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The 5-Dimensional Model: A Tangible Framework for Differentiation

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Differentiation has become an indispensable teaching approach to meet the needs of diverse learners, and has thus garnered a lot of attention, particularly on a theoretical level. This has resulted in an abundance of differentiation models and frameworks. Despite the attention given to differentiation, most teachers still seem to struggle with implementing it in practice. The previous models have therefore failed to provide teachers with a clear and easy-to-use framework for differentiation. For this reason, we have created the 5-dimensional (5D) model of differentiation which aims to be a more accessible and tangible model than the existing ones. The model approaches differentiation through five dimensions, which are 1) *teaching arrangements*, 2) *learning environment*, 3) *teaching methods*, 4) *support materials* and 5) *assessment*. The model draws on *constructivism*, *Zone of Proximal Development (ZPD)*, *Theory of Multiple Intelligences* and *motivation* as its core theoretical underpinnings. The model stems from the Finnish educational context but can be transferred to and applied in various school contexts. In this article, we will first review various definitions of differentiation. We will then critically examine some of the existing models for differentiation. Finally, we will elaborate on the theoretical underpinnings and different dimensions of our 5D model.

Introduction

It is generally agreed that the traditional one-size-fits-all approach to teaching is outdated and defective to meet the needs of all learners. On the contrary, the individuality and diversity of learners have started to receive increasing attention in schools globally in the past few decades (e.g. Banegas et al., 2021). This is for instance due to constructivism, the dominant learning theory in contemporary times, or the efforts to educate all students in the mainstream classrooms. Differentiation, a pedagogical approach in which teaching is adjusted to meet the needs of individual learners, is often put forward as one solution to the challenges brought about by heterogeneous student body (e.g. Pozas et al., 2020). Differentiation is not a new concept but its visibility and prominence has proliferated in educational discourse in many contexts in recent years. Differentiation has been studied quite

extensively but predominantly from the perspective of teachers' differentiation practices and attitudes towards differentiation (e.g. Pozas et al., 2020; Roiha, 2014). Although the effects of differentiation have not been studied exhaustively (Prast et al., 2018), some studies have indicated that it can be a beneficial teaching approach with regard to students' learning, school satisfaction and self-concept (e.g. Deunk et al., 2018; McCrea Simpkins et al., 2009; Roy et al., 2015; Valiandes, 2015).

This article focuses on the 5-dimensional (5D) model of differentiation which draws on research and endeavors to be an easy-to-use instrument to practice differentiation in classrooms across the world. To begin with, we will review how differentiation has previously been defined and argue for a broader understanding of the concept. We will then zoom in on existing models and precepts to implement differentiation. Finally, we will explain the background

and theoretical underpinnings of our model and elaborate on its five different dimensions.

Defining Differentiation

Differentiation has been defined and conceptualized in various ways. One approach has been to focus mostly on students' ability differences. This is the case for instance with Roy et al. (2013) who define differentiation as "an approach by which teaching is varied and adapted to match students' abilities using systematic procedures for academic progress monitoring and data-based decision-making" (p. 1187). In their view, differentiation entails two interrelated components, that is, adapting instruction and monitoring the progress (Roy et al., 2015). Roy et al.'s (2013) ability-focused definition disregards other relevant dimensions of differentiation such as students' interests or self-esteem.

Differentiation is often viewed solely as a reactive response to students' needs. For instance, Hall (2002) states that "to differentiate instruction is to recognize students varying background knowledge, readiness, language, preferences in learning, interests, and to react responsively. Differentiated instruction is a process to approach teaching and learning for students of differing abilities in the same class" (p. 1). The above statement reflects a view which focuses predominantly on ability differences although expands it also to include interests and learning preferences. In addition to the above, a common feature in the definitions of differentiation is to perceive it mostly as a set of teaching practices. This is the case for instance for Benjamin (2002), according to whom differentiation is "a variety of classroom practices that accommodate differences in students' learning styles, interests, prior knowledge, socialization needs, and comfort zones" (p. 1). Perceiving differentiation as a mechanical set of teaching practices neglects to see it as a broader phenomenon. What is positive in Benjamin's (2002) definition, however, is that it expands the scope of differentiation to other dimensions than merely students' abilities.

Differentiation has also been defined in a broader sense than reviewed above. Among the more inclusive definitions of differentiation is that of Tomlinson et al. (2003) who define differentiation as

an approach to teaching in which teachers proactively modify curricula, teaching methods, resources, learning activities, and student products to address the diverse needs of individual students and small groups of students to maximize the learning opportunity for each student in a classroom (p. 120).

Defining differentiation as a *proactive approach* essentially adds to the more limited definitions of differentiation. What is more, Tomlinson et al.'s (2003) definition acknowledges that differentiation is ultimately both an individual and group-level phenomenon.

Another more progressive and relatively comprehensive definition of differentiation comes from Suprayogi and Valcke (2016). They have reviewed various definitions of differentiation and formed their own eclectic definition, which integrates five dimensions reflected in some of the previous definitions. More specifically, Suprayogi and Valcke (2016) draw on the definitions by Moore (2005), Tomlinson and Imbeau (2010), Fogarty and Pete (2011), Whipple (2012) as well as Smit and Humpert (2012). According to Suprayogi and Valcke (2016), differentiation is "an instructional approach that accommodates the diversity of students by (1) coping with student diversity; (2) adopting specific teaching strategy; (3) invoking a variety in learning activity; (4) monitoring individual student needs, and (5) pursuing optimal learning outcomes" (p. 4). Coping with student diversity in essence means that teachers acknowledge each student's readiness, ability, learning style and socioeconomic status in teaching and cater for such diversity for instance by flexible grouping or differentiating homework. Adopting a specific teaching strategy means that teachers rely on strategies that are suitable to their students' characteristics. Suprayogi and Valcke (2016) particularly highlight peer and collaborative learning methods. Invoking a variety in learning activities signifies that teachers should employ a broad array of teaching strategies, among them allowing students to progress at their own pace and capitalizing on the students' input in learning activities. Monitoring individual student needs, in turn, entails modifying content, process and product based on the learners' needs and readiness levels. Finally, pursuing optimal learning outcomes means trying to create the conditions for each learner to reach their maximum potential in learning. This entails setting

individual goals and employing assessment methods based on students' abilities and prior knowledge.

In our view, the last two definitions presented above (Tomlinson et al., 2003; Suprayogi & Valcke, 2016) provide a fairly thorough and comprehensive take on differentiation. Positively they both define differentiation as a holistic approach that seems to permeate all teaching. However, we would like to complement Tomlinson et al.'s (2003) definition by adding also the reactive dimension of differentiation to it. That is to say, in ideal differentiation, teachers respond to students' differences both *proactively* and *reactively*. Next, we move on to juxtapose differentiation with other similar concepts.

Differentiation in Relation to Other Concepts

The term *differentiation* is often used interchangeably with *differentiated instruction* or *differentiated teaching*. We have opted for the use of the term differentiation as, in our view, it more accurately corresponds to the phenomenon in question than the two other terms do. That is, differentiation is a wider term and not limited only to instruction or teaching as it also covers topics such as the learning environment and support materials.

Some scholars distinguish between the terms *personalization*, *differentiation* and *individualization* while others use them interchangeably. Those who differentiate the above concepts claim that differentiation focuses more on groups as opposed to the more individual and student-centered personalization and individualization (e.g. Bray & McClaskey, 2013). In our line of thinking, however, differentiation is the broadest of the three terms and subsumes the two others. We perceive differentiation as encompassing both individual and group-level adjustments whereas personalization and individualization only focus on the former. Furthermore, differentiation better reflects the view shared by most educators that effective learning is predominantly a social process.

Several other terms are often associated with differentiation such as *inclusive education*, *homogeneous and heterogeneous grouping*, *response to intervention* (Fox & Hoffman, 2011), *universal design for learning* (UDL)

(Meyer et al., 2014) or *adaptive teaching* (Parsons et al., 2013). For instance, some scholars consider UDL and differentiation separate concepts while others use them synonymously (Alsalamah, 2017). UDL is often defined as a proactive approach in which teaching is made accessible for all learners at the outset. Differentiation, in turn, is sometimes viewed in a more restricted manner as only being a reactive approach to respond to the needs of individual students by changing and modifying instruction (Alsalamah, 2017; Longfellow, 2019). However, differentiation can also be defined in a broad sense as being a proactive (as well as reactive) approach to teaching (e.g. Roiha & Polso, 2020; Tomlinson, 2014), therefore somewhat resembling UDL.

As Demirsky Allan and Goddard (2010) accurately state, differentiation and response to intervention (RTI) have different origins but they share the goal of modifying instruction until it meets the needs of all learners. That is, differentiation emerged as an approach to consider each student's individuality whereas response to intervention predominantly focuses on struggling learners. However, we also share Demirsky Allan's and Goddard's (2010) view of differentiation and RTI having several commonalities and overlaps. Both approaches aim to take students' individuality into account and are flexible in their implementation. One difference between the two approaches is that response to intervention adheres to the often used 3-Tiered support system in education which can be (but not necessarily is) a part of differentiation.

Differentiation is often juxtaposed with adaptive teaching. According to Prast et al. (2018), the term differentiation is often associated with macro-adaptations which are pre-planned and pre-designed whereas adaptive teaching refers to micro-adaptations which are more spontaneous and based on students' immediate needs (see also Corno, 2008). We, however, see differentiation encompassing both levels, that is, purposeful differentiation entails both proactive and reactive adaptations to teaching in response to students' needs.

Finally, differentiation is often presented as a central element of inclusive education (e.g. Laari et al., 2021). Inclusive education is defined as an unfinished process, approach, alternative to mainstream education and a continuum (Hausstätter, 2014; Qvortrup &

Qvortrup, 2018; UNESCO, 2005) whereas differentiation only as a set of strategies to help pursue inclusive education (e.g. Benjamin, 2002). However, if differentiation is once again perceived more broadly than that (i.e. both as a set of strategies and an approach to teaching), it starts to resemble inclusive education. Differentiation also endeavors to remove barriers and support the participation of all students with a particular emphasis on marginalized, excluded and underachieving students (see UNESCO, 2005 for elements of inclusion).

To conclude, we perceive differentiation as a holistic notion that partly intersects and overlaps with concepts such as inclusive education and universal design for learning. We agree with Tomlinson (2000a) who has stated that “differentiated instruction is not a strategy. It is a total way of thinking about learners, teaching, and learning” (p. 31). Furthermore, our views coincide with those of Santamaria (2009), according to whom differentiation “is considered as much a philosophical orientation as it is a best teaching practice or theory” (p. 217). More specifically, we rely on a two-pronged definition of differentiation. On the one hand, differentiation is both a proactive and reactive approach taking into account the diversity of individuals and groups of learners. It is an on-going and constantly evolving process. On the other hand, differentiation comprises all practical teaching strategies and principles that enable teachers to consider the individual characteristics of students in order to best support their learning and schooling. These include both macro-level practices, such as teaching arrangements and learning environment, and micro-level practices, such as teaching methods, support materials and assessment. All differentiation practices are always informed by the students and their individual features such as *learning profile, self-esteem, interests, readiness, needs, motivation, personality and history*. We will provide concrete examples of both macro- and micro-level differentiation practices later in this article (see the section *The five dimensions of the model*). Next, we will review some key models designed to assist teachers in their differentiation.

Previous Models of Differentiation

Several models and guidelines have been created to help to implement differentiation. Probably the

most renowned differentiation model is that of Tomlinson (2014). According to her, differentiation means modifying content, process, products and learning environment based on students’ readiness, interests, and learning profiles. By content, Tomlinson (2014) refers to what students are expected to learn. Process, in turn, designates the activities implemented to ascertain that students understand the topics covered whereas products denote the ways students demonstrate their learning. By learning environment, Tomlinson (2014) primarily means the psycho-social learning environment and the atmosphere in the classroom. Readiness refers to students’ current stage in relation to particular learning goals, interests to students’ affinity and preferences and learning profile to the ways students prefer to learn. Although Tomlinson’s model can be considered seminal, she acknowledges that it is not necessarily all-encompassing as she states that “teachers can differentiate *at least* four classroom elements” (Tomlinson, 2000b, p. 2, our emphasis), that is, content, process, products or learning environment. Our model bears similarities to Tomlinson’s model but aims to group the various differentiation practices into more concrete five dimensions.

In addition to her differentiation model, Tomlinson (2017) has categorized various differentiation practices into “low-prep” and “high-prep” (p. 65) strategies. She recommends teachers to annually opt for a few strategies that require little preparation and one strategy that requires a lot of preparation. Tomlinson (2017) further encourages teachers to annually add a similar set of new strategies on top of the existing ones, which, in a few years, results in an extensive repertoire of differentiation practices. This classification provides a more concrete tool for teachers to approach differentiation than her model above. Although the threshold to adopt differentiation strategies that require a lot of preparation may be high as research has shown that teachers tend to opt for strategies that require little preparation (e.g. Roy et al., 2013).

Other somewhat more concrete precepts for differentiation come from Smets (2017) who provides “an evidence-informed checklist” (p. 2075) to implement differentiation. He has divided the checklist into three sets based on 1) teacher-student relationship, 2) learning goals and 3) lesson design. The first set

comprises five statements, among them for instance fostering a classroom culture in which failure is possible and knowing the students and their personal characteristics well. In other words, the first set touches on the topics of psycho-social learning environment and knowledge of one's students in differentiation. The two remaining sets contain four statements each, for instance, providing students with feedback of and feed-up for their learning and using a variety of teaching strategies, respectively. Smets (2017) argues that teachers can consult the checklist as a guideline for their differentiated teaching. Although Smet's (2017) checklist is likely to be a useful tool for teachers, it however remains on a rather abstract level. Moreover, it gives a somewhat limited view of various teaching arrangements or differentiated assessment methods.

Many scholars have emphasized the cyclical nature of differentiation. For instance, Oaksford and Jones' (as cited in Hall, 2002) model starts with pre-assessment, on the grounds of which teachers differentiate content, process and product based on the curricula and students' individual features. Thousand et al.'s (2007) proactive differentiation model, in turn, relies on the knowledge of their students as the premise. That is, they emphasize the importance of getting to know one's students as well as possible and focusing on each student's specific needs, individual characteristics and, above all, strengths. With the information teachers receive from students, they differentiate their teaching across different disciplines and monitor student performance, which in turn produces more information about the students and guides future differentiation. Finally, Prast et al.'s (2015) model follows a similar path. It starts from identifying educational needs and moves on to differentiated goals, instruction, practice, and evaluation of progress and process. The above models provide a framework in which differentiation is seen as a proactive and ongoing process. They, however, seem to suffer from the same issue than most previous models, that is, the lack of concreteness and leaving certain dimensions of differentiation such as teaching arrangements or support materials with little attention.

Rock et al. (2008) have created a five-step framework for differentiation called REACH which is an acronym deriving from the initial letters of each step. All the steps have also their corresponding

indicators, which represent factors often associated with differentiation. The steps of the model are the following: "(a) reflect on will and skill, (b) evaluate the curriculum, (c) analyze the learners, (d) craft research-based lessons, and (e) hone in on the data" (Rock et al., 2008, p. 34). The corresponding indicators are *teacher*, *content*, *learner*, *instruction* and *assessment*, respectively. The first step and indicator focus on the teacher and their actions. According to Rock et al. (2008), teachers should constantly reflect on their teaching and try to integrate differentiation in their daily practices. The second step and indicator pertain to the curriculum. Rock et al. (2008) encourage teachers to critically review the curriculum and identify the core ideas to teach based on students' pre-knowledge and background. The third step and its corresponding indicator are centered on the students. Rock et al. (2008) propose that teachers should determine for instance the readiness, interests and preferences of the class and its individual students and plan and execute their teaching accordingly. The fourth step and indicator focus on teaching. More specifically, Rock et al. (2008) suggest that teachers should use a variety of evidence-based practices based on their students' needs. Finally, the fifth step and indicator are about assessment. According to Rock et al. (2008), ongoing assessment is essential in differentiation. They have further proposed that teachers should rely on the common tripartite approach to assessment, namely pre-assessment, formal assessment and summative assessment and actively involve the students in the assessment process. Rock et al. (2008) advise teachers to set specific goals for their differentiation relying on the REACH framework, implement differentiation according to those goals and evaluate how the goals were achieved. Rock et al.'s (2008) framework seems to be fairly thorough and comprehensive, albeit slightly complex and abstract. Although the model approaches differentiation holistically and from many viewpoints, it fails to give very concrete tools for teaching.

Another model that adheres to five factors is from Reis and Renzulli (2015) who have created a model which incidentally has almost the same name as our model, that is "the five dimensions of differentiation". It is an expanded version of the typical dimensions of differentiation, namely content, process and product. More specifically, Reis and Renzulli (2015) propose that differentiation should be approached through the following five dimensions: 1) content, 2) instructional

strategies, 3) the classroom, 4) products and 5) the teacher. In Reis and Renzulli's (2015) model, the dimensions of content and products correspond to the similar dimensions in Tomlinson's (2014) model. With instructional strategies, Reis and Renzulli (2015) refer to the use of varied teaching strategies based on students' profiles. The classroom dimension mostly refers to the physical learning environment and the teacher refers to teacher's actions and choices when differentiating based on students' learning styles, interests and abilities. According to the authors, their dimensions provide "five ways to integrate differentiation into teaching practices" (Reis & Renzulli, 2015, p. 2). What differentiates our model from Reis and Renzulli's (2015) model is that it places more emphasis on various macro-level teaching arrangements thus expanding the responsibility of differentiation also to the entire school community. This is important since the lack of administrative support is one of the challenges of differentiation identified by teachers (e.g. Hertberg-Davis & Brighton, 2006). Moreover, our model gives more weight to the psycho-social learning environment in differentiation since studies have shown a direct link between the environment and learning outcomes (e.g. Dorman, 2002; Yager & Walton, 2011).

After having reviewed several differentiation models, one could question the need for another model for differentiation. However, despite the various attempts to provide teachers with frameworks to implement differentiation, many studies report that teachers find it extremely challenging. Among the most typical challenges voiced by teachers are large class sizes, time constraints, impractical physical environment, materials, lack of knowledge of effective differentiation methods, lack of resources, lack of collaborative planning time and lack of administrative support (e.g. Berbaum, 2009; Hertberg-Davis & Brighton, 2006; Roiha, 2014; Tomlinson & Imbeau, 2010; Wan, 2017). Particularly most novice teachers often feel unprepared to practice differentiation (Mansfield et al., 2014; van Geel et al., 2019). According to Santamaria (2009), there has been a clear gap in offering teachers practical tools to implement differentiation. Smets (2017), in turn, argues that both pre- and in-service teacher education will be increasingly challenged to prepare teachers who are equipped to differentiate and cater for diversity.

The fundamental purpose of our model is to alleviate the challenges of differentiation and promote a broad perception of it. Moreover, the model endeavors to provide teachers with a tangible framework for approaching differentiation. What differentiates our model from the above models is that, on the one hand, it deals with differentiation in a more pervasive manner than some of the previous models, and, on the other, aims to be a more practical instrument for teachers. One example of this is the dimension of support materials which is often implicit in most differentiation models and not highlighted as a dimension of its own. We, however, feel that it brings more concreteness to differentiation and also gives credit to the important role support materials play in many students' learning. Despite this, we do not claim that the 5D model is by any means a panacea to the challenges of differentiation but believe that it can nevertheless offer useful resources to educators in dealing with diversity in class. In what follows, we discuss the theoretical basis of our model and elaborate on its five dimensions.

Background of the 5D Model

The 5D model is a research-informed model designed to facilitate the implementation of differentiation in schools. The model has been created in the Finnish education system and the dimensions of the model and their differentiation practices correspond to the main aspects of teaching in Finland as set out in the national core curriculum for basic education, which obligates all teachers to differentiate their teaching in practice. The model provides a framework for differentiation and the various differentiation strategies in each dimension can and should vary according to the context. For example, teachers can use various assessment and teaching methods, as long as they are approached from the perspective of differentiation. The dimensions of the model are also emphasized differently in various contexts depending on the resources available and the needs of the students. In some schools, it is possible to implement very systematic and extensive differentiation with teaching arrangements, while in others differentiation focuses more on teaching methods and support materials. The main purpose of our model is to foster a mindset of differentiation

whereby one uses the differentiation practices feasible in one's own school setting.

The model has its theoretical base in *constructivism* (e.g. Rauste-von Wright et al., 2003), *zone of proximal development* (Vygotsky, 1978), *theory of multiple intelligences* (Gardner, 2008) and *motivation* (e.g. Dörnyei & Ushioda, 2013). According to constructivism, the learner's own activity and motivation are relevant in the learning process. Much emphasis is also placed on students' prior beliefs and perceptions (Rauste-von Wright et al., 2003). Similarly, student's own interest and prior knowledge as the starting points are also part of the basic idea of differentiation. Differentiation is one way of applying the principles of constructivism in practice.

The concept of zone of proximal development is also central to differentiation. With it, Vygotsky (1978) refers to the distance between student's actual development level and their potential development level achievable under the guidance of the teacher. The zone of proximal development is unique and independent of age (Vygotsky, 1978). The premise of differentiation is that teachers would be aware of each student's zone of proximal development and would thus be able to provide suitable challenges for all students. In ideal differentiation, each student would work on tasks that correspond to their zone of proximal development.

Differentiation can also be seen connected to Gardner's (2008) theory of multiple intelligences in which he has identified several forms of intelligence, for instance musical intelligence, logical-mathematical intelligence and intrapersonal intelligence to name but a few. According to Gardner (2008), everyone has some traits of all these intelligences but their degree varies from individual to individual. Gardner (2008) believes that traditional education should better cater all forms of intelligence and talent as traditional one-sided schooling has focused on favoring only linguistically and logically-mathematically oriented students. Although Gardner's theory has received much criticism for, among other things, the lack of empirical research and the use of the term intelligence (e.g. Schaler, 2006; Waterhouse, 2006), from the perspective of differentiation the theory highlights students' differences and how they should be taken

into account in school. Differentiation can be seen as a pedagogical application of Gardner's theory, as differentiation entails the recognition and consideration of the individuality of all students.

Finally, motivation is important in differentiation since students' interests are at the core of differentiation. Motivation determines why individuals perform a particular function, how long they are willing to maintain that function and how much effort they are willing put to that function (Dörnyei & Ushioda, 2013). Differentiation approaches learning from students' interests as it increases their involvement and commitment to the learning process.

More concretely, the 5D model is based on the postulate that differentiation is a proactive and student-centered approach that transcends all teaching. The model progresses from general to specific and advocates for differentiation to be implemented in five dimensions of teaching, namely *teaching arrangements*, *learning environment*, *teaching methods*, *support materials* and *assessment*. First, it is important that the teaching arrangements as well as both the physical and psychosocial learning environments support the learning of each student. After that, teachers can differentiate in more detail with the help of various teaching methods and support materials. Finally, when the support is in place in all the previous dimensions, students learning can be assessed in a valid and differentiated way.

The 5D model proposes that all differentiation should stem from students' individual characteristics, such as *learning profile*, *self-esteem*, *interests*, *readiness*, *needs*, *motivation*, *personality* and *history*. By learning profile, we mean students' abilities and preferred learning styles and by self-esteem, students' subjective evaluations and beliefs about themselves. Interests relate to the subjects and topics which students are enthusiastic and affectionate about. Readiness refers to the level at which students are in relation to learning and needs to things that are necessary for students to be able to learn. Motivation, in turn, relates to the factors that drive students' actions and behavior. By personality, we mean students' unique characteristics and by history, students' background and school experiences to date. In the following, we describe our model in more detail (for a more detailed discussion, see Roiha & Polso, 2020).

The Five Dimensions of the Model

Dimension 1: Teaching arrangements

At the apex of our model are teaching arrangements which refer to various macro-level solutions in how teaching can be organized. The dimension includes arrangements that can be used by individual teachers as well as arrangements that require structural changes and resources. This way the dimension extends the responsibility of differentiation to include also the school administration and the whole school community.

The principal teaching arrangements in this dimension are flexible grouping and co-teaching which are often interconnected. By flexible grouping, we mean grouping students temporarily in various ways based on different criteria. It is important to note that the grouping should not be fixed but constantly re-assessed. Moreover, students should not be grouped solely based on their abilities but also on the grounds of their interests, social relations or learning preferences. Even though research results on flexible grouping have not been conclusive (e.g. Hattie, 2002; Kulik & Kulik, 1992; Tieso, 2005), some studies have found that it can improve students' learning (e.g. Castle et al., 2005; Dubé et al., 2013). There is also evidence that flexible grouping can diminish disruptive behavior (e.g. Rytivaara, 2011). In our model, we encourage teachers to use flexible grouping within and across classes and grade levels.

By co-teaching, we refer to an arrangement in which two or more staff members of the school collaboratively plan and execute their teaching (see Thousand et al., 2006). In the 5D model, the other party involved can be a teacher, teaching assistant or another school professional such as school counselor or school nurse. Research has documented positive outcomes of co-teaching (e.g. Ahtiainen et al., 2011; Murawski & Swanson, 2001; Scruggs et al., 2007; Sirkko et al., 2020; Thousand et al., 2006). We encourage schools to use flexible grouping together with co-teaching.

Other research-supported teaching arrangements in our model are for instance remedial teaching, small group tutoring, pre-teaching and extended instruction (e.g. Fuchs et al., 2005; Smets & Struyven, 2018; Yang et al., 2014). We would particularly like to emphasize that remedial teaching can be offered both proactively

and reactively. With some learners, it is often useful to pre-emptively cover the topics of upcoming lessons. In addition, teaching assistants and part-time special needs education are also essential teaching arrangements in differentiation and vastly used in Finland (Roiha & Polso, 2021).

Often certain teaching arrangements, such as co-teaching or remedial education, are not associated with differentiation but rather viewed as separate practices. However, following our broad definition of differentiation, the above arrangements also fall under the umbrella of differentiation and lay the foundation for more micro-level differentiation. Many teaching arrangements are often directly linked with school resources and thus decided on at the administrative level. We claim that differentiation should involve the entire school community and cannot take place solely in the classrooms. It is important to note, that differentiation does not require only resources from administration. Rather it calls for flexible and supportive atmosphere to differentiation practices. For example, co-teaching and flexible grouping can take place with two normal size classes, although it is more efficient when supported by suitable physical spaces or allocated time for teachers' joint planning.

Dimension 2: Learning environment

The second dimension in our 5D model is learning environment which we have broadly divided into physical and psycho-social environments. Physical learning environment refers to the physical spaces where learning happens and the tangible objects in them. Studies have shown that the physical environment in which students learn has an effect on their performance (e.g. Murillo & Roman, 2011; Suleman & Hussain, 2014). The ideal physical learning environments for differentiation are flexible and adaptable. The seating arrangements can be flexibly adjusted according to the activity and students can also be encouraged to choose their own seats based on their current needs. Furthermore, in differentiated classrooms, there are venues for various types of learning, for instance silent reading, computer-based learning or group work.

Psycho-social learning environment refers to the feelings and emotions associated with learning. It has been found that even small psycho-social interventions

can have a positive effect on students' achievement (e.g. Yager & Walton, 2011). Therefore, it is essential to spend time on creating a positive atmosphere in the classroom. This can be done, for instance, by systematically grouping students in various ways and having a zero-tolerance policy towards bullying. It is beneficial if the students learn to work with different people and that all students get to know each other well. Thus the composition of the groups should be mixed regularly. Different strategies can be used in forming the groups. It may sometimes be worthwhile to have the teacher to determine the groups for educational or social reasons to better differentiate the learning situation based on the students' needs (e.g. Liljedahl, 2014). Other times the students can choose with whom to work and the groups can also be formed randomly. Liljedahl (2014) found that randomly grouping the students resulted in a positive learning environment as it eliminated social barriers and increased the engagement and enthusiasm of the students.

The 5D model also highlights the outside class environments, such as transitions and break times, in differentiation. For many students, these are the most challenging moments in a school day and require extra support. Anticipating and preparing students for changing situations, and offering them different solutions differentiates the psycho-social learning environment. It is important to make sure that the students know what is expected of them in those moments and offer them prescribed solutions to difficult conflict situations. Similarly, it is useful to prepare students for transitions and free moments and tell the student about those in advance.

Dimension 3: Teaching methods

Teaching methods should always mirror both the topic as well as the individual needs of the students in question. Thus, teaching methods cannot be overlooked when talking about differentiation. We divide this third dimension of our model into general principles of differentiated teaching and more concrete teaching practices. The former one refers to certain practices that benefit all students and that are the cornerstones of any differentiated classroom. For instance, teaching study skills, giving instructions, individual progress and homework are among these. We would particularly like to underscore the

importance of study skills and their role in differentiation since providing students with learning strategy instruction has resulted in increased metacognitive knowledge and consequently in increased achievement (e.g. Caliskan & Sunbul, 2011). Often students are unaware of the ways that are most effective and suitable for them in learning. Therefore, it is essential to cover these with the entire class since effective learning frees the teacher's resources to give individual assistance to certain students. Different learning strategies and techniques can also be taught to students individually, based on their needs. Moreover, differentiation has been found to improve students' engagement with and attitude towards homework (e.g. Keane & Heinz, 2019). Students can for instance choose their own homework, either entirely freely or from pre-determined options. Alternatively, the teacher can assign individual homework for certain students so that it is at an appropriate level for them and supports their learning in the best possible way. Similarly, individual and tiered instruction have been found to be beneficial for students' learning (e.g. DeBaryshe et al., 2009). Therefore, it is important to create a flexible working culture in the classroom where individual progress and learning are normalized.

In general, the teaching methods used at school should meet the students' individual needs. It is also good to have a broad repertoire of different teaching methods and vary their use to consider Gardner's (2008) different forms of intelligence. Functional and action-based teaching approaches are particularly suitable for differentiation. For instance, inquiry-based teaching is a very student-based teaching approach that lends itself to differentiation since students are able to learn in ways that are suitable to their individual needs. Research indicates that inquiry-based teaching is an effective method so long as it is adequately scaffolded (e.g. Furtak et al., 2012; Lazonder & Harmsen, 2016). Inquiry-based learning is often divided into different phases, namely orientation, conceptualization, investigation, conclusion and discussion (Pedaste et al., 2015). Each phase can be conducted differently by students and the framework itself promotes differentiation as inquiry-based learning focuses on students' interests and curiosities. It is important to note that there are different levels of inquiry (controlled, structured, guided and free) and some students may need more guidance in their learning whereas others are equipped to inquire into topics

relatively independently (see e.g. Brandwagt & Lynam, 2021).

Examples of more concrete teaching practices are station work and projects. Both can improve students' achievement and have a positive effect on their attitudes (Chen & Yang, 2019; Kaldi et al., 2011; Rogayan, 2019). In the former one, students can work in pairs or groups at different stations with different activities. One option is to make the stations correspond to Gardner's (2008) theory of multiple intelligences and have stations dedicated to musical instruments (musical intelligence), role-plays and discussions (interpersonal intelligence) and crafting work (bodily-kinesthetic intelligence) to name but a few examples (see also Armstrong, 2006). A more thorough differentiation can be implemented by offering different level work in each station, for instance in color codes. Differentiation can also be practiced by grouping the students in a certain way to support their learning or social skills during station work. With regard to projects, differentiation should start already when choosing the topic and extend to the ways of working and documenting one's learning. Furthermore, projects allow setting individual goals and can be done in various ways which promotes differentiation.

Overall, the 5D model promotes the inclusion of various teaching methods to cater for diversity in the class. It is important to bear in mind that all teaching should be approached by considering the individuality of the students.

Dimension 4: Support materials

The penultimate dimension in the 5D model is support materials which can be used to promote the learning of students. These refer to, among others, individual learning material as well as to various tools for concentration. The role of concrete support materials is often overshadowed by other dimensions in differentiation. We have wanted to underscore its role in differentiation by dedicating a separate dimension to it. Several studies have corroborated the importance of support materials in learning. For instance, the use of manipulatives has been found to improve the learning of mathematics (e.g. Carbonneau et al., 2013), self-selected and personal reading materials have been found to improve reading

comprehension and fluency (e.g. Reis et al., 2011; Shaunnessy-Dedrick et al., 2015) and the use of information and communication technology (ICT) has been found to facilitate differentiation (e.g. Deunk et al., 2018).

ICT offers a wealth of possibilities for differentiation and more personalized learning. The internet offers access to various online activities that can be used in differentiation for both low- and high-achieving students. Students who have issues with their fine motor skills can use computers to make notes or tablets to take pictures of teachers' notes on the board. In addition, several programs can be used to convert speech to text or vice versa and computers or tablets can be used to zoom, highlight or annotate text.

Students' concentration can be supported with various tools such as noise-cancelling headphones, earplugs, partitions, seating cushions, stress balls, hour glasses or time timer clocks. Students can also be allowed to wear caps inside or draw during teacher talk if that helps them to concentrate better. In general, we encourage teachers to try out different materials that can support the learning of their students. It is also important to involve the students in deciding on the most appropriate support materials for them.

Dimension 5: Assessment

The final dimension in our model is assessment which guides students learning more than any other factor (Hayward 2012; Hodgson & Pang 2012) making its differentiation of paramount importance. Assessment can be roughly divided into pre-assessment, formative assessment and summative assessment. They all have an important role in learning and a wide range of methods can be employed in all of them. With regard to pre-assessment, Guskey and McTighe (2016) have aptly pointed out that "the likelihood of pre-assessment yielding positive results depends on how effectively it is applied" (p. 39). They, as well as Hockett and Doubet (2014), have provided a list containing the benefits of pre-assessment. One potential benefit of pre-assessment is that it helps to determine the students' knowledge of a topic before the teaching takes place. Based on the information, teachers can plan and tailor their teaching for each learner and they can also use the information to inform their flexible grouping arrangements. Moreover, pre-

assessment provides students with information on what they are expected to learn. Therefore, pre-assessment essentially feeds into differentiation. In the 5D model, pre-assessment plays an important role and can be done in various ways, for instance with whole group discussions, written assignments, checklists or mind-maps, to name but a few examples.

Another form of assessment that is crucial to differentiation is formative assessment, the purpose of which is to monitor the progress of learning by providing constant feedback to learners. Formative assessment can also be translated as assessment for learning. It is considered a process where feedback is provided to support and guide students in their learning (Dolin et al., 2018). This is important since formative feedback has been shown to enhance achievement (McMillan et al., 2013; Van der Kleij et al., 2015). In addition, there is evidence that regularly providing parents with information on their child's school performance in a positive way can improve student achievement (e.g. Baker et al., 2002). From the perspective of differentiation, it is important that the data from formative assessment inform future teaching decisions (McGlynn & Kelly, 2017). Similar to pre-assessment, formative assessment can also take several forms such as observations, open-ended tasks, checklists or learning journals. Moreover, self- and peer assessment are an important part of formative assessment. Unfortunately, they are both usually done retrospectively when they should be implemented constantly and throughout the learning process. Self- and peer assessment can also be differentiated. Some students are better at reflecting on their learning and setting realistic goals for themselves whereas others need more guidance in this. For some students, especially the younger ones, it would be helpful to practice self- assessment every day on a small-scale. At the beginning of the day, a student can be asked to set their own goals for the day either orally or in writing and review these goals at the end of the school day.

Finally, summative assessment is most often done at the end of a unit. Its purpose is to measure students' learning at a particular moment. Compared to formative assessment, its purpose is not to advance learning, at least to the same extent (Dolin et al., 2018). Summative assessment can also be conducted in various forms. Students' learning can be assessed using written essays, videos, role-plays, drama, interviews,

experiments, tests, quizzes, posters, portfolios or group presentations.

It is important that not all students be assessed in the same way or even at the same time of the learning process. Truly differentiated approach to assessment would be to allow students to choose the assessment method used at the beginning of the learning process. This empowers learners as it gives them ownership in their own learning process and helps them to understand their personal strengths. In general, the assessment methods should rather be chosen with the students' individual features in mind. Some students can do a written exam at the end of the unit whereas others can showcase their learning with a recording or a video. Furthermore, some students' learning can be monitored halfway the unit whereas others can be expected to progress without formally assessing them until the end of the unit.

Conclusion

In this article, we have reviewed some existing definitions and models of differentiation and presented our own approach to it. In essence, we have advocated for a broader take on differentiation. We have introduced our 5D model for differentiation and explained its theoretical underpinnings as well as described its five dimensions. A point to note here is that our model is just one conceptualization of differentiation and, alongside its practical objectives, aims to further the discussion and increase awareness of this valuable teaching approach. There are multiple ways to implement differentiation and similarly to mainstream pedagogy, a one-size-fits-all approach is not suitable for differentiation. However, based on our experiences from schools that have adopted our model, it seems to offer a relatively clear and well-structured approach to differentiation (e.g. Roiha et al., 2020). Laari et al.,'s (2021) study also substantiated the view that the 5D model covers the elements of differentiation in a comprehensive way. In addition, an ongoing research project in the Netherlands aims to investigate how Dutch English-as-a-foreign-language teachers differentiate their teaching according to the 5D model (Roiha et al., 2021) which will shed more light on its usefulness.

The 5D model aims to address the most common challenges of differentiation presented in relation to

the previous models of differentiation. With regard to class sizes, the model offers several solutions to alleviate this problem such as the use of flexible grouping, co-teaching, teaching assistants, peer support or involving the parents. The issue with large class sizes also partly reflects the view of perceiving differentiation predominantly as individualized teaching for all learners when it can also be approached on a group level. That is, certain practices and teaching methods introduced in this article can be used to take different learners into consideration. For the challenge of not having enough time to differentiate, the 5D model encourages to start from one dimension and gradually build up from there. Moreover, teachers can use the same material with all students but differentiate in the goals and execution which saves time as opposed to producing individual materials for different learners. As the lack of administrative support is one challenge of differentiation, the 5D model includes elements that are at the responsibility of the entire school community including administration. For instance, by allocating resources to the classrooms, teachers can use support materials, teaching assistants and practice co-teaching more efficiently.

We acknowledge that thorough differentiation may be easier to implement at primary level compared to secondary level where the content objectives are often more ambitious and teachers see their students only a few lessons per week. However, we argue that comprehensive differentiation can, and should, be done also in secondary education and that the 5D model can offer a potential framework for this. Our model is meant to provide a wide range of ideas on how to differentiate in several dimensions. In an ideal situation, all the dimensions should receive equal attention but this is not always possible in practice. Therefore, secondary teachers can focus on the dimensions they deem the most important in differentiation. If teachers adopt differentiation as a part of their teaching philosophy, they approach all teaching with students' individuality in mind and use small-scale differentiation practices, such as extra time or differentiated homework, flexibly and spontaneously. Moreover, our model might therefore be useful for curriculum designers to pay attention to profound differentiation when forming new curricula and educational policies. For instance, in the case of Finland, both primary and secondary education share the same national core curriculum and consequently

the same differentiated approach when it comes to teaching arrangements, learning environment, teaching methods and assessment.

Regardless of the model used, differentiation should be perceived and implemented in a broader manner in schools than is presently done. Profound differentiation calls for a paradigm shift where the traditional school culture where all students work on the same topics, at the same time and in the same way is replaced by a more flexible way of working. In truly differentiated classrooms, teachers instill a classroom culture where students' individuality is considered, everyone accepted and diversity promoted. Although the goal may be ambitious, it is certainly one that is worth pursuing. We hope that our 5D model can, for its part, contribute to achieving this goal.

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