data.

Several studies have shown that there are many differentiation strategies (Maeng & Bell, 2015; Smale-Jacobse et al., 2019; Smit & Humpert, 2012). The core of differentiation lies in the choices teachers make pertaining to *what* to adapt, *for whom*, *how* and *when* (Snow, 1997; Smets & Struyven, 2018; Van Geel et al., 2018). To be responsive to students' learner characteristics teachers can make multiple adaptations in their teaching – for example, how students will be grouped for instruction, which new concepts will be taught, how they will be taught, the difficulty of assignments, the pace at which students have to work, the amount and type of support and feedback they give, the autonomy students are given, and so on (Cassady et al., 2004; Roy, et al., 2013; Smit & Humpert, 2012; Tomlinson et al., 2003). Likewise, there is a wide variety in student learner characteristics that teachers may address when they make such adaptations. Students' readiness (including abilities, knowledge and skills), interest and learning profile (including cultural backgrounds and learning styles or preferences) are frequently mentioned as particularly relevant to take into account to support the students' learning process (Jager et al., 2021; Plass & Pawar, 2020; Subban, 2006; Tomlinson et al., 2003). Given the wide variety of possibilities, instructional differentiation is a teaching approach that requires complex decision-making strategies (Moon, 2005; Van Geel et al., 2018).

These decisions have been analysed as a step-by-step process in several studies (Denessen & Douglas, 2015; Prast et al., 2015; Rock et al., 2008; Van Geel et al.,

2018). According to most differentiation models, teachers first need to accurately diagnose relevant student learner characteristics, for example by pre-assessments or observations and ongoing interactions with their students (Brimijoin, et al., 2003; Faber et al., 2017; Moon, 2005; NRO, 2014; Prast et al., 2015). Second, teachers must decide on the differentiated learning goals for their students. Third, based on the assessed students' learner characteristics and the set goals, teachers choose and perform the instructional strategies to reach the differentiated learning goals (Moon, 2005; Prast et al., 2015, Smale-Jacobse et al., 2019; Van Geel et al., 2018). During a lesson, a teacher monitors student learning and, if necessary, makes adaptations to the instructional strategies during or after the lesson. For an illustrative example of such a step-by-step approach to differentiation, see the model by Prast et al. below (Figure 4.1). Many studies following such an approach focus on teachers' instructional differentiation to increase subject-specific learning, for example in mathematics (Prast et al. 2015; Van Geel et al. 2018) and strongly focus on differences in students' cognitive learner characteristics.

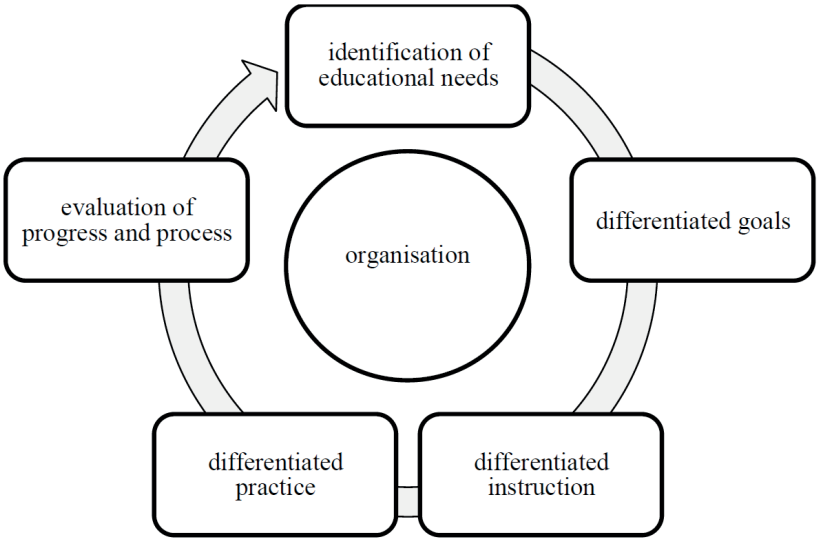

Figure 4.1. Example of a step-by-step model of differentiation (Source: Prast et al. (2015), p. 98).

These step-by-step models shed light on the necessary steps of instructional differentiation and have studied specific skills and knowledge that are required of teachers to implement these steps. From these studies it follows that teachers need to have knowledge about their students, subject matter and about strategies that might work to support students and skills, such as diagnosing student learning, setting learning goals and organizing instruction(s) (Prast et al., 2015; Van Geel et

al, 2018; Vogt & Rogalla, 2009; Whitley et al., 2019). However, given the complexity of teachers' daily practice, these models seem limited to supporting teachers in how to realize instructional differentiation. First, they do not take into account the multiple learner characteristics and learning goals that are part of the educational reality. Second, these models do not shed light on why teachers choose specific instructional differentiation strategies. For a richer understanding of the complexity of instructional differentiation in teachers' daily practice it is important that research sheds light on these points.

4.2.2 Instructional differentiation in practice

Indailypractice, instructional differentiation is part of a broader educational reality in which teachers face differing learner characteristics simultaneously (Blease, 1995; Civitillo et al., 2016; Jager et al., 2021). Students differ in their achievements, knowledge, preferences, personality, social skills, cultural backgrounds, abilities and more. Moreover, each student is a unique composition of all of these characteristics. Empirical explorations about the student learner characteristics teachers perceive as relevant for their adaptations showed large differences among teachers (Civitillo et al., 2016; Jager et al., 2021; Noddings, 2005). Teachers differ with regard to which student learning characteristics they perceive/conceive as relevant to adapt to. Some teachers seem more focused on cognitive or motivational differences while others see personal or cultural backgrounds as most relevant. At each given moment there may be any combination of multiple relevant learner characteristics that teachers could, and may want to, take into account.

In addition, teaching is also a normative practice in which teachers' decisions are informed by multiple, sometimes opposing goals (Biesta, 2007; Kennedy, 2016a; Loughran, 2015). Teaching involves a range of educational goals, such as enhancing students' subject-specific knowledge and skills, the socialization of students within society or helping them to become aware of, and develop, their identity (e.g. Biesta, 2007; Bulterman-Bos, 2004; Van Kan et al., 2013). These goals often are strived for simultaneously and might cause internal conflicts or dilemmas in teachers' daily practice (Kavanagh et al., 2020; Vijfeijken et al., 2021). Several scholars have highlighted that what is appropriate teaching, and what are relevant learner characteristics to be addressed by teachers are not neutral instrumental judgements but also ideological ones (Barrow, 2015; Biesta, 2007; Corno, 2008). An illustrative example is presented in a study by Lampert (1985). She studied how she, as a teacher, found herself balancing '*promoting classroom order*' and '*provide equal learning opportunities*'. To reach classroom order, she believed it is necessary to give more attention to the boys, while to provide equal learning opportunities she wants to be '*more attentive and encouraging toward the*

more well-behaved girls' (p. 179). Teachers thus may take multiple goals into account in their instructional differentiation strategies. What teachers do and why they choose specific teaching strategies is affected by the teaching situation they face (Kennedy, 2016a; Loughran, 2015; Tiilikainen et al., 2019). Many scholars suggest that there is not 'one right or best way to differentiate' (Tomlinson et al., 2003; Van Casteren et al., 2017; Van Geel et al., 2018). In practice, teachers need to find strategies that are appropriate within each specific teaching situation.

These complexities – multiple learner characteristics, multiple goals and the situational contingency of teaching – seem to be overlooked in step-by-step models of instructional differentiation that focus on specific learner characteristics and learning outcomes. Additionally, models and studies tend to focus more on what teachers do (i.e. their actions) than on how they decide upon their instructional differentiation practices. Approaching instructional differentiation in this way as instrumental and one-dimensional seems limited to better understand how teachers come to their instructional differentiation and make decisions about what to adapt, for whom, how and when. To gain a fuller understanding of the complexity of instructional differentiation, insight is needed in why teachers arrive at their specific instructional differentiation strategies. To gain such insights, studying teacher thinking that underpins their actions could help (Cochran-Smith et al., 2016; Kelchtermans, 2009; Loughran, 2015). Teachers' actions and thinking are interwoven and insight into the cognitive work of teachers may lead to a better understanding of the complexity of teaching (Cochran-Smith et al. 2016; Hirst, 1971; Loughran, 2019). Studying teacher reasoning in the context of instructional differentiation provides valuable insights into the complex nature of instructional differentiation.

4.2.3 Teacher reasoning

Teacher reasoning is the thinking activity through which teachers attach their actions to the purposes and requirements of teaching situations that underlie them (cf. Kavanagh et al., 2020; Loughran, 2019). It has also been referred to as *pedagogical reasoning*, *instructional reasoning* (Tiilikainen et al., 2019) and *practical reasoning* (Fenstermacher & Richardson, 1993). Reasoning refers to the active functioning of the mind that is required in making decisions. By studying the reasoning of teachers' underlying specific instructional choices, the cognitive work underlying teaching can become visible (Loughran, 2019).

The link between teachers' reasoning and teachers' actions is argued to be complex in that a single action may have multiple reasons of different types and relationships among them, and actions can seem quite remote (Fenstermacher & Richardson, 1993).

Studying teacher reasoning gives a unique insight into the thinking of teachers that helps to shed light on the purposes a teacher aims to achieve by teaching (intention-oriented reasons) and how teachers try to achieve these purposes given the particular classroom situations they face (attention-oriented reasons) (Tilikkainen et al., 2019). Teacher reasoning is situated in an instructional context and includes the domain of *teacher*, *students* and *curricular substance* (Kavanagh et al., 2020; Tiilikainen et al., 2019). The concept of teacher reasoning has been used in studies to access teachers' practical knowledge or practical theories (Tilikkainen et al., 2019), teacher dispositions (Tillikainen et al., 2019) and practical arguments (Fenstermacher & Richardson, 1993). Studying teacher reasoning also offers a way to examine both the purposes and goals that underlie specific actions, as well as how such an action is the result of the instructional situational context.

4.2.4 Research goals and focus of inquiry

This study aims to contribute to a better understanding of the complexity of instructional differentiation in teachers' daily practice by performing a qualitative multi-case study of teachers' reasoning underlying their instructional differentiation. This is an approach not often employed in research on instructional differentiation. However, it provides valuable information that could lead to a better understanding of the complexity of instructional differentiation in practice. Insight into teachers' reasoning makes the cognitive work underlying instructional differentiation visible. It provides an opportunity to study why teachers arrive at specific strategies and makes visible how teachers take into account the purposes and requirements of their teaching situation. Studying how teachers do so seems helpful to understand the complexity of instructional differentiation in teachers' daily practice and is important for two reasons.

First, it provides an opportunity to explore the complexity of teachers' cognitive work underlying instructional differentiation in practice. This seems necessary to better understand how teachers differentiate (Smale-Jacobse et al., 2019) and the personal and situational nature of instructional differentiation. Although it seems commonly accepted that there is no one right strategy to differentiate, the situational nature of differentiation is not well understood (Snow, 1993; Van Geel et al., 2018). For the theoretical development of instructional differentiation, it is important to gain insight into the situational characteristics that affect strategies. Studying teacher reasoning can make these characteristics visible.

Second, studying teacher reasoning could provide helpful insights to support teachers in the development of their instructional differentiation. From research into effective teacher development, we know it is important to not only focus on

teachers' actions but to address the teacher thinking that underlies them (Cochran-Smith et al., 2016 Kennedy, 2016b; Loughran, 2016). This study provides insight into the thinking processes that may be addressed in teachers' professional development. Highlighting the various reasons of other teachers for using specific strategies could be helpful for teachers as this might help them to develop their own personal instructional differentiation strategies.

Our inquiry first focuses on teachers' instructional strategies. We explore teachers' lessons and focus on what teachers adapt in these lessons and in response to which learner characteristics they do so. This exploration will provide insight into the instructional differentiation strategies that are manifest during the lessons included in this study. The research question that guides this exploration is:

RQ1 Which instructional differentiation strategies are realized by the teachers in this study?

Next, we explore the reasons that underlie these instructional differentiation strategies. Using the distinction in intentional and attentional reasoning from the framework of Tillikanen et al. (2019), we study the purposes (intentional reasoning) and the personal and situational characteristics (attentional reasoning) that compose teachers' strategies. This exploration will focus on the content of teacher reasoning that is included in the instructional differentiation practices and shed light on the purposes and situational characteristics that teachers taken into account in their practices. The two research questions that guide this exploration are:

(RQ2) Which purposes are included in teachers' instructional differentiation practices?

(RQ3) Which personal and situational characteristics are included in teachers' instructional differentiation practices?

Our main goal was to gain a deeper understanding of the complexity of instructional differentiation in practice by studying teacher reasoning. We invited teachers who frequently employed instructional differentiation and who valued these practices to participate in this study. After presenting the findings of the analyses of their differentiation strategies, we will conclude and discuss what we can learn from this approach of researching instructional differentiation.

4.3 Method

4.3.1 Context and participants

This qualitative study was conducted in the context of Dutch secondary education. Teachers in this context are subject-matter specialists who teach multiple classes per day. A purposive sample was drawn of secondary school teachers who, on a regular basis, differentiated their instruction as well as attached value to this practice. In all communication, differentiation was referred to as when a teacher 'varied instructional elements within a lesson to adapt to student characteristics'. Teachers were recruited via several secondary school teacher training institutes. Teacher educators were asked to provide names of teachers whom they knew were using instructional differentiation in their lessons. The first author contacted these teachers for participation in the study. After first contact was made through a short conversation to ensure teachers regularly adapted their instruction to student differences and valued their adaptations, teachers were invited to participate in the study. This sampling method yielded nine participants. We then added chain referral sampling and asked these teachers whether they could name teachers who also differentiated their instruction. This method provided two more teachers. However, one teacher left her job before all data were collected and was therefore excluded.

In total, ten teachers from nine different schools took part in this study. The two aims of this study were to better understand the personal and situational nature of instructional differentiation as well as to use these insights to support teachers in the development of instructional differentiation practices. Therefore, we deemed it necessary to only include practices that the teachers themselves valued. Additionally, practices had to be intentionally adaptive to students' diverse learner characteristics to be identified as instructional differentiation. However, whether teachers valued their practice as well as intended to be adaptive became visible during the second step of the data analysis wherein we explored teachers' reasoning. During the exploration of teachers' reasoning, one teacher expressed a negative attitude about the employed instructional adaptation. For another teacher the most important reason for instructional adaptations came from a personal need to *'do something different for a change'* to break her teaching routine. In addition, the reasoning of one of the teachers consisted mostly of referrals to the ideas and practices of colleagues since the differentiation practice was not designed nor really understood by the teacher and reasoning was limited. After excluding these practices, we fully analysed the practices of seven teachers (3 males, 4 females), from seven different schools. Their teaching experience ranged from 10 to 24 years. Their subject matter backgrounds were physics, mathematics, Dutch (mother tongue), French (n=2), geography and religious studies.

4.3.2 Data collection and procedure

Teachers were asked to select one lesson in which they were to differentiate their instruction. Prior to the selected lesson, the researcher (first author) visited the school and introduced herself to the teacher and students by attending a lesson of the specific teacher to these students. We ensured that both teacher and students were familiar with the presence of the researcher as an observer. During these visits, all teachers gave their active consent for participation in the study. Ethics approval for this study was given by the ethics committee of the Radboud Teachers Academy (Reference: 19U.504685).

The lessons that teachers selected for this study ranged from lessons to 12-year-old students to 15-year-old students, and included lessons in pre-vocational education as well as general education. During the selected lesson, the researcher was present and made field notes about the set-up of the lesson, the content, the different phases of the lesson, if and what teachers explicated to students about the differentiation and how students, in general, reacted (verbally and non-verbally). These field notes were used to better understand teachers' responses during a post-lesson interview and were helpful when teachers recalled the various phases in their lessons.

The main instrument of this study was a semi-structured interview with each teacher after the observed lesson. The set-up of the data collection and the formulation of the interview questions were the result of a number of pilot test with secondary school teachers not included in this study. During these pilots it appeared that being present during the lesson and making field notes was needed in order to get a picture of the whole lesson in chronological order and to help in phrasing the exact wording of the interview questions. The general set-up of the interview was to first identify the instructional elements that teachers deliberately adapted that were present in the lesson. Therefore the first questions asked teachers to identify and describe the instructional elements of the lessons that were purposefully adapted to different students. These questions were descriptive in nature and the exact formulation was adapted by the researcher based on the observations of the lesson, for example, '*Please describe the lesson from start to finish: what was the overall structure of the lesson?*' or '*You included three different assignments during the lesson. Can you describe these assignments and how they differed from each other?*'). After this demarcation of the instructional differentiation present within the lesson, teachers' reasoning underlying these differentiated elements was further explored per element. First, to uncover teachers' reasoning, follow-up questions were asked to explore the considerations of teachers underlying the designed variations. Questions were formulated to shed light on these reasons and considerations (*what were the considerations you had to …, why or for what is it*

important to adapt these elements in this way?). Second, teachers were asked to describe the students' learner characteristics that were relevant for the specific variation in their lessons and why they thought these characteristics were relevant to adapt to. When multiple adaptations were present, teacher reasoning underlying these adaptations was explored consecutively. The list of interview questions is included in Appendix 4.1. The interviews ranged from 43 to 90 minutes. The interviews were recorded on audio, transcribed verbatim and uploaded in Atlas.ti for further data analysis.

4.3.3 Data analysis

In this study, we employed a multiple case study approach. Case studies are appropriate for examining complex phenomena and offer a way to study and acknowledge similarities and variations between cases to better understand the phenomenon (Grandy, 2010; Miles et al., 2014). This study aimed to contribute to insights pertaining to the nature of instructional differentiation by studying teachers' practices. The object of this study, thus, is the 'instructional differentiation' teaching approach, an instructional differentiation practice was seen as a case. We discerned 11 differentiation cases of the 7 participating teachers. This meant that all interviews were treated as a single data set without aiming to profile individual teachers. The cases were used to better understand instructional differentiation via an analysis of teachers' actions and reasoning. The goal of the data analysis was not to gain an in-depth understanding of the case and can beseen as an instrumental case analysis (Grandy, 2010).

Data analysis was performed in two phases with subsequent steps, see Figure 4.2 for an overview of the data analysis procedure. The first phase focused on the delineation of the unit of analysis, that is, to distinguish and identify teachers' instructional differentiation practices from the interviews. In the second phase, the identified instructional differentiation practices were analysed based on the purposes and personal and situational characteristics they included. The analysis of this phase focused on the reasons included in the practices.

Phase 1: discerning adaptive practices from the interviews

In line with the work by Cochran-Smith et al. (2016), a practice is conceptualized as a combination of an action and its underlying thinking. An instructional differentiation practice is defined as teachers' instructional adaptations that were deliberately designed with an intention to meet specific students' learner characteristics (actions) and the underlying reasoning (thinking) that teachers expressed in regard to these adaptations. In this study, teachers' adaptations were determined by using the teachers' own description of their instructional adaptations that were supported by the lesson observations.

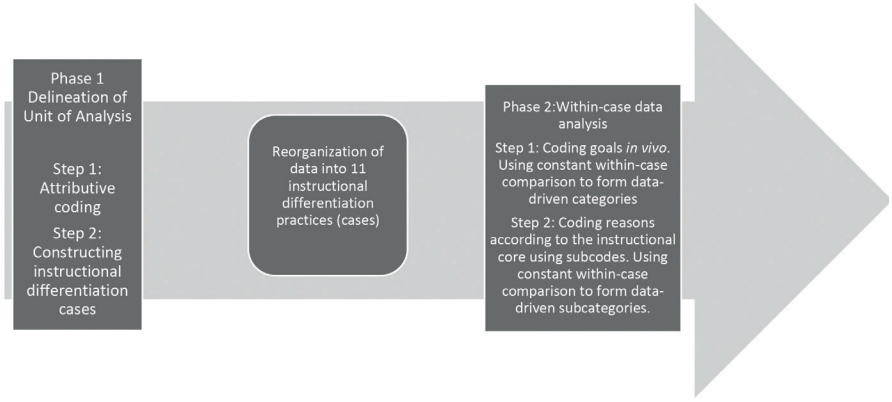

Figure 4.2. Overview of the data analysis procedure

The *first phase* started with a thorough reading of the interviews and the field notes, per teacher. Although the interview was set up to discern instructional differentiation practices consecutively, teachers' reasoning pertaining to specific adaptations were often expressed and elaborated upon in different parts of the interviews. To get an overall sense of the practices present in the data set we used attributive coding, wherein we described basic context information such as the subject, context-specific information, type of class as well as the overall lesson structure and the instructional adaptations that teachers discussed during the interview. This resulted in a first written description of the lessons and instructional differentiation present in the data set.

Next, we selected fragments from the interviews that contained a description of instructional adaptations and/or pedagogical reasoning pertaining to these described adaptations. Interview fragments that were not included in the further analyses most often contained: (1) evaluations of the lesson or after-lesson reflection that had no impact on teacher actions during the lesson; (2) descriptions of what could have been, but did not happen or was not realized; or (3) descriptions of other lessons with no explicit connection to the current lesson.

To construct the instructional differentiation practices of teachers from the interview, all selected interview fragments wherein learner characteristics were present in the pedagogical reasoning were identified (i.e. when specific student learner characteristics were included in the reasoning pertaining to the adaptation of a specific instructional element). These fragments were labelled as 'Adaptive Practice' (AP), contained the case identification of the teacher (TeacherID), and were numbered (AP+teacherID+numberofpractice). Next, all descriptions and reasoning

within an interview pertaining to the adaptive practice were labelled using the same code. To discern between instructional differentiation practices, descriptive *in vivo* coding was used to describe the instructional elements teachers adapted as well as the students' learner characteristics that were included in the teacher's reasoning. Of the seven lessons included in the data analysis, four had more than one instructional differentiation strategy. These strategies could be discerned from each other since the elements that were adapted differed as did the students' learner characteristics. Using the procedure described above we discerned 11 instructional differentiation practices in this first phase of data analysis. Table 4.1, in the results section provides a summary of the practices filtered from the interviews and observations.

The data analysis in this first phase was carried out by the first author. To increase the objectivity and reliability of this step, the first author made a detailed description of all steps in the data analysis and, while coding, provided examples and decision rules for the inclusion or exclusion of interview fragments. This record was thoroughly discussed with an independent researcher who thereafter used the record to analyse one interview. The adaptive practices discerned by this researcher from the interview were similar to those discerned in the data analysis.

Phase 2: within-case data analysis

In the second phase of data analysis, the 11 cases were analysed to explore the content of teachers' pedagogical reasoning. Following the framework of Tillikanen et al. (2019) we explored both the purposes underlying the teachers' instructional differentiation (intention-oriented reasoning) as well as personal and situational characteristics teachers expressed (attention-oriented reasoning).

First, we used *in vivo* coding to code teachers' purposes so as to stay as close to their wording as possible. Using within-case constant compare and contrast strategies during the first cycle of *in vivo* coding, we categorized similar purposes within each case. These within-case categories were then clustered into overall categories. These can be found in Table 4.2.

Second, to discern the personal and situational characteristics teachers expressed, we used the main categories of Tillikanen et al. 's (2018) for a first cycle of deductive subcoding. The following four categories are interrelated domains that are included in teachers' instructional reasoning: *teacher; student; subject; and context* (Shulman, 1987; Tillikanen et al., 2018; Zierer, 2015). Fragments that included reasoning were coded according to these categories, adding a descriptive subcode. Using within-case compare and contrast strategies, data-driven subcategories emerged from each case.

4.4 Results

The three focal research questions for this study were: (RQ1) Which instructional differentiation strategies are realized by the teachers in this study? (RQ2) Which purposes are included in teachers' instructional differentiation practices? (RQ3) Which personal and situational characteristics are included in teachers' instructional differentiation practices?

To report these findings, we first describe the 11 cases that were part of the second phase of the data analysis. Each case description includes an overview of the instructional elements that teachers described as being adapted, how they adapted these elements and the student learner characteristics included in these adaptations. These descriptions were based on classroom observations complemented by information teachers provided during the interviews. Teachers described their instructional adaptations according to: (1) the instructional elements that teachers adapted; (2) what was adapted within these elements; and (3) the student learner characteristics that teachers adapted these elements to. See Table 4.1 for the description of the cases.

4.4.1 Teachers' instructional differentiation strategies

Across the cases, we found a variety of instructional elements that were adapted to a variety of students' learner characteristics. The instructional elements that were adapted included **subject matter** (cases 1, 8 and 9),**difficulty of the assignments** (cases 5, 8, 9 and 11), **learning activities** (cases 2, 4, 5, 6 and 8), **teaching approach** (cases 3, 4, 10 and 11), **materials/resources** students worked with (cases 2, 8, and 9), **student grouping** (cases 1 and 9) and **student autonomy** (cases 3, 4 and 11).

In addition to this overall variety in instructional elements adapted across cases, there was also a wide variety in *how* each separate instructional element was adapted. For example, in cases 3, 4 and 10, teachers adapted their teaching approach; in case 3 the teaching approach varied between **more or less instruction**, while in case 4 the teaching approach was adapted to contain **more or less help/support during student independent work**and in case 10 the teacher either explained new content either **inductively or deductively**. Both quantitative as well as qualitative adaptations were present in the data. Another example of the variety of adaptations within an instructional element can be found among cases in which learning activities were adapted – these were, for example, described as containing a **varied amount of scaffolds within exercises** (case 8), **factual/reproductive questions versus comprehensive/open questions** (case 6), or varied in **pace and sequence** (case 4).

Across cases, there is a widespread variety in the elements that were adapted as well as a variety in how instructional elements were adapted.

Table 4.1. Overview of the eleven cases of Instructional Differentiation: Manifestation during the lesson and description of the Instructional Elements adapted and Students' Learner Characteristics adapted to.

Adaptive practice	**Context**	**Description of the manifestation of Instructional Differentiation during the lesson (observation).** ***Description of the instructional elements teachers adapted and the students' learner characteristics adapted to (interviews).***
1	Geography Year 3 class	After a general introduction the teacher rearranges the class in five groups of three to five students. The teacher indicates with whom the students are grouped. *The teacher uses a mixture of grouping, mostly using heterogenous grouping on students' abilities and friend group, however making some expectations and used homogenous grouping of high-ability students as well as grouping students together of the same friend groups*. Within these groups each student individually chose between different content to work on. *This choice was aimed to be adaptive to students' interest, pre-knowledge and cultural backgrounds*. The learning activities were similar for all students. When finishing the individual learning activities, students within groups compared their work to form general conclusions pertaining the lesson topic.
2	Math Year 2 class	During the introduction of the lesson the teacher provided multiple ways of activating students pre-knowledge. Students, *based on their own learning preference*, individually, chose between three options. In the first option students participate in teacher-led instruction, in the second option students read the textbook and do several exercises, in the third option students watch a video on the electronic learning environment.
3		After a whole-classroom explanation of the new content the teacher does some exercises together with all students. Students then make an individual exercise. After a whole classroom discussion of the exercise, student chose to participated in further teacher guided instruction or to work independently of the teacher using a period planner indicating which exercises to make. *High ability students, students who were familiar with the topic and/or preferred to work independently were expected to work on their own. Students who struggle with math or have low self-esteem were expected to work with the teacher during the remainder of the lesson. These student were allowed to work independently only when exercises were performed successfully.*
4	French Year 3 class	In the second part of the lesson student self-work was scheduled. Students organized themselves in three groups, based on formerly made agreements with the teacher. *Based on a study planner containing an overview of the learning objectives with corresponding exercises, students chose what to do. The first group consist of well performing students with good study behaviors, they work without teacher help. The second group consists of students who perform well however seem to need more feedback and guidance, either because of their work behavior or because they indicated they prefer more feedback and guidance. The teacher monitors their work-behaviour and learning during the lesson, providing feedback when necessary. The last groups consists of low-performing students. They participated in teacher-led instruction and were told which exercises to do since these were discussed*. During the lesson the students in the other two groups made individual choices pertaining the exercises they work on.

Table 4.1. Continued

5	Religious study Year 2 class	At the start of the lesson students participated in an online quiz pertaining the lesson content *intended to assess their pre-knowledge*. Based on the results students got assigned an specific assignment, either an *easy assignment focusing on knowledge acquisition, or an advanced assignment, with more open, reflective and elaborative questions focusing on developing informed opinions*. Students worked on that assignment for the first half of the lesson.
6		In the second half of the lesson the students participated in a classroom-debate wherein students either had to defend or oppose a teacher given statement that was central in the assignment of the first half of the lesson. Students, *based on their personal affiliations with the topic, their self-esteem and their personal preferences*, chose to be an active participants in the debate or chose to listen to others. During the debate there were two moments students switch roles.
7	Dutch Year 3 class	At the beginning of the lesson, the teacher uses an interactive way of instruction to explain new content wherein short explanations were followed by one or two questions. Students first shared their answers to these questions in groups of two/three before participating in a whole-classroom discussion. This way of instruction provided the teacher with opportunities to be adaptive to students' *varied abilities, self-esteem and personalities.*
8		After the instruction of the new content, students chose between three assignments. Either an assignment that covers the content of the previous lessons or one of two assignments covering the content discussed in the current lesson. The teacher advised students who struggled with the homework of the previous lesson to choose the assignment covering the content of the previous lesson. This assignment included a video on the electronic learning environment with extra exercises. If students chose to work on one of the two assignments covering the newly taught content they chose between an easy assignmentsor a more difficult one. *The easier assignment included making a schematic overview of the content from the study book and using this overview to analyses a text*. The more difficult assignment started with the analysis of a text in the study book, students then had to find and analyze new texts, of their own interest, from the internet. Students were encouraged to base their choice on how well they understood the preceding instruction as well as their interest and preferences.
9	Science Year 3 class	At the start of the lesson, the teacher divided the students in pairs *wherein the teacher to find a balance between heterogenous groups that could sill work together without one out performing the other. Students' ability, personalities and work-behaviour* were included in these grouping decisions. The students compete with other pairs to win as many points. Points would be rewarded when successfully answering exercises. Exercises varied in difficulty, more difficult exercises were rewarded more points. Exercises also varied in content, students had the opportunity to choose content that matches their interests.
10	French Year 2 class	*To be adaptive to students' preferences, at the start of the lesson, the teacher used a mixture of two different ways of explaining the subject matter. First she explained the new content inductively, than an deductive explanation followed*.
11		During self-work, students were rearranged in three abilities groups based on their performance, *their own preferences and aspirations. Students work on the same content but the assignments were more difficult for the students in the higher ability group and these students received little to none help of the teacher. Students in the lower ability group received most help and feedback from the teacher*.

The students' learner characteristics that were the foci of adaptations were **students' abilities**, **learning preference**, **aspirations**, **self-esteem**, **subject matter knowledge/ skills**, **cultural backgrounds**, **work-behaviour**, **interests**, **peer groups** and **personality**. Among cases there was a variation in how specific learner characteristics were included in teachers' reasoning. For example, several teachers described how their practice was intended to be adaptive to students' learning preferences. However, this was further explained as differences among students in their preferred ways of acquiring knowledge – for example, by watching videos, making diagrams or listening to the teacher. In other cases, preferences were seen as general ways of working (for example, independent versus teacher-led) or more situational preferences, such as a preference for activities based on their current concentration or work attitude.

Table 4.1 shows that all cases differed from one another. The realized instructional adaptations were varied and often multiple instructional elements were adapted and multiple learner characteristics were taken into account. Some cases were alike regarding the instructional elements that were adapted – for example, cases 7 and 10, in which the teaching approach was adapted. However, these cases differed in the learner characteristics that were addressed (students' abilities, self-esteem and personalities in case 7 and students' learning preferences in case 10). Some cases addressed the same learner characteristics. For example, in cases 6 and 11 adaptations aimed to match students' learning preferences. However, in case 6 the learning activities were adapted while in case 11 the teaching approach was adapted. Additionally, Table 4.1 shows that some cases focus on the adaptations of a single instructional element in response to a single student characteristic (for example, cases 5 and 10), whereas in most cases multiple instructional elements were adapted and these adaptations intended to be adaptive to several learner characteristics.

4.4.2 Teacher reasoning underlying their instructional adaptations

In this section we will present the results regarding teacher reasoning and focus on RQ2 and RQ3. First, we give an overview of the goals underlying the strategies used (4.2.1), and second of the personal and situational characteristics that were included in teachers' reasoning (4.2.2).

Intentional reasons to differentiate: goals underlying the strategies

Coding the goals teachers expressed as underlying their instructional differentiation strategies, six data-driven categories were discerned. Attached to their strategies were the following different goals: **student learning outcomes**; **student motivation**; **student self-awareness**; **a safe and productive learning climate**; **social cohesion; and equal learning opportunities**.

Since all practices were aimed at ensuring that all students would learn, the goal underlying all practices was to increase **students' learning outcomes**.However, teacher reasoning pertaining to student learning in most cases did not include specific learning goals or that specific students would attain different or higher learning outcomes than others. Learning was used in a more general term – see for example the quote in Figure 4.3. In several cases other learning outcomes then subject-related outcomes were seen as most important. For example, in case 4 the teacher expressed that, in this practice, she valued metacognitive learning goals over subject-related learning goals: *'… and that is what I try to achieve, I want them to experience that they can [learn a language] and that, later in life, if they may want to learn it .. they know what works for them.'* Only in case 1 was differentiation specifically intended to contribute to *content*-related learning goals. In this lesson, students could choose between three topics to match their interest and prior knowledge, specifically because one of the learning goals of the lesson was that students would gain insight into the differences between these topics. Although an underlying purpose of all cases was to increase students' learning, this learning frequently did not directly focus on specific content-related goals.

Increasing **student motivation** was also expressed as a reason for instructional differentiation. Teachers reasoned that providing students with a choice in learning activities would increase their engagement. In cases 1 and 9, students were provided with choice in content to match their own interests to increase student motivation. In other cases (1, 6, 8) the teachers reasoned that providing students with choices in general was seen as a way to increase motivation. Additionally, challenging high-achieving students was described as a way to engage these students during the lesson, more so than to help them attain different or higher-level learning outcomes.

In almost all cases, increasing **students' self-awareness** was an important goal of instructional adaptations.

> *For me that is the primary goal of working in this way, that in the end, they become self-reliant… not to work on their own, but really to become independent… to know when to ask for help or when to go to the group who receive more instruction. (Case 11)*

Another example can be found in Case 4:

> *…it is most important that they learn what their strengths are and what not. Not only which subjects they are good at, but they become self-aware of how they act in the face of difficulties, to what extent do I like to challenge myself*

and where do my efforts to deal with struggles stop. In case 9, students' self-awareness pertaining to the subject seemed central:

I believe, if at any moment you have gone through all the subject matter and exercises and a student wants more depth, then they have to get the opportunity. Especially in the 3rd grade it is important for students to found out where their interests ley and where not. .. and to discover how good am I in science. .. By offering different levels of difficulty involving topics that belong to the 4th, 5th or even 6th grade, they can make more informed decisions… In addition to becoming self-aware and independent, teachers also aimed to increase students' self-acceptance:

and I always emphasize.. guys no shame… it does not matter in which group you work as long as you know what you are doing' (case 11) and 'That a student experiences that despite he or she needs extra instruction, that they can learn and attain goals. So… that it is ok that your path is different than the learning path of another student, so a bit of self-acceptence. (Case 2)

Cases 3, 5, 6 and 7 all included intentions with regard to ensuring **a safe learning climate**. Teachers expressed safety as a condition for learning. For example, '*When a setting is unsafe ..uhh.. it is like you add a barrier to coming to learn*'. Theintention to ensure a safe climate for some came out in a subject-related context, for example in case 5: '*It is a sensitive topic [near death experience], some students had to deal with death in their own family.. I wanted all students to work in a [safe] space, allowing them to form their own opinions…*' and in case 3, students could choose when to start to work independently or whether they work with the teachers on exercises. The teacher expressed:

I want them to have to opportunity to feel supported, to feel confident in that they know what the next steps are' .. 'A child who has a negative self-image.. will just not come as far as child with a positive self-image. Especially with maths, some students just are convinced they are bad at it.In two cases (case 1 and 9) students were grouped by the teacher and were explicitly instructed to collaborate. In both cases the teacher intended to increase the **social cohesion** *in the class. In both cases the teacher grouped students that were part of different peer groups together to promote these students getting to know each other better.*

The instructional differentiation in cases 1 and 9 were aimed at providing **equal learning opportunities.** In case 1, the teacher aimed to challenge and engage several high-achieving students since in most other practices during the year the teacher

aimed to support his low-achieving students. In case 9 the teacher aimed to provide support for both his struggling students as well as his high-achieving students, saying that he thought it was important to be a teacher 'for all of his students'.

Multiple goals: balancing reasons

We found that some practices were directed at one or two goals, whilst in other practices, several goals were mentioned. Looking more closely at teacher reasoning in cases involving multiple goals showed that these goals sometimes aligned, but could also be at odds. An example of aligned multiple goals was case 8. Figure 4.3 illustrates how, in the reasoning of the teacher, these goals were aligned. This teacher aimed to increase students' learning outcomes, student motivation and student self-awareness. The reasoning of this teacher showed that these purposes positively interact and align when providing students with choices regarding the level of difficulty in which they can work. An example of goals being at odds in teacher reasoning was found in case 1.

Figure 4.3. Illustration of Alignment between Goals (Case 8).

'Students have to develop cognitively, they have to attain to standards… if they want to pass their exams and, even before, pass this class. So those cognitive goals, understanding the substance, are important…'.	**Increasing students' learning outcomes**
'And I also want to give them the feeling, I have a say in this, I know whether I understand this or not and I can express this … that a student feels he or she is part of the learning process and it matters how they partake in the process'; 'Life is all about making choices, so they need to learn that'; '..having the opportunity to express one's own preferences and making choices accordingly.'	**Supporting students' self-awareness**
'And what I know is that when you can make a choice, this increases your motivation. And that is helpful to attain those cognitive goals.'	**Alignment 'supporting students' self-awareness' and 'increasing students' learning outcomes'.**

Figure 4.4 illustrates how, underlying one strategy, this teacher tried to find a balance between goals in his practice. In this case, the teacher described how the differentiation during the lesson was aimed to challenge several high-achieving students ('*the louder boys*') without providing them with extra or different work by designing a challenging assignment that all students could work on in groups. He also typified this class as having a low social cohesion and negative interactions between several peer groups. Figure 4.4 illustrates how he sought to balance these goals in his grouping decisions.

Figure 4.4. Illustration of balancing between goals (Case 1).

'I have tried, at least in a few of the groups, to mix students who struggle with higher-level questions with students for whom these questions are easier'Although, not with regard to all students, all those louder boys, I have assigned them to one group, they could work at their own level and not disrupt the other groups.'	**Balancing 'Increasing students' learning outcomes'** and **'Ensuring safe and productive learning climate'**
'In my grouping I also try to mix the different peer groups, however, some students are strongly opposed to this, which negatively affects their learning. So I have chosen that some of them can stay and work within their peer-group because they support each other and the safety of the group positively affects their learning.'	**Balancing 'social cohesion'** and **'Increasing students' learning outcomes'**

Attentional reasoning underlying instructional adaptations

Teachers' instructional reasoning was further analysed with regard to their attentional-reasoning and the domain to which these reasons related: teacher-based; student-based; substance-based; and contextual-based reasons).

Teacher-based reasons that were expressed were related to teachers' concerns for keeping the teaching practice organizable. Teachers referred to what they experienced as the limits of addressing differences within any given lesson:

> *…I know, I can only manage three groups simultaneously… More I cannot manage within a lesson, so I can, I can focus on high ability students, autistics students and visual learners, and then I cannot also provide for students with language impairments. (Case 2)*
>
> *Or*
>
> *It is important that such a practice is attainable, I know there are more possibilities, but how am I going to keep up? Then I might only be able to provide such choices for one class, however I want to provide options in all my groups… do this means, I can provide these options, I cannot manage providing four different assignments or routes of learning. (Case 8)*

Practices were thus bound by teachers' perceptions of their own capabilities and teachers strived to be able to provide as much differentiation as they are able to manage themselves. Although teachers did express limitations pertaining to the time to design different assignments and routes, they also referred to limitations to the amount of different learning routes they were able to monitor.

Other reasons for differentiation were related to teachers' personal beliefs or personality characteristics: *'Personally, I am just not a control freak.. I was a very autonomous learner myself which conflicted with the traditional form of education… to a large extent I project this in my teaching'* (Case 4); *'I am the teacher of all students and I want to get them all to think about science, not only helping the weaker students but also challenging students who understand the substance…so everybody has something to gain from me'* (Case 9).

Student-based reasons that were included in teachers reasoning referred mostly to characteristics at the classroom level and how these characteristics either affected the variety of student learner characteristics that were relevant to adapt to, or they affected boundaries of adaptations. Teachers referred, for example, to general characteristics of the group of students, for instance on their general abilities *'You have to realize, we have the brightest students here, they are at the highest level… maybe they do not always act accordingly.. but still they are quite capable… we are preparing them for universities'* (Case 4); or preferences: *'This class in general does well when they can work for themselves and work on assignments with others…I see some students that need help to restrict social talk during such activities'* (Case 9).

Substance-based reasons that were included in the reasoning of teachers referred to characteristics of the specific subject matter. However, these characteristics were almost always described in interaction with students or the specific context. The teacher in cases 5 and 6 (the same lesson), who typified the specific substance (near-death experience) as potentially 'emotionally unsafe', depended on students' own life experiences and how this increased the impact of students' backgrounds. For example, in Case 7, the teacher explicitly described how the specific content of that lesson led to using strategies other than the content that was taught earlier that semester. The fact that the specific content was new for almost all of the students made her differentiate. She chose strategies that were aimed at making students' prior knowledge and skills visible, both for students themselves as well as for her as a teacher. *'The strategy I use with regard to reading comprehension is totally different to what I do, for example, with regard to spelling. Spelling they all previously had, I just do a diagnostic assessment, that would not work for reading comprehension…'* In Case 1 the teacher described diversity among students in their prior knowledge and how this affected domain-specific learning difficulties.

In several cases, the instructional sequences were the basis of chosen differentiation strategies. For example, in case 9, the teacher described that the chosen strategy was especially appropriate since this lesson was at the end of a chapter and shortly before a test. In his perception, differences in students in how well they understood the

content were very large at that specific moment. Moreover, having worked with these students on the topic for several weeks meant that he thought he had a good grasp of the differences among his students, on who was struggling and who was not, as well as the diversity in students' interest related to the topic. In other cases, teacher reasoning revealed that teachers' choices were made based on specific activities in other lesson periods. For example, in Case 1 the teachers did not aim to adapt to variance in students' creative aspirations since such differences could more easily be taken into account in writing assignments that would be included in the next period.

Contextual-based reasons Pertaining to the contextual reasons, two main categories emerged. The first was the specific context of the lesson. For example, the differentiation strategy in case 1 was related to the context that this lesson was very late in the day. Being late in the day affected students' concentration and therefore a strategy was chosen that would offer the opportunity for students to be able to work at their own pace to match their levels of concentration in the moment. Other contextual-based reasons focused on the school, and how this strategy was affected by the larger school context. For example, the strategy in case 11 was based on a school-wide practice of formative evaluations that meant that students were used to monitor their own achievements and making decisions according to their achievements. In contrast, in cases 1 and 8 the teachers expressed that working in a 'traditional' environment students were not used to make choices, therefore both increasing the necessity, as well as the challenge, to support student in making informed and responsible choices.

4.5 Conclusion and discussion

To gain a deeper understanding of instructional differentiation, we aimed to get an insight into the thinking of teachers underlying their instructional differentiation strategies. In this study we inquired after the reasoning of teachers who frequently employed instructional differentiation and who valued these practices. We studied their reasoning underlying their instructional differentiation strategies within one lesson. Before presenting some general conclusions regarding instructional differentiation and the value of studying teacher reasoning, we will first discuss the specific findings of this study.

4.5.1 Instructional differentiation strategies

We found large variations among the 11 cases, both on how and which instructional elements were adapted and the students' learner characteristics these were adapted

to. All cases either involved several learner characteristics and/or several instructional adaptations. Given these results, the instructional adaptations we found seemed to represent more complex strategies, as identified in studies such as that of Maeng and Bell (2015) and Roy et al. (2013), for example *'present information in a different sequence, give more explanations or vary complexity of the assignments'* (Roy et al., p. 1197). Eleven unique instructional differentiation strategies have been identified and in teachers' daily practice these strategies involve an amalgam of different types of adaptations to several different students' learner characteristics.

The 11 cases represent a vast number of possible differentiation strategies. Nevertheless, it appeared that among the differentiation strategies identified in this study, no strategy was focused on the adaptation of student assessments nor the adaptation of learning goals. In none of the cases was instructional differentiation aimed at attaining different learning outcomes for different students pertaining to subject content. The absence of such strategies might be attributed to the educational context of teachers' work. Especially in the context of secondary education, teachers have been found to perceive demanding academic standards within this context as hindering them in designing variations in learning goals or assessments (McTighe & Brown, 2005; Whitley et al., 2019). However, this finding is striking since most instructional differentiation frameworks and models start with the adaptations of goals in response to specific student learner characteristics. Overall, it seemed that teachers used instructional differentiation in the attainment of undifferentiated goals.

Findings of this study support the inclusion of student choice or autonomy as a salient instructional element to be adapted within instructional differentiation frameworks, as argued by, for example, Cassady et al., (2004) and Rubie-Davies (2009). Teachers perceived offering choice to students as an important element underlying their instructional differentiation and varied between students in the freedom they received for making their own choices. In almost all cases students had some sort of choice regarding the instructional variations teachers organized. Although it is often conceptualized that by instructional differentiation teachers realize a match between the instructional environment and student learner characteristics (Corno, 2008; Jager et al., 2022; Tomlinson et al., 2003), the findings of this study indicate that in teachers' daily practice, teachers seem to provide students with opportunities for them to realize this match. By giving students choices, students affect whether or not a match is realized.

4.5.2 Teacher reasoning underlying the instructional differentiation strategies

In this study we have found that teachers' instructional differentiation strategies were aimed at various goals. Strategies were used to increase *students' learning outcomes, student engagement, student autonomy, student self-knowledge* and/or *create a safe and productive learning environment*. Although instructional differentiation is often described as a way of increasing students' learning outcomes, student engagement or equal learning opportunities (Tomlinson et al., 2003; Valiandes, 2015), our findings reveal that several other educational purposes were the focus of instructional differentiation strategies. Prominent in our study was the finding that instructional differentiation is seen as a practice that not only serves teacher-defined goals but also makes it easier for students to explore who they are as learners, their aspirations, abilities and interests. This finding aligns with the work of Van Casteren et al. (2007) who studied instructional differentiation in Dutch secondary education and also found that teachers expressed instructional differentiation as a way to meet students' need for autonomy. That this purpose was frequently found in teacher reasoning also explains why, in many of the strategies, teachers provided students with choices. Student choice was seen as the vehicle by which they can learn and experience who they are as learners. The student-centredness of differentiation strategies as appear in this study show that differentiation does not always follow a step-by-step model of differentiation, as presented in the introduction, where teachers adapt their teaching to reach predefined learning goals.

Even more complex, teachers do not focus only on one aim with differentiation, but rather multiple purposes coexist in teachers' reasoning, sometimes aligned and complementary, whilst at other times misaligned and conflicting. Instructional differentiation in teachers' daily practice seems to place teachers in normative dilemmas. Although a systematic analysis of these dilemmas was not within the scope of this paper, this finding is consistent with other studies that shed light on the dilemmas teachers face in their instructional differentiation (cf. Bulterman-Bos, 2004; Norwich, 1994; Vijfeiken et al., 2021). From the current study, we saw teachers balancing misaligned goals by using a combination of instructional strategies simultaneously – for example, using heterogeneous grouping for some groups/students with respect to some characteristics (ability, peer groups) and homogeneous grouping for other groups/students. Multiple differentiation strategies could simultaneously be in place.

Teachers' reasoning underlying their instructional differentiation practices was found to include student characteristics, educational goals and specific contextual conditions related to the curriculum and classroom setting. This study aligns with other studies that show that, in teacher reasoning, multiple aspects of the teaching situation interact and teachers use a mixture of knowledge pertaining to students and their subject (Gholami & Husu, 2010; Tillikainen et al., 2019). Teacher reasoning underlying their instructional differentiation does not seem to differ from teacher reasoning underlying teaching. Additionally, it is often emphasized that teachers in secondary education are subject-matter specialists (Whitley et al., 2019) and subject-matter knowledge is deemed important for instructional differentiation (van Geel et al., 2018; Vogt & Rogalla, 2009). Since subject-matter was not expressed as a reason underlying the instructional differentiation strategy in several cases, substance-based reasons seemed less subject-specific, as has been suggested in the literature.

4.5.3 General conclusions

As described in the theoretical framework, instructional differentiation is often portrayed and studied as a technical, straightforward practice in which step-by-step decision making is key. The findings of this study illustrate that instructional differentiation in teachers' daily practice is multifaceted. Teachers adapt multiple instructional elements simultaneously in response to several student learner characteristics in light of several educational purposes. The findings in this study show that differentiation cases vary on the extent of instructional elements adapted, learner characteristics included, and purposes addressed. This indicates the uniqueness of each differentiation case and that differentiation strategies are hard to typify or label. This finding has important implications for research and policy pertaining to teacher professionalization and instructional differentiation.

Several studies have focused on the extent to which teachers 'implement' specific instructional differentiation strategies (Smale-Jacobse et al., 2019; Suprayogi et al., 2017; Whitley et al., 2019). These studies often conclude that teachers seldom implement specific strategies or that implemented strategies did not seem to be effective in increasing students' cognitive learning outcomes (Smale-Jacobse et al., 2019). Our study suggests that teachers do not 'implement specific strategies', instead they make multifaceted instructional choices based on their perceptions about their students, subject matter and the specific context in which they teach. Supporting teachers in their development of instructional differentiation could benefit from these findings by addressing these facets with teachers as they shape and inform their reasoning that will result in well-reasoned instructional adaptations.

Second, it is difficult to assess the effectiveness of differentiation. The findings of this study suggest that teachers differentiate for multiple purposes and that evaluating the effectiveness of differentiation strategies in terms of students' learning outcomes would not do justice to the variety of purposes that were aimed at. Studies that aim to evaluate differentiation should be more sensitive to its multiple goals. Additionally, the findings of this study suggest that understanding how instructional differentiation affects student learning is very complex. In almost all cases, teachers provided students with choice and in several cases the used strategies varied among (groups of) students within a class. Research inquiring into the effects of strategies should take these findings into account by studying how students interact with the strategies provided to them.

4.5.4 The value of studying teacher reasoning to better understand instructional differentiation

Teachers' descriptions of their adaptations during the interviews as well as their reasoning underlying their strategies were vital to understand how specific elements were adapted as well as the students' learner characteristics they were adapted to. It appeared that this was often not, or not fully, observable during the lesson. In line with other studies, this study suggest that teachers' instructional differentiation cannot be determined based on observations alone (cf. Faber et al., 2017; Jager et al., 2021). Additionally, the interview data revealed that most strategies included different instructional adaptations simultaneously to take into account several students' learner characteristics, aimed at multiple purposes. Each case was unique, using a mixture of different strategies. This implies that to understand the ways in which teachers differentiate their practice, it might not be meaningful to discern specific 'strategies' based on teachers' actions. It might be more valuable to explore whether different strategies could be discerned at the level of practices, i.e. studying variation in teachers' underlying reasoning.

Looking back at the results from this perspective, practices seemed to differ especially in whether they included more personal reasons or whether practices included reasons from several domains. Some practices seemed to represent a routine for teachers, and were less influenced by the specific context, subject matter or the specific group or students they taught. These practices seemed like more general strategies the teacher could use in various lessons since these strategies seemed strongly attached to teachers' personal characteristics, the purposes they are striving for and the learner characteristics they see as relevant.

In this study, cases 3, 4 and 11 could be seen as illustrative of such strategies. In case 4, the teacher expressed how she values student autonomy and how she, personally, disliked telling students what to do, in line with her own experiences as a learner in high school. In her vision, the most important thing is to let students experience for themselves how they best learn a language, by trial and error, and with teacher support to help them reflect on their experiences. This way of working, so the teacher expressed, aligned with her own teaching style, her vision on education, and matches the students in her school context (high ability). Moreover, these practices were primarily aimed at achieving one goal, which, in case 4 was increasing student self-awareness. This practice does not seem to be affected by specific characteristics of the subject and seems appropriate as long as the contextual characteristics are stable.

Other cases seemed more situational in nature, strongly attached to specific situational characteristics, such as specific student, context or subject characteristics. These strategies seemed only appropriate in the specific lesson in which they were practised. For example, in the practice in case 1, the teacher expressed how this strategy was linked to several specific characteristics salient in that class (low social cohesion), with learning difficulties pertaining to the specific content (variety within an continent) and contextual characteristics (time of the lesson). The reasoning of cases 1, 8 and 9 also showed such varied reasons. Moreover, underlying these cases were with multiple purposes that seemed in conflict with each other and needed to be balanced.

In line with the findings of Tiilikainen et al. (2019), these latter practices seemed to include more complex teacher reasoning. Complexity increased because these practices included several reasons encompassing teacher-based reasons, student-based reasons, substance-based reasons and context-based reasons. Additionally, complexity increased when practices were aimed at several goals and these goals were balanced in the practice. However, it is not said that complex or more situational reasoning would be more desirable per se, routine teacher practices have a value in their own right (Kavanagh et al., 2020; Tillikainen et al. 2019). However, since this analysis is very preliminary and was not the focal point of this study, the suggestion that the differences in teacher reasoning would be a (more) valuable distinction among different instructional differentiation strategies should be studied more thoroughly.

4.5.5 Limitations, implications and future research

An important limitation of this study is that we only studied 11 practices of seven teachers. Moreover, we only studied the practices of these teachers in one lesson. Interestingly, even in such a small sample, we found a wide range of strategies. It

would be very interesting to see whether a larger sample would provide an even larger range of practices, 'wherein other purposes or situational characteristics are taken into account and/or wherein teachers respond to other student characteristics, or involve the adaptations of other instructional elements – for example, student learning objectives or assessments.'?

Studying more practices might lead to a better insight into specific dilemmas that teachers include in these practices and whether certain dilemmas might have prevalence over others. Moreover, to better understand the personal and/or situational nature of these practices, future research could study several lessons of a teacher who, on a regular basis, uses differentiation in his or her lessons. Although the conclusions pertaining to the two different practices are supported by our analysis of teachers' reasoning and their remarks about how the practice central to the interview differed from other practices, or the remarks of teachers that their approach was general for other students/content areas, the data upon which these conclusions are drawn are small. It would be interesting to study whether teachers indeed use some practices on multiple occasions or whether practices are indeed unique to the situation.

An additional limitation is that we only interviewed teachers. In the interviews, teachers sometimes struggled to verbalize their instructional reasons and sometimes repeated themselves or tried to explain what they meant by using metaphors or examples. This is not uncommon, since teacher reasoning is seldom made explicit (Loughran, 2015). Although we found that the combination of observation and interviews helped teachers to express their reasoning, it cannot be said with certainty that all teacher reasoning was explicated via the interviews. Following up on this, observing and interviewing teachers multiple times and in multiple lessons might help teachers to verbalize their reasoning even more clearly.

In conclusion, from an exploration of teacher reasoning underlying their instructional differentiation strategies, we found that instructional differentiation practices in teachers' daily practice are multifaceted. Although the ideals of instructional differentiation – such as more effective education and equal learning opportunities – were present in teachers thoughts, they were part of complex reasonings in which many different purposes and personal and contextual factors were involved. This supports findings of other studies (cf. Connelly et al., 1997; Kennedy, 2004) that investigated teacher reasoning and found that teachers are not '*mere screens who translate others' intentions and ideologies in practice*' (Connelly et al., 1997, p. 647) but their actions stem from personal beliefs and interpretations of their

teaching situations (Connelly et al., 1997; Kennedy, 2004). Moreover, the findings of this study warn against the portrayal of instructional differentiation as 'a strategy to be implemented by teachers'. It might be more accurate to portray instructional differentiation as a multifaceted decision-making process in which purposes and situational characteristics need to be considered.

One aim of this study was to support teachers in informed decision-making. To support teachers in developing their practices, it seems important to address their personal beliefs, interpretations of the teaching situation and the dilemmas they face when making choices regarding when, how and what to adapt and for whom. Teacher educators or other professionals in the field of teacher development can use the findings of this study to address teachers' personal beliefs and their interpretations of their teaching situations when supporting teachers in developing their personal differentiation strategies.

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Appendix 4.1. Set up of the interview and interview questions.

1. Could you briefly describe the structure of the lesson from start to finish?
- What are important characteristics of the setting of this lesson.
- What were important learning goals for the students within this lesson?

The interviewer wrote the structure of the lesson the teacher explicated down on post-its and checked with the classroom observations. If observations were different, the interviewer gave examples of a situation seemingly missing in teachers' explication and asked to which of the described lesson parts included these situation.

2. The following questions pertains the instructional adaptations of the lesson. What parts of the lesson were designed by you to be adaptive to different students?

The interviewer only kept the post-its of those elements in the structure of the lesson that are indicated to be adapted to student differences.

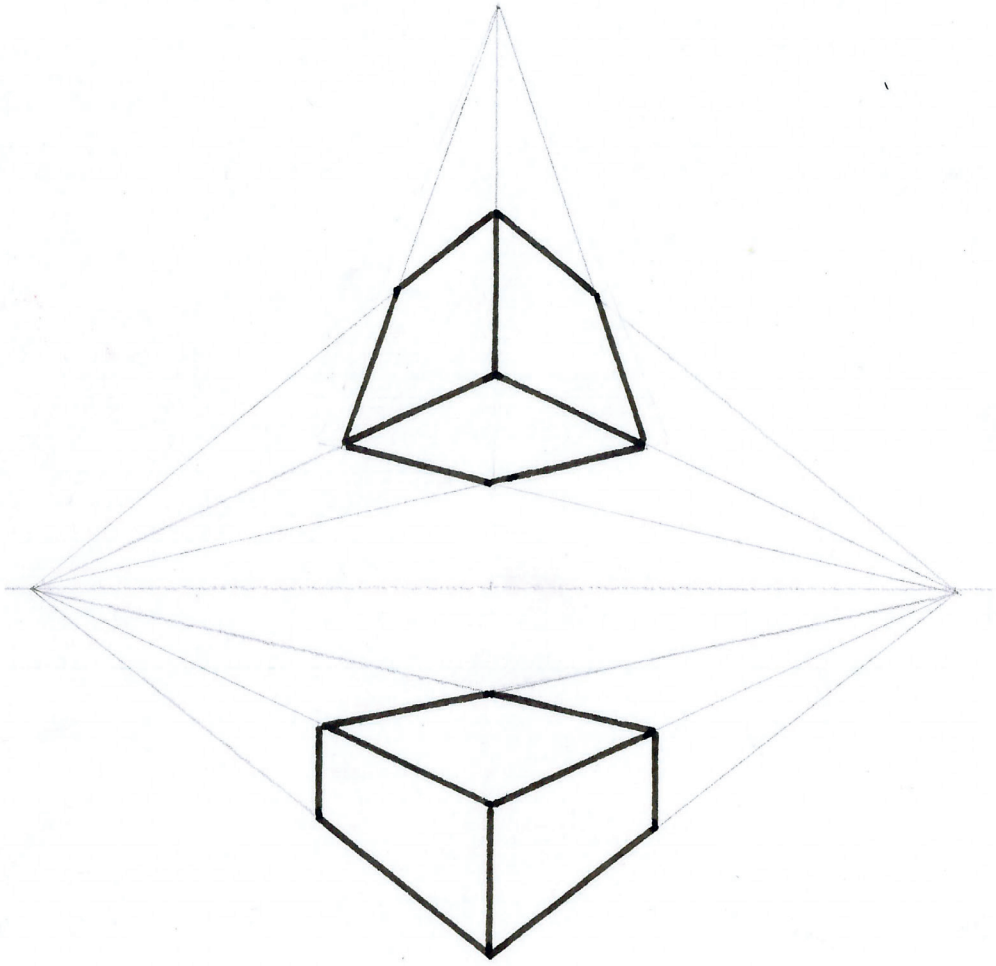
3. We will now, one-by-one, focus on these different parts that were adapted by you.

The interviewer placed the post-it with the lesson part in front of the teacher and asked the questions below. After asking all questions a new post-it was placed in front of the teacher.

- What were your purposes underlying this part of the lesson?
- Could you give a detailed description of the adaptation you designed; What was different for the different students?
- What where important reasons for you to come to these adaptations? What was in your mind when designing these adaptations?
- Which differences between students were included in these adaptations?
- Why is it important to adapt to these differences in this lesson?
- What is it you aim to achieve with these adaptations?

4. Until this point we mainly focused on the lesson and your reasoning underlying this lesson. To what extent or in which ways did the lesson go as expected pertaining the described adaptations?
- If decisions were made during lessons that influenced the instructional adaptations how did the lesson divert from its earlier plan?
- How do you look back on the adaptations you organized? Do you value these adaptations? What are the effects of these adaptations?

5. Thank you for this detailed account of the instructional adaptivity you designed in this lesson. Before we finish the interview, could you indicate the extent or ways in which these instructional adaptations are representative for your teaching?
- How many of your lessons include instructional adaptations?
- Are these adaptations similar to the ones described in this interview, what is similar, what is different?



CHAPTER 5

Capturing instructional differentiation in educational research: Investigating opportunities and challenges

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Abstract

Background: Instructional differentiation within classrooms involves educators' adaptations of instructional elements to meet diverse learners' needs. It is usually regarded as a crucial component of high quality education that promotes equal and inclusive opportunities for all students. However, defining and operationalising this complex construct is challenging, and important, in efforts to better understand instructional differentiation and support learners worldwide.

Purpose: This paper aims to contribute to a better understanding of instructional differentiation. It discusses definitions and operationalisations of instructional differentiation in the educational research literature and argues for the inclusion of *deliberateness* and *adaptiveness* as two defining characteristics of instructional differentiation.

Sources of evidence and main arguments: Using theoretical arguments and illustrations from empirical research, including a small-scale study of our own, we discuss and exemplify the value of considering deliberateness and adaptiveness in empirical research on instructional differentiation. Further, we consider the challenges and opportunities for research on instructional differentiation.

Conclusions: Studying the deliberateness and adaptiveness of instructional variation calls for conceptual and operational alignment, and research methodologies that take into account the multiple perspectives of teachers and students. Our investigations draw attention to the conceptual complexity of instructional differentiation, challenges in practice and the need for professional development to support teachers' embedding of instructional differentiation practices.

5.1 Introduction

Instructional differentiation within classrooms is usually regarded as a crucial practice in the provision of high quality education that promotes equal academic opportunities for all students. Internationally, it has become a standard for teachers (Banks et al. 2005; Brevik, Gunnulfsen, and Renzulli 2018; Prud'homme et al. 2006; van de Grift 2014; Pereira, et al. 2019; Wan 2017). Instructional differentiation entails educators' adaptions of instructional elements (e.g. content, assignments, materials) to meet learning characteristics that differ among students (e.g. their interests, abilities, cultural backgrounds). Teachers, for example, may design different assignments at varying levels of difficulty to adapt to their students' levels of knowledge and skills and/or they might offer specific curriculum content to individual students or subgroups to match their interests.

The concept of instructional differentiation has been an object of study for decades. Until the 1990s, differentiation was often thought of primarily as a way to respond to the needs of specific groups of students – for example, students with special educational needs. In the early nineties, a somewhat different conceptualisation emerged, with instructional differentiation regarded as a way of responding to the needs of *all* learners in the classroom (see Stradling and Saunders 1993; Norwich 1994). More recently, instructional differentiation has evolved from a strategy for teachers' lesson planning to a broader approach affecting teaching decisions during lessons (Parsons, Dodman and Burrowbridge 2013; van Geel et al. 2018). The concept not only pertains to teachers' planning and adaptations of differentiated instruction, but it is also presented as a teaching philosophy that includes teachers' educational beliefs (Valiandes and Neophytou 2018). In addition, differentiated instruction has been conceptualised in the context of the broader educational environment in which teaching takes place, such as the school curriculum and assessments (Tomlinson et al. 2003; Smale-Jacobse et al. 2019). Instructional differentiation can be challenging for teachers, due in part to the range of knowledge, skills, and attitudes which are required to implement it in their daily practice. For instructional differentiation to be successful, teachers need to utilise expert knowledge of their students as well as of the curriculum (Van Geel et al. 2018) and employ an array of relevant skills (Van Geel et al. 2018; Van de Grift 2007).

It is clear in these studies that instructional differentiation is a broad, complex construct that affects and encompasses all aspects of instruction (content, activities, grouping, evaluating) and phases of teaching (i.e. pre-lesson, post-lesson and during the lesson). In the pre-lesson phase, teachers can review student reports to gain

insight into students' learning needs (performance level and learning profile), set different learning goals for students with varying levels of understanding, and design student grouping in response to student differences. During lessons, teachers can monitor student progress and understanding, and adapt their teaching in response to their observations. After the lesson, they can evaluate whether all students met their learning goals and plan the following lesson according to these evaluations.

However, instructional differentiation is not only challenging for teachers. Despite being regarded as an important concept, instructional differentiation is also a demanding concept for researchers, both conceptually as operationally. It has been argued that the term is fuzzy and inconsistent (e.g. Deunk et al. 2018; Smets and Struyven 2018). Variations in definitions lead to unclear interpretations and diverse operationalisations that may prevent a consistent scientific understanding of the construct. Besides lack of conceptual clarity, there are insufficient well-developed research methods to study it, which can result in incompatible assessments between studies (e.g. Smale-Jacobse et al. 2019; Smets and Struyven 2018; van Geel et al. 2018). In this paper, we seek to explore these two issues.

Purpose

To advance empirical research on instructional differentiation, it is important to undertake critical review of the alignment between what is understood by this construct and how it is studied in empirical research. This paper offers a reflection on the conceptualisation and operationalisation of instructional differentiation and describes challenges for researchers who aim to study it. This paper originated from our own attempt to capture instructional differentiation and our reflections on why we did not succeed in doing so. We use the word 'capture' to emphasize that we attempt to reflect on what is necessary to know about classroom practices to determine whether they can be labelled as instructional differentiation. Our primary goal was not to develop methods that directly study the effectiveness or quality of instructional differentiation.

We had three aims: (1) to investigate what is understood by the construct instructional differentiation, (2) to explore how it is operationalised in empirical research, and (3) to reflect on consistencies/inconsistencies of definitions and operationalisations, and the challenges and opportunities that arise for researchers when studying it. We illustrate these challenges and opportunities with our own data from an empirical study of instructional differentiation.

5.2 Investigating the construct of instructional differentiation

In this section, we address what is understood by the construct of instructional differentiation. We explore several up-to-date definitions and understandings of instructional differentiation, probing their similarities and differences. The premise of this study was that it is important for educational research that definitions are both descriptive and stipulative. That is, the definitions need to connect with *how* terms are used in educational practice, as well as making clear *what* is being studied and what could potentially generate fruitful empirical research (Philips 1968; Sternberg 1990). An approach for arriving at a descriptive and stipulative definition is to identify essential defining characteristics of the construct. These defining characteristics indicate what a construct means and legitimize the use of a particular term. Characteristics of a concept that are related, but not defining, are called accompanying characteristics. They provide information about things referred to by the term and are of value to better understand the construct (Philips 1968). Given our aim of seeking to provide clarity for empirical research, the focus of our analysis was on the defining characteristics of instructional differentiation.

Definitions of instructional differentiation

Norwich (1994) discussed different conceptions of instructional differentiation based on the aspects of the instructional environment they focused on: for example, differentiation as the adaptations of curricula objectives versus differentiation as a grouping strategy without the adaptation of objectives. However, the educational literature includes a variety of definitions of instructional differentiation. As an illustration of this variety, Mills et al. (2014, 334) observed:

> Differentiation can also occur at a class level and this can involve splitting the class into small groups, giving individual learning activities, or modifying curriculum materials based on perceived ability. Yet differentiation can also entail a recognition of the different knowledge that various students bring to the classroom, their differing skills, and their diverse interests and circumstances, and responding in ways that value these differences and use them to engage students in the work of the classroom.

The first conception here focuses on instructional varieties among students with different abilities and on teachers' actions. The second takes several broad learner characteristics into account and includes considerations and values underlying

teachers' actions. Thus, these conceptions appear to differ in the scope of learner characteristics that are taken into account. There is contrast, too, in terms of whether differentiation is an instructional action of creating a variety in instructional features or whether it also reflects specific beliefs underlying such an action.

How broad instructional differentiation is perceived also varies between studies. For example, in the work of Maeng and Bell (2015, 2067) the framework of Tomlinson and Allen (2008) is used. Instructional differentiation is portrayed as a practice that ensures 'meaningful learning experiences that allow for interactions with other people and the physical environment'; 'a high-quality curriculum that is focused, engaging, demanding and scaffolded'; and 'formative and ongoing assessments and student monitoring'. In other studies, some of these practices (for example, formative and ongoing assessment and student monitoring), do not appear to be regarded as inherent to the construct. Rather, they are variously regarded as: quality characteristics (Smets 2017); hallmarks of effective (Cassady et al. 2004; Tomlinson et al. 2003); or authentic (Heacox 2018) differentiation; or as different but strongly related teaching strategies (Roy, Guay, and Valois 2013). This suggests differences in the scope of the instructional actions that are included in different understandings and conceptualisations of instructional differentiation.

Such varying and broad descriptions all have value, including as approaches to envision desirable practices. However, the breadth of conceptualisations makes the empirical study of the defining characteristics of instructional differentiation challenging, especially when they present not only the defining criteria but also accompanying characteristics. A clear conceptual definition of instructional differentiation and its defining characteristics is certainly a helpful tool for consistent empirical research. In an attempt to arrive at a clear definition that is stipulative and descriptive, we undertook a study of up-to-date definitions and understandings of instructional differentiation. Scholars have already described the different interpretations of instructional differentiation in the educational science literature (Norwich 1994; Mills et al. 2014; Suprayogi, Valcke, and Godwin 2017). We sought to build on their underpinning work by reflecting on and identifying what appeared to be connected elements amongst the various definitions of instructional differentiation.

Defining elements of instructional differentiation

In recent times, the definition in Tomlinson et al. (2003) has become a point of departure in many empirical studies (e.g. de Graaf, Westbroek, and Janssen 2018; Maeng and Bell 2015; Wan 2017) and theoretical papers (e.g. Prud'homme et al. 2006; Smets & Struyven 2018; Subban 2006). This definition conceptualises instructional differentiation as:

> an approach to teaching in which teachers proactively modify curricula, teaching methods, resources, learning activities, and student products to address the diverse needs of individual students and small groups of students to maximizes the learning opportunity for each student in a classroom. Tomlinson et al. (2003, 121).

More recently, Suprayogi et al. (2017) integrated several definitions of instructional differentiation by focusing on the dimensions that they found were shared by many authors. They came to the following definition:

> Differentiation is an instructional approach that accommodates the diversity of students by 1) coping with student diversity, 2) adopting specific teaching strategies, 3) invoking a variety in learning activities, 4) monitoring individual student needs, and 5) pursuing optimal learning outcomes. Suprayogi et al. (2017, 292).

Common to these definitions is the sense that instructional differentiation is practised with within-lesson variations of instructional aspects. These variations can occur in any aspect of an instructional environment (e.g. goals, content, learning activities, teaching strategies, resources and materials, grouping, learning time, and assessments). However, not all instructional variations are forms of instructional differentiation: they need to meet certain criteria to be classified as such. Below, we elaborate on two criteria that variations should satisfy in order to be counted as instructional differentiation. The first criterion is that a variation is *deliberate*: in other words, intentionally designed to address student diversity. The second criterion is that a variation is *adaptive*: in other words, the variation is not only designed to match students' learning characteristics, but actually does so. In the paragraphs below, we explore these two criteria in greater detail.

Instructional differentiation has been classified as a learner-centred instructional theory, emphasising that learner characteristics are central in the decision-making process underlying practices (Reigeluth and Carr-Chellman 2012). A crucial element in many conceptualisations is that instructional variations between students are created to match their learning characteristics or needs (Corno 2008; Smets and Struyven 2018). Instructional differentiation is portrayed as a conscious and intentional way of engaging with student diversity by varying instructional methods.

Other terms that connote this characteristic of deliberateness are 'thoughtful' (Hoffman and Duffy 2016, 173); 'proactive' (Tomlinson et al. 2003, 131); and 'planned'

(Faber, Glas, and Visscher 2017, 45). Moreover, in many articles, instructional differentiation is conceptualised as a rational and data-informed decision-making process. From this perspective, instructional differentiation is seen as a planned cycle of: (1) diagnosing individual students' learning needs; (2) mapping and selecting alternatives regarding the lesson planning; (3) adjusting teaching methods or strategies; and (4) monitoring students' understanding and further need of support (Brimijoin, Marquisse, and Tomlinson et al. 2003; Brühwiler and Blatchford 2011; Faber et al. 2017; Prast, et al. 2015; Roy et al. 2013). This process should start with a reliable and valid assessment of relevant learner characteristics, after which teachers proactively adapt their instruction (Brimijoin et al. 2003; Moon 2005; Rock, Gregg, Ellis, and Gable 2008). Instructional differentiation is understood as a teaching practice in which variations in presenting the material are deliberately designed to address specific learner characteristics.

As well as being deliberately designed, instructional differentiation is also understood as realising a match between a student's learning characteristics and instructional features. The more the instructional setup of a lesson adapts to the learning characteristics of individual students, the more opportunities for learning are provided, and the more such practices benefit acquisition of the material (Banks et al. 2005; Corno 2008; Nicolae 2014). Theoretically, instructional differentiation leads to lessons that are adaptive: that is, the instruction matches the abilities, interests, and learning profiles of all students. Such a match should, then, pave the way towards lessons in which all students receive instruction and assignments that are challenging, interesting, and relevant (Corno 2008; Tomlinson et al. 2003).

Many definitions or descriptions of instructional differentiation incorporate their effects on student learning. For example, in the widely-used definition of Tomlinson et al. (2003, 121), the desired effects are to 'maximize the learning opportunity of each student in a class'. Definitions of instructional differentiation often include positive student outcomes: i.e. regarded as a quality indicator of teachers or lessons (van de Grift 2014; Wan 2017). Therefore, instructional differentiation is frequently conceptualised as a practice that positively affects student learning and thus reflects a desirable teaching practice (Mills et al. 2014; Nicolae 2014; Schleiger 2016; van de Grift 2014; Wan 2017).

An accurate assessment of students' learning needs or learner characteristics is an important step or skill in adaptive instructional differentiation (Tomlinson et al. 2003; Vogt and Rogalla 2009). Inaccurate assessments have been argued to cause ineffective (not truly adaptive) instructional differentiation (Faber et al. 2017). For example, if

teachers do not know their students well, their instructional differentiation may not match their students' learning characteristics (Faber et al. 2017; van Geel et al. 2018). Adaptivity refers to the idea that, if teachers differentiate between students, their instructional activities will match their learning characteristics, which should have a positive effect on their students' learning.

Conceptually, then, research suggests that instructional differentiation refers to instructional variations across students within a lesson that are both deliberate and adaptive. These two criteria underlie current understandings. They also seem helpful as a way of distinguishing instructional differentiation from practices that, on the face of it, seem similar: not all instances of instructional variations are deliberate or adaptive. Interestingly, studies have identified instructional variations across students of which teachers were not aware – and thus did not practice deliberately (Denessen and Douglas, 2015; Consuegra, Engels, and Willegems 2016; Good and Brophy 1974;). Teachers have, for example, been observed unconsciously to provide unequal amounts of feedback to students (Consuegra, et al. 2016; Good and Brophy 1974; Rubie-Davies 2007). In addition, studies have shown that teachers' intentions of being adaptive with instructional variations are not necessarily realized (Faber et al. 2017). Variations in difficulty levels of assignments, or amount and type of feedback, might be intended to be adaptive but may not actually be so - for example, when the diagnosis of students' needs is incorrect. In such cases, these variations cannot be considered instructional differentiation, since they do not meet the criteria of deliberateness and adaptiveness.

5.3 Investigating the operationalisation of instructional differentiation

The extent to which instructional variations in the classroom are deliberate and adaptative has important implications for the research instruments and approaches used in empirical studies to capture this concept. Before discussing these implications, we first explore various ways that instructional differentiation has been operationalised in empirical research by discussing several instruments. There is wide variety in terms of how instructional differentiation is studied: for example, by analysing teachers' lessons planning (Faber et al. 2017), observing lessons (Van de Grift et al. 2014), interviewing teachers (Van Geel et al. 2018), issuing teacher questionnaires (Smit and Humpert 2012), and student questionnaires (Vaughn et al. 1995). Some studies combine several of such measures (Eysink, Hulsbeek and Gijlers 2017; Faber et al. 20147; Maeng and Bell 2015). Additionally, more research is needed

on the reliability and validity of instruments. As a result, there appears to be a lack of agreed-upon standard instruments for studying instructional differentiation (Smale-Jacobse et al. 2019; Smets and Struyven 2018).

To explore and reflect on how instructional differentiation is operationalised, this paper will provide illustrations of how instructional differentiation is captured. We focus on two research methods that are currently employed to capture instructional differentiation: lesson observations and teacher self-reports. These methods will be illustrated by several instruments and the practices they investigate. We describe instruments that are fully disclosed in peer-reviewed journal articles (Cassady et al. 2004; Maulana, Helms-Lorenz, and van de Grift 2014; Pereira et al. 2019; Prast et al. 2015; Roy et al. 2013; van de Grift, Helms-Lorenz, and Maulana 2014; Van Tassel-Baska, Quek, & Feng 2006). Our discussion reflects the value of these instruments and the body of research literature dedicated to exploring the important and challenging area of instructional differentiation: it is not our intention to displace these instruments or suggest that previous research is limited. Rather, it is our hope that our inquiry can help to build upon previous studies by using them as input to better understand ways of capturing the complex concept of instructional differentiation in practice. In the paragraphs that follow, we focus attention on research methods and instruments used to study instructional differentiation, including classroom observation methods and teacher reports.

Classroom observation

The Classroom Observation Scale-Revisited (COS-R; Van Tassel-Baska et al. 2006) and the Differentiated Classroom Observation Scale (DCOS; Cassady et al. 2004) have been specifically developed to study instructional differentiation in terms of gifted students in primary education. The COS-R was designed to observe whether teachers implemented five dimensions of instructional differentiation essential for gifted students: i.e. (1) accommodations for individual differences, (2) problem-solving, (3) critical thinking strategies, (4) creative thinking strategies, and (5) research strategies. The DCOS combines lesson observations with a pre-lesson interview. The pre-lesson interview considers the general set-up of the lesson (e.g. who developed the lesson and whether it was tiered). Next, the students in a class are identified as gifted or not gifted. For both groups, the observer rates five 5-minute lesson segments of one lesson. Ratings are given for the instructional activities applied (e.g. lecture, lecture with discussion, demonstration by teacher, student responding, questioning by teacher; student engagement, students' cognitive activity and the learning director (i.e. teacher directs all, teacher directs most, student and teacher share, student directs most, student directs all). At the end of the lesson, the observer

also gives a holistic description of instructional features. This description addresses how grouping occurred, whether there were differentiated practices, and how well the practices scored on several criteria, such as the degree to which the learning activities were student-directed and the instructional strategies and activities accounted for students' prior knowledge. This observation instrument focuses on instructional features of the lessons, as well as student engagement and cognition.

The International Comparative Analysis of Learning and Teaching (ICALT), developed by Van de Grift (2007; van de Grift et al. 2014), measures six components of teaching behaviour, one of which is 'adaptation of teaching', the term used to describe instructional differentiation (Van de Grift 2007, 134). The instrument was developed and tested for its reliability and validity in primary and secondary education (Maulana and Helms-Lorenz 2016; van de Grift et al. 2014). Instructional differentiation is measured with three items: (1) 'adapts instructions to relevant inter-learner differences', (2) 'offers weaker learners extra study and instruction time' and (3) 'adapts the assignments and processing to relevant inter-learner differences' (Van der Grift 2014, 303).

Teacher reports

Other studies (Pereira et al. 2019; Prast et al. 2015; Roy et al. 2013; Smit and Humpert 2012) have used teacher self-reports on their practices. In some studies (Pereira et al. 2019; Prast et al. 2015; Roy et al. 2013), structured questionnaires about differentiation practices are used. Other studies (e.g. Smit and Humpert 2012) have used a mixture of open questions and closed questions. There are several studies in which teachers are interviewed about their practices (Maeng and Bell 2015; Van Geel et al. 2018; Whitley et al. 2019). Three instruments have been developed to determine instructional differentiation based on teachers' self-assessments with reported psychometric properties (reliability and validity): the Differentiation Instruction Scale (DIS) by Roy and colleagues (2013); the Differentiation Self-Assessment Questionnaire (DSAQ) by Prast and colleagues (2015); and the Classroom Practices Survey (Archambault et al. 1993; study updating original instrument: Pereira et al. 2019). In Pereira et al. 2019, which is a validity study updating the original Classroom Practices Survey instrument, the authors concluded from their investigation that further research and possible modifications were necessary, because the results from their data study indicated that the recommended values for good model fit were not reached (Pereira et al. 2019, 443). For the DSAQ and the DIS, it was concluded they both reliably and validly captured instructional differentiation (Prast et al. 2015; Roy et al. 2013).

Both the DSAQ and the DIS were developed in the context of primary education. The DIS was developed with mathematics and French language teachers (in France). The DSAQ was developed solely for mathematics lessons (in the Netherlands). The instruments were intended to measure teachers' deliberate adaptations in response to their students' abilities and needs. All items include a teacher action to vary instructional features as well as the objective of the variation (e.g. 'adapt the level of abstraction . . . to the educational needs of the students' (Prast et al. 2015, 105) or 'plan different assignments . . . to match students' abilities' (Roy et al. 2013, 1195). The questionnaire by Roy et al. (2013) has eight items. Examples are 'Adjust the amount of work required in accordance with students' capabilities' (1195); 'Plan different assignments to match students' abilities' (1195); 'Vary the complexity of assignments to match students' abilities' (1195). The DSAQ (Prast et al. 2015) has five scales that relate to a five-step cycle of differentiation: (1) the identification of educational needs, (2) setting differentiated goals, 3) differentiate instruction, (4) differentiate practice, and (5) the evaluation of progress and process.

It is important to note that the instruments under discussion have been developed with different purposes and vary in the scope of practices they include. For example, the purpose of some instruments is to study instructional differentiation within a lesson (Van Tassel-Baska et al. 2006; Van der Grift 2014). Others examine the instructional differentiation that teachers use over a period of lessons (Roy et al. 2013), describe the type of instructional differentiation that is apparent (Cassady et al. 2004), or investigate the extent of instructional differentiation (Roy et al. 2013; van de Grift, et al. 2014). However, all instruments may be very broadly described as seeking to capture instructional differentiation and examine instructional variations, predominantly in response to differences in students' abilities. Instruments may differ, though, in the breadth of instructional aspects included: for example, variation in educational goals is included in the instrument of Prast and colleagues (2015), but not in the ICALT or the COS-R. Instruments may focus both on variations in teaching (e.g. instruction, lecture) as well as variations in student assignments: however, the specific variations included (e.g. variations in time, abstraction level, complexity, required critical thinking skills) vary greatly between instruments. The scope of instructional variations that these instruments address thus varies, which of course is not, in itself, problematic. However, it does draw attention to the importance of alignment between the practices included in an instrument on the one hand, and the definitions and understandings of the concept on the other. Hence, in the following section of this paper, we explore the challenges and opportunities associated with capturing instructional differentiation, with particular reference to this alignment.

5.4 Capturing instructional differentiation: challenges and opportunities

Our own empirical study resulted in a deeper reflection on the construct of instructional differentiation and the complex question of how to study it empirically. In the sections below, we use translated, anonymised illustrative examples from this research to illuminate our discussion and reflection, which is further contextualised with reference to the literature. During the school year 2016–2017, we studied the instructional differentiation practices of seven secondary school teachers in the Netherlands. These teachers participated in a larger research project on personalising education. This larger research project is described in Jager, et al. (2019)[1]. In this paper, we refer to data that were analysed to determine the type of instructional differentiation performed in three lessons per teacher during the school year. Teachers gave informed consent to use this data in research papers by the authors of this paper. Ethics approval was given by the ethics committee of Radboud Teachers Academy.

The theoretical starting point of the data collection was the framework of Tomlinson et al. (2003). To obtain a holistic understanding of the practices, we used multiple research methods (see Meijer, Verloop and Beijaard, 2002). That is, to determine instructional differentiation practices, we used classroom observations and teacher interviews. Classroom observations were performed using a protocol similar to that of Cassady et al. (2004) and van Tassel-Baska et al. (2006). The content of the observation scheme was adapted to fit the framework of Tomlinson et al. (2003). For each lesson, we determined whether variation across students was apparent in five instructional components: lesson content, process, products, student grouping, and student autonomy. After each lesson, the teacher was interviewed about their teaching decisions and their general beliefs that influenced these decisions prompted by a video recording of their lessons (van Tartwijk, et al. 2009). Teachers were stimulated to recall thoughts or decisions regarding the adaptations of instructional activities to an individual student or subgroup of students during the lesson.

Thus far in this paper, we have identified the defining elements of instructional differentiation as being *deliberate* and *adaptive*. The methods used to study instructional differentiation, in particular, observations and teacher reports, have also been explored. Our own study allowed us to reflect upon what we determined to be a crucial question: the extent to which classroom observations and teacher reports can capture the deliberateness and adaptiveness of instructional variations. In the paragraphs below, we focus on two main challenges that emerged: (1) not all

1 The data used in this current paper are different from the data used in Jager et al. (2019).

observed variations are deliberate, and (2) not all deliberate instructional variations are adaptive. We then follow up by discussing the opportunities for researchers that are presented by these challenges.

Challenges for research on instructional differentiation

Challenge (1) Not all observed variations are deliberate: As noted above, instructional differentiation involves considerably more than the notion of variations in instruction features across students. The conceptualisation of instructional differentiation as *deliberate* seems to be incorporated into research methods that use teachers' self-reports about whether, when, and how they differentiate. In these self-reports, the instructional variations that teachers design are accompanied by specific objectives. An example is the following item from the DIS (Roy et al. 2016, 1195) 'Plan different assignments to match students' abilities'. However, a general limitation to the use of self-report in any field is that those reporting may indicate practices they do not perform (Perreira 2019;Prast et al. 2015; Roy et al. 2013). The researchers therefore suggested that teachers' self-assessments should be combined with classroom observations. In the observation instruments that were discussed, the deliberate, purposeful characteristic of instructional differentiation is also apparent: for example, 'provided opportunities for independent or group learning *to promote depth in understanding content* [italics added]'(VanTassel-Baska 2012, 45) or 'Adjusts instructions *to relevant inter-learner differences* [italics added]' (van de Grift 2014, 303). It is, though, uncertain as to how observers can consistently determine whether variations are indeed based on these considerations, because teachers' intentions and considerations are usually not explicitly addressed while teaching (Loughran, 2015).

Our empirical study suggested that not all observed instructional variations could be regarded as differentiated instruction, as variation did not always appear to arise from deliberate intentions to address differences between students. For example, in one lesson, instructional differentiation was determined based on the observation that students worked in groups of three to four with different materials. In the interview, the teacher commented on the following: 'When we (the students and teacher) entered the classroom, the tables were like this in groups. It was such a fuss to let the students rearrange themselves into their normal position that I just let them stay like this'; and 'I first needed to organise my stuff, so I let them work for themselves for a moment'.This highlights that, although there were instructional variations across students, in this instance the teacher's objective was not to adapt instruction to relevant student differences. Another interesting illustration relates to a lesson by an English language teacher. During the entire lesson, the teacher

had the students working in small groups, each exploring a different topic. These instructional variations were proactively planned and well organised. However, during the post-observation interview, the teacher explained that, in the next lesson, the topics would be rotated between the groups so that, at the end of the lesson sequence, all students had worked on the same content. Therefore, although students worked on different assignments and topics in the observed lesson, the teacher did not express considerations for relevant differences between students that she aimed to address. All in all, this draws attention to the importance of systematically studying teachers' objectives, and considerations pertaining these variations, in order to properly identify instructional differentiation.

Challenge (2) Not all deliberate instructional variations are adaptive: As discussed above, in order to shed light on instructional differentiation, the adaptivity of instructional variations must be determined. The need to study, empirically, the adaptivity of instructional differentiation has been discussed elsewhere (Faber et al. 2017; van Geel et al. 2018). Many scholars observe that instructional differentiation realises a match between students' learning characteristics and the instructional context (Corno 2008; Maeng and Bell 2018; Tomlinson et al. 2003; Valiandes 2015). The imperative for further exploration in this important area has been raised in other articles (Faber et al. 2017; Smets and Struyven 2018; van Geel et al. 2018). Although the ICALT (Van der Grift et al. 2014) and the DCOS (Cassady et al. 2004) observe student engagement, there is a need to further understand how such observations can be used to determine instructional differentiation or the adaptivity of the instructional variations that are observed. Van Geel and colleagues (2018) concluded that, in many observation instruments and teacher-report instruments, items assessing the match between students' needs and instructional variations are often limited, and when they are present it is unclear how observers or teachers would be able to evaluate this match.

When instruments only focus on what teachers aim for, it appears to be assumed that teachers' objectives and students' activities are complementary. That is, if a teacher gives different instructions to different students with an intent to be adaptive (for example, to students' interests), it seems to be assumed that, in line with the objectives of the teacher, students' interest is indeed positively influenced. However, the association between teaching and learning is extremely dynamic and complex (Loughran 2015; Smets & Struyven 2018). If a teacher designs several instructional activities with the goal of challenging all students, it does not necessarily mean that all students are indeed challenged by these activities. To determine whether instructional variations are adaptive, it is thus crucial to examine how the instructional variations affect student thinking, behaviour and learning how they interact.

It has been suggested that, in order to establish the adaptivity of instructions, researchers could study the interaction between teachers' instructional strategies and students' learning, pre-assessing learner characteristics and monitoring student progress (Smets and Struyven 2018). Another suggestion was to establish the adaptivity by interviewing students after lessons, to determine to what extent they experienced a match (Faber et al. 2017). On the one hand, it seems that the adaptivity of instructional differentiation could be determined by studying student learning outcomes or engagement. In other words, if instructional variations do not lead to increased student engagement or learning outcomes, it could be inferred that the match between students' learning needs and instructional context was not realised. On the other hand, the adaptivity of instructional differentiation could be determined by studying whether students, teachers or researchers, perceive a match themselves. However, it remains unclear how best to establish this dimension.

The need to include the perspective of the student in determining the adaptivity of teachers' instructional variations was also apparent in our study. The context of a maths lesson provides an apt illustrative example in this regard. In this lesson, the teacher instructed the students to rearrange themselves into three ability groups so that students could both (1) work on assignments that matched their own abilities and (2) receive teacher support matched to those abilities. However, while students rearranged themselves into subgroups, some were noted by other students to be in the 'wrong' group. This might indicate that those students either saw their ability differently from their peers, or deliberately choose a group that did not reflect their (self-perceived) abilities. During the interview, this teacher commented that one of the 'more motivated and high ability' students chose the intermediate exercise - as did a student whom the teacher described as 'in need of most help'. Further, some students in this lesson commented that they were struggling with the 'easier' exercises and experienced the more difficult ones as easier. Thus, it became unclear as to whether the assignments and teacher support accurately matched student understanding (and therefore helped students to progress in their grasp of the material). Interestingly, some students in this lesson did not seem to experience the adaptivity intended by the teacher, nor did all students respond to the instructional variety as intended by the teacher. This underscores how, in studying the adaptivity of instructional variations and identifying instructional differentiation, it is of crucial importance to study the student perspective.

Opportunities for research on instructional differentiation

For our own empirical studies, we learned two important lessons about studying these elements, and also identified opportunities for future research that arise from these lessons.

Lesson (1) To determine instructional differentiation, observed instructional variations should be systematically connected with teachers' objectives for these practices: To determine the deliberateness of teachers' actions, it is necessary to understand the thinking that underlies the practice. One way of approaching this might be to connect the observed variations of teaching behaviour with teachers' own accounts of their objectives underlying their behaviour. This is important, not least because sometimes teachers' deliberate variations can be easily overlooked. Teachers can vary several instructional features in their lessons in several different ways. Although, in theory, variations in instructional features can be observed, we have discussed how in practice this can be very challenging. For example, teachers may deliberately adjust minor details of their instruction; such subtleties may not always be detected. Not all instructional variations that can be observed are deliberate (and, thus, validly considered as instructional differentiation). To determine instructional differentiation, we suggest that classroom observations should be systematically related to teachers' objectives underlying their pedagogical practices.On the one hand, without being aware of teachers' objectives underlying the variations within their lessons, some of such approaches could appear deliberate despite the fact that they are not. On the other hand, some deliberate variations may be overlooked because instructional differentiation could be apparent in many different aspects of a lesson, without identifying which aspect teachers deliberately designed to be adaptive. It thus is important to study teachers' objectives regarding their instructional variations.

Lesson (2) To determine instructional differentiation, the adaptivity of instructional variations should be studied by including the perspective of students: In this paper, we have highlighted potential ways to study the adaptivity of instructional variations. This can be approached, for example, by studying student engagement and student outcomes or by studying whether students, teachers, or researchers perceive instructional variations to be adaptive. From our own empirical study, we learned that it is crucially important to include students in determining the extent to which instructional differentiation is adaptive, as their verbal reactions during lessons may well contradict teachers' adaptive intentions. The relevance of students' perspectives with regards to the adaptivity of instructional differentiation has been highlighted by others (Babad 1993, 1996; Maulana and Helms-Lorenz 2016; Vaughn, Schumm, Klinger, and Saumell 1995; Vaughn, Schumm, Niarhos, and Daugherty 1993). In addition, several studies (Kyriakides, Creemers, and Antoniou 2009; Maulana and Helms-Lorenz 2016) suggest that students' perceptions of their teachers' behaviours can be more predictive of students' academic engagement and achievement than observations of teacher behaviours by teachers or external observers. Researchers should carefully consider what to ask students, what can be expected from their

articulation of experiences, and how best to involve students (Hotam and Hadar 2013; Messiou et al. 2016; Vaughn et al. 2013). Overall, our investigations point to the many opportunities for further research in this important area of educational research inquiry. The extent to which observers, researchers, teachers or students can assess the adaptivity of instructional variations, and what kind of data are needed to accurately determine the adaptivity need further exploration.

5.5 Conclusion

The construct of instructional differentiation is widely employed by researchers, teachers, educators, and schools. In much educational policy, it is considered to be a valuable and desirable practice to implement. However, it is also a complex and challenging practice. The complexity of instructional differentiation for teachers, and the demands it makes of teachers in terms of knowledge, skills, and attitudes, is increasingly recognised. It is important to acknowledge that teachers may not always have the time, skills, and opportunities to make deliberate decisions and to be adaptive (Tomlinson et al. 2003; Van Geel et al. 2018) and that professional development opportunities are required to enable and support teachers to gain confidence and embed practice. It can be a challenge for teachers to know all students and provide them with adaptive instructional variations (Parsons et al. 2017). The adaptivity of instructional differentiation to students can be difficult to assess, because many other factors affect adaptiveness.

There is growing attention to the challenging nature of studying instructional differentiation for researchers. The need for research to be clear about what instructional differentiation is, and the need to choose appropriate operationalisations in research is discussed by several authors (e.g. Smets and Struyven 2018; Van Geel et al. 2018; Smale-Jacobsen et al. 2019). We have argued in this paper that aligning the definitions and operationalisations of instructional differentiation in research calls for further investigations using methodologies that include multiple perspectives, including teachers, students, and researchers. Deeper exploration of the differences among the perspectives of teachers, researchers, and students regarding the deliberateness and adaptivity of instructional variations is needed to better understand the complex construct of instructional differentiation and to inform related empirical research. By discussing the notions of *deliberateness* and *adaptiveness* as defining characteristics of instructional differentiation, and by addressing the implications of this for operationalisations, instruments, and methods, we offer a contribution to the development of research on the important topic of instructional differentiation.

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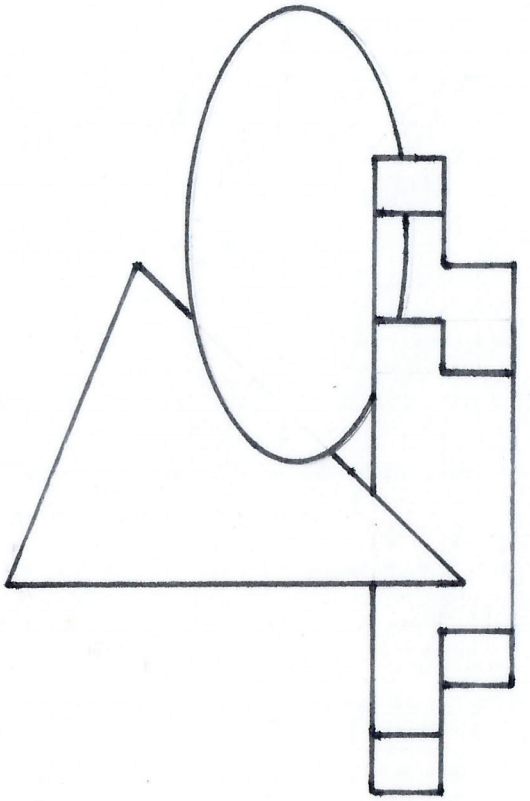

CHAPTER 6

General Discussion

6.1 Introduction

Making instructional adaptations to address variance in students' learner characteristics is widely accepted as a practice that teachers should strive for (Corno, 2008; Horowitz et al., 2005; Parsons et al., 2017; Tomlinson et al., 2003). In educational research, instructional adaptations are studied from different perspectives that all understand them as the result of different mechanisms, using different concepts and research methodologies to study them. These different perspectives lead to different, and sometimes contrasting, insights pertaining to how to understand and study such adaptations. To understand them from multiple perspectives, we explored an integrated approach, combining different perspectives to study how teachers, in their daily practice, come to create their instructional adaptations. We explored the cognitive work that underlies teachers' instructional adaptations in four studies. In this way, we aimed to achieve an integrated understanding of these adaptations. In this final chapter, I reflect on what these explorations taught us about understanding teachers' instructional adaptations.

The two central research questions were as follows:

1. What variations do teachers perceive in students' learner characteristics, and how can these perceptions be understood?
2. How do teachers take these perceptions of their students various learner characteristics into account in their instructional adaptations?

I begin this chapter by summarising the main findings of the four studies. I then synthesise these findings to answer the two central research questions, and then discuss what can be learned from the studies. Next, I look back and reflect on the research methodology we used and present some limitations of this dissertation. Finally, I present suggestions for future educational research and practice.

6.2 Findings of the studies

In Chapter 2, we discussed the knowledge and perceptions of seven teachers of one second-year class in secondary education. We did this by giving each teacher 60 seconds to disclose their knowledge and perceptions pertaining to each student using a profile photo of the student as a prompt. Teachers were asked to describe that student and what that student needed to reach valuable learning outcomes. On the basis of these descriptions, the variety between students' learner characteristics the teachers perceived were determined.

Overall, we found 23 characteristics, grouped into three broad categories, that teachers used to describe students. Teachers identified cognitive characteristics, such as abilities, achievements, and knowledge; noncognitive characteristics, such as psychosocial, emotional maturity, motivation, effort, or home environment; and characteristics related to the teacher–student relationship, such as affective evaluations and whether or not teachers felt that they knew a student.

These broad categories and 23 learner characteristics were not expressed by all teacher nor for all students. Teachers differed in the knowledge and perceptions they had of individual students. The characteristics they used differed between students, which suggests that teachers had an eye for the students' uniqueness. Teachers also differed from another in the characteristics that they used to describe their students. For example, some teachers spoke of students' well-being in school, while others did not. That teachers differed in the characteristics that were meaningful to them in understanding their students suggests that teachers' personal interpretative frames play a role in how students are perceived.

Based on the qualitative and quantitative analyses of the data, the results of this study suggest that teachers' knowledge and perceptions are interpersonal in nature. Some students were described quite similarly; multiple teachers described the same characteristics as pertaining these students. This finding, which was corroborated by calculations of intraclass correlations and teacher statements, indicates that students affect what the teachers knew and perceived about them. This in turn suggests that teachers' perceptions of differences between students may be better understood as being interpersonal in nature. Teachers' perceptions of students' learner characteristics are the result of personal interpretations as well as students' unique characteristics.

In Chapter 3, we discussed how we had studied the variety of teacher interpretations of students' low performance and further explored the intrapersonal nature of teachers' perceptions. By means of a questionnaire, we inquired about teachers' attributions of three of their low-performing students. We tried to stay close to teachers' daily work by asking them to provide their interpretations of the low performance of three students they actually taught. Before teachers were asked to explore the causes of a student's low performance, they were first asked to describe the student.

The teachers in this study predominantly used student-related attributions (e.g., ability, effort, attention, background) to account for the students' low achievement as opposed to teacher-related attributions (e.g., quality of the instruction, difficulty

of the lesson). However, there was within-teacher variance pertaining to student-controllable attributions such as attention, effort, and interest. Although teachers might perceive these factors as a cause of low achievement for some students, they did not attribute these factors to the low achievements of other low-performing students. Moreover, we found a relatively high consistency of the attribution of factors such as 'quality of instruction' and 'difficulty of the lesson', indicating that teachers perceive these causes more consistently for all their low-achieving students. It suggests that some teachers are more inclined to use those attributions as explanations for student performance than others. However, given the low average scores on these factors, teachers were not very likely to attribute student performance to these 'teacher-related factors'. The findings of this study suggest that the nature of teacher attributions is not only personal but also is influenced by interpersonal processes. Teachers do not have the same attribution style for all (low-performing) students.

In Chapter 4, we examined the reasoning underlying teachers' instructional adaptations. We studied these adaptations and the underlying reasoning of seven secondary school teachers in regard to one lesson. In this lesson, they aimed to adapt their teaching to students' various learner characteristics. We observed this lesson, and afterward interviewed teachers about their instructional adaptations and inquired about the reasons why they had used these adaptations. We used instrumental case analysis wherein teachers' instructional adaptations were seen as a case. From the seven lessons, 11 different cases were delineated.

The findings showed that there was a wide variety of instructional adaptations and student learner characteristics that were included in these cases. Many of the cases consisted of multiple instructional adaptations in response to several student learner characteristics. Multiple instructional adaptations were driven by multiple purposes, such as increasing students' learning outcomes, motivation, and self-awareness and ensuring a safe and productive learning environment and equal learning opportunities. Moreover, several teacher-related reasons for instructional adaptations were found, such as their abilities, personality, and professional vision, as well as situational reasons, such as the particular topic central to the lesson, specific classroom and student characteristics, and contextual school organisation factors.

The findings suggested that instructional adaptations in teachers' daily practice are multifaceted. Teachers adapt multiple instructional elements simultaneously in response to several student learner characteristics in the context of a variety of educational purposes. To gain insight into this multidimensionality, the inquiry

into teachers' descriptions of their adaptations during the interviews, as well as the reasoning underlying their adaptations, were of vital importance. This information was valuable for understanding how specific elements were adapted as well as the students' learning characteristics to which they were adapted. This study suggests that these teachers did not 'implement' instructional adaptations. Rather that they make choices about what to adapt, and for whom, in light of multiple purposes, and based on their perceptions of their students, the specific subject matter, their selves, and the specific context in which they teach.

In Chapter 5 we present a conceptual study in which several definitions and operationalisations of instructional differentiation were discussed, followed by a reflection on the implications for research methods in the study of instructional differentiation. In this chapter, we argued that the research field pertaining to instructional differentiation is messy because of the lack of congruency between conceptualisations and operationalisations of instructional differentiation. This lack of congruency obscures the relation between research findings and the practices that these findings reflect. In the chapter, we argue that a practice in which different students are taught differently are labelled *instructional differentiation* when two stipulative criteria are in place: (1) *deliberateness* and(2) *adaptiveness*. The criterion of deliberateness stipulates that instructional variations should be intentionally designed to address diversity in students' learner characteristics, and the criterion of adaptiveness reflects the fact that adaptations are not only designed to match students' learner characteristics but actually do so.

Using theoretical arguments and illustrations from an empirical study, we illustrate that, to study whether instructional adaptations meet these two criteria, it is important to take into account the perspective of both the teachers and the students. We warn against the single use of observations or interviews as a research method to study instructional differentiation. In this chapter, we call attention to the complexity of instructional differentiation, not only for teachers but—being the focus of the analysis of this chapter—for researchers who attempt to study this complex construct.

6.3 Conclusions and discussion of the findings

In the sections that follow, I synthesise and discuss the findings from the studies to answer the two central research questions: (1) which variations in students' learner characteristics do teachers perceive, and how can these perceptions be understood,

and (2) how do teachers take into account these perceptions of their students' various learner characteristics when making their instructional adaptations? I discuss these findings in light of this dissertation's objective to contribute to an integrated understanding of teachers' instructional adaptions in their daily practice by making visible the cognitive work of teachers underlying these adaptations.

6.3.1 The interpersonal nature of teacher perceptions of their students' learner characteristics

A focal point in educational research is which student characteristics are, or ought to be, taken into account by teachers when making instructional adaptations. In chapter 1, we portrayed a debate between, on the one hand, a perspective stressing that student variance can be understood as an objective entity and be determined outside daily classroom practice and, on the other hand, a perspective emphasizing that these variations are subjective in nature and need to be understood in the context of daily classroom interactions. The studies described in this dissertation focused on teachers' perceptions of their students' diversity and tried to study variations among students through the lens of teacher perceptions. Earlier studies that have shed light on teacher perceptions have pointed to differences between teachers in regard to student characteristics that they perceive and take into account (Blease, 1995; Kagan & Tippins, 1991). These studies suggested that differences between students are subjective and characterise teachers more than they characterise students. However, we found nuances in this view that suggest otherwise.

In the first three studies discussed in this dissertation we examined teachers' perceptions of their students' learner characteristics in their daily practice. We did this using a mixture of methods, from highly structured (Chapter 2) to open interviews (Chapter 4) and a questionnaire (Chapter 3), using both qualitative and quantitative data analysis techniques. The findings presented in Chapters 2, 3, and 4 show that teachers perceive a broad range of student learner characteristics, including several cognitive, social–emotional, and background characteristics. For these teachers, students differed from one another in various ways, and the variations in students' learner characteristics are multifaceted. Moreover, the specific characteristics addressed within these broader domains proved to be varied, and further analyses revealed that these variations could be explained both from between-teacher differences as well as within-teacher and between-student differences.

Teachers differ from one another in the range of learner characteristic they use to describe their students. As shown in Chapter 2, even regarding the same class of students there is a variety in the student characteristics teachers perceive. Although

this might not be surprising given the generally low consensus in person perception (Kenny, 2004), it suggests that how a student is perceived, and the variations teachers see, is teacher dependent. Studying these differences in teachers' perceptions requires that one makes their subjective perceptive frameworks visible. The studies described in this dissertation, however, also shed light on within-teacher, between-student variations.

We found that teachers ascribe different characteristics as more relevant for some students than for others. For example, in Chapter 2 we found that, although some teachers are more inclined to describe differences in socio-emotional learner characteristics, they did not do this for all their students. The main finding from the studies discussed in Chapters 2 and 3 indicate that, for teachers, salient learner characteristics differ according to the student. Students may, for example, differ from each other in terms of their knowledge and skills; however, not for all students particular cognitive characteristics were described by teachers as a salient characteristic in the context of their instructional adaptations. This suggests that the nature of teachers' perceptions of their students has an interpersonal dimension; what is salient for one student may not be for another. Information of such an interpersonal nature refers not to a single person (the teacher or the student) but rather to multiple persons (the teacher and the student) embedded within a social context (Kenny et al., 2006, p. 1; Kenny, 2004). To understand how perceptions of students' learner characteristics affect teachers' instructional adaptations, it is necessary to make their perceptual frameworks visible and to do this pertain to individual students.

6.3.2 Teachers' instructional adaptations: a multifaceted practice

How teachers take into account their perceptions of their students' learner characteristic when creating their instructional adaptations was the focal point of Research Question 2. To define teachers' instructional adaptations, we built upon the broad definition of *adaptive instruction* posited by Reigeluth et al. (2009, p. 12) as *anything that is deliberately adapted to a variety of students' learner characteristics to facilitate student learning*. In Chapter 5, we discussed how empirically capturing these adaptations is challenging because the definition implies two stipulative criteria: (1) adaptations are deliberate in that they are intentionally designed to address the variety in students' learner characteristics and (2) not only are adaptations aimed to be adaptive but also this adaptivity is realised, that is, they facilitate student learning. We concluded that the study of whether adaptations meet these criteria requires complex research methods that involve classroom observations as well as inquiries into both the teachers' and the students' perspectives. Merely observing

classroom teaching to study instructional adaptations (as is done in many studies) does not seem to suffice. Not all observable adaptations are underpinned with deliberate intentions nor are all deliberate adaptations easily observable. Observing teachers or using teachers' self-reports to study instructional adaptations comes with the risk of under- or overestimating teachers' instructional adaptations.

In Chapter 4, using a combination of observations and interviews, we showed how teachers take into account diverse learner characteristics in their proactive deliberate instructional adaptations. In addition, we noted that teachers adapted multiple instructional elements in response to several student learner characteristics simultaneously. Although conceptual models as well as empirical studies have primarily focused on specific instructional adaptations in response to specific students' learner characteristics (cf. Smale-Jacobse et al., 2019; Tomlinson et al., 2003; van Geel et al., 2018), in teachers' daily practice these adaptations are multifaceted, pertaining both to students' learner characteristics and the instructional elements teachers adapted. The multifaceted nature of teachers' instructional adaptations was also present in the reasoning underlying their adaptations. Adaptations were targeted at several different educational purposes, including increasing students' self-awareness and ensuring a safe and productive learning environment.

In Chapter 5, we discussed how instructional adaptations are often conceptualised as deliberately designed to facilitate student learning outcomes and that, in many studies, these outcomes are operationalized as students' *cognitive* learning outcomes. The results presented in Chapter 4 emphasise that, for teachers, instructional adaptations may be intended to facilitate students' subject-related learning activities or cognitive achievements, but they are not limited to, nor only designed for, such outcomes. Although the effects of instructional adaptations (i.e., whether or not such adaptations have resulted in student learning) are often understood in terms of their contribution to cognitive outcomes (cf. Smale-Jacobse et al., 2019; van Geel et al., 2018), this view is limited given the multiple goals that potentially underlie these adaptations.

Teachers' instructional adaptions in their daily practice are part of a larger educational reality that involves multiple educational purposes as well as personal and situational characteristics that affect the students' learner characteristics that are taken into account as well as the instructional elements that are adapted. Insight into these purposes and personal and situational characteristics is necessary to understand why and how teachers take into account varrious students' learner characteristics.

6.3.3 Towards an integrated understanding: instructional adaptations as a pedagogical practice

Across the educational literature there is a consensus that instructional adaptations requires teachers to make decisions on what to adapt, to whom, when, and how (Brimijoin et al., 2003; Brinkworth & Gehlbach, 2015; Snow, 1997; Smets & Struyven, 2018). However, the way these decisions are portrayed, understood, and studied varies among different research perspectives. In Chapter 1, I described our integrative approach to the cognitive work that underlies teachers' instructional adaptations, including multiple research perspectives, such as *Instructional differentiation*, *differential teaching*, and *adaptive teaching*. This approach generated a deeper understanding of the complexity of instructional adaptations given that secondary school teachers' daily instructional adaptations are multifaceted and intrapersonal in nature. Instructional adaptations seem to be built on a continuous process of perceiving student variance and finding ways to be responsive to this variance given teachers' educational goals and situational characteristics.

For a better understanding of how instructional adaptions come about, it is important to understand why these have been designed, and this requires an understanding of teachers' reasoning. This reasoning shows how teachers' perceptions of student learner characteristics are translated into actions, the situational characteristics that affect these adaptations, and reveals the learning that teachers intended to facilitate. Teachers' instructional adaptations can therefore be best conceptualised as *a pedagogical practice*. The notion of pedagogical practice emphasises that teaching should be understood, and studied, by focusing on teachers' actions (what teachers do) in combination with the reasoning that underpins these actions (Cochran-Smith et al., 2016; Kelchtermans, 2009; Loughran, 2019). To understand how instructional adaptations come about and could be developed, research should focus on gaining a better understanding of the reasoning that underlies these actions. Capturing such adaptations requires a mixture of research methods that aims to integrate different perspectives, that is, observing classroom behaviour and interviewing teachers to support them in explicating their perceptions of student diversity, their instructional adaptations, and their underlying reasoning.

Additionally, the findings of this dissertation emphasize students are not only the object of teachers' instructional adaptations. They are also actors who influence these adaptations and whether adaptive teaching is realised. The assumption underlying instructional adaptations, and why educational scholars want teachers to be adaptive, is that the more teachers seek to match their instructional approach to the learner characteristics of an individual or a group of students, the more

meaningful opportunities for learning would be provided (Corno, 2008; Tomlinson et al, 2003; Valiandes, 2015). Chapter 4 sheds light on how and why instructional adaptations do not necessarily mean that teachers prescribe learners what to do but also include practices that give students an option to select learning activities that match their unique learner profile. In Chapter 5 we discussed that students made choices that (potentially) decreased the realised adaptivity within a lesson, for example, when 'bright students' chose the most easy assignments. Thus, the instructional adaptations that were actually realised during lessons were dependent on student choice. To understand the relation between instructional adaptations and student learning it is crucial to study instructional adaptations from the students' perspective and study how they interpret, and interact with, these adaptations.

Scholars who inquire into teaching as a pedagogical practice have portrayed the relation between teaching and learning as a two-way interaction. Teachers base their teaching actions on their interpretations and understanding of their students, and students interact with these actions on the basis of how they understand and interpret teachers' actions (Biesta, 2007; Hotam & Hadar, 2013; Loughran, 2013). If teaching is to have any effect on learning, it is because students interpret and try to make sense of what and how they are being taught (Biesta, 2007). To reach a more integrated understanding of instructional adaptations—how they come about, as well as how they affect student learning—I conclude that we need more research that can shed light both on teachers' instructional adaptations as well as on students' interpretations of, and interactions with, these adaptations.

6.3.4 Reflections on research methodology

In Chapter 1, I discussed the wide variety of operationalisations of instructional adaptations within the educational research field. The ambitions of this dissertation to (1) take a more integrative approach, (2) stay close to teachers' daily practice, and (3) focus on teachers' cognitive work imply that several appropriate research methods needed to be explored. *Appropriate* in the context of this dissertation meant that, in addition to regular quality standards for research, I aimed for methods with a high ecological validity, that supported teachers in explicating their cognitions, and provided the opportunity to explore and value differences between students and teachers. In this section, I critically reflect on the value of the methodological approach within this dissertation.

One of the goals underlying the research was to stay close to teachers' daily practice, and we therefore aimed for methods with a high ecological validity. The term *ecological validity* is often used in quantitative research to describe the artificial

situation created in research and how it may resemble or differ from real practice (Holleman et al., 2020). In the first studies of this dissertation we used a more quantitative approach to teacher differences and student variety. We attempted to increase ecological validity by questioning teachers about their own students. The data collection in the study described in chapter 2, in which we used the 60-seconds method, was done in a context wherein I worked with these teachers for a full year (September 2016–July 2017) and saw them interact with, and reason about, their students on multiple occasions. This helped in gaining more insight into their daily practice and how they perceived their students. The 60-seconds methods used in that study seemed to come close to teachers' daily practice because it produced results that did not seem different from my experiences with these teachers. Moreover, the data that were collected with this method were rich in that they made teacher perceptions of their students visible and provided opportunities to explore teachers' differences in the student variety they perceived. In light of the research ambitions, I highly value the 60-method.

In qualitative research, a strong relation with 'what real life is like' is portrayed as a feature of (well-collected) data because it focuses on naturally occurring events in natural settings (Miles et al., 2014, p. 11). During the year in which I worked closely with the teachers, they at times expressed that the instructional adaptions they organised in a specific lesson, would not have been implemented had I not been present. This indicates that, although we studied these teachers in daily practice, an artificial situation was created anyway. We used the data from these lessons to reflect on the methodological challenges encountered when capturing the concept of instructional adaptations. The data collected in these lessons were not used to form conclusions pertaining to the nature of these adaptations or to portray teacher reasoning and therefore did not affect the ecological validity of the findings. However the lessons we learned in this study were translated to a later study (described in Chapter 4), with other teachers, in which we emphasised that we wanted to study only lessons that would be adapted in similar vein even if the researcher were not present. This asked for a great amount of flexibility on the part of the researchers because lessons were rescheduled more often than not. The teachers in the Chapter 4 indicated that, in essence, the practices that were studied would have been present even had I not been there. For future research that aims to study teachers' daily practice, it seems important to check whether the practices studied do indeed reflect this practice.

Although the studies described in this dissertation can be valued because they stayed close to teachers' daily practice, such an ambition provides other challenges. One of the challenges that we encoutered was the tension between supporting teachers in

explicating their cognitions underlying their practice versus staying close to their daily practice, wherein such cognitions are normally not explicated. We started our research from the premise that teachers may be more or less unaware of their perceptions of their students and the cognitions and decisions that underlie their instructional adaptations. Processes and decisions that are not likely to be conciously experienced by teachers should not be assumed to be ready for direct report (Winkielman & Schooler, 2012). In addition, teaching does not often involve teachers explaining the thinking and reasoning that underlie their practice (Loughran, 2019; Meijer et al., 1999). Moreover, most teachers participating in this research were experienced teachers whose actions might be part of routines of which they gradually became less aware. Therefore, we used research methodology that involved cues and prompts, either pertaining their students (self-generated descriptions in Chapter 3, and profile pictures in Chapter 2) or their instructional adaptations (observational information of lessons in Chapter 4, video-stimulated recall in Chapter 5). In this way, we helped teachers (re)construct their work and gained insight into the complex cognitions that underlie their practice (Lyle, 2003; Nguyen et al., 2013). This approach led to rich accounts of teacher perceptions and their instructional adaptations. We realise that this might also have led to teachers explaining perceptions or reasons that might not have really affected their daily practice at the very moment this occurred. These cognitions or reasons may have been recalled in hindsight (Lyle, 2003). Studying teachers' reasoning or cognitions during practice—for example, using thinking-out-load methods when teachers prepare their lessons—may reveal other insights and can be used as part of data triangulation to gain insight into whether cognitions are representative of teachers' everyday lives.

6.4 Limitations of this dissertation and suggestions for future research

6.4.1 Limitations of this dissertation

In this dissertation, a variety of perspectives and research methods were used to gain insight into the cognitive work that underlies teachers' instructional adaptations. This mixed approach has been proven fruitful to gain insight into several complexities of teachers' instructional adaptations in their daily practice. The findings in this dissertation led to the suggestion that teachers' instructional adaptations can be understood as interpersonal and multifaceted. In this section, we reflect on some limitations of this dissertation, why the conclusions should be interpreted with caution. These limitations build on those of individual studies that are discussed in the limitation paragraph in each chapter and focus on the overall limitations of this dissertation.

First, the context in which these studies were performed was limited to teachers and students in the first years of secondary education in the Netherlands. The small number of participants and the specificity of the sample are important limitations to making conclusions about the nature of instructional adaptions and the cognitive work of teachers. Any conclusions need to be further explored in larger, and more diverse, samples, including teachers in different educational (and international) contexts.

Second, the studies discussed in the first two chapters focus on the exploration of teachers' knowledge and perceptions. We found that teachers had broad and varying perceptions of their students' learner characteristics; however, the way specific perceptions affected their teaching was not studied. There is a wide agreement that, in general, teachers' perceptions of students' learner characteristics affect their instructional practices (Nurmi, 2012; Wang & Hall, 2018). However, to gain insight into the effect of specific perceptions that were found in chapters 1 and 2, on teachers' instructional adaptations, it seems important to study when and how these learner characteristics actually influence those adaptions. This is also important if one aims to understand how teachers' perceptions of individual students' learner characteristics (that were studied in these first chapters) are translated into instructional decisions at the classroom level. Smets and Struyven (2018) stated that an understanding of teachers' instructional adaptations should involve an integrated exploration at the individual (student) and the collective (classroom) level. To better understand teachers' instructional adaptations it is important to study both how teachers perceive their students and when, how, and why these perceptions are taken into account in their instructional adaptations.

Third, in this dissertation we took a cognitive perspective when studying the work underlying teaching. But teachers' work is not only cognitive; their affect and emotions are also an integral part of their lives (Kelchtermans, 2009; Sutton & Wheatley, 2003). Studies of teachers' instructional adaptations have shown that their emotions may affect their perceptions of their students, for example, regarding the attributions they adopt as the most likely explanation for student performance and how this affects teachers' emotional responses and choices of teaching strategies (Georgiou et al., 2002; Poulou & Norwich, 2000). How teachers' perceptions are formed, and how such perceptions are translated into actions, cannot be understood by merely focusing on teachers' cognitions and might benefit from an explorations of the role of their emotions.

Fourth, teachers' perceptions might be understood as the outcome of a social cognitive process: 'the process by which people think about and make sense of people'

(Fiske, 1993, p. 151). Such perceptions are the results of multiple social psychological processes (Brinkworth & Gehlbach, 2015; Kenny, 2004). In this dissertation we focused only on teachers' explicit perceptions and adaptations, those cognitions of which teachers were (more or less) aware and were able to report. Several researchers, however, have pointed out that teachers' instructional adaptations are affected by implicit processes, such as specific biases (Brinkworth & Gehlbach, 2015; Consuegra et al., 2016) or implicit attitudes (Glock et al., 2013; Peterson et al., 2016). For example, people tend to perceive others in a way that makes them able to maintain positive perceptions of themselves (Brinkworth & Gehlbach, 2015; Fiske, 1993). This could explain, for example, why teachers in the study discussed in Chapter 3 did not seem inclined to attribute the failure of their low-performing students to teacher-based causes but were more likely to attribute these to students' learner characteristics. Other studies have indicated how gendered or cultural stereotypes may affect perceptions of students' learner characteristics (Consuegra et al., 2016; Denessen et al., 2022; Peterson et al., 2016). Currently, several social–cognitive theories highlight that everyday life involves processes of which we are concious as well as processes of which we are unconsious (Winkielman & Schooler, 2012). This implies that an understanding of the way humans think and act requires one to study both processes (Glock & Kovacs, 2013; Strack & Deutsch, 2015). In the studies described in this dissertation we did not include such implicit processes and thus might have under- or overestimated the role of specific perceptions in instructional adaptations.

6.4.2 Suggestions for future research

The findings of the studies described in this dissertation suggest that teachers' perceptions of their students' learner characteristics are interpersonal in nature and that teachers' proactive instructional adaptations are multifaceted in nature and complex to study. These insights have led me to conclude that teachers' instructional adaptations can best be understood and studied as a pedagogical practice, that is, as a combination of instructional actions and teachers' underlying reasoning. To gain insight into the reasoning that underlies teacher' adaptations, we concluded that it is necessary to use research methods that support teachers in explicating this reasoning. Determining instructional adaptations that are present during lessons calls for a combination of research methods that include observations and teacher interviews as well as an exploration of students' perspectives. On the basis of these conclusions, and taking into account the limitations, we propose two lines of inquiry for future educational research. The first line of inquiry aims to provide more insight into teachers' perceptions of their students' learner characteristics and how these are translated into instructional adaptations. The second line of inquiry aims to provide more insight into teachers' instructional adaptations as a pedagogical practice, that is, by focusing on

the integration of teachers' reasoning and the students' perspective to understand how teachers' instructional adaptations affect student learning and development.

Further explorations of teachers' perceptions of their students' learning characteristics
The insights into the reasoning underlying teachers' instructional adaptations showed that their instructional adaptations are not only responsive to the varying learner characteristics of their students. The learner characteristics that teachers are adaptive to, as well the adaptations made in response to these characteristics, are also influenced by situational and teacher factors as well as teachers' diverse educational purposes. The relationship between teachers' perceptions of their students' learner characteristics and their instructional adaptations is not straightforward. To better understand this relationship, as well as the various processes that may affect how these perceptions are formed and affect teachers' adaptations, further explorations are needed.

First, to gain insight into these perceptions, we suggest further exploring how teacher perceptions of their *individual* students are formed and develop over time. Given the intrapersonal nature of these perceptions future research might study these perceptions at the individual student level to account for within-teacher between-student variety. The 60-seconds method that we used in the study described in Chapter 2 seems a valuable approach. Using this method to shed light on teachers' perceptions could be a starting point to further explore these perceptions and changes in them over time. Moreover, using this technique in different contexts, for example, in schools with distinct educational visions, in the levels preparing students for vocational tracks or in (international) contexts with high levels or divers, social and cultural diversity, could provide insight into the role of contextual features in teachers' perceptions. In addition, to deepen insights into the social–cognitive mechanisms that play a role in teacher perceptions the 60-seconds method could be combined with explorations of how specific perceptions come about and affect teaching, for example, by combing the method with implicit measures of teacher perceptions.

In addition to using insights from social psychology to explore the diverse ways teachers' perceptions are formed, the 60-seconds method might also be an interesting starting point to further explore how teachers translate those perceptions into their instructional adaptations. Studies of this relation could for example explore teacher reasoning that attaches specific perceptions of students to instructional adaptations. Given the complexity of studying instructional adaptations, it might be interesting to first explore whether combining the 60-seconds method with teacher interviews in which the results of this method are discussed with the teacher in terms of when and

how these perceptions affect their teaching. This would provide insights into when specific learning characteristics are taken into account in their teaching.

Further explorations of teachers' instructional adaptations as a pedagogical practice
In this dissertation, teaching was conceptualised primarily as cognitive work of a teacher. By gaining insight into this, we strived to better understand instructional adaptations and how they come about. A better understanding of how teachers come to their instructional adaptations is important to better grasp the concept of these adaptations as well as to support teachers in the development of those adaptations so they can use them to create and realise valuable opportunities for learning. Research has revealed that adaptations can both enhance and hinder learning (Denessen, 2017; Mills et al., 2014; Rubie-Davies, 2007). Insight into the work of teachers may help us better understand the diverse ways by which their perceptions of students' learner characteristics affect their instructional adaptations and support teachers in providing adaptations that create classroom situations that enhance student learning and development. To support teachers in doing so, we argue that it is important to gain insight into their thinking that underlies instructional adaptations as well as how these adaptations affect student learning.

First, we suggest that future studies deepen what teachers perceive as relevant to adapt to, as well as what is adapted, and how this is affected by the various goals they consider important to strive for in their teaching as well as by situational characteristics. To gain more insight into how these goals and situational characteristics influence teachers' instructional adaptations, in-depth qualitative case studies seem fruitful. Complementing the study described in Chapter 4, wherein instructional practices were seen as a case, we suggest to include research design wherein a teacher is seen as a case. Such an approach permits one to study teacher reasoning with longitudinal design and follow teacher reasoning across different school years or levels. Such an in-depth study would offer the opportunity to study patterns in reasoning, for example, patterns in how situational characteristics or underlying purposes interact and affect teachers' instructional adaptations. In addition, some authors have highlighted specific dilemmas that underlie teachers' instructional adaptations (Bulterman-Bos, 2004; Norwich, 1994; Vijfeijken et al., 2021). In-depth studies that focus on exploring how teachers find ways to deal with these dilemmas and the way self-understanding and emotions affect how they engage in these dilemmas also could clarify this specific complexity of instructional adaptations.

Second, the findings of this dissertation point to the necessity of including the perspective of students to gain insights into how teachers' instructional adaptations

might affect learning. Students are not only the object of teachers' instructional adaptations; they are also actors who influence these adaptations and determine whether adaptive teaching is realised. It is crucial to study instructional adaptations from the students' perspective and focus on how they interact with these adaptations. The study presented in Chapter 5 emphasises that students are not passive recipients of their teachers' instructional adaptations. In Chapter 4 we showed that, consistent with Chapter 5, students are often not seen by their teachers as such. The instructional adaptations discussed in Chapter 4 showed that these teachers organised a variety of instructional adaptations from which students could choose. Thus, the adaptations that were actually realised were dependent on student choice. To understand the effects of instructional adaptations on student learning, student interactions with these adaptations should be a focal point of research.

Research that has studied students' interpretations of teachers' instructional adaptations, or teaching in general, have shown that such perceptions are diverse and may not always be consistent with teachers' intentions (Hotam & Hadar, 2013; Messiou et al., 2016; Vaughn et al., 1993, 1995). In-depth studies that explore students' interpretations of and responses to teachers' instructional adaptations can lead to a better understanding of how they affect student learning. Additionally, we suggest that research on how instructional adaptations affect student learning should take a broad perspective and include the multiple purposes teachers strive for in their instructional adaptations, for example, effects on the learning climate, social cohesion, and students' self-knowledge. Moreover, when teachers make instructional adaptations that are based on students' learning characteristics, students also receive (implicit) messages on who they are as learners and what they need. These messages can trigger self-fulfilling prophecy effects (Verhoeven et al., 2019). To support teachers and students in profiting from valuable opportunities for learning provided by instructional adaptations, a further understanding of these processes, the role students play, how they make choices, and how this might affect their cognitive as well as social–emotional and identity development, need further exploration.

6.5 Suggestions for practice: explicating and refining teacher thinking

On the basis of the findings in this dissertation, I present two suggestions for educational practice. Both suggestions focus on the cognitive work underlying teachers' instructional adaptations and aim to contribute to the development of the thinking that underlies these adaptations. In this dissertation I have concluded

that instructional adaptations should be understood as a multifaceted decision-making process that involves complex teacher reasoning, that is, reasoning that includes multiple educational purposes and several situational characteristics that need to be balanced. In each specific situation, teachers need to decide how to be adaptive to the students' varying learner characteristics. Teachers' decisions about what to do in particular situations are guided by their practical knowledge wherein both moral knowledge and knowledge about what works in specific situations are integrated (Gholami & Husu, 2010). To support teachers in accepting the complexity of instructional adaptations and finding ways to develop adaptations that fit the specific situations they encounter, well-developed practical knowledge pertaining how to be adaptive to students' learner characteristics thus is crucial.

Teachers develop this knowledge by explicating and critically reflecting on both their actions as well as the knowledge that informed these actions (Gholami & Husu, 2010; Loughran, 2019). This knowledge is accessible through the pedagogical reasoning that underpins their decision making, actions, and intentions. By explicating and reflecting on the reasoning that underlies their instructional adaptations, teachers can thus shape and build their knowledge of what works, for whom, and why (Kennedy, 2016; Loughran, 2019). Both suggested activities therefore aim to support teachers in explaining, discussing, and reflecting on the knowledge they use to create their adaptations and thereby offer the opportunity to develop their practical knowledge. To substantiate these suggestions it is, however, crucial to study how teachers' instructional adaptations practices (actions and their underlying reasoning) develop through these activities.

First, I suggest that teachers use the 60-seconds method from Chapter 2 to explicate their perceptions of their students. Awareness of the perceptive framework teachers have and inquiry into how these perceptions come about, as well as how they affect their teaching, has been shown to contribute to an awareness of (implicit) biases and can spur reflections on whether specific adaptations in relation to these perceptions are educationally valuable (Consuegra et al., 2016; Good & Brophy, 1974). These explications should be followed by reflections on how these perceptions have come about and how they affect their teaching. The 60-seconds method from Chapter 2 has been rewritten into a collaborative activity that supports teachers in becoming aware of their perceptual framework: how they come to these perceptions as well as effects on their teaching (cf. Klabbers et al., 2020).

Our second suggestion for teachers is to use the interview protocol described in Chapter 4 and with each other to explicate their instructional adaptations and the reasoning that underlies these adaptations. After this, they could further discuss the different purposes and the situational characteristics underlying their adaptations and the extent to which these are aligned in their adaptations. They also can discuss dilemmas they experience when reasons do not align and how they find a way to balance these. This activity may help teachers become more comfortable with the multifaceted nature of instructional adaptations and find a way to adapt their instruction to ask for continuous multifaceted, normative decisions.

However, for teachers do this—to become aware of, discuss, and critically reflect on what they are doing, and why—they need support to step out of the business of teaching. Education is still often an environment wherein teaching is seen as doing and teachers are not used to, or inclined to, 'unpack' their methods (Loughran, 2019). Therefore, all actors in educational practice and policy, such as teacher educators, government, and school leaders, should aim to help teachers regularly unpack their methods and techniques. This could start in teacher education, wherein future teachers learn the ways to, and the value of, explicating practical knowledge. This calls for pedagogies in which the explanation of knowledge with all those involved (student teachers, their mentors, and teacher educators) is central in teacher education (Kavanagh, 2020; Kennedy, 2016). In addition, I suggest that such pedagogies are not limited to teacher education and should be continued in their professional development, especially those programmes aiming to support them in their instructional adaptations.

6.6 Concluding thoughts

I would like to end this final chapter with a more personal reflection. The majority of implications discussed in the studies and in this final chapter pertain to how to further develop research that would lead to a better understanding of teachers' instructional adaptations, how they come about, and how these interact with student learning. One of the main results of conducting this PhD project is that I now better understand what still remains to be understood, and I have a clearer idea about what is required of researcher to gain such understandings. There is still so much to discover about teachers' instructional adaptations, and I aim, in the future, to discover this together with teachers and their students. Moreover, I will start these new research endeavours with the idea that what is required will probably be refined during the process.

One of the conclusions of this dissertation is that to better understand teachers' instructional adaptations, we need more, and more advanced, research. I therefore see, and would advise the reader to do the same, the content of this dissertation as the product of a reflective equilibrium: 'a temporary stage in the process of inquiry where initial doubt is resolved but also where new doubt is about to be generated' (Badley, 2003, p. 305). What I have learned most from this PhD project is that research is an endless continuing critical reflection. The past few years, the experienced reflective equilibriums, have been very temporary. I therefore would like to conclude this dissertation with the following statement: I hereby admit that, despite the stability pertaining to instructional adaptations I think I may have reached at this moment, it might actually be otherwise.

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Nederlandse samenvatting

Introductie

Leraren geven les aan klassen met leerlingen die onderling van elkaar verschillen. Leerlingen kunnen bijvoorbeeld van elkaar verschillen in hoeveel kennis ze al over een onderwerp dat wordt behandeld hebben, in wat hen interesseert en motiveert, in hoe ze opdrachten aanpakken, in waar ze vandaan komen, in waar ze heen willen en in nog veel meer. Van leraren wordt verwacht dat zij in hun onderwijs inspelen op verschillen tussen leerlingen door hun didactiek af te stemmen op deze verschillen. In dit proefschrift staat deze '*didactische afstemming*' centraal. Met didactische afstemming worden de aanpassingen bedoeld die leraren maken in hun onderwijs om het leren van leerlingen te faciliteren, waarbij zij inspelen op één of meerdere verschillen tussen leerlingen binnen een les of klas. Dat afstemmen kan de vorm krijgen van bijvoorbeeld extra uitdaging voor leerlingen die goed presteren of het aanbieden van verschillende lesstof om in te spelen op interesses of voorkennis van leerlingen. Algemeen wordt aangenomen dat didactische afstemming ertoe leidt dat het leren van leerlingen beter gefaciliteerd wordt en dat er gelijke leerkansen komen voor alle leerlingen.

Onderzoek in de context van het voortgezet onderwijs laat zien dat deze didactische afstemming daar weinig wordt geobserveerd en door leraren uitdagend wordt gevonden. Voor leraren is het blijkbaar moeilijk om die afstemming in de praktijk te realiseren. In de literatuur wordt deze afstemming ook beschouwd als een complexe docentvaardigheid. Zo blijkt didactische afstemming van leraren om specifieke bekwaamheden te vragen zoals het leren kennen van leerlingen én deze kennis vertalen in gevarieerde onderwijspraktijken. Daarnaast lijken basisbekwaamheden zoals het zorgdragen voor een positief leerklimaat én het kunnen geven van heldere instructies voorwaardelijk om tot didactische afstemming te komen.

Echter, minder duidelijk blijft hoe die afstemming in de dagelijkse praktijk van leraren in het voortgezet onderwijs ontstaat. Didactische afstemming wordt in onderzoek vaak gezien als een vaardigheid die door onderzoekers kan worden waargenomen. In de dagelijkse praktijk zullen leraren deze afstemming op verschillen tussen leerlingen combineren met allerlei andere taken en factoren, zoals het zorgdragen voor een positief leerklimaat, het afwegen van aandacht voor individuele leerlingen en voor de gehele klas en de relaties tussen leerlingen in de klas onderling. Daarnaast wordt onderzoek naar didactische afstemming vooral in het primair onderwijs uitgevoerd, waar leraren minder klassen/leerlingen hebben en deze leerlingen meer uren zien. Om zicht te krijgen op hoe afstemming in de praktijk in het voortgezet onderwijs tot stand komt en wat dit zo complex maakt dient juist de dagelijkse praktijk van leraren in het voortgezet onderwijs onderzocht te worden.

In dit onderzoek bestuderen we didactische afstemming vanuit het perspectief van de leraren zelf. Door onderzoek te doen hoe leraren didactische afstemming aanpakken, welke verschillen tussen leerlingen zij zelf relevant vinden en welke afwegingen ze maken in hun didactische keuzes, willen we beter zicht krijgen op hoe didactische afstemming tot stand komt. Het concept 'didactische afstemming' wordt in dit onderzoek gezien als het resultaat van afwegingen van leraren bij verschillen tussen leerlingen. Deze afwegingen leiden tot aanpassingen die inspelen op een of meer verschillen tussen leerlingen. Hoe leraren die verschillen zien en hoe zij deze meenemen in hun afwegingen is het object van dit onderzoek. In dit onderzoek ligt de focus op de cognitieve activiteiten van leraren, te beginnen bij het waarnemen van verschillen tussen leerlingen. Vervolgens ligt de focus op hoe leraren het onderwijs op de waargenomen verschillen afstemmen en tegelijkertijd rekening houden met allerlei andere factoren die in een complexe klassituatie spelen.

Het onderzoek

Onderstaande twee vragen zijn richtinggevend voor het onderzoek in dit proefschrift:

1. Welke verschillen tussen leerlingen binnen een klas worden door leraren waargenomen?
2. Hoe stemmen leraren hun onderwijs af op waargenomen verschillen tussen leerlingen in hun klas?

Theorie en onderzoek laten grofweg drie perspectieven op didactische afstemming zien. Deze perspectieven verschillen in hoe het proces en de aard van het doen van afstemming worden beschreven en onderzocht, welke verschillen tussen leerlingen daarin een rol spelen en de didactische elementen die centraal staan in de afstemming.

Vanuit het eerste perspectief, *didactische differentiatie*, wordt didactische afstemming beschouwd als een bewust, rationeel en proactief proces. In dit perspectief wordt met name onderzoek gedaan naar afstemmingen gericht op één of enkele specifieke verschillen tussen leerlingen (bv. aanleg, interesse of leerprofiel) en gericht op specifieke leerinhouden (bv. de leerdoelen, leeractiviteiten of uitleg gericht op specifieke inhouden bij taal of rekenen/wiskunde).

In het tweede perspectief, *gedifferentieerd lesgeven*, ziet men didactische afstemming als een intuïtief en onbewust proces. Leraren stemmen af op basis van, soms onjuiste, interpretaties van leerlingen, bijvoorbeeld verwachtingen van leraren over

leerlingen. Deze afstemming is met name zichtbaar in leraar-leerlinginteracties, bijvoorbeeld wanneer de leraar vragen stelt of feedback geeft.

Een derde perspectief, *adaptief lesgeven*, onderzoekt didactische afstemming als een reactief en weloverwogen denkproces van leraren. Leraren spelen in op verschillen die gezien worden tijdens de les, bijvoorbeeld omdat sommige leerlingen iets niet begrijpen. Leraren spelen hierop in door hun vragen, feedback of uitleg aan te passen aan deze leerlingen.

In het meeste onderzoek wordt slechts één van deze perspectieven als uitgangspunt genomen, maar in de dagelijkse praktijk van leraren spelen al deze perspectieven een rol. Om die reden hebben we in dit onderzoek geprobeerd om inzichten uit de verschillende perspectieven mee te nemen, met name door open onderzoeksmethoden te gebruiken. Onderzoeksmethoden die leraren uitnodigen om te, en ondersteunen bij het, verwoorden van welke verschillen tussen leerlingen zij zien, welke didactische afstemming zij vormgeven en welke overwegingen daarbij een rol spelen.

De studies

In hoofdstuk 2 van dit proefschrift hebben we ons gericht op het onderzoeken van de verschillen tussen leerlingen die leraren zien. Daarvoor hebben we zeven leraren geïnterviewd over de leerlingen van dezelfde jaar-2 havo/vwo klas. De leraren werden gevraagd om iedere leerling te beschrijven door te vertellen welk beeld ze van de leerling hadden, wat ze van de leerling wisten én wat de docent dacht dat deze leerling nodig had om belangrijke leerdoelen te behalen. De leraar kreeg 60 seconde per leerling om dit te vertellen en van iedere leerling werd een foto gebruikt als geheugensteun. Op basis van de beschrijvingen van iedere leraar van deze leerlingen hebben we zicht gekregen op leerlingkenmerken die verschillende leraren waarnemen, maar ook in hoeverre leerlingen door verschillende leraren hetzelfde of anders werden beschreven.

We zagen dat de leraren bij het beschrijven van hun leerlingen gebruikmaken van een rijke variatie aan leerlingkenmerken. Zo beschreven ze leerlingen op basis van cognitieve kenmerken zoals de aanleg, prestaties en kennis die leerlingen hadden. Ze gebruikten niet-cognitieve kenmerken zoals het welbevinden, de sociale ontwikkeling, inzet en achtergrondkenmerken van leerlingen, zoals familieomstandigheden. Daarnaast benoemden leraren in de interviews ook

nog specifieke eigenschappen van de relatie die zij hadden met de leerling, zoals affectieve evaluaties (*'leuke leerling', 'lieve meid'*) en in hoeverre de leraren zelf het idee had of ze de leerlingen eigenlijk wel kende (*'deze leerling ken ik eigenlijk niet zo goed'*).

In potentie zien leraren veel verschillende verschillen. De leraren verschilden echter van elkaar in welke kenmerken zij van hun leerlingen beschreven. Sommige benoemden bijvoorbeeld veelvuldig het welzijn van leerlingen of hoe een leerling samenwerkte met anderen, waar andere leraren dit niet of nauwelijks deden. Leraren verschilden ook in de kenmerken die ze van verschillende leerlingen beschreven. Over sommige leerlingen benoemden ze andere kenmerken dan over anderen, zij lijken leerlingen anders te zien. Dit suggereert ten eerste dat leraren oog hadden voor de uniekheid van leerlingen. Ten tweede laat dit zien dat verschillen die gezien worden ook leraar-afhankelijk zijn. Sommige leraren waren bijvoorbeeld veel meer gericht op cognitieve kenmerken van leerlingen, terwijl andere leraren het welbevinden van leerlingen veelvuldig benoemden. Persoonlijke kaders van leraren lijken dus een rol te spelen in welke leerlingkenmerken relevant zijn en welke verschillen waargenomen worden.

In Hoofdstuk 3 hebben we onderzocht hoe leraren verschillend kijken naar laagpresterende leerlingen, en wat zij beschouwen als oorzaken van deze lage prestaties. We hebben 64 leraren een vragenlijst laten invullen over de factoren (kenmerken van leerling, les of docent) die zij als de oorzaak van lage leerlingprestaties zien. Aan leraren werd eerst gevraagd een beschrijving te geven van drie van hun laagpresterende leerlingen. Vervolgens werd per leerling gevraagd om aan te geven welke factoren volgens hen van invloed waren op de prestaties van die leerling. We maakten daarbij onderscheid tussen leerlingfactoren (bv. aanleg, inzet, aandacht, achtergrondkenmerken) en docentfactoren (bv. moeilijkheid van de les, kwaliteit van de instructie). Uit verschillende onderzoeken blijkt dat waaraan leraren de prestaties van leerlingen toeschrijven (attributies) van invloed zijn op de manier waarop leraren in hun onderwijs inspelen op prestaties. In onderzoek wordt vaak aangenomen dat hoe een leraar attribueert stabiel is, dat wil zeggen dat zij dezelfde attributies hanteren bij verschillende leerlingen.

De leraren in deze studie lieten met name leerlinggerelateerde attributies zien. Ze schreven lage prestaties dus vooral toe aan de aanleg van een leerling, diens inzet, aandacht en/of achtergrondkenmerken. Docentgerelateerde factoren kwamen minder vaak voor.

De leerlingkenmerken waar lage prestaties aan werden toegeschreven waren echter niet voor iedere leerling gelijk. Met name voor die leerlingkenmerken die

worden gezien als beïnvloedbaar door de leerling (zoals aandacht en inzet) was er variatie te zien in de attributies bij verschillende leerlingen van één leraar. Andere leerlingkenmerken, waar leerlingen minder invloed op hebben, zoals familieomstandigheden, aanleg en eerder onderwijs, waren minder gevarieerd tussenleerlingen. Sommige leraren lijken dat dus eerder als oorzaak te zien van de lage prestaties dan andere leraren. Met betrekking tot de docentfactoren was er juist weinig variatie binnen leraren, maar wel tussen leraren: sommige leraren noemen wel docentfactoren als verklaring voor lage leerlingprestaties, en andere niet.

Dit onderzoek laat zien dat laagpresterende leerlingen door hun leraar niet als één groep worden gezien, maar van elkaar verschillen. Attributies van leraren kunnen niet zonder meer gezien worden als een 'attributiestijl' van een leraar, maar leraren hanteren verschillende attributies bij verschillende leerlingen. Het is daarmee aannemelijk dat leraren ook variëren in de mate waarin en de manier waarop zij afstemmen op deze leerlingen in hun praktijk.

In hoofdstuk 4 hebben we onderzoek gedaan bij zeven leraren in het voortgezet onderwijs in de context van één les. We hebben onderzocht welke verschillen tussen leerlingen ze belangrijk vonden en hoe ze daarop probeerden in te spelen. Voor deze studie hebben we leraren gezocht die regelmatig didactische afstemming vormgeven in hun les én deze afstemming ook zien als een meerwaarde. We richtten ons in deze studie vooral op de didactische afstemming die leraren voorafgaand aan de les hadden bedacht. We hebben dit onderzocht door de les te observeren en de leraren te interviewen over deze didactische afstemming en de verschillen tussen leerlingen waarop deze afstemming gericht waren. We wilden met name zicht krijgen op de overwegingen van leraren die daarbij een rol spelen.

Uit de interviews bleek dat veel van de didactische aanpassingen afgestemd waren op meerdere verschillen tussen leerlingen, zoals hun aspiraties, interesses en eigen leervoorkeuren. In afstemming op deze verschillen werden er veelal meerdere leselementen tegelijkertijd aangepast, bijvoorbeeld de inhoud van de les, de ondersteuning van leerlingen en de manier waarop de leerlingen met de inhoud aan de slag moesten. Daarnaast bleek uit de analyse van de overwegingen van leraren dat om tot de afstemming te komen meerdere doelen een rol speelden. Zo wilden leraren met hun afstemming bijvoorbeeld tegelijkertijd leeropbrengsten bevorderen, leerlingen motiveren, bijdragen aan de zelfkennis van leerlingen en een veilig en productief leerklimaat stimuleren.

Didactische afstemming in de dagelijkste praktijk van leraren lijkt dus meervoudig van aard. Meervoudig omdat leraren meerdere didactische elementen gelijktijdig aanpassen om in te spelen op verschillende leerlingkenmerken. Maar ook meervoudig omdat leraren deze aanpassingen doen in het licht van verschillende onderwijsdoelen die binnen die praktijk met elkaar worden verbonden. De studie laat zien dat leraren meerdere en uiteenlopende overwegingen kunnen hebben om tot didactische afstemming te komen, zoals de doelen die ze nastreven, hun beeld van de leerlingen en de klas, de specifieke vakinhoud die centraal staat, hun eigen kunnen en visie, en de context waarbinnen zij lesgeven.

In hoofdstuk 5 beschrijven we een aantal uitdagingen bij het onderzoeken van didactische differentiatie. Het hoofdstuk begint met een uiteenzetting van verschillende definities van didactische differentiatie en hoe dit concept onderzocht wordt in empirisch onderzoek. We laten zien dat er licht zit tussen enerzijds hoe het concept wordt gedefinieerd en anderzijds hoe het wordt onderzocht. Specifiek onderbouwen we eerst dat er twee stipulatieve criteria verbonden zijn aan het concept van didactische differentiatie: (1) dat er pas sprake is van differentiatie als didactische variaties tussen leerlingen *doelgericht* zijn én (2) dat deze variaties ook *adaptief* moeten zijn, dat wil zeggen, dat ze het leren van de verschillende leerlingen ook moeten faciliteren. Onderzoek naar differentiatie is weinig kritisch ten aanzien van beide criteria.

In het vervolg van het hoofdstuk laten we zien wat het zicht krijgen op deze bepalende criteria vraagt van onderzoeksmethoden. Als onderzoek naar differentiatie inzicht wil geven in de doelgerichtheid en adaptiviteit van de didactische afstemming van leraren, dan zal dat onderzoek zowel zicht moeten geven op het handelen én denken van leraren, als op hoe leerlingen de didactische differentiatie ervaren én de gevolgen voor hun leren en ontwikkeling. Pas dan kan worden nagegaan in hoeverre een doelgerichte afstemming ook daadwerkelijk adaptief is. We laten zien dat het voor onderzoek naar differentiatie noodzakelijk is om zicht te krijgen op de criteria van doelgerichtheid en adaptiviteit. Door gebruik te maken van empirische data uit een eigen studie, gecombineerd met inzichten uit onderzoek van anderen, laten we zien dat dit niet eenvoudig is. Dit hoofdstuk laat zien dat niet alleen de praktijk van didactische differentiatie meervoudig en complex is, maar dat dit tevens geldt voor het doen van onderzoek naar differentiatie.

Conclusies en implicaties

Het concept dat in dit proefschrift centraal stond was '*didactische afstemming*'. Met didactische afstemming worden de aanpassingen bedoeld die leraren maken in hun onderwijs om het leren van leerlingen te faciliteren, waarbij zij inspelen op één of meerdere verschillen tussen leerlingen binnen een les of klas. Om zicht te krijgen op hoe leraren in hun dagelijkse praktijk vormgeven aan didactische afstemming hebben we onderzocht welke verschillen tussen leerlingen leraren zien en hoe leraren op de waargenomen verschillen afstemmen.

De bevindingen in dit proefschrift maken duidelijk dat leraren een variatie aan verschillen tussen leerlingen zien en dat hun didactische afstemming gericht is op meerdere verschillen tegelijkertijd. Welke verschillen worden waargenomen en waarop wordt ingespeeld lijkt te verschillen per leraar en per situatie. Leraren verschillen van elkaar in de verschillen tussen leerlingen die ze zien. Daarnaast zien ze ook niet dezelfde kenmerken als belangrijk voor al hun leerlingen. Bij sommige leerlingen letten ze bijvoorbeeld op hun welbevinden, bij een andere leerling de relaties met leerlingen in de klas en bij weer andere leerlingen lijken met name cognitieve kenmerken een rol te spelen in wat ze waarnemen of waar ze op afstemmen. Welke verschillen leraren zien, waar ze adaptief op zijn, lijkt dus vooral begrepen en onderzocht te moeten worden op het niveau van hoe de leraar zijn/haar individuele leerlingen beziet.

De tweede onderzoeksvraag van dit manuscript richtte zich op de manier waarop leraren afstemmen op de verschillen tussen leerlingen die zij belangrijk vinden. Deze didactische afstemming blijkt een meervoudige praktijk waarin verschillende didactische elementen worden aangepast in relatie tot een verscheidenheid van verschillen tussen leerlingen. Zelfs binnen de beperkte focus van dit onderzoek, waarin we met name hebben gekeken naar de proactieve en doelgerichte vormen van afstemming bij een kleine groep leraren, is die meervoudigheid volop aanwezig. Deze meervoudigheid is niet alleen van toepassing op wat er wordt aangepast en op welke verschillen deze aanpassingen gericht zijn, maar ook op de overwegingen van leraren onderliggend aan deze aanpassingen. In het denken van leraren onderliggend aan hun didactische aanpassingen speelden verschillende onderwijsdoelen een rol. Naast het bijdragen aan het leren en de motivatie van de leerlingen probeerden leraren in hun afstemming er ook aan bij te dragen dat leerlingen zichzelf beter leerden kennen. In de overwegingen van leraren onderliggend aan hun afstemming in de dagelijkse praktijk spelen verschillende doelen en factoren een rol.

Bovenstaande resultaten en conclusies zijn gericht op het beantwoorden van de vooraf gestelde onderzoeksvragen. Daarnaast hebben we door deze studies ook andere lessen geleerd over het concept 'didactische afstemming'.

Ten eerste laat deze dissertatie zien dat er meer én ander onderzoek naar didactische afstemming nodig is om grip te krijgen op deze complexe praktijk. Specifiek suggereren bevindingen in de verschillende studies dat om didactische afstemming te begrijpen er onderzoek nodig is waarin zowel het perspectief van de leraar als dat van de leerling een rol speelt. Uitspraken doen over de mate en richting van didactische afstemming op basis van uitsluitend observaties, zoals in veel onderzoek gebeurt, is ontoereikend en kan een verkeerde indruk geven. Om de didactische afstemming van leraren binnen een les te analyseren is het cruciaal om zicht te krijgen op de overwegingen van leraren, die overwegingen zijn nodig om de interpersoonlijke en meervoudige aard van de didactische afstemming te vangen en te begrijpen.

Daarnaast bleek uit de verschillende studies dat leerlingen niet alleen een passieve rol spelen in de afstemming, als object waarop wordt afgestemd, maar dat leerlingen ook een actieve rol hebben. Bijvoorbeeld een rol in het zichzelf laten kennen (hoofdstuk 2) maar tevens bestaat didactische afstemming vaak uit het geven van keuzemogelijkheden voor leerlingen (hoofdstuk 3). In hoeverre daadwerkelijk afstemming tot stand komt wordt mede beïnvloed door de keuzes die leerlingen maken en kan niet alleen worden begrepen vanuit de intenties van leraren. Voor toekomstig onderzoek, dat uitspraken wil doen over hoe didactische afstemming het leren en de ontwikkeling van leerlingen beïnvloedt, is het belangrijk om grip te krijgen zowel op de overwegingen van leraren als op de manier waarop leerlingen reageren op de didactische afstemming.

Zowel waar het gaat om het begrijpen van de verschillen die leraren zien, als de afstemming die zij vormgeven, blijkt de pedagogische aard van onderwijs een belangrijke rol te spelen. Met pedagogische aard van het onderwijs wordt bedoeld dat 1) lesgeven van leraren gebaseerd is op overwegingen die meervoudig en normatief van aard zijn en 2) dat hoe lesgeven het leren en de ontwikkeling van leerlingen beïnvloedt geen lineair proces is, maar afhankelijk van de interacties van de leerlingen met wat hun leraren doen.

Implicaties voor de praktijk

Dit onderzoek laat zien dat didactische afstemming geen losse, of zomaar te implementeren, vaardigheid is. Didactische afstemming vraagt om het maken van keuzes in de complexe dagelijkse onderwijspraktijk. Om leraren te ondersteunen in hun didactische afstemming is het belangrijk dat leraren zicht krijgen op deze keuzes en de praktijkkennis waarop deze keuzes gemaakt worden. De belangrijkste bron daarbij zijn de leraren zelf. Praktijkkennis bouw je op door, met elkaar, de inzichten onderliggend aan het lesgeven te bespreken. De implicaties zijn dan ook met name gericht om leraren te ondersteunen bij het gezamenlijk expliciteren van keuzes en praktijkkennis.

Het is belangrijk voor leraren om zicht te krijgen op de leerlingkenmerken die zij belangrijk vinden en de verschillen tussen leerlingen die in de dagelijkse praktijk een rol spelen. Om daar zicht op te krijgen kunnen leraren de interviewmethode in hoofdstuk 2 gebruiken. Deze interviewmethode is reeds omgeschreven naar een professionaliseringsactiviteit voor leraren. Om zicht te krijgen op de didactische afstemming en de overwegingen die daaronder liggen kunnen leraren de interviewmethode gebruiken uit hoofdstuk 3. Deze methode is er op gericht om de praktijkkennis van leraren onderliggend aan de didactische afstemming te expliciteren. Naast het expliciteren en bespreken van de verschillen tussen leerlingen, de didactische afstemming en de onderliggende overwegingen, is het ook van belang dat leraren zichzelf en elkaar bevragen op of, hoe en welk leren van de verschillende leerlingen bevorderd wordt middels de afstemming.

In de dagelijkse praktijk van leraren lijken deze mogelijkheden voor het delen en ontwikkelen van dergelijke praktijkkennis niet vanzelfsprekend aanwezig. Het onderwijs blijft veelal een praktijk waarin lesgeven wordt gezien als ‘doen’ en waarin leraren zelden het denken onderliggend aan het lesgeven uitspreken en/of met elkaar bespreken. Er is meer tijd en ruimte nodig voor leraren om juist dat denken met elkaar te bespreken. Bijvoorbeeld door het met elkaar samen te werken in Professionele Leergemeenschappen of Docent Ontwikkel Teams. Deze implicatie vraagt tegelijkertijd om vervolgonderzoek om ook daadwerkelijk zicht te krijgen hoe zulke activiteiten de didactische afstemming én het leren van leerlingen beïnvloedt. Graag zou ik, samen met leraren en leerlingen, verder onderzoeken hoe, middels didactische afstemming, waardevolle leermomenten te creëren.

Dankwoord

Toen ik aan dit traject begon, zo zeiden mijn begeleiders, mocht ik beginnen met 'even rond zwemmen'. En ik dacht nog, 'dat kan ik wel… zwemmen'. Helaas bleek die ruim 20 jaar aan zwemtraining in de veilige context van het zwembad, met duidelijke lijnen en helder water, een zeer beperkte voorbereiding. Ik werd door stromingen alle kanten opgetrokken en wist niet meer waar ik vandaan kwam, noch waar ik heen ging.

Na ruim een jaar kreeg ik te horen dat ik klaar was met 'zwemmen' en dat ik mocht gaan 'duiken'. Ik moest de diepte in. Een beetje vertwijfeld, ik had nog geen idee waar ik dan precies heen was gezwommen, dacht ik nog… 'dat kan ik wel, duiken'. Maar ook al die ervaringen en brevetten, opgedaan in tropische oorden met 'clear visibility' en een gids, bleken niet toereikend. Al snel kwam ik terecht in een ongecontroleerde afdaling. Het werd steeds donkerder. Waar was boven? Waar was onder? Ik had geen idee meer. En toen kwam ik op de bodem. Geen licht en geen vertrouwen in mijn interne kompas. En een vrees om zonder zuurstof te komen. Paniek.

Dankbaar voor en dank aan de fijne mensen om me heen, die me hebben geholpen om het vertrouwen in mijzelf te vinden, waardoor ik rustig weer naar boven kon.

Lieve Spirit Crew, mijn enorme diepte- én hoogtepunten heb ik met jullie kunnen delen en mogen beleven. Mooie ORD(feestjes), troostbiertjes om 11.00 's ochtends, champagneflessen na scripties, baby's en al jullie promoties. Eindelijk mag ik ook, eindelijk die trui! Chris, dank voor je stiltes en je gouden tip 'en nu mag je niets meer lezen'. Ellen, dank je voor je Brabantse relativering en de avonturen in Linz. Merel, dank voor je nuchterheid en (congres)humor. Petrie, dank voor je structuur en het meermaals delen van hotelkamers. Wat was het heerlijk om deze tijd met jullie te hebben mogen beleven. Zelfs toen jullie één voor één verder gingen, maar iedereen toch nabij bleef.

Wat mis ik 'ons' nog vaak op de 20e.

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Ik heb mijn onderzoekswerk altijd mogen combineren met mijn werk als lerarenopleider bij de Radboud Docenten Academie. Ik ben blij met alle collega's die ervoor gezorgd hebben dat die werkplek voor mij zo fijn was en is.

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Fijne vrienden en vriendinnen, in het bijzonder, Marit, Margo, Nienke en Susan, Tom en Melanie, Diva's. Jullie laten mij altijd weer ervaren hoe het is om gewaardeerd te worden om wie ik ben en dat dat goed is. Heerlijk hoe we alle kleine en grote beslommeringen des levens met elkaar delen. Of dat nu gebeurt tijdens de heerlijke (gezins)vakanties/weekendjes weg, serenades in hotelkamers, op menig ontvangen kaartje, 3-wekelijkse etentjes, tijdens het sporten, kopjes thee, of half-way meetings in Den Bosch of Tilburg. Ik had niet altijd veel tijd of energie te geven, maar ontving het toch altijd van jullie. Dank!

Eddie, Paulien en Toon, soms verzucht dat ik niet zeker wist of ik nou ondanks of dankzij al die gesprekken verder kwam. Stiekem weten we natuurlijk allemaal dat ik vooral dankzij jullie mezelf heb weten te vinden als onderzoeker. Toon, fijn om ook iemand in het begeleidingsteam te hebben die zo af en toe ook kan benoemen wat er wél al staat. Paulien, dank voor je steun in woeste tijden. Ik waardeer dat het je niet alleen ging om de vordering van mijn onderzoek maar je brede blik op, en ondersteuning van, mijn ontwikkeling als onderzoekster en persoon. Dank ook voor de Spirit Crew.

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Curriculum Vitae

Lieke Jager is op 24 mei 1987 geboren te Utrecht. In 2008 slaagde ze voor de Lerarenopleiding Geschiedenis aan de Fontys in Tilburg. Het laatste jaar van deze opleiding werkte ze tevens als docent Geschiedenis op De Nassau in Breda. Daarna begon ze met de studie Pedagogische Wetenschappen en Onderwijskunde aan de Radboud Universiteit, Nijmegen. In 2012 behaalde ze daar haar Master Onderwijskunde waarna ze werd aangenomen als lerarenopleider bij het toenmalige Radboud-ILS, nu de Radboud Docenten Academie. Naast haar werk als opleider kreeg ze daar de kans om haar masterthesis naar leraar attributies te publiceren. Van september 2015 tot juli 2020 volgde een deeltijdaanstelling als promovenda om naast haar werk als lerarenopleider onderzoek te doen naar didactische afstemming van leraren in het voortgezet onderwijs.

Tijdens haar promotieonderzoek was ze onderdeel van de onderzoeksschool van de Faculteit Sociale Wetenschappen, het Behavioural Science Institute (BSI), en van de interuniversitaire onderzoeksschool voor onderwijsonderzoek, de Interuniversity Centre for Educational Sciences (ICO). Ze presenteerde haar onderzoek op nationale (ORD) en internationale conferenties (AERA, ECER en EARLI). Van 2017-2020 was ze secretaris van het bestuur van de divisie leraar en lerarenopleidingen (L&L) van de Vereniging voor Onderwijs Research (VOR). In 2018 en 2019 was ze als co-convenor betrokken bij de organisatie en invulling van de Emerging Researchers Conference (ERC) van de European Educational Research Association (EERA). In 2018 en 2019 was ze onderdeel van het onderzoeksteam van het NRO RAAK-publiek-onderzoek 'Afstemmen op diversiteit in de klas'. Dit project richtte zich op het ontwikkelen én onderzoeken van een passend professionaliseringpalet gericht op het afstemmen op diversiteit in de klas voor leraren in het primair onderwijs.

Haar onderzoek heeft ze gecombineerd met haar baan als lerarenopleider bij de Radboud Docenten Academie. Als lerarenopleider is ze betrokken bij de uitvoering en de ontwikkeling van de generieke didactische en pedagogische onderwijslijnen en de onderwijslijn waarin de persoonlijke en professionele ontwikkeling van studenten centraal staat. Daarnaast is ze vanaf 2018 verbonden als instituutsopleider bij de Academische Opleidingsschool Zuidoost Brabant. Vanaf 2020 is Lieke opleidingscoördinator van de Educatieve Minor/Module. Ze is verantwoordelijk voor de organisatie en doorontwikkeling van die opleiding en geeft, samen met haar collega's, vorm aan dit opleidingstraject.

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Havekes, H., & Jager, L. (2018). 'Ik wil de leerlingen niet een one size fits all geven. Maar hoe ga ik het doen?' Denken over en werken aan gepersonaliseerd leren in het voortgezet onderwijs. *Tijdschrift voor Lerarenopleiders*, *39*(3), 11-22.

Klabbers, W., Jager, L., & Van den Bergh, L. (2020). Een leerling in 60 seconden. *Didactief*, te raadplegen via: https://didactiefonline.nl/artikel/een-leerling-in-60-seconden

Declaration Data Management PhD Thesis

Declaration Data Management PhD Thesis

Radboud Teachers Academy, Radboud University

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For my thesis I have collected **primary** data / information.

Yes ■ → Complete section A.
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B3.	The data / information is not shared with third parties, and has been treated in accordance with the agreements made with the information provider	Yes/No

Section C. General

I declare that

C1.	A short methodological justification, and/or the syntax and method of data / information processing is deposited in the Radboud Data Repository.	**Yes**/No
C2.	It is not possible to link data / information in publications to individuals (except with explicit consent).	**Yes**/No
C3.	The data / information is analyzed in a trustworthy manner and is not been deliberately manipulated toward certain outcomes.	**Yes**/No

Signature

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Title Thesis: Secondary school teachers' instructional adaptations: Perceiving and addressing students' various learner characteristics in daily practice
Date: 18-07-2023
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