Chapter 6
Discussion

6.1 Introduction

In this dissertation, we conducted several studies on the practice of differentiated instruction in the context of GUTS. A teacher perspective was used to gain a better understanding of what influences teachers in their implementation of DI, how teacher knowledge of DI is put into practice, and how they make sense of an innovation that stimulates DI. Our aim with this perspective was to contribute to the literature on DI and teacher knowledge, but also to improve the support given to teachers to implement DI. We conducted a systematic literature review and three empirical studies. In the systematic literature review we elaborated on factors in teachers' working environments that influence the implementation of DI. In two of the three empirical studies, a small number of teachers from the secondary school where GUTS was organized participated in stimulated recall interviews (SRIs) to enable exploration of their interactive cognitions regarding DI. In the fourth empirical study we examined 15 teachers' sense-making processes during GUTS using a questionnaire study.

In this chapter, we first summarize the results and conclusions of the four studies. We then elaborate on some general conclusions that overarch the individual studies in relation to the current literature on DI. We conclude this chapter with limitations, practical implications and suggestions for future research.

6.2 Conclusions per chapter

6.2.1 Chapter 2

In chapter 2, we conducted a systematic literature review to gain an overview of what factors in teachers' working environments have been found to influence their implementation of DI. More specifically, we

aimed to answer the following question: *How do different school, intervention, teacher, and classroom characteristics influence the implementation of differentiated instruction by teachers in primary and secondary education?*

To answer the research question, a selection of 29 articles was made that met four inclusion criteria (published in a peer-reviewed journal; reporting an empirical study; focused on in-service primary/secondary teachers, principals, or schools; and aimed at elaborating on factors influencing teachers' practices of DI). The factors, together with an explanation of how these were found to influence implementation, were summarized and organized using Brühwiler and Blatchford's (2011) supply-use model of student learning.

The results from the literature review showed that many factors in a teachers' working environment influence the implementation of DI: school level, policy, principal, colleagues, tools & resources, intervention, teacher beliefs, teacher learning activities, classroom processes, and classroom context. These factors all influenced the teachers and how they implemented DI. For example, when teachers had colleagues who did not consider DI an important approach to teach all students, there was less collaboration within the school and implementation of DI was less likely to occur. Other examples were a lack of proper tools and resources, and a hindering physical classroom setting (classroom context). These factors made the teachers feel constrained in implementing DI and in those cases DI was not implemented exactly as intended.

To enable implementation, these factors and the way they work on teachers need to be taken into account in deciding the specific DI- or implementation method. In addition, some of the studies provided results on several of the identified factors. It is thus likely that those factors work together in the implementation of DI. Small class sizes, for example, are preferred in implementing DI, but when the physical classroom setting is not adapted to differentiated teaching methods the

teacher can still feel constrained. The main conclusion of this study therefore was that context matters, and each specific school setting requires its own specific way of bringing different factors in the teachers' working environment together.

6.2.2 Chapter 3

In chapter 3, we compared teachers' interactive cognitions of DI in regular and GUTS lessons. Our aim was to answer the following question: *What are teachers' interactive cognitions of differentiated instruction in two different learning environments?*

Four teachers of different subjects participated in two SRIs each: one SRI about a regular lesson and one SRI about a GUTS lesson. In each SRI teachers were shown five video clips of the observed lesson, each containing teacher-student interactions in one of the following categories: (1) providing instruction; (2) offering help; (3) giving assignments; (4) calling on a student; and (5) checking up on a student. After each video clip teachers were asked what they were thinking at that moment. In the transcripts of the interviews, the teacher-student interactions were retraced and coded with the names of the categories. Teachers' considerations during those interactions were characterized as interactive cognitions. In the final step of the analysis, the interactive cognitions were coded for the student characteristics *readiness*, *interest* and/or *learning profile,* or *none* if no student characteristic was considered by the teacher. After coding, the frequencies of the interactive cognition codes were compared between the two contexts and across the two contexts per teacher. In addition, to provide more detail and to examine whether the teachers focused on the whole class, groups of students, or individual students, summaries were made of the lessons.

Overall, the results showed that the frequencies of almost all teacher-student interactions for all teachers were similar for both types of lessons. The summaries of the lessons, however, gave a more

detailed view of the differences between the two types of lessons. The main difference was that for two teachers, in their regular lessons, many student-characteristic codes had to be interpreted as the characteristics of the whole class rather than individual students' characteristics. In the GUTS lessons, these teachers focused more on individual students' characteristics. A third teacher appeared to take more student characteristics into account during the regular lesson than in the GUTS lesson. This teacher explained that she had some difficulties in the GUTS lesson. She only had three students to teach, and if she monitored and interacted with them all the time, they could feel like they were being watched. This made the teacher feel uncomfortable; therefore, she kept some distance.

We concluded from this study that teachers' interactive cognitions nearly always focused on at least one student characteristic when they were deciding how to engage with a group of students or individual students. This led us to argue that teachers are during teacher-student interactions always learner-centered, though it depends on the context whether the teacher focuses on larger groups of students (regular lessons) or smaller groups of or individual students (GUTS lessons).

6.2.3 Chapter 4

Since in chapter 3 we mainly explored differences in teachers' interactive cognitions of DI between the regular and GUTS context, we aimed to focus more on the specific content of teachers' interactive cognitions of DI and how learner-centered teachers' interactive cognitions are in chapter 4. Instead of reporting how often teachers considered student characteristics and summarizing what this looks like in their lessons (chapter 3), we decided to explore what the teachers' interactive cognitions are and on how they consider different student characteristics. Two research questions were formulated: *What*

interactive cognitions of differentiated instruction do teachers have? How do they take learning needs into account in these interactive cognitions?

Four teachers were interviewed in four SRIs spread out over the school year. The teachers viewed six video clips in each SRI. In the observations that preceded the SRIs, the 'Classroom Observation Form for Summative Assessment of Differentiated Instruction' was used to place the teacher-student interactions in one of the following categories: (1) context/goal setting; (2) student assessment; (3) attention to the individual student; (4) instruction and classroom routine; and (5) positive, supportive learning environment. One or two video clips were selected from each category to show the teachers during the SRIs: the teachers were asked to explain what they were thinking during these teacher-student interactions. Their considerations during their actions were characterized as their interactive cognitions. During the analysis, we first brought together, per teacher, the interactive cognitions in one category of interactions that were similar to each other. We then coded these according to who they were aimed at (class, groups of students, students with certain characteristics, individual students) and what student characteristics were taken into account (readiness, interest, learning profile).

From these analyses, we found that the teachers always – with one exception – took student characteristics into account in their interactive cognitions: mostly the students' readiness. However, it appeared to depend on the type of interaction; in the interaction types *instruction and classroom routine* and *positive, supportive learning environment*, teachers often took two learning needs into account. In addition, the learner centeredness of the teachers' interactive cognitions appeared to vary from class-centered to student-centered. The results also showed that teachers' interactive cognitions were mostly focused on convergent DI. Another conclusion from this study was that interactive cognitions differed greatly between the teachers, meaning that interactive cognitions are personal. Other differences were found within the teachers: their interactive cognitions differed

per type of teacher-student interaction, and teachers had multiple interactive cognitions in each type of teacher-student interaction. This means that interactive cognitions also depend on the situation, and on context. By studying the content of the teachers' interactive cognitions, we found differences between and within teachers suggesting the person-, situation-, and context-dependency of interactive cognitions. Teachers thus might have a similar knowledge base regarding DI, but the person-, situation-, and context-dependency of their interactive cognitions means that within the same type of teacher-student interaction differences necessarily exist. Therefore, it is not preferable to confront teachers with a uniform solution to learning to implement DI.

6.2.4 Chapter 5

In the study described in chapter 5 we focused on the dynamic and complex process of teachers' sense-making within the context of GUTS. Our aim was to answer these research questions: *How can teachers' sense-making within an innovation to differentiate instruction be characterized in terms of type of search for meaning and sources of ambiguity and uncertainty? How does this sense-making process change over two school years?*

15 teachers voluntarily completed a questionnaire at two moments in time (in the Fall of the second and third year of GUTS). The questionnaire was aimed at measuring teachers' personal frames of reference regarding differentiated student talent development, and their perceptions of the situational demands of GUTS. Teachers' personal frames of reference were coded to find out how these corresponded with the innovation. In the analysis, the teachers' answers were analyzed for their types of search for meaning (assimilation, adaptation, or toleration), and their experienced sources of uncertainty and ambiguity (limited resources and/or conflicting goals). Then, we characterized teachers' sense-making by aligning the teachers' types of search for meaning, their experienced sources of

uncertainty and ambiguity, and their personal frames of reference. Finally, we compared the results from both school years with each other to see whether the teachers' sense-making had changed.

The results showed that the teachers made sense of GUTS, a minimally structured innovation, in very different ways. Teachers with similar types of search for meaning could hold very different personal frames of reference. It also appeared that when we examined teachers' perceptions of the situational demands, several teachers would explain what they perceived that GUTS *should* be. We valued this as part of the teachers' personal frames of reference, however, these perceptions did not always correspond with the 'actual' personal frames of reference. For example, for several teachers, their personal frames of reference with regard to differentiated student talent development were very similar to the ideas of GUTS. However, with respect to the perceptions of the innovation (the situational demands), they mentioned that students' talents should be stimulated differently from what was aimed for in GUTS. In addition, the comparisons between the school years showed that teachers' sense-making also changed with the changes that were made to the innovation. The dynamic character of teachers' sense-making meant in this study that the fifteen teachers became more similar in the type of search for meaning they used in their sense-making process in the second year of data collection. While in the first year of data collection, teachers had very different types of search for meaning and experienced different sources of uncertainty and ambiguity, in the second year, most of them used assimilation as type of search for meaning, though they still experienced different sources of uncertainty and ambiguity. Finally, the freedom teachers got within GUTS appeared to cause the differences in the teachers' sense-making processes: some teachers experienced this as freedom to experiment with DI, whereas others experienced this as too little guidance in the actual implementation of

the innovation. Thus, freedom appears necessary, but not sufficient, it is important that support and guidance are available for teachers.

6.3 General discussion

6.3.1 Perspectives on differentiated instruction

In this dissertation, we adhered to Tomlinson et al.'s (2003) definition of DI: "Differentiation can be defined 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 maximize the learning opportunity for each student in a classroom" (p.121). We understood this definition broadly and thus a very broad range of teaching practices and teacher cognitions that indicate how teachers adapt their teaching to students were accepted as examples of DI. Thus, in our understanding of the definition, when teachers interact with students and they take at least one student characteristic into account in that interaction, they are adapting their instruction to the students. In chapters 3 and 4 we concluded that teachers almost always take student characteristics into account during teacher-student interactions. The teachers in these two studies mostly took students' readiness into account. On the one end of the continuum of the size of the student group whose readiness was considered, there was the whole class and on the other end, individual students. It can be argued whether adapting instruction to the whole class' readiness is an example of DI (Denessen, 2017; Tomlinson et al., 2003). However, Corno (2008) mentions that it can also be viewed as a first step where the participating teachers who often used whole-class instruction sought a common ground for the level of their teaching where all students would be addressed. During or after the whole-class instruction, those teachers would then often engage in an interaction with a (group of) student(s) that were considered to have a different

readiness level and teachers would consequently adjust instruction in that interaction to the individual student's needs.

Furthermore, by studying interactive cognitions, we focused more on teachers' reactive DI than on proactive DI. Although proactively planning for DI is one of the hallmarks of effective DI (Tomlinson et al., 2003), during teaching it is very likely that situations arise that need an immediate response (Denessen & Douglas, 2015). Ideally, in this response the teacher takes the student's learning needs into account and thus differentiates reactively. However, especially with reactive DI teachers often seem to adjust their instruction in response to informal assessments of student characteristics, like personality and social skills (Corno, 2008; Denessen, 2017; Denessen & Douglas, 2015; Rubie-Davies, Hattie, & Hamilton, 2006). These types of assessments could increase the possibility of judgement errors (Corno, 2008; Denessen & Douglas, 2015). In their assessments, teachers can, unintentionally, be negatively influenced by students' background characteristics summarized by the student characteristic *learning profile*, like ethnicity, SES, and parents' educational history (Denessen, 2017; Denessen & Douglas, 2015; Rubie-Davies et al., 2006; Severiens, 2014). According to Denessen (2017), teachers often have lower expectations of students whose parents have low education levels, as well as of students who are first- or second-generation Dutch. These expectations change how teachers treat these students. If these practices become systematic behavior from the teacher towards certain groups of students, the teacher might unintentionally reinforce differences between students (Cohen & Lotan, 1995; Denessen 2017; Severiens, 2014; Turner, Christensen, & Meyer, 2009). This can cause students to feel excluded from certain groups in the class or school based on their socio-cultural backgrounds, and in turn their self-esteem might be affected (Cohen & Lotan, 1995; Severiens, 2014). Consequently, not all students may get the opportunity to maximize their learning potential (Cohen & Lotan, 1995; Denessen, 2017;

Denessen & Douglas, 2015; Severiens, 2014; Turner et al., 2009). The teachers studied in chapters 3 and 4 were unintentionally influenced by background characteristics of certain students. Possibly, a perspective on DI from a cultural point of view in addition to academic DI, as proposed by Severiens (2014) could provide a more complete picture on teachers adapting instruction with regard to students' cultural backgrounds. The teachers studied in chapters 3 and 4 did not know all students before they met them during their GUTS lessons, which might cause teachers to only informally assess those students on different characteristics. An example is one teacher in chapter 4, who mentioned trying to challenge a student, because, as she explained it, that student had chosen her subject for GUTS and thus should be able to achieve more. Although the teacher thus tried to adjust her instruction to this student's readiness, she did not yet know what this student could actually accomplish. However, in many of the interactive cognitions in which student *readiness* was taken into account, teachers appeared to adjust the interaction on actual achievement of the students thus also aiming to address students' learning profile.

The potential danger of unequal treatment of students when teachers are differentiating reactively, also leads to the discussion of the difference between convergent and divergent DI and which of these might be more preferable (Bosker & Doolaard, 2009; Corno, 2008; Denessen, 2017; Severiens, 2014; Subban, 2006). In the chapters 3 through 5 we have found that most of the teachers' (proclaimed) DI practices in the context of GUTS correspond to convergent DI. One possible explanation for these findings might be that convergent DI appears easier for teachers, for with divergent DI teachers have to focus on all student characteristics and hold different goals for different (groups of) students (Deunk, Doolaard, Smale-Jacobse, & Bosker, 2015). It is especially having different goals for different students that matches with what we described in section 1.3.1: teachers

experience DI to be an impractical approach to teaching, because they perceive it to be an approach for which they have to develop individual lesson plans for each student (Janssen, Hulshof, & Van Veen, 2016; Janssen, Westbroek, Doyle, & Van Driel, 2013). In recent literature there appears to be a preference for a mixture of both convergent and divergent DI (Denessen, 2017; Severiens, 2014). Based on the findings of the studies reported in this dissertation (chapters 3-5), we argue that teachers' use of convergent DI can provide a base from which they can, with proper and continuous support, further develop their teaching incorporating divergent DI as well (Corno, 2008; Smit & Humpert, 2012). We recognize that this development requires a deep, substantial and complex change to teaching practices, which will not be achieved easily (Janssen et al., 2016; Severiens, 2014; Tomlinson et al., 2003; Tomlinson, Brimijoin, & Narvaez, 2008). In the sections 6.4 and 6.5.2 we elaborate on several suggestions for teaching practices and future research into teachers' developing DI.

6.3.2 The importance of context

Throughout this dissertation, we discussed how different context characteristics can influence teachers' practices, interactive cognitions, and sense-making regarding DI. In the literature review (chapter 2), we found many different factors that influence teachers' implementation practices. The model of Brühwiler and Blatchford (2011) was used to categorize these factors. By also reviewing the ways these factors influence the teachers' implementation practices, we found that it is important to take the school context into account when there is a wish to implement DI. Each school context has its own unique characteristics and within that specific context, alignment of school, intervention, teacher, and classroom characteristics should be strived for (Fullan, 2007; Marsh & Willis, 2007).

The empirical studies reported in this dissertation (chapters 3-5) all took place within the context of one school in the Netherlands

and illustrate how different factors can be aligned. This school's context can be described as an innovative school, which means that change and trying out new ideas within classroom practice is a familiar phenomenon for the teachers. Although several teachers mentioned they had missed specific instruction about (the start of) GUTS in 2013-2014, the implementation of an innovation is something familiar for most teachers in this school.

The characteristics of the intervention GUTS can be described as providing the teachers with a lot of space to experiment with DI because there were only the four criteria (explained in 1.4) the lessons had to adhere to, and no PD trajectories were required for the teachers. In line with the literature, many teachers felt that this little structured context indeed provided them freedom to experiment with DI (De Neve, Devos, & Tuytens, 2015; Schmidt & Datnow, 2005). In line with this, the teachers' interactive cognitions studied in chapter 3 showed that several teachers during the GUTS lessons felt more freedom to focus on individual and small groups of students, than during their regular lessons. Yet, as chapter 5 showed, a small group of teachers would have appreciated more guidance in what was exactly expected of them during the lessons. This latter group experienced limited resources and sometimes even conflicting goals (Allen & Penuel, 2015). Thus, the influence of the school and intervention characteristics on the teachers in this dissertation became apparent through these results from chapters 3 and 5. Support and guidance, combined with freedom to experiment are important for teachers when implementing DI.

However, even when school and intervention characteristics are considered in the implementation of DI, many differences in teacher and classroom characteristics can be found, and it will be difficult to attend to each unique characteristic. In chapter 4, we found that teachers' interactive cognitions differed not only between teachers as a result of individual teacher characteristics, but also within teachers. It appeared that classroom characteristics like time of day and

specific composition of the class influenced the interactions teachers had with their students. This adds to the classroom characteristics we found in the reviewed literature (chapter 2), like physical classroom setting and the type of community that is created within the classroom (Brimijoin, 2005; Roiha, 2014).

Putting these results together in the supply-use model (Brühwiler & Blatchford, 2011), we see that school, intervention, and classroom characteristics indeed influence teacher characteristics, like the model suggests. Looking at the results from chapters 3 through 5, combined with important factors influencing teachers' implementation of DI that were found in the literature (chapter 2), we argue that merely focusing on teachers' knowledge and practices of DI in isolation from those other influencing factors does not do justice to the complex reality of classroom practice (Janssen, 2017; Janssen, Westbroek, Doyle et al., 2013; Meijer, Verloop, & Beijaard, 2002). Consequently, this dissertation has provided the insight that in trying to implement DI – the definition of which states that a one-size-fits-all approach to student learning is not desirable – neither a one-size-fits-all approach for teachers in their implementation of DI should be desired.

6.4 Practical implications

6.4.1 Support for teachers to experiment with innovative ideas

The three empirical studies described in this dissertation took place in the context of GUTS, which was aimed at fostering differentiated student talent development. One of the underlying assumptions in studying DI in this context, was that GUTS provided teachers some freedom to experiment with implementing DI (De Neve et al., 2015). The results described in chapter 3 endorse this assumption. The teachers' interactive cognitions investigated after the GUTS lessons tended more towards effective DI since they were more focused on small groups and individual students, than the interactive cognitions

measured after regular lessons, which focused more on the whole class. In addition, we found in the study reported in chapter 5 that some, not all, teachers experienced freedom to experiment with DI, as illustrated by a quote from one teacher: "It provides us space to experiment with other pedagogical approaches."

What might have helped teachers in GUTS is that the lessons did not have to fit within the regular curriculum. Many teachers feel that one of the things holding them back in experimenting with DI, is the regular curriculum (De Neve et al., 2015; McTighe & Brown, 2005). Teachers feel that the obligation to meet the goals of the regular curriculum makes it impossible to divert too much from the pedagogical methods of their regular lessons (McTighe & Brown, 2005). For example, the comparison of teachers' interactive cognitions in regular and GUTS lessons described in chapter 3, showed that teachers who were used to giving whole class instruction, felt more freedom during the GUTS lessons to teach individual students and small groups of students. Our conclusion that teachers might feel more freedom to experiment due to the separation from the regular curriculum was also acknowledged by the school management when we reported back to them on the most important findings of this dissertation. In addition to providing teachers with an innovation in which they can experiment with DI, this innovation should be embedded within the schedule. From the point of view of practicality, an innovation that is embedded within the regular school schedule is more congruent with teachers' regular practice and thus may help teachers with the transfer of practices from one context to another (Janssen, Westbroek, Doyle et al., 2013).

We thus suggest that it might be beneficial to provide teachers with a context to experiment, an environment in which they feel it is safe to change (Hertberg-Davis & Brighton, 2006). However, merely providing this context is insufficient: teachers also need support and guidance (e.g. Puzio et al., 2015; Schmidt & Datnow, 2005; Tomlinson

et al., 2008). The findings reported in chapters 3, 4, and 5 all show that there are many differences between teachers; chapter 5 specifically shows that teachers differ in how they make sense of a new context that is presented within an innovation. In addition, teachers' sense-making also changes during the course of an innovation. To give all teachers the support and guidance they need, and to support them in their sense-making, it is therefore important that the school management maintains an ongoing conversation with the teachers (Allen & Penuel, 2015; Fullan, 2007; Marsh & Willis, 2007; Schmidt & Datnow, 2005). The school could, for example ask several teachers how they wish to be supported when experimenting with DI, and what they think themselves is realistic and practical (Janssen, Westbroek, Doyle et al., 2013). Teachers who already have more experience with DI could be appointed as teacher leaders (Smit & Humpert, 2012). On the one hand, these teacher leaders could be available to provide support to other teachers, and on the other hand, they could talk to the school management about what teachers need and what goals would be realistic to set for the school regarding change towards implementing DI. By emphasizing ongoing communication with the teachers, it becomes clear what in the innovation helps teachers and what constrains them, and adaptations can be made. Other ideas for support and guidance to implement DI in a context like GUTS, but also within a regular context, are described in the next section.

6.4.2 Taking differences between teachers into account

All four studies described in this dissertation provided results that indicate that teachers are engaging in DI on different levels or at least thinking about ways to implement it. Also, variety in teachers' interactive cognitions and sense-making processes was found. This adds to the literature that argues that teachers say they know what DI is and how to practice it, but that little DI is observed in teachers' classroom practice (e.g., Graham et al., 2008; Dutch Inspectorate of

Education, 2016; Roiha, 2014). It also demonstrates possibilities for growth towards more (effective) DI. For this growth, teachers need to receive help in discovering the possibilities for implementing DI in their teaching practice (Janssen et al., 2013). To help teachers see DI as a more practical approach, they need to be supported with methods that stay close to their practice, depart from what they already do, and take their own learning needs into account (Corno, 2008; Janssen, Westbroek, Doyle et al., 2013; Smit & Humpert, 2012; Van Veen et al., 2010).

The SRI method, used in the studies reported in chapters 3 and 4, can also be implemented as a tool for personalized learning. Together with a researcher, colleague, or coach, teachers can observe their teaching practice to examine their own interactive cognitions. In engaging in SRIs with coaches, teachers have to explicate their thinking about DI and the coaches can invite them to also reflect on those explicated interactive cognitions (Van Veen & Janssen, 2016). Teachers can also engage in SRIs with other teachers, colleagues or teacher leaders, as suggested in 6.4.1. The support of colleagues is important in the implementation of DI (Bianchini & Brenner, 2010; Puzio et al., 2015); by engaging in SRIs with supporting colleagues, not only do teachers experience mutual trust and openness, and the benefits of explicating and reflecting on interactive cognitions, but they can also learn from each other. This collaboration with colleagues using SRIs could also be further expanded in to professional learning communities, which have shown positive results on teacher learning (e.g. De Neve et al., 2015; Puzio et al., 2015).

Teachers can further be supported while keeping close to their practice by combining SRIs with laddering interviews (Van Veen & Janssen, 2016). In laddering interviews teachers explain what they do during a 'typical' lesson and what goals they aim to achieve with those practices. Thus, in contrast to SRIs which focus on situation specific interactive cognitions that are interpreted by researchers, teachers

themselves relate more typical practices to the goals they aim for during a typical lesson. The result of such an interview is typically an elaborate goal system hierarchy (Janssen, Westbroek, & van Driel, 2013; Van Veen & Janssen, 2016). Such a goal hierarchy can then be used to develop an (individual) PD trajectory that takes the teachers' learning needs into account. The SRIs can provide support to this trajectory by having teachers explicate situation specific interactive cognitions (Van Veen & Janssen, 2016).

Combining SRIs and laddering interviews might also help teachers to become aware of possible mistakes in their assessments of students or provide them with the guidance they need in the implementation of DI (Denessen & Douglas, 2015; Schmidt & Datnow, 2005). For example, making teachers aware of the actions they undertake to achieve certain goals might also make them become more aware of the assessments they make and how they respond to those assessments. It is important, therefore, that teachers are properly supported in changing towards DI based on appropriate student assessments.

6.5 Limitations and future research

6.5.1 Limitations

The findings of this dissertation have provided greater insight into the teacher perspective in DI. However, a small number of teachers was studied. In addition, the research was conducted in one school at which a specific innovation, GUTS, was taking place. GUTS has not taken place at other schools; therefore, the results of this dissertation are not generalizable. However, as mentioned above, the new context GUTS provided, did allow us to come to several interesting conclusions, which we would not have found in a regular context.

In the studies reported in chapters 3 and 4, we used the SRI method to study teachers' interactive cognitions. For these SRIs, we, the researchers, selected video clips from lesson observations to show

to the teachers. Because we made these selections ourselves and showed only these selections to the teachers, bias was possible. Sometimes it is difficult for a teacher to recall every action in detail (Meijer, 1999; Verloop, 1989). Presenting teachers with video clips might confront them with actions for which they cannot immediately recall their thoughts, thus it might seem that teachers are reconstructing rather than recalling their thoughts. However, research has shown that, teachers constantly make conscious and unconscious decisions during teaching (Verloop et al., 2001). This suggests that even though teachers, on their first viewing of a preselected video clip, might not immediately recall their thinking, it is likely that upon a second showing or talking about what is happening in the video clip, as in the studies in chapters 3 and 4, they will recall rather than reconstruct their thoughts. It should be noted though that there is still a possibility that some of the interactive cognitions were more reconstructed instead of recalled thoughts. In addition, in the results reported in chapter 4, we related the teachers' interactive cognitions during specific teacher-student interactions to, among other things, their goals for those interactions. However, these relations were our interpretations of what the teachers said during the interviews. In our analyses, we remained as close as possible to what the teachers explicitly said during the interviews. To ensure the relationship between teachers' interactions with students and their goals for those specific interactions, laddering interviews could provide more information.

The use of SRIs in chapters 3 and 4 also means that we mainly focused on teachers' adaptations in the process of their instruction (Tomlinson et al., 2003). Teachers' differentiation in content and product of their instruction might thus be underexposed in this dissertation since we argue these adaptations to mainly take place in the planning of their instruction.

6.5.2 Future research

In this dissertation, we focused on a small group of teachers in a specific context to focus on the teacher perspective. To delve even deeper into this perspective in future endeavors, it would be interesting to study a group of teachers for an extended period with multiple moments of data collection and in different contexts. Following the teachers over a longer period in different contexts would make it possible to find out whether the interactive cognitions of teachers change over time (towards more DI) and how the context influences those changes. For, with DI, experience and repeated practice with DI is important to build further (e.g., Subban, 2006; Tomlinson et al., 2003). Such a prolonged research study, would allow teachers to engage in deliberate practice: teachers' DI practices could develop further as a result of repeated practice and feedback from researchers (and colleagues), among others, while students' learning outcomes could increase as a consequence (Bronkhorst, 2013; Marsh & Willis, 2007). In addition, teachers' interactive cognitions gain shape through experience, which means that development is possible through reflection (e.g. Meijer, 1999).

Our aim in taking the teacher perspective in this dissertation was to provide a deeper view on the complex practice of DI. We did this by examining what in a teachers' working environment influences teachers' implementation of DI and how (chapter 2); connecting teacher knowledge of DI to teachers' DI practices by examining that knowledge in practice (chapters 3 and 4); and studying how teachers make sense of a context in which they were stimulated to implement DI and how that sense-making changes (chapter 5). The idea was that this would provide a more detailed view on the complex approach that DI is. In future studies, it would be relevant to ask teachers to explicate their choices regarding the specific interactions and the students with whom the interactions took place. The combination of laddering interview and SRIs, as mentioned in section 6.4.2 would then serve not

only as a method in the professional development of teachers regarding DI, but also as a research method. Teachers' interactive cognitions of DI could then be explored in the light of the goals of their practices (Van Veen & Janssen, 2016).

Finally, it is important in future research to also consider other perspectives. In the current dissertation, we deemed it important to focus on the teacher perspective, since it is the teacher who, in the end, has to implement DI (Marsh & Willis, 2007). However, the supply-use model of student learning outcomes of Brühwiler & Blatchford (2011), our use of it in the study reported in chapter 2, and the discussion in section 6.3.2, show that all stakeholders, like school administration, students, and even students' parents, are connected. All stakeholders need to be supportive of new practices, because their support influences implementation (Marsh & Willis, 2007; Tomlinson et al., 2008). Especially students make an important group of stakeholders that require attention together with the teachers, since the students are the ones that should benefit from DI. In the PhD research project that took place parallel to the research reported on in the current dissertation, for example, students' perspectives on the GUTS lessons and the development of their motivation and achievement as a result of the innovation were studied (Wijsman, 2018). In a future undertaking, changes in students' achievement and motivation, but also their perceptions of teachers' DI practices can be studied alongside the teachers' interactive cognitions and practice of DI. Such research, preferably set up in a longitudinal study, can help to reveal what DI practices students perceive they need and whether the teachers' practices are in accordance with this. Studies like this can help to get a complete picture of how innovations stimulating DI practices influence classroom practice.