# Chapter 2
# The influence of school, intervention, teacher, and classroom characteristics on the successful implementation of differentiated instruction: A review of empirical findings[1]

**Abstract**

In recent decades knowledge about differentiated instruction has expanded. However, difficulties with its implementation in practice are still observed. In order to better understand these difficulties and to further aid efforts to include differentiated instruction in teachers' practice, we systematically reviewed 29 studies that elaborated on factors in teachers' daily practice that were of influence on the implementation of differentiated instruction. The factors found in this review were categorized as school characteristics, intervention characteristics, teacher characteristics, and classroom characteristics. This provided the overview that many different factors in the teachers' daily work environment were of influence on the implementation of differentiated instruction. One of the most important factors appears to be support, since teachers need a safe and secure environment to change. Not all factors described in this review are necessary in every school, nor will they look the same in each school. Therefore, the context in which differentiated instruction is to be implemented, is of great importance. We therefore conclude that in order to implement differentiated instruction effectively, differentiated implementation is necessary.

[1] This chapter has been submitted in an adapted form as:

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## 2.1 Introduction

*2.1.1 The need for differentiated instruction*

The need for differentiated instruction (DI) at all levels of education seems to have increased in recent decades. In many countries, governments are developing legislation for inclusive education, in which students with and without learning disabilities are taught in the same classes. As a result, student diversity in the classroom is increasing (Cha & Ahn, 2014; McTighe & Brown, 2005). This growing student diversity presents teachers with a challenge: to educate every student while accounting for their individual needs. If the teacher does not face this challenge, many students will not be completely engaged during the lessons, nor reach their maximum learning potential (Anderson, 2007; McTighe & Brown, 2005). Unfortunately, many teachers experience difficulties with this. Teachers often choose to teach to the middle, which means they adjust their instruction to the students who are in the middle with regard to achievement (Subban, 2006). This way, the level may be too high for some students, and too low for others, but also exactly right for a third group. Subban (2006) describes in a literature review disadvantages of this teaching to the middle: "Ignoring these fundamental differences [i.e., student differences] may result in some students falling behind, losing motivation, and failing to succeed" (p.938). Differentiated instruction, "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" (Tomlinson et al., 2003, p.121), is thus necessary.

In the past 15 years several studies among elementary and lower secondary school students have identified increases in student engagement and achievement as a result of DI (Deunk, Doolaard, Smale-Jacobse, & Bosker, 2015; Maeng & Bell, 2015). Thus, students

should be taught in accordance with their individual learning needs (Tomlinson et al., 2003). The learning needs are subdivided into students' *readiness* (achievement level, zone of proximal development), *interest* (motivation, interest), and *learning profile* (ethnicity, SES, learning preferences). Teachers can account for these needs through differentiating in the process, content, and product of their teaching (Tomlinson et al., 2003).

*2.1.2 The current state of differentiated instruction in practice*

Although a great deal is known about what DI is and its beneficial effects on student engagement and achievement, it is a very little observed practice (Tomlinson, 2015). Graham, Harris, Fink-Chorzempa, and MacArthur (2003) investigated primary grade teachers teaching students basic writing skills and processes, and their differentiated adaptations in their instruction. In this study, Graham et al. (2003) found that the teachers made very few, if any, adaptations: "Although the nationally representative sample of teachers in this study reported an average of four adaptations for the struggling writers in their classrooms, the majority of these adaptations were made by a relatively small proportion of the teachers surveyed. Seventy-five percent of all reported adaptations were made by only 29% of the participating teachers" (p.289). Graham et al. (2008) conducted a follow-up study which provided similar results: many teachers made at least some adaptations for the weaker students, but 42% of the teachers did not make any adaptations at all. Again, 25% of the teachers made two thirds of the adaptations (thus of the 58% of the teachers who reported making adaptations for the weaker students, not even half made the majority of all adaptations).

Among the reasons DI is so difficult for teachers are the many elements that have to be taken into account and the complexity of combining these different elements. Tomlinson et al. (2003) state in their review that DI is most effective when the teacher: (a) plans it

proactively; (b) uses small teaching-learning groups; (c) makes sure the instruction is learner-centered; (d) makes sure the instruction is knowledge-centered; (e) uses flexible pacing; and (f) makes flexible use of different materials. Of all these characteristics of effective differentiation, grouping is the most commonly used by teachers (Tomlinson, 2015). In the US, this is mostly observed in the form of between-class grouping. In countries where students are tracked, e.g., in different streams of secondary education, the type of grouping that is often observed is within-class grouping. The practice of within- or between-class grouping is often based on teachers' perceptions of student achievement, instead of solely on pre-assessment results (Tomlinson, 2015), as recommended by Tomlinson et al. (2003).

The type of DI in teachers' practice is often a reactive type, instead of a proactively planned practice (Tomlinson, 2015; Tomlinson et al., 2003). Roy, Guay, and Valois (2013) show this in their study validating their 'Differentiated Instruction Scale' (DIS), concluding that teachers use these more ad-hoc strategies of differentiation. The two most used strategies were (1) adjusting the amount of work to the students' capacities, and (2) providing the weaker students with extra aids and support. The least used strategies appeared to be (1) adjusting the difficulty of the assignments to the students' capacities, and (2) adjusting the lesson plan format, such as offering the information to students in different orders or providing more explanations.

Roiha (2014) investigated the most often used differentiation methods in Finnish CLIL (Content and Language Integrated Learning) education. The results resemble those from Roy et al. (2013) in that these most often used methods are more like reactive than proactive differentiation: the teachers reported most often that they (1) expected individuals to accomplish similar tasks, (2) provided individual support, and (3) had students produce presentations and projects according to their individual abilities. Although the teachers thus used more reactive differentiation, this does not mean that they did not

consider (effective) DI important. According to Roiha (2014) teachers do see the necessity of it, and they do make an effort to differentiate, but they find it a very difficult practice to implement.

Although definitions of DI are often very similar to Tomlinson et al.'s (2003) definition, practice differs. Anderson (2007) discusses differentiation of the content of literacy education, and how teachers can do this by using different types of texts, like novels or short stories, and providing these to students in varying reading levels. But they can also use different sources, like books on paper or tape, or the internet. In addition, Levy (2008) discusses the existence of different techniques for using assessment to differentiate the content, process, and product. Pre-assessment appears to be very important for teachers to get to know their students' readiness, interests, and learning profiles. However, there are different ways to pre-assess students. For example, a teacher can have students fill in a form to tell what they already know and can do (regarding a specific subject), what they want to know and be able to do, and what they have learned. But, he can also prepare a test, to pre-assess his students. Additionally, Levy (2008) describes how flexible grouping can be used differently: the groups can be based on the students' *readiness*, *interests*, or *learning profiles*. Furthermore, the teacher can choose to use heterogeneous grouping one time, and homogeneous grouping the other.

### *2.1.3 The implementation of differentiated instruction*

In order to better understand the difficulties and possibilities of implementing DI, and to aid future efforts to include DI in teachers' practice, in the current study we systematically reviewed the literature to examine what factors in teachers' working environments influence this implementation, and how.

We mention above that the current state of DI is one where it is often not (effectively) implemented in many instructional situations. With the often found lack of (effective) implementation we mean not

only that teachers do not use effective DI, but that because of their use of ad-hoc methods of DI, DI is often not fully embedded in their practice. Where DI is implemented, that implementation is often described in a way like Levy's (2008) and Anderson's (2007) studies do. The aim of those studies is to provide examples of how difficult DI is when successfully implemented. But, in order to identify the difficulties and possibilities for teachers of implementing DI, there are also studies that, using situated perspective, provide more details about the context in which the implementation of DI took place. This situated perspective gives us information on important factors that influence the implementation of DI. The findings of this type of research are necessary for an optimal (re)design of interventions aimed at fostering teachers' use of DI in their teaching practice.

In order to present the results of this review in a structural manner, we use the multilevel supply-use model of learning outcomes by Brühwiler and Blatchford (2011). Though used in their research to investigate relationships between different factors and levels in school, it was designed to visualize and identify what factors are at play in a teachers' daily work environment (Figure 2.1). In this model, the *supply* for learning, the *use* of learning, and student *outcomes* are combined. Within the supply for learning, several levels ranging from the educational system to teacher characteristics can be distinguished.

In the current study the model was used as a framework to gain a more comprehensive view of what is known about factors influencing the implementation of DI. In order to come to this comprehensive view, we focused on the *supply* part of the multilevel supply-use model of learning outcomes, as this represents the context in which teachers work. We believe that a review focusing on this part adds to what is already known about DI, as reviews on the effects on students have been published. Thus, we know the effects of DI on students in the *use* and *outcome* parts of the model (Deunk et al., 2015), and review studies have been conducted on what DI actually is

(Tomlinson et al., 2003). Furthermore, this review builds on what we already know from the professional development (PD) literature. Reviews on PD (Van Veen, Zwart, Meirink, & Verloop, 2010) often list factors that are generally important when trying to implement new practices. However, DI is a complex and unique pedagogical approach; this emphasizes the need to find an explanation for how those factors can influence the implementation of DI specifically. It was our aim to provide an overview of influencing factors, and how they affect teachers' working environments, which can be used in future endeavors to implement DI.

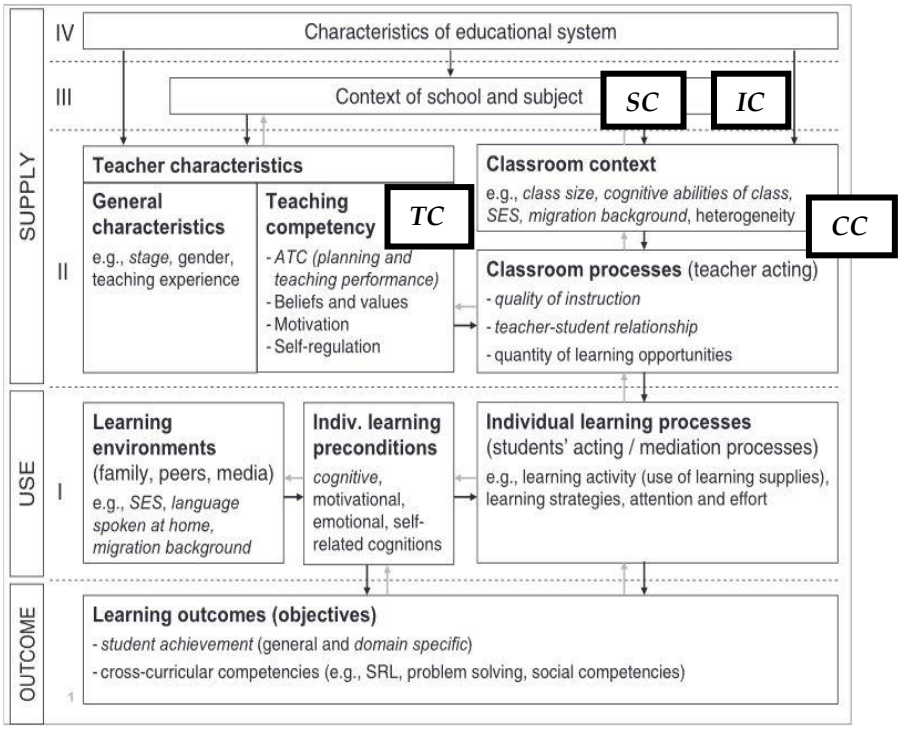


*Figure 2.1* Multilevel supply-use model of learning outcomes (Brühwiler & Blatchford, 2011) SC=School characteristic; IC=Intervention characteristic; TC=Teacher characteristic; CC=Classroom characteristic

In sum, in this study we systematically reviewed research into teachers' implementation of DI, with the aim of answering the following research question: *How do different school, intervention, teacher, and classroom characteristics influence the implementation of differentiated instruction by teachers in primary and secondary education?*

## 2.2 Method

*2.2.1 Search strategies and criteria*

A systematic literature search was conducted in the databases Web of Knowledge; Educational Resources Information Center (ERIC); and Catalogue of Leiden University. During the searches different combinations of *differentiated instruction* with the following key words were used: teacher characteristics/factors, personal characteristics/factors, individual characteristics/factors, context of school, school factors/characteristics, organizational factors/characteristics, classroom context/characteristics, leadership, administrative support, teacher variables, school variables, implementation, and enabling factors. All searches were conducted within the time span 2003-2015.[2] The titles and abstracts of the search results were checked for several criteria in order to be included for further review. The journal the article was published in, titles, or abstracts had to give information on whether the article was:

1. published in a peer-reviewed journal.
2. an empirical study.
3. focused on in-service primary and/or secondary teachers, principals, or schools as participants.
4. aimed at elaborating on factors influencing teachers' practices with regard to DI.

[2] We searched from 2003, as this was the year the Tomlinson et al. (2003) review was published. We found that from this year on many papers written on the matter used this review as the starting point for explaining the concept of DI.

With regard to the fourth criterion, it is important to remark here that articles specifically had to mention influences on the practice of *differentiated instruction*.

Applying these criteria to the search results gave a total set of 82 articles. The full texts of all these articles were retrieved and read by the PhD candidate. After reading the full-text versions, we excluded several articles. Those articles did not meet the fourth criterion: they did not report influencing factors directly based on empirical data, nor did they elaborate on how those factors influenced implementation of DI. In the end, 29 articles were included.

### *2.2.2 Data management and analysis*

*Data collection*

To be able to collect data from the remaining articles, we reported relevant information from them in an Access database. First, descriptive data were extracted: country; instruments and aim; context; school type; teachers' years of experience; and the definition of DI the researchers adhered to. We then summarized the results about the influencing factors that enable/constrain implementation of DI.

*Coding of the factors*

To compile the list of influencing factors, we read the full texts of all articles and searched the results and conclusion/discussion sections for key words like 'influencing', 'hampering' or 'stimulating'. Although such terms carry in it a meaning of a causal relationship, such a relationship was not necessarily found and tested by the authors of the articles. For example, conclusions were often based on self-report data where participants themselves described to have experienced influence from certain factors in their daily working environment. We thus mainly adhered to the respondents' or authors' interpretation of factors as being 'influencing' factors. Sentences like

'… influenced the teachers' willingness to implement DI' were thus considered to contain an influencing factor. Subsequently, we looked for an explanation of how the identified factor worked in the implementation of DI.

*Data analysis*

We used the multilevel supply-use model of student learning by Brühwiler and Blatchford (2011) to organize our results. After selecting and reading the articles, we labeled them according to the categories in the model (TC for Teacher Characteristic, CC for Classroom Characteristic, SC for School Characteristic, and IC for Intervention Characteristic). Consequently, we ended up adding 'Intervention Characteristic' to 'context of school and subject' and 'Classroom Characteristic' was relevant for both 'Classroom context' and 'Classroom processes', as shown in Figure 2.1. The model allowed us to analyze how certain identified factors related to each other in the implementation of differentiated instruction.

## 2.3 Results and discussion

We list here the identified characteristics in the same order as in the multilevel supply-use model from top to bottom (Table 2.1). We then elaborate per included article on what we found about how the characteristics influence the implementation of DI.

### *2.3.1 Characteristics of educational system*

*School level*

The first factor at the level of the educational system which influences the implementation of DI is the school level (Bianchini & Brenner, 2010). In their study aimed at examining the influence of an induction program on beginning teachers' equitable practices in the classroom in the US, Bianchini and Brenner (2010) describe how the director of the induction program claimed in an interview that DI was less 'embraced'

*Table 2.1* Overview of factors and references, based on Brühwiler and Blatchford's (2011) model

| | | |
|---|---|---|
| **IV** | **Characteristics of educational system** | |
| | ***School level*** | Bianchini & Brenner (2010) |
| | ***Policy*** | Valli & Buese (2007)<br>Mills et al. (2014) |
| **III** | **Context of school, subject, & intervention** | |
| ***SC*** | ***Principal*** | Hertberg-Davis & Brighton (2006)<br>Goddard et al. (2010)<br>Puzio et al. (2015) |
| | ***Colleagues*** | Puzio et al. (2015)<br>Bianchini & Brenner (2010)<br>Cha & Ahn (2014)<br>Smit & Humpert (2012) |
| | ***Tools & resources*** | Boudah et al. (2008)<br>Ciampa & Gallagher (2013)<br>Rubenstein et al. (2015)<br>Sornson (2015)<br>De Jager (2013)<br>Tobin & Tippett (2014)<br>Voltz (2006)<br>Butcher et al. (2014)<br>Cha & Ahn (2014)<br>Puzio et al. (2015)<br>Roiha (2014) |
| ***IC*** | ***Intervention*** | Ciampa & Gallagher (2013)<br>Walpole et al. (2011)<br>Rubenstein et al. (2015)<br>VanTassel-Baska et al. (2008)<br>Beecher & Sweeney (2008) |
| **II** | **Teacher characteristics: Teaching competency** | |
| ***TC*** | ***Teacher beliefs*** | Brighton (2003)<br>De Neve et al. (2015)<br>Dixon et al. (2014)<br>De Jager (2013) |
| | ***Teacher learning activities*** | Maeng & Bell (2015)<br>Tricarico & Yendol-Hoppey (2012)<br>Santamaria (2009) |
| | **Classroom characteristics** | |
| ***CC*** | ***Classroom processes*** | Brimijoin (2005)<br>Tobin & Tippett (2014) |
| | ***Classroom context*** | De Jager (2013)<br>Roiha (2014) |

by secondary school teachers than by elementary school teachers. She explained this as follows: "I think it is actually easier to get elementary teachers to think about instructional strategies because they are more accustomed to differentiating because they are with this [same] class of kids all day. It is very challenging to get junior high and especially high school teachers (…) to be open to the fact that your strategies might not be working [for all students]" (p.176). Thus, in this study, a participant mentioned explicitly what is often suggested in research (Deunk et al., 2015): that teaching in secondary education might be constraining for the implementation of DI.

This characteristic of the educational system is clearly difficult to influence. Schools and teachers can, however, carefully consider which approach to DI is desirable for their specific context.

*Policy*

As stated in the introduction, more and more policies with regard to DI are being introduced at national, state, and district level in different countries. The aim of these policies is to have an effect on schools' and teachers' practices with regard to DI. Mills et al. (2014) and Valli and Buese (2007) reported such effects in their studies. Valli and Buese (2007) investigated how elementary teachers' roles changed over the course of four years as a result of the implementation of different federal, state, and local policies. The federal government of the USA signed the NCLB (No Child Left Behind) act in 2001 and the state government initiated several standards, tests, etc., to enact the NCLB; in addition, the school district implemented new mathematics and reading curricula and initiated several improvement programs. Looking in detail at the results from the interviews, the authors found positive changes in teachers' collaboration and learning roles. Their findings showed that teachers were working together to group students better for DI. However, the teachers stuck to the grouping and regrouping of students and did not move on to learn more about implementing DI in their classrooms. Teachers' learning with regard to

DI did evolve positively thanks to the PD courses offered by state and school. The teachers learned how to read pre-assessment data for the purposes of grouping and regrouping students and aligning and pacing the curriculum. However, the pre-assessment data were not used to their maximum potential. Discussions about using these data to change practices and actually implement DI did not take place. This left the main conclusion less positive than some of the results suggested.

Mills et al. (2014) explored the Teaching and Learning Audit in the Australian state Queensland, which served to investigate school performance in all government schools in the state. Apparently, of all eight dimensions that were measured in the audit, 'differentiated classroom learning' was the lowest scoring dimension in all schools. In this study, one school was selected that scored 'medium' on that dimension. During the study, which took three years, interviews were held with 11 teachers and nine staff members, classroom observations were carried out, and the authors gave workshops. The findings reported in the case study revealed that, apart from practices such as streaming and individualized plans, DI was not implemented deeply. The authors called the implemented forms of DI '*narrow*', as they either did not take the individual student into account in enough detail, for example, by streaming students, or they considered the individual in too much detail.

Schools need to work in accordance with certain policy decisions made at national or state level. Adequate support for teachers appears to be necessary. We saw, for example, in Valli and Buese's study (2007) that a school district adding its own policies to the national and state policies put a lot of extra pressure on teachers and was not beneficial to the implementation of DI. We see in the following sections what effects school context might have (Goddard, Neumerski, Goddard, Salloum, & Berebitsky, 2010; Puzio, Newcomer, & Goff, 2015).

*2.3.2 Context of school, subject, and intervention*

*SC: Principal*

Hertberg-Davis and Brighton (2006) found that a safe and secure environment for change, attained and maintained by the principal, made teachers more willing and able to differentiate their instruction. In the larger study of which this study examining the principal's influence on teachers' willingness and ability to differentiate was a part, the teachers and principals received professional development training with regard to DI. The principal's influence was measured in depth at three secondary schools using interviews with the principals and teachers, classroom observations, and the field notes of coaches. Each school's principal offered a different level of support for the intervention and teachers: one principal was very supportive, the second showed weak support, and the third was '*sabotaging*' the intervention. The principal who was very supportive of the intervention had teachers in his school who were making noteworthy efforts to change. In addition, principal support appeared to be very important to teachers' attempts to change, because it made them feel comfortable about changing. Starting to differentiate instruction is a change that stretches many teachers beyond the limits of their comfort zones. A principal who believes that his teachers are able to change, and gives them an environment in which they feel safe stepping outside their comfort zone, has a positive influence on the implementation of DI. Goddard et al. (2010) added to these findings that principals' instructional support can have a positive influence on teachers' perceptions of the use of DI in their schools. The authors administered surveys within 77 primary schools measuring the teachers' perceptions of the use of DI and their school leaders' instructional support. They used hierarchical linear modelling to analyze the results. Goddard et al. (2010) concluded from the results that teachers' perceptions of principals' instructional support positively predicted the use of DI in their schools. This supports the notion that the principal is a key factor in implementing DI schoolwide.

In addition, the authors concluded that a principal simultaneously has to be an instructional and a transformational leader in order to improve instruction.

Other actions from the principal that enable the implementation of DI were reported by Puzio et al. (2015), who investigated using interviews with the teachers and principals how principals supported differentiation in the domain of literacy in their school. The authors focused on the principal as a learning-centered instructional leader, meaning that the principal was both an instructional leader (focusing on the instructional development of teachers) and a learning-centered leader (focusing on the impact of policies and the principal's practices on student learning). They found that principals can function in a school as learning-centered instructional leaders. They saw three practices with which the principals supported the implementation of DI: (1) by fostering mutual engagement between teachers; (2) by fostering alignment between perspectives and practices; and (3) by acting as brokers, thus participating in two different groups. In the case of this study, the principals, for example, co-constructed communities of practice around differentiation, and brought in the support of key district personnel who could offer a variety of instructional support, such as expert speakers. These conclusions were drawn on the basis of the principal and teacher interviews the authors held at three of the 31 schools involved in a larger study (see Cordray, Pion, Brandt, Molefe, & Toby, 2013).

Summarizing the above, we conclude that the principal has to be supportive of the teachers in their endeavors to implement DI, both by being focused on teachers' instructional development and by making teachers feel comfortable in making major changes to their regular teaching practices. A very important example of making teachers feel

comfortable is that the principal has to be aware that a practice like DI stretches teachers beyond their comfort zones and is very demanding.

*SC: Colleagues*

Puzio et al. (2015) found not only the principal to be important for the implementation of DI: teachers' colleagues appeared to be an important factor, too. When the principal provided teachers with structured time to discuss instruction and ways to differentiate with each other, collaboration with regard to instruction really took place. In addition, this collaboration appeared to be very important for the teachers in learning how to differentiate, as became clear from the standardized open-ended interviews the authors held with teachers and principals. The results of these interviews showed that teachers shared resources with each other during that collaboration time, and also narratives, including instructional suggestions, stories about teaching and students, and so on. In one of the three primary schools in which this study took place, this caused the teachers to develop a common language around their practice, which was an invaluable tool according to the teachers. As a result of the collaboration that took place, the teachers reported using an array of different techniques to differentiate their instruction (Puzio et al., 2015). Also, the observations in the investigated school showed increases in DI practices.

Another study in which the importance of colleagues came to the fore was described by Bianchini and Brenner (2010). This study was organized around an induction program aimed at training beginning teachers to teach in equitable and effective ways. The authors used interviews with beginning teachers (and their mentors and induction professionals), observations of the induction seminars and several lessons, and their performance assessment products as methods to examine the effects of this induction program. The data showed, for instance, that beginning teachers wishing to differentiate instruction could observe colleagues using differentiation to teach a unit, a few days before they had to teach it themselves. The authors concluded

from the interviews with the beginning teachers that teachers who were supported by colleagues and mentors in implementing DI were able to expand and enhance their practices with regard to DI.

Interaction with colleagues is important for the implementation of DI. Cha and Ahn (2014) investigated four teachers and five community members (parents, administration personnel, and a special teacher) in a Korean primary school. They used interviews about participants' difficulties and tensions in DI practice in order to come up with design guidelines for a teaching tool for DI. In the interviews, all teachers mentioned the identification of student characteristics as the most important part of DI practice. In their view, this could be facilitated by different means, including communication with other teachers (class teachers and subject teachers) and community members. However, although the reason was not explained in detail, according to Cha and Ahn (2014) opportunities for interaction between teachers had decreased over time as a result of their not feeling at liberty to discuss students' negative attitudes with each other. Open communication about student characteristics would help teachers in getting to know students' needs and reflecting these in instructional strategies (Cha & Ahn, 2014). Thus, one of the guidelines for a teacher tool that facilitates DI is that it has to enable communication among community members.

Finally, Smit and Humpert (2012) used teacher questionnaires to measure, among other things, the practice of DI and team culture in order to identify factors that may support the use of DI. The authors found correlations between team culture and (the practice of) DI, suggesting the same as the studies reported above: readiness for innovation, shared pedagogical visions, a supportive team climate, and availability for discussing pedagogical topics – which Smit and Humpert (2012) capsulize under the term pedagogical team culture – within the school are important facilitators for the implementation of DI in teachers' practice. The authors did not discuss which of these

aspects of a pedagogical team culture were more important to this positive correlation, and which less important.

The above studies demonstrate that the implementation of DI is preferably not an endeavor of an individual teacher. A team culture in which colleagues are available for collaboration is desirable. Teachers should then be able to communicate freely and clearly about their students and their practices, in order to get to know them and their needs.

*SC: Tools, resources, and time*

Not only are the principal and colleagues important for the implementation of DI, but appropriate tools, resources, and time can make implementation easier, too (Cha & Ahn, 2014; Puzio et al., 2015; Rubenstein, Gilson, Bruce-Davis, & Gubbins, 2015). Several researchers have reported that teachers were willing to implement DI, and sometimes had training in how to differentiate, but found it difficult or even impossible to implement in the end, because the right tools, resources, and time were lacking (De Jager, 2013; Roiha, 2014; Tobin & Tippett, 2014). Time appears to be one of the most essential elements: Tobin and Tippett (2014) describe how even in a project with a successful professional development program for the implementation of DI, a lack of time was a serious constraint for the five teachers who were interviewed. De Jager (2013) and Roiha (2014), too, describe this lack of time as an important constraint on implementing DI. Roiha (2014) found this first in interviews with three secondary school teachers and later in a questionnaire administered to 48 secondary school teachers in Content and Language Integrated Learning (CLIL) education in Finland. De Jager (2013) administered questionnaires to 607 secondary school teachers in South Africa, and in response to the open-ended question "what hampers the implementation of differentiated learning activities?" (p.86) she found that many teachers mentioned their workload. The teachers said they

had little time for differentiated lesson planning, as they were burdened with frequent curriculum changes, in-service training, etcetera. When teachers in those cases also do not receive proper and sufficient equipment, they feel constrained and are less willing or unwilling to implement DI at all (De Jager, 2013). What exactly that equipment should be, was not explicitly stated.

In line with this, Rubenstein et al. (2015) described how in their study the supply of appropriate materials, like pre-assessment tests, was of significant importance for teachers to differentiate their instruction. Although the teachers in their study were aware of the importance of pre-assessment to DI, they did not use it, or did not know how to use it. Furthermore, the above-mentioned interview study by Puzio et al. (2015), which demonstrated the importance of both the principal (support) and collaboration with colleagues, suggests that the implementation of DI was even further enhanced by the principal's efforts in helping the teachers to access a variety of resources and DI experts, purchasing a variety of new materials , and giving them the opportunity to attend conferences. Puzio et al. (2015) do not provide examples of resources and materials teachers should have access to.

In addition to the more general materials and resources, there are more specific tools. Several authors have tested the influence of specially designed tools on teachers' ability and willingness to implement DI. An overview of those tools and a short description of each can be found in Table 2.2. Below, we elaborate on how each of these tools helped teachers to implement DI.

Boudah, Lenz, Schumaker, and Deshler (2008) found in their action research study that a tool like the Unit Organizer Routine facilitated DI. The Unit Organizer Routine aims to help teachers in planning unit instruction and enable them to help students see the bigger picture. The tool consists of two pages, to be filled in by teachers together with their students. The first page is a visual overview of the

current unit (one broad topic) being taught, what its place is in the bigger picture, the previous and next units, and some details about the current unit. The second page is to be filled in throughout the unit and

*Table 2.2* Differentiated instruction tools and their influence on the implementation of DI

| **Tool** | **Description** | **Reference** |
|---|---|---|
| Unit Organizer Routine | A two-page tool teachers fill in together with their students. The goal is to collaboratively construct a visual overview of the current unit and its place in the bigger picture. | Boudah et al. (2008) |
| Curriculum Customization Service | A web-based tool that helps teachers "to explore online materials relevant to key instructional objectives (according to the Earth science curriculum) and to save digital resources to an individual account." (p.12) | Butcher et al. (2014) |
| Ipod Touch + apps | A mobile device that in classrooms can be used with educational apps, in order to function as a digital learning device. | Ciampa and Gallagher (2013) |
| Essential Skills Inventory | An inventory tool for teachers, inviting them to collect baseline data of all students in all learning domains. After all baseline data are gathered, teachers should systematically update data in two domains per week throughout the year. | Sornson (2015) |
| M²ECCA-framework | A framework that emphasizes major aspects of instruction, and that should enable teachers to implement differentiated instruction. | Voltz (2006) |

consists of adding and connecting relevant and important details in an expanded visual map of the unit. From interviews with the teachers it appeared that the tool enabled them to differentiate during whole-group instruction, which helped students, especially lower-achieving students and students with learning disabilities, to achieve better, as became clear from the analysis of the teacher grade books. Another tool that helps teachers in planning their lessons for DI is the Curriculum Customization Service (CCS), investigated by Butcher, Leary, Foster, and Devaul (2014). The year-long adoption of this technology-based planning tool was investigated among 11 secondary school science teachers, using interviews, in order to determine the degree to which the tool influenced the teachers' thinking about instruction and their instructional strategies. From the structured interviews it appeared that this tool facilitated more constructive teacher thinking. They discussed the use of technology in their lessons during more constructive instruction, instead of during directive instruction. In addition, teachers focused more on student-centered strategies: a tool like the CCS thus enables teachers to implement DI strategies more easily.

Another study focused on the M²ECCA framework, which can be used as a planning tool for teachers to better prepare them for DI (Voltz, 2006). In addition, the framework is said to help with planning for multicultural education. Figure 2.2 is the visual representation of the framework, showing the importance of the methods of instruction, the materials the teachers use, the environment in which the students are learning, the content they are learning, the collaboration between different teachers, and the assessment they administer. Although the framework does not visualize how the different elements are interrelated, Voltz (2006) found in the results of questionnaires administered among 44 primary school teachers that the framework had enhanced the teachers' ability to make lesson adaptations for DI.

How exactly teachers used the framework to make these adaptations remains unclear from Voltz's (2006) descriptions of the results.

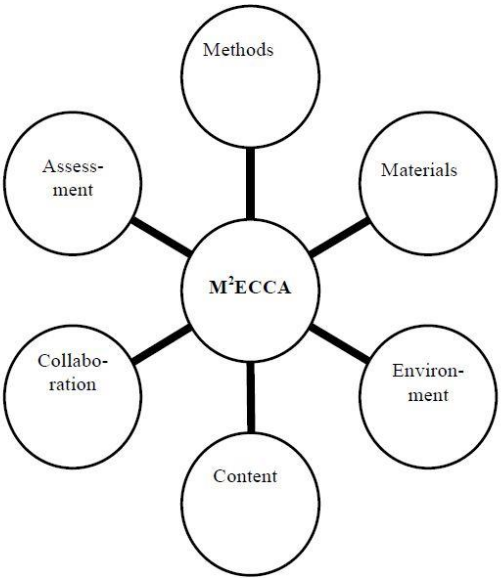


*Figure 2.2* M²ECCA Framework (Voltz, 2006)

Besides planning tools that appear to have a positive effect on the implementation of DI, there are tools that can be used either to feed the planning (the Essential Skills Inventory described in a study by Sornson, 2015) or during the lessons to make it easier for teachers to differentiate (the iPod Touch with educational apps, as described by Ciampa and Gallagher, 2013). With the Essential Skills Inventory (ESI), teachers routinely use formative assessment to keep track of their students' progress and are supposed to use these data to adapt their instruction (Sornson, 2015). The ESI is intended for K-3 years; each year the ESI consists of 7 to 8 domains and 30 to 33 skills on which teachers can measure students' progress. After the first six weeks, in which the teachers are taught to collect baseline data, at least two skills in at least two domains should be updated every week, measuring which students are proficient, which are developing proficiency, and which need intensive support. Teachers can use this information to plan their

lessons. The principal also has a role in building and keeping up with this routine of formative assessment, as (s)he is supposed to organize monthly data review meetings with the teachers. In this study, 31 primary school teachers were selected by their principals as using the ESI with fidelity and filled in a survey which consisted of a self-assessment of their behavior and skills. The findings showed that when teachers used the ESI with fidelity (i.e., they updated at least two domains weekly) they reported more use of DI strategies than before they used the ESI.

Ciampa and Gallagher (2013) focused on how the use of a mobile device like the iPod Touch, in combination with educational apps, influenced student learning and engagement. All teachers in the study (n=14) followed eight professional learning sessions to learn about the iPod Touch and how to integrate it in their classroom instruction. The sessions were set up according to the principles of DI, in order to meet the individual teachers' learning needs. In order to measure the influence of the iPod touch in the classroom, after five months of professional learning, 10 teachers were interviewed in a semi-structured individual interview. The teachers explained how the iPod Touch and the educational apps helped them differentiate their instruction, leaving the authors to conclude that the iPod Touch apps were not only a "source of fun and entertainment" (p.322), but also had benefits for student learning and enabled DI.

Different tools have been developed to help teachers implement DI. Research shows that these tools can be effective: for instance, they can make DI less time-consuming. Also, in addition to specific tools, it would be beneficial if teachers had access to enough and appropriate resources, and had enough time to plan for DI.

*IC: Intervention*

Schools and teachers need to obtain knowledge and learn strategies to act on the policies and use the tools and materials aimed at DI (De

Jager, 2013). Therefore, in several studies reported in this review, interventions were aimed at the implementation of DI (VanTassel-Baska et al., 2008; Walpole, McKenna, & Morrill, 2011).

Generally speaking, it appears important for such an intervention to make sure the context is right for implementation of DI. For example, an intervention that is designed within the framework of DI itself has a greater chance of really changing the teachers' practices towards using more DI (Brimijoin, 2005; Ciampa & Gallagher, 2013; Walpole et al., 2011). In other words, these studies underscore the importance of the 'teach what you preach' principle. In the six-year-long study by Walpole et al. (2011), this was found after the fourth year of implementing the government-initiated policy 'Reading First'. Working together with over 2,000 teachers in 153 primary schools in the American state Georgia, the authors found that in the professional learning that was part of the approach to implementing Reading First, the teachers did not begin reaching their instructional goals until the authors and coaches were successful in differentiating their professional support goals and strategies.

More support for a context of DI interventions designed using the principles of DI comes from the iPod Touch study by Ciampa and Gallagher (2013). Although it was not at the heart of this study to examine whether and how the professional learning that accompanied the implementation of the iPod Touch influenced the correct implementation of use of the device and enabled DI, the authors concluded that the differentiated set-up of the professional learning was important for the teachers to learn about how to use the device.

Rubenstein et al. (2015) also demonstrated the importance of intervention design when implementing the use of a 'tool' that should facilitate DI. In their study, the teachers were provided with pre-differentiated curricula in order to help them implement DI. Pre-differentiated curricula consist of pre-assessments and coordinated tiered lesson activities. The teachers could choose from various options

what to offer the students (as opposed to having to plan it all themselves). The teachers participating in the study also received professional development training over two days. During the first day, at the beginning of the PD, the teachers were given an overview of the complete study that was to take place, received demonstrations of lessons they were supposed to give during the study, and attended a discussion about the main ideas of the curricula. Halfway through the study, the second day of PD took place; the teachers were prompted to create their own lessons from the principles that made up the different units they taught. In the end, the tools appeared to have a positive influence on the teachers' implementation of DI. This result, however, went hand-in-hand with the fact that the use of the tool was accompanied by PD, which was probably also of influence on the implementation. It was not mentioned what specific elements from those days of PD helped the teachers.

VanTassel-Baska et al. (2008) investigated 37 primary school teachers who received training during a three-day summer institute and a one-day winter institute over a period of three years. During all years, the teachers were observed to examine changes in their instructional behavior towards more use of DI. The first summer institute was focused mainly on reviewing the project implementation guide and training in the teaching models. After that, during the subsequent institutes, differentiated training topics were provided and issues from the previous institute were addressed. The classroom observations demonstrated results that pointed towards strong positive effects on the teachers' DI behavior over the three years, with more stable implementation of DI in the third year. This result was confirmed by the results with regard to students' engagement. Again, the specific elements in the PD contributing to these results were not mentioned.

Similar results were reported by Beecher and Sweeny (2008) in their article describing an eight-year PD course taking place at one

school in the US. They describe several initiatives related to the use of enrichment and DI, with the aim of closing the achievement gap. The whole journey of this school was described in their article, which ended with the conclusion that the PD offered a differentiation model and an accompanying matrix, and that the combination served as an effective way of implementing DI in the teachers' practice.

What we can learn from the different intervention studies reported on in this review is that specific interventions focused on implementing DI appear, as intended, to be helpful. They succeed by providing teachers with ways to differentiate, for example, by supplying them with pre-differentiated curricula (Rubenstein et al., 2015), or by applying the 'teach what you preach' principle (e.g., Walpole et al., 2011). Also, the most effective interventions lasted three to eight years; for interventions to have positive outcomes, their duration should be considered.

*2.3.3 Teacher characteristics*

*TC: Teacher beliefs*

High efficacy beliefs (e.g., teacher efficacy, self-efficacy) appear to have a positive influence on the implementation of DI in Belgian and American primary and secondary education (De Neve, Devos, & Tuytens, 2015; Dixon, Yssel, McConnell, & Hardin, 2014). In Belgium, policymakers and researchers have called for the implementation of DI in the classrooms to deal with growing student diversity. Because of this, and the already known difficulty of the implementation of DI, De Neve et al. (2015) administered questionnaires to beginning teachers (0.25-5 years of experience) in primary education ($n_{schools}$=65) to measure factors that may play a role in the learning processes of beginning teachers regarding DI. With the results of the questionnaires, the authors calculated correlations and found that more autonomous teachers indicated greater use of DI strategies. Teachers' self-efficacy, too, appeared to be essential for the teachers'

implementation of DI. Dixon et al. (2014) found similar results in the US, but then for primary and secondary school teachers across the whole range of experience. Like De Neve et al. (2015), the authors used questionnaires to examine the teachers' efficacy (the Teacher Efficacy Scale, by Woolfolk, Rosoff, & Hoy, 1990). They found that the extent to which a teacher felt able to use different instructional strategies was the best predictor of differentiation (Dixon et al., 2014). Another significant predictor of differentiation in the classroom was a teacher's personal efficacy. A clear explanation of the difference between teacher efficacy and the teachers' personal efficacy was not provided by the authors.

Beliefs teachers hold about addressing academic diversity or about their students might both enable their implementation of DI or constrain it (Brighton, 2003). In her study of teachers' beliefs about teaching in diverse classrooms, Brighton (2003) identified four beliefs that emerged from the interview, observation and document data that conflicted with DI. Those four beliefs were: (1) "Teacher is an entertainer" (p.186); (2) "Teaching is talking; listening is learning" (p.189); (3) "When faced with an academic challenge, students will resist and shut down" (p.193); and (4) "Equity and fairness for students means all students do the same thing" (p.196). In her conclusion, Brighton (2003) states that these beliefs inhibit teachers in their efforts to "create and sustain learning environments compatible with meeting diverse learning needs" (p.200). In contrast, De Jager (2013) describes how a teacher's attitude towards teaching and including diversity can facilitate the implementation of DI. One of the teachers in her study states: "Teachers need to have a passion and a positive attitude to include learners with barriers" (p. 88).

From the above studies, we conclude that when implementing DI it is important to take differences in beliefs between teachers into account and, accordingly, organize a custom-made implementation, including

particularly the alignment of beliefs with DI, and increasing teachers' (self-)efficacy and autonomy regarding DI.

*TC: Teacher learning activities*

Above we discussed how collegial relationships, such as collaboration and sharing knowledge, can be beneficial for the implementation of DI (Bianchini & Brenner, 2010; Cha & Ahn, 2014; Puzio et al., 2015). Although the principal can provide time and structure for teachers to collaborate, the teachers themselves have to take responsibility for using that time and structure to collaborate. When teachers do not greatly value their relationships with colleagues and are not open to their feedback, the development of their abilities to differentiate might be less successful than when they do value them (Tricarico & Yendol-Hoppey, 2012). In their study examining the development of alternative certification candidates as planners and implementers of DI, Tricarico and Yendol-Hoppey (2012) investigated three teachers taking part in an apprenticeship program for primary schools and engaged in a PD course focused on DI. The teachers were observed on several occasions and the authors studied documents, like lesson plans, to further understand their development. With regard to relationships among colleagues, the authors illustrate the case of one of the apprentice teachers, who decided to revise her lesson according to her own vision, ignoring her colleagues' feedback. She ended up with a lesson that did not differentiate appropriately.

Another activity that might benefit teachers when using DI as a pedagogical framework is learning more about special education processes, as suggested by Santamaria (2009): she describes the changes two primary schools in California, US, went through to close the achievement gap. DI is an important concept in her description of the developments both schools went through over five years. The developments were recorded using observations, recorded conversations with school personnel, and other documents within the schools. One of the important lessons Santamaria draws from both

schools' 'journeys' in closing the achievement gap is that, when teachers who have learners with special educational needs in their classes learn more about special education processes, they are better able to provide the best teaching practices and support for diverse students. In addition, Santamaria (2009) focused on DI in combination with Culturally Responsive Teaching (CRT), an approach in which teachers deliberately adjust their instruction to take account of students' cultural backgrounds. She mentions that the one can complement the other "when attention is given to the cultural and/or linguistic needs of students, resulting in enhanced learning and student motivation" (p.241).

Maeng and Bell (2015) investigated seven secondary science teachers who were considered proficient in differentiating instruction by their colleagues, to find out how they implemented DI. By observing, interviewing, and examining teaching artefacts, the authors found out the importance of knowing about and starting to plan from the students' learning preferences. The authors conclude from their study that when teachers take their students' learning preferences as starting point, it facilitates their incorporation of differentiation strategies. Also, when teachers decide to use formative assessment, it is important that they use the data. Maeng and Bell (2015) found that when teachers used formative assessment, but failed to use the data it provided, they were unable to incorporate activities that accounted for differences in student readiness, and were thus unsuccessful in implementing DI.

*2.3.4 CC: Classroom processes*

There are factors in teachers' interactions with their students that can facilitate teachers in differentiating their instruction. Brimijoin (2005) states, based on her previous experience of investigating DI and a current case study, that teachers who create the appropriate learning community within their classroom practice DI with more ease than

teachers who do not. The appropriate learning community is one where the teacher confers status on students for contributions, sets high expectations for students, and gives them positive feedback on successes and unique perspectives. Furthermore, certain practices, like using anchor activities and task cards, help in differentiating instruction. Anchor activities and task cards provide meaningful activities students can autonomously fall back on when they have finished their work and are waiting on further or new instructions. They can help students anchor the instruction in experiences to enrich and reinforce their learning. In addition, when such practices lead to positive student reactions, teachers are more inclined to sustain that implementation of DI (Tobin & Tippett, 2014). Tobin and Tippett (2014) investigated the possibilities and potential barriers primary school teachers perceived when learning about and implementing DI in a PD project, and how their understanding of DI changed. Although this PD helped the teachers to differentiate, it was not directly the PD that helped them to fully implement DI, but the classroom processes afterwards. In the PD course, the teachers attended workshops emphasizing different aspects of DI through demonstrations, mini-lectures, etcetera. The authors collected data from observational field notes, pre-questionnaires, and teacher discussions. Afterwards, the teachers received a post-questionnaire and semi-structured interviews were held. Also, student samples of DI products were collected. Because of this extensive set of data, the authors were able to draw conclusions on what the teachers learned from the workshops, and also on what worked in the classroom for teachers in differentiating their instruction. What especially appeared to help teachers to implement DI and maintain the implementation were the effects the teachers saw that DI had on the students. Thus, successful implementation of DI not only benefits the learners at the time, but also has more sustainable outcomes as the teacher will continue to develop his practices towards greater use of DI.

*2.3.5 CC: Classroom context*

The last set of characteristics which we were able to define as influencing the implementation of DI concerns the classroom context. An often-mentioned constraining factor within this category is the large class size with which many teachers are confronted. With a large number of students in one classroom, there are more different needs, and teachers perceive it as a more time-demanding task to plan for and act upon all those different needs (De Jager, 2013; Roiha, 2014). De Jager (2013) (N>600) and Roiha (2014) (N=51) conducted survey studies in which several reasons (not) to differentiate and challenges of implementing DI were described. More detailed information on how these factors influence implementation is lacking. What was reported next to the size of the class is the physical setting within the classroom, which can feel constraining for DI (Roiha, 2014): 66% of the teachers who filled in the questionnaire mentioned this as one of the most challenging issues of differentiation. In addition, interviews with a small number of teachers showed that teachers feel that the standard classroom setting is impractical when trying to implement DI. Roiha therefore recommends decorating the classroom and arranging the desks differently to create more space and open up more areas for differentiation.

## 2.4 Conclusion

The studies incorporated in this review took place in different contexts and/or investigated the influence of those different contexts. For example, Hertberg-Davis and Brighton (2006) provided insight in how the attitude of the principal regarding an intervention aiming at the implementation of DI appeared to have a significant effect on the success of that intervention. Hence, one of the most important lessons for the implementation of DI coming forward in this review is: context matters. This leads us to conclude that to implement DI, *differentiated implementation* is necessary. There is no one-size-fits-all solution for

implementing DI, applicable to each school, all teachers, having favorable effects on all students.

In addition, we cannot conclude from the current overview what characteristic is most important, it is likely that this depends on the context in which DI is to be implemented. Nor can we conclude whether each characteristic is explicitly related to the implementation of DI or also applicable to the implementation of other approaches. However, certain characteristics clearly are explicitly related to the implementation of DI, and it is in linking these characteristics with other, more generally applicable characteristics that this overview adds to the literature elaborating on these more generic characteristics.

Furthermore, we believe that this systematic review of the literature not only shows that implementation of DI should be differentiated, but also that the different characteristics should be considered in combination. For example, the results have shown that small class sizes are favored by teachers, but when the physical classroom setting is not adapted to differentiated teaching methods, teachers can still feel constrained in implementing DI. Also, teachers should have enough time to plan for DI in that classroom, and appropriate tools should be at the teachers' disposal. What those tools are, depends on the context: how big classes are, but also whether the teachers can work together with their colleagues to learn about and plan for DI. The relations between the different characteristics are also visible in Brühwiler and Blatchford's model (Fig. 2.1). Many of the boxes with characteristics have recurrent arrows to connect them, suggesting that those characteristics are related to each other.

Not only in the practice of implementing DI should the relations between the different characteristics be taken notice of. These relations should be the focus of future studies as well. As it would be unfavorable to figure out a one-size-fits-all approach to the implementation of DI, it is important to understand how characteristics are related to each other.

In this review, we found that the results and conclusions of most studies appear to be based on self-report data. Often, the researchers held interviews with teachers, principals, or other school personnel, or administered questionnaires, asking what the participants themselves experienced. Data which are often considered to be more objective, like classroom observations to see what is really happening, are only available in a minority of the studies reported in this review. In addition, in using these methods, the researchers often focused on the teachers without making explicit connections to students' perceptions or achievement.

We further suggest that in future studies methods like multiple-case studies, focusing on all stakeholders engaged in the implementation and on both the perceptions and the practices of those stakeholders, should be used. For example, the effects of the implementation of DI on students have been investigated often (Deunk et al., 2015), but not incorporated into studies also looking at the teachers. Rather, most studies, also those incorporated into this review, focus on only one group of stakeholders. We believe that studies focusing on all stakeholders are important to get a better grasp of what actually happens in practice when (attempting to) implementing DI.

Finally, future studies could also take account of the cultural context in which the implementation of DI is taking place. In this review, we did extract the different countries the studies were from, but we were unable to find out whether certain findings were related to the specific prevailing culture of that country or school.

Based on the overview of different factors arising from current research that have an influence on the implementation of DI, we argue that to implement DI effectively, differentiated implementation is necessary. Although factors like small classrooms, an adjusted physical classroom setting, and a safe and supportive environment to change seem to be of great importance for successful implementation,

each specific school setting requires a specific way of bringing these and other factors together.

# Chapter 3

# Teachers' interactive cognitions of differentiated instruction in regular and talent development lessons