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DIPF | Leibniz-Institut für Bildungsforschung und Bildungsinformation

Informationszentrum (IZ) Bildung

E-Mail: pedocs@dipf.de

Internet: www.pedocs.de

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Verena Letzel-Alt, Marcela Pozas (Eds.)

DIFFERENTIATED INSTRUCTION AROUND THE WORLD

A Global Inclusive Insight



WAXMANN

Verena Letzel-Alt, Marcela Pozas (Eds.)

Differentiated Instruction Around the World

A Global Inclusive Insight



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Editors: Verena Letzel-Alt¹ and Marcela Pozas^{2*}

¹ Universität Trier

² Humboldt-Universität zu Berlin, Professional School of Education

*Corresponding author/editor

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To our beloved families.

A very special word of thanks goes to our fathers,
Udo and Alfonso, who are never tired of supporting,
empowering and believing in us.

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DI Around the World

Exploring Differentiated Instructional Practice in General School Education

Verena Letzel-Alt & Marcela Pozas

More than ever before we find our world today highly diverse, and worldwide classrooms mirror this reality. Student diversity (respectively heterogeneity) has only intensified by the recent global issues such as the COVID-19-pandemic, the migration crisis (e.g., Syrian refugees) and other armed conflicts (e.g., Ukraine and Russian conflict). Nonetheless, given that our world has become even more globalized, it has come to learn that unpredictable situations are bound to happen and thus, we can only expect that student diversity will be continuously increasing in future. With this substantial ongoing (and expected) increase of individual learning demands, the need for teachers to meaningfully address student heterogeneity in their daily teaching practice has only become more crucial. Teachers are urged to embrace diversity and successfully address their learners' individual skills in order to help them flourish to their full potential, which is essential in the context of educational equity (General Assembly of the United Nations, 2017). A promising inclusive teaching approach that aims to meet students' individual learning needs by maximizing educational opportunities is differentiated instruction (DI) (Gheysens et al., 2020). Moreover, DI is an essential facet of high-quality teaching models (e.g., Bell et al., 2019; Hattie, 2009; Praetorius et al., 2018; Van de Grift, 2014). Educational equity, inclusion and high-quality teaching are key educational elements of global importance. In this context, DI can foster those elements among the student body and can be considered as a malleable inclusive teaching strategy that can be used in different educational settings and crises.

In order to set the direction of the present special issue book, it is necessary to start by defining the concept of DI. Within scientific literature, the concept of DI is, as stated above, considered to be the educational response to student heterogeneity (Prast et al., 2018). However, when we take a deeper look into the theoretical conceptualizations on the topic, one can quickly identify that DI itself, is also a 'heterogeneous and multifaceted teaching approach'. In other words, DI has various definitions, encompasses a manifold of practices, is investigated using a wide range of empirical research approaches and designs, has an impact on the different educational stakeholders and settings, and constitutes an interplay of theory, practice, research and policy.

Considering the above, it is important to find a common ground that can guide and direct research. Nevertheless, despite the vast amount of existing literature on DI (e.g., Carolan & Guinn, 2007; Chamberlin & Powers, 2010; Coffey, 2011; Coubergs et al., 2017; Hall, 2002; Landrum & McDuffie, 2010; Lawrence-Brown, 2004; Levy, 2008; McTighe & Brown, 2005; Reis et al., 2011; Santangelo & Tomlinson, 2009; Schumm, & Vaughn, 1991; Smit & Humpert, 2012; Tomlinson, 2017; Valiandes, 2015; Wischer & Trautmann, 2012), no theoretical conceptualization of DI has been agreed upon (Jennek et al., 2019; Prast et al., 2015; Roy et al., 2013). What can be extracted from the majority of the DI scientific literature is that it builds upon the theoretical conceptualization of Tomlinson and colleagues (2017, 2003), who operationalize DI either as a one-dimensional approach, a narrow rationale or a comprehensive construct. Within a one-dimensional approach, authors (e.g., McTighe & Brown, 2005; Levy, 2008; Santangelo & Tomlinson, 2009; Coffey, 2011) and large- and small-scale empirical studies (e.g., PIRLS, 2016; PISA, 2006; Roy et al., 2013; TIMSS, 2015) employ one-dimensional DI scales that do not differentiate across the several DI practices that can be implemented within in-classroom teaching. This one-dimensional view limits the possibility of testing the effectiveness of unique DI practices for addressing student heterogeneity (Valiandes & Koutselini, 2009). On the other hand, a narrow understanding of DI is given when the term is reduced only to a specific instructional practice such as grouping students by ability level or interests (Bräu, 2005), or when it involves the use of tiered assignments (Westphal et al., 2014). Lastly, a comprehensive rationale of the DI construct considers all measures that can be implemented in order to meaningfully address learner variance and thereby support student learning. In this vein, and for the purpose of the present book, the concept of DI is established following a wide rationale and is defined as all the *intentional, systematically planned and reflected practices* that enable teachers to meet the needs of all learners in heterogeneous classrooms (Graham et al., 2020; Letzel et al., 2020).

Using a comprehensive and wide understanding of DI calls for a systematization of the construct as well as a categorization of the possible instructional practices applied to address the broad array of student differences. To this end, the taxonomy of DI practices has been introduced and establishes six categories of DI instructional strategies (Letzel et al., 2020; Pozas & Schneider, 2019):

1. Tiered assignments: qualitative and/or quantitative variation of materials and tasks according to challenge level, complexity, outcome, process, product, and/or resources.
2. Intentional composition of student working groups: establishing decidedly to build homogeneous or heterogeneous student subgroups based on performance, readiness, interests, etc.

3. Tutoring systems within the learning group: high ability students take up the role of teacher assistants and tutor low ability students. These roles may persist for a long term.
4. Staggered nonverbal (material) learning aids: carefully and purposely designed series of (material) learning aids that range in complexity level. The learning aids must only contain the minimal information necessary for a student to overcome an obstacle in the learning process. If they still are unable to deal with the task, a second aid with additional information and guidance is provided, and so on.
5. Mastery learning: all instructional practices which ensure that all students achieve at least minimum standards (in combination with higher standards for the more advanced students). This involves close monitoring of students' learning progress.
6. Open education / granting autonomy to students: Students are responsible for their own learning process and may autonomously decide on materials to work upon. Examples of such practices include: student choice of tasks, station work, project-based learning, portfolios, etc.

In order to effectively implement DI practices, teachers should continuously monitor their students' academic process (Dack, 2019; Tomlinson, 2017) and should be paired up with other teacher behaviours such as classroom management, positive classroom climate, and clarity of instruction (Maulana et al., 2020). Thus, the implementation of DI is by no means just to be considered as a normative recommendation, but an important criterion of high-quality teaching and professionalization (Praetorius et al., 2018).

Given the importance of DI for successful inclusive education, it is not surprising that research into the topic is substantially increasing. Nevertheless, a recent scoping review (Graham et al., 2021) and a bibliometric analysis (Sun & Xiao, 2021) on DI research has identified important shortcomings: 1) a gap on research concerning DI in general school education, 2) a lack of focus on the planning, employing and evaluating of concrete DI practices, 3) their effects on students' achievement and non-achievement outcomes, 4) influence of context factors (i.e. school track, teacher characteristics, school resources), and 5) an underrepresented international research output. Considering the current DI research context, this Special Issue Book sets to explore how DI is understood and implemented in different countries around the world and encompasses empirical as well as theoretical papers addressing the aforementioned gaps. Thus, this Special Issue Book offers a unique global opportunity as it brings together worldwide experts that through their research allow an empirical discussion and reflection of DI in practice.

Overview of all articles within the special issue

The book includes six theoretical, nine empirical and one practical contribution. Consequently, the contributions within this special issue book are sorted following their research approach. The theoretical section begins with the contribution by Scarpolo and Subban from Australia. The authors point at definitional inconsistencies and misperceptions of the DI model (e.g., by Tomlinson), as well as variations in teachers' implementation of DI, and thus, provide a distinction between differentiation as an overarching philosophy and pedagogical approach to inclusive teaching, and differentiated instruction as responsive, effective instruction.

From the USA, Lawrence-Brown and Abkowitz introduce their Multilevel Differentiated Instruction concept for general school education which aims to benefit the whole class. This concept includes in-class approaches as well as digital approaches.

Rubie-Davies, an author from New Zealand, provides a theoretical contribution that brings insights into the theoretical framework of High Expectation Teaching. Additionally, the author further explores the link to the concept of DI. Within the contribution, it is possible to extract important lines for potential research that allow for a more comprehensive view on the concept of DI.

Considering that Finland is one of the countries that achieves over the mean results in international large-scale assessments such as PISA (OECD, 2019), Savolainen provides insights into Finland's inclusive education in the era of the current comprehensive school system.

Similarly, the contribution from Kalatskaya, Valeeva, and Kalimullin reports on the development of Differentiated Instruction within the Russian educational field, and therefore allows insights into the policies, practices and challenges concerning DI in this country.

Lastly, although DI is considered as a high-quality as well as effective approach that is recommended to implement in order to meet students' heterogeneous needs, the approach is not implemented frequently in school practice. Schwab and Woltran from Austria deal with potential reasons for this discrepancy by discussing downsides of the concept of DI.

The empirical contributions section can be divided into qualitative and quantitative research papers that aim to explore the concept of DI. The qualitative contributions derive from Turkey, China, Switzerland/Austria and Belgium.

In an interview study, Culhoaglu and Letzel-Alt explore Turkish primary school teachers' implementation of DI. Research on DI and inclusive education is scarce in Turkey. Thus, the contribution gives an explorative and inductive insight into this research gap.

In their contribution, Yuen, Leung, and Wan focus on the professional development of Hong Kong primary and secondary school teachers. Within their qualitative study, 38 teachers were interviewed regarding their experience

and participation within a program targeted at teachers' development of DI implementation. The authors further explore teachers perceived professional changes as well as factors associated with these changes.

Smit, Hecht, Taras, and Matic investigated differences in frequency and perceptions of inclusive education by comparing primary and secondary teachers in Switzerland and Austria. Following an action research and video analysis design, the authors were able to observe and analyze evidence of teachers' inclusive teaching practices.

As stated at the beginning of this editorial, DI is a multifaceted concept which can be investigated through different perspectives. In this line, Smets conducts an autoethnographic study which reports from the perspective of a Belgian teacher educator and states that emotions are an important psychological variable when educating in-service teachers concerning the implementation of DI.

The quantitative contributions stem from Mexico, Germany, South Africa and Austria. Three papers examine DI from students' perspectives. For instance, Krischler, Knickenberg, and Zurbriggen explore students' perceptions of individualized learning and its impact on their emotional and motivational experience during lessons. The authors provide insights into the positive and negative experiences of fifth-grade students in Germany using data from conventional questionnaires and the experience sampling method. Likewise, Kleintert, Besa, Haunhorst, and Wilde also explore the impact of DI on students' non-academic outcomes. By means of multivariate analysis of covariance, the authors investigate the influence of scaffolds in biology and mathematics lessons on students' situational interest. On the other hand, Pozas, Tovar, Guerra, Armendariz, and Zubiría focus on examining Mexican students' experiences of their mathematics teachers' DI practice. Following a mixed analysis of variance, the authors investigate which specific DI practices students report within their mathematics lessons. Moreover, the authors offer a comparison between inclusive and non-inclusive classrooms.

By means of observations, de Jager examined secondary school teachers' the DI practices across 34 public rural schools in South Africa. The main objective of the study was not only to explore teachers' DI implementation, but as well evaluate their effectiveness.

The impact of the COVID-19 pandemic on teachers' DI practice is the focus of Helm and Huber's paper. Using teachers' retrospective assessments and conducting latent growth curve modelling, the authors examine whether the practice of student-centered teaching in Austria changed during the different phases of the pandemic.

Lastly, the contribution of Marciuš Logožar provides practical examples from Croatian schools on how DI can be implemented within online teaching courses of German as a foreign language. The author describes how collaborative and differentiated learning could be designed and implemented, as well as explains how such resources can be used for both asynchronous and synchronous teaching.

Conclusion

The use of the inclusive instructional practice of DI has become even more necessary over time as educators have sought to respond to the continuously increasing student diversity. With the need to meaningfully address the broad array of learning needs, inherently there has also been a requirement to theoretically and empirically explore the construct of DI. In this context, this special issue book aims to respond to such need and addresses further research gaps identified through international scientific literature. The diverse contributions within this special issue book allow for a critical reflection on relevant issues and discussion points. Firstly, it is essential to clearly define and distinguish between terms used as common (inclusive) educational concepts such as inclusive practices, DI practices, adaptive strategies, etc. A first effort has been made by Smit et al., where the authors seek to clarify such terms through a didactical and practical perspective.

Furthermore, the multiple contributions presented in this special issue book follow a rich variety of methodological and research designs, for instance theoretical papers that critically discuss different approaches and practices of DI (e.g., Scarpolo & Subban; Rubie-Davies), explore potential drawbacks (e.g., Schwab & Woltran) as well as reflect on the development of inclusive education (e.g., Savolainen). On the other hand, there are qualitative contributions that implement designs such as autoethnography (e.g., Smets), interviews (e.g., Yuen et al., Culhoaglu & Letzel-Alt), and video analysis (e.g., Smit et al.) that provide an in-depth exploration on teachers and teacher educators adoption of DI. Lastly, the special issue book also includes quantitative contributions that range from Experience Sampling Method (e.g., Krischler et al.), Mixed Analysis of Variance (e.g., Pozas et al.), descriptive analyses (e.g., de Jager), Multivariate Analyses of Covariance (e.g., Kleinert et al.), and Latent Growth Curve Modelling (e.g., Helm et al.). Although the present special issue book includes a wide variety of methodologies, it is important to highlight that each research method can only shed very specific type of data. Thus, in order to gain more in-depth findings, it is strongly recommended that further research seeks to use a combined research methodology through a mixed methods approach. Using a mixed methods approach would allow to capture detailed information on the object of research by adding depth and context (Creswell & Plano Clark, 2007). Similarly, the present special issue book contains studies that explore the different educational stakeholders, such as teachers (e.g., Culhoaglu & Letzel-Alt, Smit et al.; de Jager; Yuen et al.; Helm et al.), teacher educators (e.g., Smets), and students (e.g., Krischler et al.; Pozas et al.; Kleinert et al.). Given the important role that teachers' play in the implementation of DI, it is not surprising that most contributions focus on teachers' perspectives. This mirrors as well the numerous research output on DI throughout the past years (Pozas et al., 2020). However, many authors call upon the urgent need to include *all* educational stakeholders

(Tetzlaff et al., 2022), such as school principals, students, parents, and educational staff. Within this special issue book, the parental perspective, which is key for a successful inclusive school (Letzel et al., 2022), is unfortunately not taken into account. Taken together, it is essential for further research to follow a multi-perspective research design where different educational stakeholders' voices are considered and examined together.

Another key feature of this special issue book is that contributions showed that DI can be not only implemented in face-to-face classroom teaching, but as well in digital teaching and learning. Contributions such as those by Lawrence-Brown and Abkowitz, Helm et al., as well as Marcius, critically reflect and provide an insight into the potential of a digital practice of DI. These contributions allow for a discussion of the future of DI through the use of digital resources, not only as a response to the current global educational crisis due to the COVID-19 pandemic, but it opens the door to a new notion and application of differentiation in post-pandemic times.

The various contributions within the special issue book derive from different geographical areas displaying perspectives from five continents (North America, Europe, Africa, Asia and Australia) and thirteen countries (United States of America, Mexico, Turkey, Germany, Finland, Austria, Switzerland, Croatia, China, South Africa, Australia and New Zealand). This international approach allows for insights into the different educational systems and contexts, which inherently has an impact on the macro- (policy), meso- (resources, school tracks, forms, and schools), and microlevel (teaching and learning) of the school systems. In this vein, the practice of DI has to be understood as an interplay of theory, research and practice. Thus, the output for this synergy should be used to inform and support decision-making processes at the policy level.

In addition, it is important to highlight that DI is not implemented similarly in every classroom around the globe. For instance, Mexican lower secondary students report that their teachers differentiated their instruction mainly by means of mastery learning (Pozas et al.), whereas in Turkey DI practices such as station work, grouping and use of different materials according to students' interest are more commonly implemented (Culhoaglu & Letzel-Alt). Such findings, besides indicating cultural differences, also emphasize the different teaching philosophies, intentions, teacher education trainings as well as the varying interpretations of DI and inclusive education around the world. However, despite the fact that it was possible to bring together a manifold of international authors, countries from South America as well as North Africa, and for instance Canada are not represented. Unfortunately, even though attempts were made to approach such countries, there was no response to the call. Perhaps what can be an important recommendation stemming from this special issue book, is to develop and strengthen a research network of collaboration between countries. Not only would this bring a more comprehensive understanding of DI and

inclusive education, but it can also serve as a learning experience on the best practices around the world.

Taken together, the special issue book not only explores and discusses the current status of DI from an international perspective, but also allows to identify future lines of research and practical implications. However, one last major challenge and gap remains across the DI research output: DI research, just as our world itself, is heterogenous. This stems from the different cultural contexts, languages and consequently, instruments used to collect data. This should be an essential project of us DI researchers. Our aims should be set in the development and evolving of the current “context specific” status quo and seek for an international approach to DI research. Thus, this editorial wishes to highlight the importance of the “what is known up until now”. Nonetheless, it also seeks to encourage for a more global approach that allows for cross-country comparisons, as well as mixed methods approach and multi-perspective data. In other words, this editorial calls for an inclusive approach in research, where we all can learn from each other. The heart of DI is set on the students, in providing them with the best learning opportunities, to an equal access and to the development of their best selves. Hence, how can we best support our students in this current world of global challenges, if we are not *learning together and from each other*?

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Differentiation and Differentiated Instruction

A Philosophy and Pedagogical Approach to Inclusive Teaching and Responsive, Effective Instruction

Gemma Scarparolo & Pearl Subban

Abstract

Over the last twenty years, Tomlinson's definition and model of differentiation have gained increasing attention as an inclusive pedagogical approach where instruction is focused on being responsive to student diversity. However, recent research reviews have identified that there are definitional inconsistencies, misperceptions, and variations in teacher implementation. In this chapter, the authors set out to provide a distinction between differentiation as an overarching philosophy and pedagogical approach to inclusive teaching, and differentiated instruction as responsive, effective instruction. Furthermore, differentiated instruction is explicitly linked to some of the literature on effective instruction with examples of different instructional practices and approaches that teachers can draw upon from their instructional toolkit as part of responsive instruction. The chapter also includes a spotlight on student diversity and differentiation as an inclusive pedagogical approach in the Australian educational context.

Differentiation or differentiated instruction?

Teachers are expected to differentiate (Pozas et al., 2020; Whitley et al., 2019) in response to diversity in inclusive classrooms, yet there are "definitional inconsistencies" (Graham et al., 2021, p. 161) around the term and this is likely to impact teachers' understanding, implementation and research in this area. With increasing publications that focus on differentiation, it is important to have a clear and consistent definition, especially as the spotlight is on further confirmation of it as an effective pedagogical approach. While the terms differentiation and differentiated instruction are often used interchangeably, we believe that there is a difference. Since Tomlinson introduced her model of differentiation in the 1990s, many variations of the term have been used, including: differentiate/d instruction, differentiated curriculum and differentiated classroom. In this chapter, the authors propose that the following distinction can be made; differentiation identifies the overarching philosophy (Tom-

linson, 2001; UNESCO, 2004) and pedagogical approach to inclusive teaching to respond to student diversity, and differentiated instruction specifically refers to the instructional elements of differentiation which focuses on matching teaching and learning to student diversity (responsive instruction) so that teachers provide “appropriately challenging learning experiences for all their students” (Tomlinson, 2001, p. 5) to maximise teaching and learning time and maximise learning opportunities for all students. Thus, differentiated instruction is responsive, effective instruction. Furthermore, differentiation and differentiated instruction identify more than a set of principles, specific instructional strategies or practices (such as tiering and flexible grouping), or ways that teachers can adapt aspects of teaching and learning (content, process, product) and the learning environment. They also include and encapsulate a way of thinking about diversity (expecting it, respecting it, valuing it and being responsive to diversity in inclusive classrooms), as well as teachers’ holding high expectations for all learners, optimising learning conditions, and maximising learning opportunities for all students by employing effective instruction in response to student diversity. “Differentiation is more than a strategy or series of strategies – it’s a way of thinking about teaching and learning” (New South Wales Government Education, 2021), and differentiated instruction involves teachers drawing upon a “toolbox of instructional practices” (Pozas et al., 2020, p. 218) as part of responsive, effective instruction.

The Australian educational context: student diversity and inclusive teaching

As a signatory of the United Nations Conventions on the Rights of the Child (United Nations, 1989), Australian schools are committed to providing *all* children with an education that is equitable and of high quality where *all* children are supported to develop to their fullest potential. To achieve this, teachers must recognise that students differ as learners and acknowledge that not all students will learn in the same way (UNESCO, 1994). Therefore, teachers should differentiate instruction in all classrooms in response to student diversity. In Australian educational contexts, diversity is defined in different ways. The national curriculum presents three categories of student diversity: students with disability, gifted and talented students, and students who are learning English as an additional language or dialect (Australian Curriculum, Assessment and Reporting Authority, n.d.); however, student diversity is recognised more broadly in other contexts to specifically include Aboriginal and Torres Strait Islander students, as well as other factors that may impact students’ access, participation and achievement including socioeconomic status, culture, gender, sexual orientation, mental health, beliefs, attitudes, care arrangements, and

geographical location. This broader understanding of inclusive education to include *all* learners is reflected in international reports (UNESCO, 2020), where ‘all means all’ as “learners have multiple intersecting identities and no one characteristic is associated with any predetermined ability to learn” (UNESCO, 2020, p. 10).

In Australia, (like in many countries) teachers have a legal obligation to make reasonable adjustments for students with disability under the national legislation, the Disability Discrimination Act (Commonwealth of Australia, 1992) and sub legislation, the Disability Standards for Education (Commonwealth of Australia, 2005). Under the definition of disability in the Disability Discrimination Act, students with disability include students with physical disability, intellectual disability, mental health disorders and students with a disorder who learn differently from people without the disorder (such as Autism Spectrum Disorder, Attention Deficit Hyperactivity Disorder, and Specific Learning Disorders) (Commonwealth of Australia, 1992). With 7.7% of children under 15 in Australia reported to have a disability (Australian Bureau of Statistics, 2019), it is an expectation that there will be at least one student with a disability in each class and it is a legal requirement that teachers consult with all stakeholders in the educative process. Consultation should include students, their parents/carers, and other relevant stakeholders and should inform teacher decisions that are made regarding making reasonable adjustments (Commonwealth of Australia, 2005), such as providing students with assistive technology, extra learning or working time and additional scaffolds. While differentiation is not explicitly stated as a legal requirement, it is a suitable pedagogical approach as it is based on teachers’ responsiveness to student diversity, including students with disability.

Since 2011, teachers in Australia have also had a professional responsibility to “differentiate teaching to meet the specific learning needs of students across the full range of abilities” (Standard 1.5) and “support full participation of students with disability” (Standard 1.6) as a requirement of meeting the Australian Professional Standards for Teachers (AITSL, 2017). While differentiation is included as one of the 37 professional standards for teachers, differentiation relies on many aspects of teacher knowledge and practice; it is not a standalone pedagogical approach or practice. Differentiated instruction relies on teachers’ professional knowledge of their students and how students learn (Standard 1), incorporating many other elements of their professional practice, including “planning for and implementing effective teaching and learning” (Standard 3), “creating and maintaining supportive and safe learning environments” (Standard 4) and “assessing and providing feedback on student learning” (Standard 5: specifically Standard 5.4) (AITSL, 2017).

While it is a professional expectation and requirement that teachers differentiate instruction in response to student diversity, support for teachers in Australia regarding implementation is varied. In some contexts, differentiation

and differentiated instruction is mentioned and subtly embedded with little elaboration provided, while in others differentiation and differentiated instruction is explicitly defined, identified as an inclusive pedagogical approach and elaborated on, including explanation of specific instructional strategies that teachers can implement to make differentiated instruction manageable, such as tiering, choice boards, and learning menus. Therefore, to support teachers' implementation of differentiated instruction, clarification and more support could be provided for teachers in Australia, including consistent use of terminology and explicit links to other elements that are integral to effective instruction, such as learner motivation and engagement, and inclusive teaching practices such as the use of assistive technology (e.g. speech to text functions), to prompt teachers to view differentiation and differentiated instruction as embedded throughout all aspects of teaching and learning, and not as a standalone approach to address student diversity

A snapshot of research on differentiation and differentiated instruction

Acknowledged as an inclusive pedagogical approach for the 21st century classroom (Graham et al., 2021; Lindner & Schwab, 2020; Loreman, 2017; Pozas et al., 2020), differentiation and differentiated instruction have received considerable attention from researchers, practitioners and educational administrators over the last two decades (Gibbs & Beamish, 2021; Smale-Jacobse et al., 2019; Sun & Xiao, 2021). Yet, there is some variability in the research findings on its effectiveness as a pedagogical approach and this has been attributed to various factors including inconsistent definitions, teacher preparation, and few empirical studies which examine the impact of differentiated instruction on student achievement. Since Tomlinson's formative definition in the 1990s, research studies have principally focused on investigating teachers' knowledge, understanding, attitudes and beliefs about differentiation, and teachers' implementation (primarily in teaching mathematics and reading; Bondie et al., 2019), including challenges. Overall, teachers are reported to recognise that differentiation and differentiated instruction are necessary, however, they can be hesitant to differentiate instruction based on some of the following factors and concerns: implications for assessment, time constraints, resources, managing student and parent expectations and classroom management concerns (Nicolae, 2014; Tobin & Tippett, 2014; Whitley et al., 2019). Furthermore, there has also been commentary that there is variance in teachers' interpretation and implementation of differentiation and differentiated instruction (Graham et al., 2021).

To learn more about teachers' implementation and understanding of differentiated instruction, researchers have developed varied ways of organising, categorizing and framing differentiated instruction practices, such as the taxonomy of differentiated instruction developed by Pozas and Schneider (2019), and Bondie and Zusho's (2018) framework, All Learners Learning Every Day (ALL-ED), that includes a focus on differentiated instruction as adjusting "instruction to increase clarity, access, rigor, and relevance for all students" (p. xvi). Recently, Smale-Jacobse et al. (2019, p. 3) provided a theoretical model of differentiated instruction that elaborates on Tomlinson's work by providing an overview of how differentiation and differentiated instruction can be applied to the planning, teaching, assessment and evaluation cycle from lesson to lesson. However, we propose that some clarification or expansion on the term 'learning needs of students' would enhance this model as some teachers may interpret the term students' learning needs to specifically refer to students' cognitive learning needs (readiness), whereas, as we have already established, student diversity encompasses many different ways that diversity can impact engagement and learning.

Some of the most adopted differentiated instruction practices are reported to be tiering and heterogeneous ability grouping (Pozas et al., 2020), particularly in subjects such as Mathematics and when teaching reading. It is evident from the research that there is variability in teachers' approach to differentiation and differentiated instruction; some teachers think of it as an intuitive strategy, some implement superficial and/or isolated practices of differentiated instruction, and some teachers adopt the philosophy and pedagogical approach of differentiation in all aspects of teaching and learning, including differentiated instruction as an intentional, proactive, inclusive, responsive and effective instruction.

Clarifying the difference between differentiation and differentiated instruction is an important step towards increasing and improving teachers' implementation, addressing teachers' concerns and building empirical research in the area. To learn more about research on differentiation and differentiated instruction over the last twenty years, readers are encouraged to read two recent reviews (Graham et al., 2021; Sun & Xiao, 2021).

Differentiation: the overarching philosophy and pedagogical approach

Differentiation focuses on optimising learning and learning conditions (including the learning environment) for *all* students; thus, it is an inclusive pedagogical approach (Loreman, 2017) where all students feel respected, safe and supported to participate and learn for maximum student achievement. Differ-

entiation is also a mindset (Tomlinson, 2001) that implies that student diversity can impact learning and recognition that teachers need to match instruction to student diversity to maximise learning for all students. Student diversity includes cognitive, behavioural and affective needs and each of these domains are integral parts and influencing factors on student engagement, motivation, commitment to task and academic success. Therefore, an important and integral part of differentiated instruction is dependent on how well teachers know their students, including their readiness (or capability, prior knowledge and skills for upcoming content), passions, interests and motivations as well as other important considerations such as “cultural perspectives and social emotional readiness” (Department of Education and Training Victoria, 2019, p. 2). Once teachers know their students and have identified aspects of diversity that may impact teaching and learning, the next step is to create a safe and inclusive learning environment where students are assured that their teacher will respond to this accordingly to maximise participation and maximise achievement. Creating an inclusive learning environment firstly involves the consideration of the physical environment (e.g. the furniture, access, lighting, sound, access to resources) and how these elements can impact access, safety, participation and learning for students, and secondly deliberately and consciously creating a learning environment where students feel safe (to make mistakes, to share their ideas, values, opinions and beliefs, and challenges with learning), supported and included. Students learn better when they are comfortable, both physically and psychologically.

Classrooms should be stimulating and conducive to learning, and places where students feel valued, safe and supported to take risks to support their learning. This approach maximises emotional, cognitive and behavioural engagement and helps students to invest in their learning. Quality teaching starts with the belief that all students can learn given the right support and learning pathway (Department of Education and Training Victoria, 2019, p. 2).

While differentiation as a philosophy and pedagogical approach identify the rationale and define broad ways that teachers can adopt this inclusive approach (e.g. by modifying elements of content, process, product and learning environment in response to student readiness, interests and learning preferences), differentiated instruction focuses on the specific elements of instruction as the implementation of the philosophy and pedagogical approach.

Differentiated instruction: responsive instruction

Once teachers have chosen to adopt the philosophy and mindset of differentiation and they know their students, the next step of differentiated instruction is matching instruction to the elements of student diversity with the aim of increasing student motivation, engagement and maximising achievement. When teachers differentiate instruction, the content should make sense to students (clarity) and be interesting and relevant (Bondie & Zusho, 2018) as this can increase motivation, engagement and lead to increased achievement.

What teachers do and how students perform intersect, making teachers a critical factor for determining student success. When teachers use effective instructional approaches as part of their practice, they maximise the probability that students will be actively engaged in instruction. Student engagement is one of the most well-established predictors of achievement; when students are more engaged in academic instruction, they tend to have greater academic and social success (Harbour, Evanovich, Sweigart, & Hughes, 2015, p. 5). It is recognised that “students learn more effectively when they are interested in their learning” and that interest can be “maintained by allowing students to have some control over their learning” (UNESCO, 2004, p. 25; CAST, 2018). Teachers can proactively seek to enhance student engagement and enhance motivation by recruiting and leveraging students’ interests and through providing students with some elements of choice in learning experiences (CAST, 2018; Loreman, 2017). This can be managed quite easily when using instructional strategies such as choice boards and learning menus where students can choose activities to complete and, in some cases, relate their interest/s to an activity.

It is well established that learners are more intrinsically motivated when they are provided with elements of choice and autonomy (CAST, 2018; Ryan & Deci, 2000). Autonomy is known to be a powerful motivator (Ryan & Deci, 2000), so it is important for teachers to identify opportunities to provide students with some autonomy as one way to increase students’ intrinsic motivation to learn. Consulting with students about aspects of their learning and incorporating this where relevant is also a motivating factor for students as it provides them with a sense of control over their learning (Scarparolo & MacKinnon, 2022). Teachers can use assessment data (to determine readiness) and what they know about their students (such as their interests, passions, motivation, levels of engagement, how they like to work and how they like to demonstrate/communicate their learning etc.) to inform instructional choices to match this diversity (Scarparolo & MacKinnon, 2022). This data informed decision making is one of the guiding principles of Tomlinson’s model of differentiation (Tomlinson, 2017), where she notes that it is wise for teachers to recognise and “understand the connection between students’ interests and their motivation to learn” (2017, p. 109).

It is important that students are motivated to learn as it is understood to be a pre-requisite and integral part of student engagement (Saeed & Zyngier, 2012). With student engagement being closely linked to student academic success (Harbour et al., 2015), it is important that teachers optimize learning conditions and employ effective and appropriate instruction to maximise student engagement. Student engagement is multifaceted, and teachers should purposefully and proactively consider the behavioural, cognitive and emotional/affective components of engagement. When students are engaged in learning they feel safe, happy, included and respected in the classroom; they are actively involved in their learning, willing to learn and participate, persist with learning challenges, and invest effort (Saeed & Zyngier, 2012). Students are less likely to become frustrated and disengaged when teachers purposefully and intentionally match instruction and learning experiences with students' readiness levels (Tomlinson, 2017), and when teachers provide learning experiences where students achieve competence (through scaffolding, guided practice, independent practice, corrective feedback, rehearsal and distributed practice), and when students accept responsibility for their learning and have some control over their learning. Competence is one of the contributing factors to motivation (Ryan & Deci, 2000) and "to learn well, each student needs challenge and success" (Tomlinson, 2017, p. 13). Instruction and learning are optimized when teachers teach content and skills within their students' zone of proximal development (Department of Education and Training Victoria, 2019) and this is reflected in Tomlinson's model of differentiation, which is underpinned by the principles of constructivism (Subban, 2006), in the term readiness, and what we know about how people learn (Tomlinson, 2017) and effective instruction.

Differentiated instruction: effective instruction

It is well established that effective instruction consists of many variables and elements of teacher practice, and that effective instruction is associated with positive student achievement. Therefore, teachers must "attend to methods of adapting instruction to students' level of knowledge, motivating students to learn, managing student behaviour, and grouping students for instruction" (Slavin, 1995, p. 166), then evaluate the effectiveness and respond accordingly. Here, it is evident that the purpose of differentiated instruction aligns with Slavin's early definition of effective instruction that is responsive to student diversity.

It is widely recognised that there are common elements or principles of instruction that are effective in improving student achievement (Rosenshine, 2012), and many of these originate from the QAIT model of instruction (Slavin, 1994) and the Theory of Instruction (Engelmann & Carnine, 1991). Specific instructional models or pedagogical approaches, such as direct instruction, The

Gradual Release of Responsibility (Pearson & Gallagher, 1983) and Explicit Instruction (Archer & Hughes, 2011) all focus on the following elements of instructional design: assessing and activating students' prior knowledge; matching instruction to assessment data; providing clear, unambiguous instruction; modelling; providing multiple opportunities for students to respond; continual checking for student understanding; scaffolding; rehearsal; guided practice and independent practice; targeted and corrective feedback; re-teaching as required; review; and distributed practice. These approaches are all focused on responsive instruction, intentional teaching and providing efficient and effective instruction to maximise student achievement. While these approaches have been proven to be effective, particularly in response to teaching reading and for teaching students with disability, these approaches do not acknowledge all aspects of learner diversity or factors that can influence and impact motivation and engagement.

One of the earliest models of instruction identifies "four alterable elements of classroom organisation and instruction: quality of instruction, appropriate levels of instruction, incentive, and time", known as the QAIT model (Slavin, 1994, p. 141). Slavin identified that the elements in his model are interdependent and that all four elements "must be adequate for instruction to be effective" (Slavin, 1994, p. 143). In the QAIT model, quality of instruction refers to how the information or skills are presented "so that students can easily learn them" (Slavin, p. 143). Here, we consider quality instruction to be effective instruction, where the instruction has a high impact on student achievement. "When instruction is high in quality, the information being presented makes sense to students, is interesting to them, is easy to remember and apply" (Slavin, 1994, p. 144). For instruction to be effective, teacher decisions must be based on assessment data to determine readiness as well as what they know about their students more broadly (including their interests and strengths) and as learners (maintaining interest, engagement, and motivation). Slavin's QAIT model and definition of effective instruction (both high quality and appropriate) account for instructional elements as well as consideration of cognitive, affective and behavioural elements related to teaching and learning.

Effective instruction is not just good teaching. No matter how high the quality of instruction, students will not learn a lesson if they lack the necessary prior skills or information, if they lack the motivation, or if they lack the time they need to learn the lesson (Slavin, 1994, p. 143).

Differentiated instruction: a toolbox of instructional practices

Differentiated instruction should be considered by teachers "as an umbrella term encompassing any instructional practice that enables teachers to address

student heterogeneity adequately and thereby support student learning” (Pozas & Schneider, 2019, p. 74). Furthermore, differentiated instruction as responsive, effective instruction requires teachers to draw upon a variety of instructional strategies or practices (e.g. learning menus, choice boards, tiering, cubing), and instructional approaches or models, such as Explicit Instruction (Archer & Hughes, 2011) to maximise teaching time and opportunities for students to learn in consideration of all aspects of student diversity and what we know about factors that impact student engagement and motivation. Therefore, differentiated instruction involves teachers making many instructional decisions in response to the following: what they know about their students, curriculum knowledge, and their knowledge of effective instruction and how students learn.

Differentiated instruction promotes the use of flexible grouping and a blend of whole class, group and individual instruction (Tomlinson, 2017). Therefore, in one lesson, teachers could incorporate elements of Explicit Instruction (Archer & Hughes, 2001) to teach most students, and implement The Gradual Release of Responsibility model (Pearson & Gallagher, 1983) to structure the lesson. Students that have been identified as not requiring explicit instruction and/or guided practice may move straight to independent practice and either access the content at a higher level of challenge with peers at the same or similar readiness level. Here, teachers could utilize cooperative learning strategies that are linked to increasing engagement and learning (Rosenshine, 2012) and students could work independently or in pairs on learning menus, choice boards or tiered activities (Tomlinson & Moon, 2013) with elements of interest and flexibility to increase autonomy, motivation and a sense of control over their learning (Ryan & Deci, 2000; UNESCO, 2004). In the same lesson, teachers could then provide some flexibility with how students learn (process differentiation such as using assistive technology and having the choice of watching a video or listening to a podcast), and provide options with how students demonstrate their learning (product differentiation, such as a written response or a podcast); these decisions could be informed by consultation with students (e.g. interest surveys, interviews/conversations with students) about their interests and preferences about learning and communicating what they have learned (Scarparolo & MacKinnon, 2022; UNESCO, 2004).

The authors of this chapter propose that differentiated instruction is an elaboration and extension of Slavin’s QAIT model (Slavin, 1994) that focuses on “responsive instruction” (Tomlinson, 2001, p. 9) to all aspects of student diversity in inclusive classrooms. When teachers differentiate instruction, they: proactively and intentionally plan to respond to student variance by providing quality instruction (effective instruction); provide appropriate instruction (based on student readiness and knowledge of students as learners); provide incentive for students to learn by creating engaging and interesting learning experiences by including elements of choice and opportunities for autonomy, and through creating optimal conditions for learning; and they provide students

with appropriate learning time to maximise student achievement. Therefore, differentiation is an inclusive pedagogical approach (Loreman, 2017) as it is responsive to student diversity, and differentiated instruction promotes effective and efficient use of teaching and learning time to maximise opportunities for *all* students to learn in an inclusive learning environment.

Conclusion

One of the aims of this chapter was to provide a clear distinction between the terms differentiation and differentiated instruction in response to recent reviews that identified a need for definitional consistency as part of increasing and improving teacher implementation and building empirical research in this area. These definitional standpoints elaborate and further support Tomlinson's rationale for differentiation (2001, 2017), and are intended to better equip teachers to implement authentic and consistent differentiated instruction as responsive, effective instruction in inclusive learning environments. The second aim of the chapter was to provide some additional support for differentiated instruction as effective instruction, where teachers draw upon a toolbox of instructional strategies in response to student diversity to maximum student engagement and achievement. Some contextual information about diversity, disability and differentiated instruction in Australia was also provided for the reader. We hope that the chapter is useful for pre-service teachers and teachers in supporting their implementation of differentiated instruction as responsive, effective instruction in inclusive classrooms.

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Multilevel Differentiated Instruction for General School Education that Benefits the Whole Class

Diana Lawrence-Brown & Pamina Abkowitz

Abstract

The Multilevel Differentiated Instruction Framework for Inclusive Education helps educators meet the needs of students with the full range of abilities (from significant disabilities to giftedness) in general school education. Contrary to popular assumptions, students with disabilities do not usually learn more in segregated classrooms; equal or superior results are obtained when individualized supports and services follow them to general school classrooms, also benefiting the class as a whole (European Agency for Special Needs and Inclusive Education, 2016). The framework has four levels, with universally designed instruction, culturally responsive pedagogies, assistive technologies, and a collaborative team approach at its core. The other levels address barriers that make curriculum and assessment inaccessible to those who struggle with reading, writing, and/or processing difficulties, as well as adapted curricula for students who are gifted and for those with the most significant disabilities

Introduction

General school classrooms are increasingly diverse, including students ranging in ability from gifted to severe disabilities. This chapter provides a framework for multilevel differentiated instruction that explains both curriculum modifications and individual supports and services to help meet the needs of students with the full range of abilities in general school education. With suitable supports, including multi-level instruction, students ranging from gifted to those with severe disabilities can have access to more equitable educational opportunities. A multilevel lesson planning system is presented here that is manageable within general school classes and curricula, along with strategies helpful for a post-pandemic, digital approach.

The Multilevel Differentiated Instruction Framework for Inclusive Education (Lawrence-Brown, 2004; 2020) has four levels, with high quality general education curricula and instruction at its core. This level includes universally designed instruction with culturally responsive pedagogies, assistive technologies, and positive behavioral supports. The other three levels provide additional supports for students who need more accessible and structured curricula,

accelerated curriculum for advanced students, and prioritized curriculum for students with significant intellectual disabilities.

An important aspect of this model is differentiating primarily within whole-class activities, limiting separate activities for students with significant disabilities as much as possible. It is important that expectations, while not uniform, are kept high for each student. Care must be taken that, in our efforts to meet the needs of diverse students in heterogeneous classrooms, we do not import problems of segregated classrooms such as debilitating low expectations for some students (Lawrence-Brown, 2004).

The Multilevel Differentiated Instruction Framework for Inclusive Education (Lawrence-Brown, 2004; 2020) joins research-based strategies and the author's experiences as a special education teacher supporting students with the full range of abilities in general school classrooms. It extended the work of researchers such as Vaughn, Bos, & Schumm (2000), who had expanded their basic, 3-level planning pyramid with a modification providing for individualized goals for students with severe intellectual disabilities. The Multilevel Differentiated Instruction Framework for Inclusive Education specifically attends to these issues that remain troublesome for many teachers:

- Multilevel instructional decision-making (e.g., who learns at what level?) that is manageable within general school classes and curricula.
- Developing additional supports for struggling learners, especially resources that students can use with or without additional staff assigned to the general education classroom.
- Providing an appropriate education for students with special gifts and talents and for students with severe disabilities, both of whom may be members of the same heterogeneous, inclusive classrooms.
- Differentiating primarily within whole-class lessons, avoiding separate, parallel tasks as much as possible (Sharma & Salend, 2016).

Collaboration is Key

Effective inclusion of students with significant disabilities requires a collaborative approach with consultation and frequent “push in” special education services that directly support the students and teacher in the general education classroom (e.g., Ryndak, Jackson, & White, 2013). (Unlike “pull-out” services requiring the student to go to a segregated location, “push-in” service providers integrate their work with students into the general school classroom and curriculum.) In this way, students with disabilities (and others who may benefit) have access to supports and services traditionally limited to segregated classrooms.

The collaborative team includes the general and special education teachers and any paraprofessionals and other service providers involved with students

(e.g., therapists, gifted education teachers, new language teachers, etc.). Students' families are also important members of the team. Important synergies are available through a multi-disciplinary approach that are critical for the complex work of effectively including students with the full range of abilities (Brown, Pryzwansky and Schulte, 2011; Conoley and Conoley, 2010; Frye, 2005).

Use of a collaborative team approach also helps combat the common error of assuming that the general education teacher alone can or should be responsible for meeting the needs of all students. Co-teaching strategies structure the team's sharing of responsibility within the general education classroom, including effective communication, conflict resolution, and creative problem-solving, with benefits to students such as increased achievement (Villa, Thousand & Nevin, 2008).

Overview: Multilevel Differentiated Instruction Framework for Inclusive Education

Inclusive schooling is supported by international and nation-specific special education law and disability rights agreements (Convention on the Rights of Persons with Disabilities, 2007; European Agency for Special Needs and Inclusive Education, 2016; Individuals with Disabilities Education Act, 2004; UNESCO, 1994), recognizing the right to equal educational opportunity and benefits to society from a more educated population.

Although important for gaining access to general schools, legal requirements are not the most important reason for inclusive schooling; most important are learning outcomes. Contrary to common assumptions, students with disabilities do not usually learn more in segregated classrooms; equal or superior results are obtained when individualized supports and services follow them to general education classrooms (e.g., Bunch & Valeo, 1997; European Agency for Special Needs and Inclusive Education, 2016; Ingraham & Daugherty, 1995; Logan & Keefe, 1997; McGregor & Vogelsberg, 1998; O'Hara, Munk, Reedy & D'Agord, 2016; Ryndak, Jackson, & White, 2013), also benefiting the class as a whole (European Agency for Special Needs and Inclusive Education, 2016).

The Multilevel Differentiated Instruction Framework for Inclusive Education (Lawrence-Brown, 2004; 2020) has 2 primary goals:

- 1) maximize attainment of the grade-level general curriculum (represented here as a sphere) for all students;
- 2) provide adapted curricula for students whose needs extend beyond the grade-level curriculum. Adapted curricula are represented here using the larger "Accelerated Curriculum" oval (advanced material) and the smaller "Prioritized Curriculum" oval (includes functional skills in addition to some general curriculum concepts).

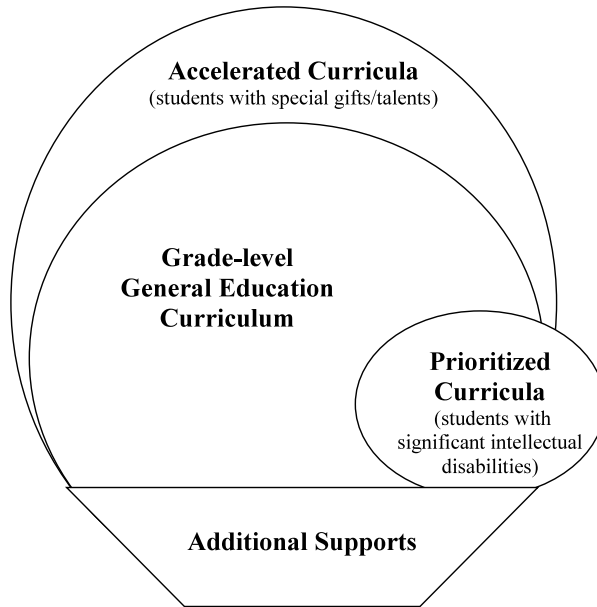


Figure 1: Multilevel Differentiated Instruction Framework for Inclusive Education

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Effective differentiated instruction starts with high-quality, culturally responsive general education lessons (Santamaria, 2009) that are responsive to the readiness, interest, and learning profile of individual students (Tomlinson, 2015). Lessons are planned using a Universal Design for Learning (UDL) mindset emphasizing flexible means of presentation, student expression, and engagement, increasing accessibility for all students (Rose & Meyer, 2002). Specific strategies that are helpful for multilevel instruction include:

Active learning, e.g., hands-on projects and activities, multi-sensory instruction (Birsch & Carreker, 2018), rich tasks (Harris, 2021; see Figure 3)

Real-life applications and multicultural connections with students' experiences, cultures, and communities (Halvorsen & Neary, 2001; Santamaria, 2009, Style, 1988)

Practices that emphasize respect for learners and development of safe, caring, and supportive classroom communities (McQuarrie, McRae & Stack-Cutler, 2008; Smets, 2017; Tomlinson, 2015), including zero-tolerance of bullying, character education, culturally responsive pedagogy, and analysis of the functions of problem behavior.

Data-driven decision-making (O'Hara, Munk, Reedy & D'Agord, 2016)

Variable grouping and cooperative learning with individualized roles: Group work is a high leverage practice for addressing individual goals for stu-

dents at the Accelerated and Prioritized curriculum levels (e.g., interpersonal skills, more basic or advanced academic concepts) within the context of grade-level general education curriculum activities (McLeskey et al, 2017). Systematic instruction for these individualized goals can take place in either a virtual or face-to-face environment (Porter, Greene, & Esposito, 2021). Groups are frequently and intentionally varied in size and composition, based on similar or different interests, learning profiles, and learning status (Smets, 2017; Tomlinson, 2015). Especially to be avoided is routine use of a “low ability” instructional group (cf. Du Plooy, 2019).

Additional Supports Level

The “Additional Supports” level is represented in Figure 1 (above) as the trapezoid-shaped foundation that supports the grade-level general curriculum. These supports are available to all students and are designed by the collaborative team to address methods, materials, and assessment that are inaccessible to those with reading, writing, and/or processing difficulties (see Daniel, Figs. 2 & 3).

For these students, grade-level standards are appropriate, but very challenging. Students in this group may be identified as having dyslexia or other specific learning disabilities, be considered “at risk,” learning a new language, have fewer prerequisite skills, learning strategies, and background knowledge/experiences, low motivation, and so forth. Without Additional Supports, many of these students will fail.

Additional Supports include those that help students access the general education curriculum, and those that lend additional structure to the curriculum.

Access to the General Curriculum

The curriculum can be made more accessible to a wide variety of students by first removing barriers to the materials themselves, and then through added structure.

Assistive Technologies

Assistive technologies are especially helpful for providing accessible instructional and assessment materials (Rose & Meyer, 2002). Examples include auditory access to print materials (e.g., audiobooks, text-to-speech programs) and support for written expression (e.g., word prediction programs, speech-to-text programs). These supports are increasingly built-in to popular platforms or available as free downloads.

Additional Supports: Daniel is strong in math and music and is a trusted helper in his family's small business. Reading and spelling are extremely difficult; however, frustration may lead to acting out verbally and physically. He asserts that he does not need school, assuming a future in the family business. Daniel has dyslexia and is supported by a special education teacher for one period each day.

Accelerated Curriculum: Elena is a recent immigrant who is highly gifted in academics. She is particularly interested in science. She is quiet and shy in class, possibly related to speaking with an accent. Direct services from a gifted education teacher are no longer provided due to budget cuts at her school; a gifted education consultant is available occasionally.

Prioritized Curriculum: Sara is an engaging and outgoing student who loves art. With intensive support from a collaborative team, she has been successfully included in general education since preschool. The team includes her special education and general education teachers, her speech pathologist, occupational therapist, physical therapist, paraprofessional, and her parents (mainly electronically). Sara has a severe intellectual disability; the team meets weekly to design modifications and facilitate supports needed to address functional living and academic skills, which are far below grade-level.

Sara's Annual Individual Education Program (IEP) Goals:

1. Print legible letters and numbers. (Present Level of Performance: Can currently print E, F, I, L, O, T, 1, 7, 9, and 0 independently. Requires a model for other letters/numbers.)
2. Increase sight word vocabulary (to 90 % of words 1–50 from the Dolch list). (Present Level of Performance: Can currently read the following words: a, I, and, big, go, make, play, see, the, you)
3. Improve articulation skills (pronounce words with initial s, z, f, v sound, clearly enough for an acquaintance to understand).
4. Improve number concepts (create models of numbers 1–50 using base 10 blocks) (Present Level of Performance: Can count & create models of numbers up to 13, independently.)
5. Improve pincer grasp.
6. Improve handwashing skills.
7. Improve turn taking skills.
8. Improve street safety skills (indicate when it's safe to cross).

Figure 2: Examples of Students (*Source:* Authors' own image).

Find vs. Guess

While students who are amply capable and confident may benefit from a “trial and error” approach, students with a history of failure need methods that structure successful experiences, to bolster both their skills and their confidence in themselves as learners (e.g., Mueller, Palkovic, & Maynard, 2007). For these students, a variety of resource materials can be provided to empower them to find answers they don't know rather than guess at them (probably incorrectly). Examples of resource materials include the following, all structured to help struggling students successfully practice the skill/concept:

These supports are most effective when they provide the least assistance necessary to allow the student to avoid random guessing, practicing the skill/concept correctly rather than practicing errors. In many cases, these supports can appropriately be offered to any student who wishes to use them. In other

Table 1: Examples of Resource Materials for “Find vs. Guess” Strategy.

Manipulatives, e.g., snap-together cubes representing the base-10 number system allow students to represent and solve problems concretely
Visual aids, e.g., diagrams, models, concept maps
Reference materials: “big ideas” summaries, step-by-step instructions, tables and charts (e.g., student-created multiplication charts to look up multiplication facts not yet memorized, providing an alternative to practicing incorrect answers)
Outlines (partially completed when appropriate), summaries, graphic organizers, study guides
Picture cues and representations, e.g., adding pictures to represent target vocabulary
Auditory versions of books, instructions, etc.

cases, their use might be limited to those likely to practice errors without them. For example, if the goal is memorization of multiplication tables, students who are able to practice with reasonable levels of accuracy without multiplication charts might appropriately be discouraged from using them.

Personal Assistance

Personal assistance, including both peer tutoring and help from adults, can also serve the purpose of providing access to grade-level curriculum. However, this should be used with considerable caution to avoid unnecessary dependencies, both during and after leaving school.

Structure

Struggling students also benefit from strategies that add structure to the general curriculum. These students may lack learning and study strategies that seem to come easily to more successful students. The next section includes both instructional strategies for teachers, and learning strategies for students.

Emphasize the most important concepts and skills

Not all aspects of the curriculum are equally important. Unlike successful students who readily hone in on main ideas and discount minor details, struggling students need scaffolded supports (McLeskey et al., 2017) to focus their efforts. This temporary assistance can be topic- and project-specific. Providing guided notes, story or chapter summaries, or videos with quizzes following a mini-lesson are effective ways to supplement instruction, a recommended role for technology in the post-pandemic world of education (Singh, Steele, & Singh, 2021). For more examples of scaffolded supports, see Figure 3 (below).

Provide clear expectations and examples

This strategy may be especially important for students whose background differs from that of the teacher; however, a broad range of students will benefit from greater explicitness, precise instructions, and examples of past student work. Students with reading and memory difficulties will need an accessible record of instructions to which they can refer as they work (e.g., a checklist at the student's independent reading level, a word processing file to which the student can listen using a text-to-speech program, etc.). These need not always be prepared in advance; for example, instructions might be recorded in audio format as they are given verbally to the large group.

Systematic breakdown of specific strategies, skills, and concepts

Desirable student performance is analyzed and recorded in step-by-step format, as in the following example for math problem-solving (adapted from Polya's four-stage problem solving model in Pressley & Woloshyn, 1995):

- a. Describe problem in your own words
- b. Decide if the answer should be more or less than what you started with
- c. Represent the problem concretely (e.g., use manipulatives or draw pictures)
- d. Write the problem and the answer
- e. Check the answer
- f. Self-evaluate (did I complete all the steps?)

Data can then be gathered for each step, helping focus further instructional interventions (cf. Browder, Spooner & Courtade, 2020).

Make specific connections with prior knowledge and real-life experiences

This culturally-responsive strategy helps students to create a space for new information within their existing cognitive schema, an essential aspect of learning and retention (Gonzales, Moll, & Amanti, 2005). It may also help with motivation for students who question the utility of some content.

Work toward increased independence by fading assistance systematically

Use of additional supports such as those described above better enables students who struggle with the general curriculum to achieve at grade-level (King-Sears, 2001). Because they rely largely upon use of resource materials and group instructional strategies, they minimize the danger of creating dependencies in students on support personnel. When assistance from support personnel is required, this should be gradually faded, allowing the student to build independence in the process (Browder, Spooner & Courtade, 2020).

Multilevel instructional strategies for students requiring more extensive adaptations (to content and expectations) are described in the next section.

<p>Instructional Example</p> <p>Approach: Rich Task Topic: Baseball</p> <p>Overview: Rich tasks use interdisciplinary exploration of a particular topic to provide students with a deep learning experience. Knowledge and experiences are linked, aiming to develop collaboration, critical thinking, communication, and creativity (Harris, 2021).</p> <p>Learning Activities: Students explore concepts in literacy, history, math, science, the arts, and engineering in heterogeneous groups to create a project and presentation about a baseball team of their choice.</p> <p>Resource Materials: Assembled by the collaborative team, with assistance from the librarian. Provided in both paper and electronic format to facilitate access, e.g., using text-to-speech:</p> <ul style="list-style-type: none">– selected short stories, articles, and news reports– one-page summary of “key concepts,” concept maps, graphic organizers, study guide– choice board to select from various projects to demonstrate their knowledge about the topic.– a holistic rubric outlining evaluation criteria for the unit. <p>Subject-specific Learning Goals:</p> <p>Literacy: Connecting literature, news reports and movies from around the world; determining the main idea and salient details.</p> <p>History: How culture, language, and geography impact the history of baseball in various countries and their teams, including the World Baseball Softball Confederation (WBSC).</p> <p>Math: Measurement of baseball field, statistical data for a selected team, geometry angles, speed.</p> <p>Science: Laws of motion, ball trajectory.</p> <p>Music: History of “Take Me Out To The Ballgame” and “Negro Baseball League” (song by Jean Grae).</p> <p>Art/Engineering: Create a baseball field diorama, explore how a team’s fields/stadiums were created.</p>	
Additional Supports	Goal Adaptations
<p>Daniel uses the summary, study guide, and concept map extensively to help him focus on the most important ideas and connections. He uses a text-to-speech program that reads electronic text aloud, audiobooks, and word prediction and speech recognition programs (to allow him to produce longer written assignments). The collaborative team has identified increasingly independent use of these tools as important to his long-term success in the workplace, as well as for current content-area assignments.</p>	<p>Sara (Prioritized Curriculum): Sara uses text to speech software and audiobooks to access all grade-level curriculum and resource materials on her tablet, sometimes learning things that surprise her teachers. For written assignments, she can use speech to text software or dictate to the paraprofessional to express her ideas verbally. She also works on skills identified in her IEP (e.g., letter and number formation, articulation skills, turn-taking skills, etc.). An academic curriculum focus is identified for each subject, e.g., collecting data about her favorite team’s wins, losses, runs batted in, and ranking for math. She will create a data chart with this information with help from her group and/or the paraprofessional.</p> <p>Elena (Accelerated Curriculum): Elena works on advanced material related to the unit, having shown early mastery through pretesting. She has a particular interest in baseball around the world; she will research the lived experience of players and teams from various countries. This addresses higher-level thinking skills and advanced academic material such as the impact of political, social, and economic factors on baseball on players and in various countries.</p>

Figure 3: Instructional Example (Source: Authors’ own image).

Goal Adaptations

To achieve the vision of inclusive education as a community that supports all learners, students who need goal adaptations must also be accommodated. These students benefit from the instructional supports described above, but also need adapted instructional goals. For some, access to more advanced material is needed, referred to here as Accelerated Curriculum. For students with severe disabilities, less advanced and/or functional curriculum goals may be needed; these are referred to here as Prioritized Curriculum because they represent individual needs deemed most important by the collaborative team responsible for the student's program.

Accelerated Curriculum

The "Accelerated Curriculum" level (see Elena, Fig. 2) goes above and beyond the general education curriculum and provides appropriately advanced learning opportunities for gifted students. These students either enter the general school classroom already having mastered much of the material, or they will master it well ahead of other students. Accelerated Curriculum is represented in Figure 1 by the large oval, indicating that opportunities for more challenging work are provided well above and beyond grade-level curriculum standards (e.g., see Figure 3, below). Opportunities for more creative work may also be appropriate.

Strategies helpful for Accelerated Curriculum include:

1. Curriculum Compacting: Students receive pretesting for grade-level content, allowing them to "test out" of this material and pursue material at an appropriate level of challenge (National Association for Gifted Children, 2022).
2. Independent study opportunities, perhaps supported by librarians, classroom volunteers, etc.
3. Academic Mentoring: Students are connected with individuals (e.g., older students, leaders from the community) who have expertise in an area of interest to them, either in-person or virtually (Ford, Dickson, Davis, Scott, & Grantham, 2018).

Prioritized Curriculum

The "Prioritized Curriculum" level (see Sara, Fig. 2) provides supports and "push-in" services necessary for access to the general school curriculum for students with significant intellectual disabilities without threatening them with removal from general education if they are unable to "keep up" with grade-level expectations. Instruction in important skills and concepts that are not part of the general curriculum (e.g., daily living skills, social and communication skills, motor skills, etc.) is also provided, during natural routines as much as possible (Schnorr, Ford, Davern, Park-Lee, & Meyer, 1989). Direct "push-in" services integrated into the general classroom and curriculum are needed, e.g., from special education teachers, paraprofessionals, and therapists.

Prioritized Curriculum is represented in Figure 1 by the small oval. Students with severe disabilities can learn of course, but at a much slower pace. This makes setting priorities a must- when the number of things that can be learned is limited due to length of time needed to learn anyone, it is essential that students' and teachers' time is invested in those that are most critical.

What is "most critical" will vary from student to student, comprising a mixture of academic and functional skills. These are often individual education program (IEP) goals (e.g., see "Sara," Figure 2), but also include other informal goals identified by the collaborative team (see "Sara," Figure 3). As shown in Figure 1, Prioritized Curriculum includes as much material from the general curriculum as the student can absorb, with the size of the oval varying from student to student depending on how much of the general curriculum each can achieve. This level also includes functional skills that fall outside of the grade-level curriculum. These are addressed under natural circumstances, to improve both motivation and generalization. For example, communication skills might be addressed during discussion-based lessons; dressing skills might be addressed in the locker room; street-crossing skills requires community-based instruction.

Prioritized Curriculum is likely to include communication, motor, and interpersonal skills since they are common IEP goals for students with significant disabilities. They are also among the easiest Prioritized Curriculum goals to address in general education lessons because they are natural parts of most active general education activities. They are often not the focus because many students have already mastered them (and thus provide good models for students who have not) but communicating, moving, and getting along with others are parts of nearly all active learning opportunities. Examples include asking for help/materials, answering questions intelligibly, moving materials and themselves from place to place, sharing materials, taking turns, working cooperatively, and so forth.

Communication, motor, and interpersonal skills have been referred to as "embedded" skills (Schnorr, Ford, Davern, Park-Lee, & Meyer, 1989), because they are naturally embedded in other tasks and activities. This concept can also be applied to lower-level academic skills that may be part of the IEP for a student with significant disabilities, for example, printing letters and understanding basic number concepts. While these would not be part of the general curriculum past the early grades, they can be viewed as skills embedded within more complex tasks, e.g., working on letter formation as part of activities in which other students work on more advanced writing skills, or working on counting and number identification as part of more complex math lessons. To reduce stigma, look for ways to use the same materials as others use, in an adapted fashion, e.g., identifying numbers on the same handout provided for students working at grade-level.

In addition to IEP goals, an academic curriculum focus should be informally identified within general curriculum lessons. These are basic concepts from

the grade-level lesson that are prioritized for team members to emphasize with Sara, especially those related to the student's interests, increased independence, and participation in local communities (see Fig. 3).

Post-Pandemic Digital Approach

Segregated education persists around the world, exacerbated by war and global disease (UNESCO, 2020). Education for all students has been interrupted; services for students with disabilities have been particularly disrupted (Porter, Greene, & Esposito, 2021), with both educators and families confronting the challenges of virtual learning.

Chevalere et al. (2021) studied inquiry-based learning (IBL) and computer-assisted instruction (CAI). They found that students who performed best with CAI had stronger working memory capacity. Students whose working memory is not as well developed can use CAI but will often require shorter and more frequent periods of instructional time.

The European Commission (2021) recommends a blended learning approach, in which learners and teachers, staff, and the community at large provide a variety of both digital and non-digital approaches to foster growth and understanding of content and skills. Similarly, Vegas (2022) found that technology is most effective when it complements, rather than replaces, teacher-delivered instruction, identifying four aims:

1. Enhancing and increasing quality instruction.
2. Directing more personalized instruction.
3. Facilitating greater practice of skills or concepts.
4. Enhancing student engagement.

Porter et al. (2021) apply constructivist theories of learning to the problem of virtual instruction, suggesting that digital collaboration and interactions between students and teachers serving as mentors are powerful teaching tools (Porter, Greene, & Esposito, 2021). These social interactions take place at both the micro level (at home, in classrooms, home and communities in which students live) as well as the macro level (larger cultural and social contexts).

Kearney et al. (2012) also investigated the efficacy of distance learning and technology through the lens of social-constructivist theories, focusing on mobile devices. Collaboration, personalization, and authenticity are the cornerstone of their model. Collaboration to support the learning process can include one-to-interaction, small groups or the whole class. These interactions can be both synchronous and asynchronous in nature, with cooperative learning groups using virtual tools such as discussion boards and/or specialized collaborative project platforms. An advantage of asynchronous interactions is affording additional time for students to process and reflect upon their learning.

Digital devices can facilitate more personalized and expansive multilevel instruction when used to access virtual environments. For example, Elena (see Figure 3) might use them to “visit” museums and historical sites to analyze the development of baseball in multiple countries (Vegas, 2022).

The personalization component of the Kearney et al. (2021) model enhances differentiated instruction by using individual choice to direct learning. Students choose aspects of a topic to learn more deeply and participate in group activities with peers, practicing with concepts in short, frequent sessions.

The authenticity component of the Kearney et al. model (2021) fosters cultural relevance by celebrating the backgrounds and family experiences of each student. Remote instruction from students’ home environments can lend itself to the further exploration of family experiences (Kearney et al., 2021).

The Kearney et al. model also facilitates multilevel differentiated instruction by focusing on empathy, connections to all students and efforts to ensure that all students participate in the e-learning environment, whether it is face-to-face or asynchronous (Kearney et al., 2021). Their model also connects with the concept of “rich tasks” (see Figure 3), which builds on students’ interests and links knowledge and experiences to develop collaboration, critical thinking, communication, and creativity (Harris, 2021).

Kearney et al. (2021) suggest that the skills students learn using digital access through school can be useful throughout the individual’s lifetime. For example, Daniel (see Figures 2 & 3), who requires additional supports such as text-to-speech software, may benefit from access to these technologies on a personal device that he could use to help meet his reading needs outside of school. Another example might be a note-taking application with word prediction and/or speech-to-text capability that Daniel could use to record thoughts and ideas as he is participating in learning activities (Kearney et al., 2021). As personal devices are in popular use by peers and in the larger society, stigma is reduced, and the opportunity is provided to develop skills for use in real life beyond the classroom.

Discussion

Global events have sharpened a focus on flexibility, both for teachers and for students (Harris, 2021), with educators around the world being forced to quickly adapt standard teaching techniques to address barriers to access and engagement (Harris, 2021). Students with disabilities have had even greater barriers to overcome, given each student’s unique needs combined with historically lower achievement in the acquisition of skills such as basic literacy (Porter, Greene, & Esposito, 2021). These have combined to make a “perfect storm” for students with disabilities and prompted rethinking how we provide instruction in a quickly changing world (Kearney et al., 2012). If we are to maximize achievement of essential curriculum, we must differentiate instruction.

The importance of a collaborative team approach with frequent push-in supports is emphasized throughout this chapter. Effective collaborators are made, not born; specific professional development for skills such as group problem-solving, conflict resolution, and co-teaching is highly recommended. Other strategies for managing multi-level instruction include:

- Set priorities for instructional changes (rather than trying to do everything at once)
- Consider establishing a building-wide collection of materials for multilevel instruction, enlisting support from teachers at other grade-levels, curriculum coordinators, parent-teacher associations, librarians, etc.
- Build upon personal talents and interests. For example, one teacher may have a passion for baseball, taking the lead for rich tasks such as shown in Figure 3. Others will pursue projects more in line with their own interests, e.g., crafts, gardening, mechanics, etc. Older students can be enlisted as co-developers of rich tasks and other hands-on projects.

Although there is significant support in the professional literature for individual strategies applied in the Multilevel Differentiated Instruction Framework for Inclusive Education (Lawrence-Brown, 2004; 2020) a limitation is that research on the framework as a whole remains as a topic for future study. Another area of fruitful study could compare various models of differentiated instruction (cf. Pozas & Schneider, 2019) as well as to test their practicability and effectiveness (Subban, 2006).

Multilevel instruction supports the general school as a community to which age peers belong, where they can and should be nourished as individuals. With multilevel instruction and appropriate supports, intended benefits of inclusion for students both with and without exceptionalities can be realized.

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High Expectation Teaching and Differentiated Instruction

Convergence and Divergence of Theories

Christine M. Rubie-Davies

Abstract

In this chapter, I present the theories of High Expectation Teaching (HET) and Differentiated Instruction (DI). I introduce the three key principles of HET as well as related empirical evidence. Similarly, the key tenets of DI are presented and discussed, along with the empirical evidence. I explore the convergence and divergence of HET and DI theories and explain their underpinning naissance and how, although catering for diversity is central to both, their underpinning foundations are different. These underlying philosophical differences may explain the similarities and differences between the two theories. I end with identifying current research gaps within DI, and provide potential avenues for future research.

Introduction

Often education and educational psychology research fields develop separately (Sorrentino, 1993). Researchers focus on their field without considering other research that might strengthen their theoretical base potentially leading to cross-fertilization between research fields. Differentiated instruction (DI) and high expectation teaching (HET) are two such fields that have grown independently and yet, as will be shown in this chapter, have some overlap, and perhaps could be strengthened by consideration of the potential contribution of each to the other. In this chapter, I explore how differentiated instruction (DI) aligns with the theory of high expectation teaching (HET). I discuss their origins, provide details about each theory, discuss areas of convergence and divergence, and identify areas for future research within the DI field.

HET origins

Teacher expectations can be defined as, “the notions that all teachers hold about the current and future academic performance and classroom behavior of their

students, based on their interpretation of available information” (Rubie-Davies, 2015, p. xv). The teacher expectation field arose from concerns for the underachievement of minority and low socioeconomic (SES) groups. The seminal *Pygmalion* study (Rosenthal & Jacobson, 1968), conducted in a low SES school, showed that when teachers believed their students could do better than current achievement, academic outcomes improved. This led to a recognition, even from detractors of *Pygmalion* (e.g., Thorndike, 1968) that teacher expectations likely existed and affected student outcomes. Put succinctly, when teachers had high expectations, students performed at higher levels than previously and when teachers had low expectations the opposite occurred.

Within many education systems, there are groups whose academic achievement is below that of the dominant group(s). Because a key tenet of expectation research is a focus on equity, researchers have mostly investigated the effects of student characteristics on teacher expectations and associated academic achievement outcomes. This research suggests that teacher expectations are lower for minoritized students (Tenenbaum & Ruck, 2007; Turner, Rubie-Davies, & Webber, 2015; Williams, et al., 2020), those from low SES backgrounds (Westphal et al., 2016), boys in literacy (Muntoni & Retelsdorf, 2018) and girls in STEM (Gentrup & Rjosk, 2018), immigrant and second language students (Meissel, Meyer, Yao, & Rubie-Davies, 2017), and students with special educational needs (Pit-ten Cate & Glock, 2018). Teachers’ low expectations for these groups may explain why the achievement gaps between advantaged and disadvantaged students grow over time rather than decrease (Sorhagen, 2013).

However, although there have been hundreds of teacher expectation studies, very few have explored the teacher practices that make a difference for student learning. In the seminal work in this area, Brophy and Good’s (1970) classroom observations established that teachers interacted differently with students for whom they had high versus low expectations. A literature review at the time (Brophy, 1983) identified 17 ways teachers portrayed their expectations to students. These included behaviors such as waiting longer for high than low expectation students to answer questions; providing informative feedback to highs, not lows; and smiling more at highs than lows.

Overall, within the teacher expectation field, the focus has mostly been on teachers: student characteristics that influence their expectations (e.g., Williams, et al., 2020; Muntoni & Retelsdorf, 2018; Gentrup & Rjosk, 2018; Pit-ten Cate & Glock, 2018), teacher behaviors that portray their expectations (Brophy & Good, 1970; Brophy 1983), teacher beliefs that moderate expectation effects (Babad, 2009; Rubie-Davies, 2015; Weinstein, 2002), and outcomes for students of being subjected to high or low teacher expectations (e.g., Ağirdağ, Avermaet, & Van Houtte, 2013; Thomas & Strunk, 2017; Timmermans, de Boer, & van der Werf, M. P. C., 2016). Generally, researchers want to alert teachers to how their expectations, beliefs, and behaviors can influence student outcomes (academic and non-academic; e.g., Demanet & Van Houtte, 2012; Pesu,

Viljaranta, & Aunola, 2016; Wang, Rubie-Davies, & Meissel, 2018), with the goal that teachers increase their expectations for, and behave more equitably towards, all students. Ultimately, it is believed that such changes will decrease the achievement gap between advantaged and disadvantaged students, and increase overall student achievement, thus enabling more students to succeed (McKown & Weinstein, 2008; Rubie-Davies, 2015). Hence, within the teacher expectation field, although the focus has been on teachers, it is with a view to achieving more positive student outcomes. The concern is for students.

HET: Three Key Principles

High expectation teachers are those whose expectations for all students' progress and academic achievement over one academic year are well above the level at which students were achieving at the beginning of the academic year. High (and low) expectation teachers have been identified in New Zealand (e.g., Rubie-Davies 2007; Rio, 2017); The Netherlands (e.g., de Boer, Bosker, & van der Werf, 2010; Timmermans, Kuyper, & van der Werf, 2015) and in China (e.g., Hao, 2021; Li, M. 2022; Li, Z. 2014; Wang, 2019) and, in all these contexts, students with high expectation teachers have been shown to make much greater academic progress over one or more years, than students with low expectation teachers or those whose expectations are neither high nor low. HET relates to the particular teaching practices (outlined below) that high expectation teachers use to support and engage students, so they are enabled to make large progress over one academic year (Rubie-Davies, 2015). HET arose from earlier teacher expectation literature (examples above). However, most earlier and current studies have focused on the conception that teachers have high expectations for some students and low for others. The analyses have been quantitative and have examined the data across all teachers. That is, what student characteristics lead *teachers* to have high expectations for some students and low for others? How do *teachers* interact differently with high versus low expectation students? What are the student outcomes when *teachers* have high or low expectations for them? These teacher expectation studies investigate the research questions with no accounting for the idea that some teachers are likely to have greater expectation effects on their students than other teachers. That is, overall, teachers may take account of student characteristics when forming expectations, but this may not apply to *all* teachers. Similarly, most teachers may enact contrasting instructional practices with high versus low expectation students, but some may not and, therefore, student outcomes may differ depending on their teacher.

HET arose from the traditional teacher expectation research but examined how teacher beliefs moderated expectation effects. Below, I present the findings from earlier studies that led to identifying three key principles of HET,

explain those principles, and describe an experimental study that showed what happened when teachers were trained in HET.

Initially, among 24 Year 1-Year 6 teachers teaching across a range of socioeconomic levels, Rubie-Davies (2007) identified six high and three low expectation *teachers* (those whose expectations were high or low for all students relative to achievement). These were teachers whose end-of-year achievement expectations (from well below average to well above) were either significantly above or below students' actual beginning-year achievement. Subsequently, observations have been undertaken in classes of high and low expectation teachers (e.g., Cai, 2017; Rubie-Davies, 2007; Wang, 2019;). Clear distinctions have been identified between how high versus low expectation teachers teach. For example, high expectation teachers ask open questions of all learners and scaffold them to an answer if unsure. Low expectation teachers ask mostly closed questions and tell students they are right or wrong. Further, high expectation teachers do not use within-class ability grouping; low expectation teachers do. High expectation teachers set learning goals with students and provided progress-focused feedback. Low expectation teachers do not use goal setting.

Researchers (e.g., Z. Li, 2014; M. Li, 2022; Rubie-Davies & Peterson, 2011) also interviewed high and low expectation teachers to further explore their beliefs and practices. High expectation teachers, more than lows, created a warm socioemotional classroom climate. They formed close relationships with all students by taking time to get to know all their students personally, taking a close interest in their academic progress, and supporting students to succeed in their learning. In addition, they fostered supportive peer-peer relationships by seating students in mixed ability groupings, engaging students in frequent collaborative activities and rewarding students for supporting each other.

The observations and interviews led to the identification of the three key principles of HET (Rubie-Davies, 2015):

- 1) High expectation teachers use mixed achievement or flexible grouping, coupled with high-level learning opportunities for all students. Students often choose their learning experiences. The salience of achievement disappears because the focus is on skill development, not peer comparison. A variety of activities, leveled within the tasks, enable students to choose the complexity of their learning experiences.
- 2) High expectation teachers create a warm, supportive class community where they have positive relationships with all students and students support each other. Students often work collaboratively.
- 3) High expectation teachers set learning goals with their students and closely monitor progress. Students have high levels of motivation, engagement, and autonomy because the focus is on mastery of skills and teachers provide feedback related to progress towards achieving goals.

The identification of these three core principles formed the basis of a randomized control trial (Rubie-Davies, Peterson, Sibley, & Rosenthal, 2015) which investigated whether regular classroom teachers could be trained in the high expectation principles and what that meant for student outcomes. The study involved 84 primary school Year 4-Year 8 teachers, who taught across the full range of socioeconomic levels. Of these teachers, 43 formed the experimental group. The study also involved collecting achievement data in mathematics and reading from the approximately 2500 students of all 84 teachers. The study showed that compared to students whose teachers were in the control group, the experimental group made greater mathematics progress across the academic year. They gained the equivalent of more than one extra term's learning (28% additional learning in a four-term year). However, the gains in reading were not statistically significant. The authors argued that this was because teachers struggled with implementing mixed ability grouping in reading. Only 21% were using this grouping in reading by the end of the first year of the experiment whereas 65% had instituted it in mathematics. A qualitative study (McDonald et al., 2014) showed teachers were enthusiastic about the pedagogical changes they had made because they saw clear student benefits. A professional development program, High Expectations Remarkable Outcomes (HERO), which resulted from the experimental study, and which trains teachers to use the high expectation principles, has been delivered in New Zealand, Australia, the United Kingdom, Canada, and the Netherlands with teachers anecdotally reporting improved outcomes in student motivation, self-belief, engagement, and academic achievement.

Differentiated Instruction

DI has been defined as, "any instructional practice that enables teachers to address student heterogeneity adequately and thereby support student learning" (Pozas & Schneider, 2019, p. 74). Roy, Guay, and Valois (2013) describe DI 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). Both these definitions imply that instructional practices teachers employ vary for different students. That is, some students are exposed to more challenging learning experiences than others. The definition of Roy and colleagues, however, includes a requirement that student progress is checked and planning for teaching is evidence-based. These definitions are broad and mean there are many instructional practices teachers could use that might differ substantially but could be called DI.

As with HET, DI also focuses on teachers but, unlike the teacher expectation field, DI arose out of concerns for teachers as well as students. As classroom diversity increased, DI was designed to enable teachers to cater for students'

varying needs. Students from a variety of backgrounds, for whom the classroom language is a second language, whose behavioral and psychosocial needs vary, and/or who have special learning needs are found in most classrooms. In addition, many schools have moved away from between-class ability grouping to having mixed ability classrooms. Teachers have not always felt adequately prepared to teach the classroom heterogeneity. DI aims to provide teachers with guidelines for meeting student needs, so students are provided with appropriate learning experiences (Pozas & Schneider, 2019). HET is also focused on enabling teachers to cater for students with diverse learning needs. However, the two theoretical stances have resulted in both similar and divergent suggestions for teachers interested in raising student achievement.

Tomlinson (2005a, 2005b) described how differentiation related to what curriculum material is taught to different students (content), what learning experiences different students engage in (process), and what students produce (product). Hall (2002), however, focused more on the learning process. She emphasized using a variety of pre-assessments to establish prior knowledge, attitudes, and interests related to the new learning, and using formative assessment to monitor student progress. This would lead teachers to differentiate their instruction by adjusting lesson pace, lesson content, and student interest. Teachers would adjust the learning objectives in line with student needs. Similarly, Lawrence-Brown (2004) advocated for adjusting the curriculum for different learners to enable them to reach at least grade-level standards.

In a literature review (Pozas & Schneider, 2019) based on the work of Tomlinson (2005a, 2005b), Hall (2002) and Lawrence-Brown (2004), Pozas and Schneider (2019) proposed a taxonomy of six ways teachers can respond to student diversity and differentiate instruction. First, they proposed the use of tiered assignments – some students would be given more difficult and complex learning experiences than others. Second, they proposed the formation of within-class ability groups – some students are assigned to lower and some to higher groups based on teacher perceptions of ability. Third, teachers can use peer tutoring – high achievers are assigned to work alongside low achievers. Fourth, teachers can prepare staggered nonverbal aids – cards students use to assist with new understandings, and which may include further task explanations through to more complex clarifications. Fifth, teachers can employ mastery learning. Pozas and Schneider (2019) state that teachers need to reduce the curriculum to include mastery learning so students are aware of minimal through to maximum achievement standards. Finally, teachers grant students autonomy enabling them to make choices but also to assume some responsibility for their learning. Hence, students make choices related to their learning materials from a range of activities at their level.

There have been several studies (mostly quasi-experimental) that have investigated DI's efficacy and effects on student outcomes. For example, with over 2400 eighth- and ninth-grade students in Flanders, Iterbeke, De

Witte, Declercq, and Schelfhout (2020) conducted two randomized control trials designed to increase students' financial literacy. The intervention involved ability-matching student pairs within classes and adapting the learning materials to suit high ability pairings versus low ability pairings. Schools were randomly assigned to either receive no financial literacy education or to one of three experimental conditions. One experimental group all received the same material and were randomly assigned into pairs. The second experimental group were ability matched but all students received the same materials. The final experimental group involved ability matching in pairs and then adapting the financial program by providing additional supports for the low ability pairs. Across all conditions, there was a very small increase (0.18 *SD*) in the (mostly) financial knowledge of the students. A 0.18 standard deviation increase is the equivalent of students being at the 43rd versus the 50th percentile. However, there were no differences in the effects of either ability matching or DI. Earlier studies (e.g., Frisancho, 2018; Villanueva, Bover, & Hospido, 2018) found an improvement in financial literacy the equivalent of approximately 0.15 *SDs* and hence the results from De Witte and colleagues' study (2020) are in line with those of earlier studies.

In a further quasi-experimental study (Karst, Bonefeld, Dotzel, Fehringer, & Steinwascher, 2022) of closely-matched schools, fifth-grade secondary school students ($N = 1288$) participated. The intervention teachers undertook a 3.5-hour course related to teaching reading strategies. Students were assessed and teachers learned how to use the assessment information to design appropriate but differentiated reading tasks. Overall, the students in intervention classes made no greater gains than those in control. However, low achievers in the control group made the greatest gain in the posttest and high achievers made the least. Within the intervention group, all students made similar gains. The authors concluded their intervention was useful for catering for achievement heterogeneity in reading and that it enabled teachers to effectively cater for student differences. However, the disparities among intervention students did not decrease; the existing differences were maintained. Among the control group, however, the gap narrowed.

The above studies were conducted in secondary schools. A primary school study (Prast, Van de Weijer-Bergsma, Kroesbergen, & Van Luit, 2018) involving Grades 1–6 students ($N = 5658$) had two intervention groups (Cohort 1 first year, Cohort 2 second year) and a control and was conducted over three years. Intervention group teachers learned to identify students' needs in mathematics and to use differentiated goals, instruction, and practice to cater for students using within-class ability groups. The findings showed a small effect on outcomes for Cohort 1 (students gained 2.5 additional points in their standardized test compared with the average of 14.4 points). The effect was small for mid and high achievers, but there was no effect for low achievers. However, there was no effect on mathematics achievement for Cohort 2. The authors then claimed

that within-class ability grouping was effective at reducing the detrimental effects of between-class ability grouping. That conclusion was not substantiated by the findings.

At times, DI intervention studies involve a complex intervention (e.g., Prast et al., 2018) and although teachers have been trained to implement a specific DI intervention, in most studies, there are no fidelity checks and so what teachers implemented and how is unknown (Smale-Jacobse, Meijer, Helms-Lorenz, & Maulana, 2019). A further factor relates to the moderation of effects of DI through teacher attitudes and beliefs. For example, Letzel, Pozas, and Schneider (2020) found that the more teachers valued DI and believed it useful, the more likely they implemented it. Conversely, if teachers believed there were insufficient resources to implement DI, they were less likely to use it. Similarly, Suprayogi, Valcke, and Godwin (2017) reported that the greater teachers' self-efficacy for using DI strategies and the more they held constructivist beliefs, the greater was the likelihood they would implement DI.

Convergence and Divergence

Enabling Student Success

As described earlier, the main focus of HET is enabling all students to succeed at high levels and to decrease achievement gaps. On the other hand, DI provides teachers with a variety of ways to cater for diversity, but some of these do not reduce the disparities between high and low ability students (e.g., Prast et al., 2018). However, both HET and DI advocate for all students to have access to high-level content and an integration of the two theories would mean teachers employing HET principles would ensure that support for all students was targeted to specific learning needs, whereas teachers using DI would be ensuring that low as well as high achievers were regularly encountering advanced learning opportunities in order to reduce achievement gaps.

Flexible Grouping

Both theories encourage the use of flexible grouping, but the understandings differ. In HET, students often work collaboratively in student-selected groups and the groups change regularly. Further, high expectation teachers run workshops to develop skills and students opt into these, but the skills taught change daily as do the groupings. In DI, flexible grouping means that as students show progress, teachers should reconfigure their groups. In terms of flexible grouping, an integration of the two fields would see those using HET principles ensuring that students were receiving skills-based teaching at appropriate levels (rather than students opting into groups) whereas those employing DI would

enable more frequent opportunities for students to work in collaborative mixed ability grouping whereby lower achievers could receive higher-level peer modeling.

Selecting Learning Activities

In both HET and DI, students can select their learning activities. However, in HET there is less teacher assignment of activities than in DI and learning experiences are levelled within activities. Students choose the level of learning experience they wish to engage in. In DI, there are different activities for those considered high, mid, and low ability. Although low ability students can select activities, they can only select those at their level. Integrating these two stances is perhaps a little more difficult. However, again, those using HET principles would need to ensure that although students had flexibility in their choices of learning experiences that teachers were confident that the selections were appropriate. They would need to direct students at times to complete certain activities. On the other hand, rather than having specific learning activities for specific students, those instituting DI could, at times, offer students a wider range of choice in the levels of the activities that students chose to complete.

Formative Assessment and Mastery Learning

Both HET and DI advocate formative assessment and mastery learning (Pozas & Schneider, 2019). In mastery learning, the focus is on developing skills rather than competition. Students have clear learning goals, and the teacher regularly monitors students and provides progress feedback and feedforward. This encourages students to self-monitor and re-set goals with their teacher, so the process is dynamic. Both HET and DI advocates recognize the importance of goal setting in accelerating student progress.

Knowing Students

Further, both HET and DI encourage teachers to know their students well but in DI this relates to understanding students' learning pace, levels of knowledge, and understanding of and interest in the topics being taught. In HET, on the other hand, teachers are encouraged to know students personally, to connect with families, and to ascertain interests outside school. Hence, both HET and DI recognize the importance of the teacher-student relationship, albeit that the focus is different. Both HET and DI teachers could be encouraged to focus as much on really knowing their students' academic learning progress and levels, as on getting to know their students personally.

Peer-peer support also differs in focus between HET and DI. In DI, high ability students are paired with lows by the teacher and are expected to act as tutors. Short term this may be effective but longer term, high ability students may become resentful of being expected to support a peer. In HET, the focus is slightly different. As students are given a lot of autonomy, often lower achieving students will be working with highs, but the groupings are self-selected rather than obligatory. Peers are rewarded for supporting, helping, and being kind to each other which helps to create a warm, supportive class climate. Nevertheless, with HET the pairings or groupings are arbitrary and lower achieving students may not be working with other peers who could provide them with the most suitable support. Hence, teacher direction in terms of grouping could be helpful at times. On the other hand, among DI advocates, the opportunity for students to choose their own pairings and groupings now and then, may lead to students in DI classrooms feeling more supportive of their peers, overall, and long-term.

Differentiation and Equity

The major divergence between HET and DI is that by its nomenclature, DI advocates for differentiation between students. Lessons are adjusted in complexity to suit students of different ability levels. Teachers are encouraged to create tiered activities involving different levels of complexity, and to which students are assigned. Together these practices mean different students learn different things and complete different activities. However, there is overwhelming evidence that within-class ability grouping has little effect on student learning ($d = .16$; Hattie, 2009; Hornby & Witte, 2014) but has negative implications for student self-esteem, liking of school, motivation, and engagement (Ireson, Hallam, & Hurley, 2005; Boliver & Capsada-Munsech, in press). Conversely, HET advocates for all students to be exposed to high-level learning activities, be given choice in their activities, have clear goals, be supported by their teachers, and support each other. These clearly divergent views are probably difficult to reconcile. Nevertheless, students in DI classrooms, at least sometimes during each week, could probably profit from being given more autonomy in terms of choices about their learning activities and partners or groups that they work with. On the other hand, students in HET classrooms could benefit from greater teacher direction at times in terms of both their learning activities and peer groupings. As a result of these changes to practice, students in both types of classrooms would likely be more motivated and engaged in their schooling and would look forward to coming to school.

Future Research Considerations in the DI Field

A striking idiosyncrasy of DI is its large range of interpretations by different researchers and theorists. DI means different things to different people. For example, a teacher can create ability groups and be implementing DI. She could use mastery learning and it could be classified as DI. She could teach varying content to different students, and it would be DI. She could use a different instructional process for diverse students, and this would be DI. The teacher could use one of these strategies, a combination, or all of them, and all these could be classified as DI. When there is no agreed-upon set of principles and strategies that comprise a DI classroom, it is impossible for researchers to gather empirical evidence to corroborate the efficacy of DI because each research group is measuring different processes, structures, and implementation. If the field agreed on a common set of strategies that comprise DI, this would help teachers and policy makers understand exactly which strategies make a difference to student learning. Currently, there is no certainty around what constitutes high-quality DI, how it should be implemented, and what this means for teachers in adapting their pedagogy (Smale-Jacobse et al., 2019; van Geel et al., 2019).

There are further implications of DI being defined in diverse ways but open to interpretation. First, there is a lack of empirical evidence in support of DI (Hall, 2002; Pozas & Schneider, 2019; Prast, Van de Weijer-Bergsma, Kroesbergen, & Van Luit, 2018). Second, there are very few randomized control trials and the quasi-experimental or experimental studies that exist seem to find very small or no effects (e.g., Iterbeke, et al. 2020; Karst, et al., 2022; Prast et al., 2018). In addition, the interventions often require complex changes to teacher practice, but there are few fidelity checks. As a result, researchers cannot be confident that the required changes to practice were implemented or to what degree guidelines were followed. Classroom observations alongside the implementation could address this issue. In addition, because teachers are asked to make multiple changes to their pedagogy, if intervention students succeed compared with a control group, the researchers are unable to report which pedagogical changes caused the intervention group to achieve at higher levels. Multiple changes may be responsible but maybe only one change was needed.

The effect sizes of DI interventions are often very small. Hattie (2009) states that almost everything teachers do benefits learning but the average effect size for teaching influences is $d=0.40$ and this effect size should be used to assess the efficacy of new practices. Therefore, recommending practices with an effect size of $d=0.20$ or less seems counterproductive to the effects many teachers have without changing practice.

Several DI papers talk about catering for different learning styles. Unfortunately, no empirical evidence supports the conception of different learning styles (e.g., Aafjes-van Doorn, Nissen, & Chen; 2022; Cuevas, 2015). Hence, it may be time for DI advocates to reconsider the idea that the consideration of

learning styles in teacher instructional practice is useful for student learning. Alternatively, studies within the DI field are sorely needed that could counter the prevailing evidence.

Most DI papers speak about high and low ability students. Interestingly, the word ‘ability’, by definition, refers to a fixed entity. You have high ability, or you do not. Assuming the term ‘ability’ within DI is problematic. When students are perceived as high or low ability, there is little room for movement. This is borne out by the literature on ability grouping that shows, despite teacher claims, that ability groups tend to be fixed and enduring (Sorhagen, 2013). The ability group students are assigned to in their first school year strongly predicts their 15-year-old achievement (Sorhagen, 2013). It is interesting that papers in the DI field (e.g., Prast, et al., 2018) advocate placing students in ability groups while advising teachers to develop a growth mindset among students. A growth mindset is a belief that intelligence can be increased (Dweck, 2010). This runs counter to the idea that students have a certain fixed ability.

Finally, there has been little DI research related to the psychosocial outcomes for students (Pozas & Schneider, 2019), for example, effects on self-belief, motivation, and engagement. Obtaining small effects for learning but being unaware of how DI practices are affecting students’ psychological well-being is a gap in the literature. In the HET field, there is evidence (e.g., Rubie-Davies et al., 2020) that in classes of high expectation teachers (compared with lows) students have greater self-belief, perceive higher levels of teacher support, higher expectations, and have greater school satisfaction. This type of research is urgently needed in the DI field.

Even more critical is establishing a firm empirical base for DI. This is currently lacking despite over two decades of research and despite the large interest in DI from teachers and policymakers. As Smale-Jacobse and colleagues (2019) state, “Apparently, the premises of differentiated instruction seem substantial enough for schools and policy makers to move towards implementation before a solid research base has been established” (p. 17). Following agreed-upon understandings of what constitutes DI, future research could verify its value for teachers and students.

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Inclusive Education in the Era of Comprehensive School System in Finland

Hannu Savolainen

Abstract

Finland's education system is well known for its good academic outcomes on this millennium. One major factor for the good average achievement levels of the Finnish students has been the relatively good results of lowest achieving students. In practice this has been shown in studies as a smaller gap between poor learners and good learners relative to average differences of these groups in OECD countries. It seems that the development of more inclusive education via the comprehensive school reform since 1970s led in the increase of both quality and equity in education (Savolainen, 2009). However some of the most recent developments challenge this view. For example, there has been a continuing and even widening gap between male and female students in achievements by grade 9 and there is evidence of clear increase in the proportion of low achievers and the difference between low achievers and good achievers has grown (Leino et al., 2019). It is slightly worrying that in public debates these developments are connected to the commitment on inclusive education.

This chapter makes an effort to give basis to understanding current situation by discussing briefly the developments of Finnish education system, including special education supports as a part of it, and how it went through a 'de facto' inclusive reform in the 1970s following the Nordic ideal of welfare society and where we are now when inclusion is an official policy facing recent challenges.

Towards a comprehensive school system

A key factor behind Finland's development into an educational society is related to commitment to the idea of Nordic welfare state. Essential elements of this idea were emphasis on equal rights, public welfare system and deliberate efforts to narrow gaps in equality between income groups and across genders. Finnish comprehensive school can be regarded as an educational manifestation of this welfare state ideal. (Antikainen, 2006). Comprehensive school reform, debated in the 1960s and implemented since 1972, was quite radical in its time. It removed the division of students after fourth grade into two tracks, one for the theoretically gifted and the other for the practically gifted. The former track led into further academic education and the latter into vocational education. Com-

prehensive school combined these tracks and the ideology behind the reform was to increase socio-cultural, geographical and gender equality. (Kivirauma, Klemelä, & Rinne, 2006). In hindsight, it is interesting that the reform was preceded by a political debate about the opportunities and threats of the reform, in which argumentation was quite similar to the debates about inclusive education since last 20 years (Rossi, 2007).

As comprehensive school, with its more heterogenous student body than before, raised understandable concerns, several measures were taken to meet the demands of this new situation. After the reform two significant approaches were implemented to support the smooth functioning of the new mainstream education system: 1) increasing quality of teacher education and, 2) gradual build-up of extensive special education support system.

In-service training of teachers was used to introduce new approaches, and differentiation in teaching a class was one major approach introduced at the time. The so called methodological differentiation included ideas for offering alternate learning materials based on students' current needs and flexible grouping within the classroom. For the early years of Comprehensive school also organizational differentiation was used whereby students were offered alternatively demanding courses in languages and mathematics in the lower secondary phase (grades 7–9) (Kangasniemi, 1997). This meant that during this period the educational routes to upper general education were blocked for those students that opted for lowest courses. However this system of organizational differentiation was abolished in the 1980s. Another important development took place in teacher education whereby all compulsory school-age teachers' education was shifted from Bachelor level to Masters level education in 1979 (Nummenmaa & Välijärvi, 2006).

The second major approach to build a comprehensive and responsive education system was that a wholly new support and related special education teacher qualification, part-time special education, was introduced. Part-time special educators were not assigned classes nor qualified to teach a class, but rather met with individual students or small student groups 2–3 times a week to support them in their specific difficulties in learning. Speech therapy was initially also an integral part of these teacher's job descriptions. This new qualification was distinct from special class teacher qualification and in fact teachers' union first opposed the idea of the new job description. But since 1970s and 1980s the numbers of these teachers increased rapidly and this kind of special education support became an integral part of the concept of comprehensive school system (see Savolainen, 2009). Some researchers see that this was a deliberate act to guarantee smooth functioning of the school system that now had more heterogenous student population taught in the same curriculum (eg. Kivirauma & Ruoho, 2007). Furthermore, the organizational differentiation of different levels of courses was removed, which in the 1980s meant that the same curriculum requirements were applied to all students. While discussion

of differentiation often concerns only mainstream class teaching and the work of classroom teachers, it could be argued that the special education system offered now two options: a kind of organisational differentiation by special class teaching and more methodical differentiation by part-time learning support as a new form of special education. The majority of students identified as having special needs were taught in special classes or schools in 1980s and 1990s. Furthermore, identification of SEN included, and still does, the requirement of having a personal individual education plan in one or more subjects. However in recent years majority of students identified as having SEN study for some time or almost all of their time in mainstream classes (developments discussed in the following).

Linking the removal of organizational differentiation by alternative courses with the increase in the number of students participating in part-time special education (increase from 3–4% in later sixties into more than 20% in early 2000s) clearly supports the argument that this new type of special education was a reaction to the challenges of teaching all students in accordance to the same curriculum. In later years this decision has been understood as a very successful one. An international comparison of schools systems (Barber & Mourshed, 2007) has concluded that one factor that is typical for the top ten schools systems in the world is that every student is provided the support that they need. Finnish part-time special education was mentioned as one well-functioning, flexible and non-stigmatizing approach to provide this kind of support. Thus, the success of the Finnish education system in later years was partially attributed to the flexible learning support system.

Developments in learning support systems in the 2000s

The Finnish comprehensive school became an international success story after the turn to this millennium as a result of repeatedly scoring at the top in OECD's PISA studies (OECD, 2001, 2004, 2006). However around the same years, the numbers of students identified as having special educational needs increased rapidly. In 1995 2,9% of students were identified as having SEN and 15 years later the number had almost tripled, being 8,5% (OSF, 2020a). The offering of part time special education support has remained at a quite stable level reaching between 20,1–22,7% of students between 2001 and 2020 (OSF, 2020b). In the first years of the millennium the country was in a situation where it got massive positive recognition on the high achievement levels in PISA studies, but on the other hand the numbers of students identified as having SEN were skyrocketing. One obvious reason for the increase was the earlier decision to give 50% increase in per student subsidy by the state to the municipalities for each SEN student (Pulkkinen, 2019). However, the increase in numbers of SEN students nevertheless raised concerns and where contradic-

tory to increased interest in inclusion and claims of well-functioning education system.

Thus, there was a need to reform special education and the pressures came mainly from two directions: practical and ideological reasons. The practical reason was the cost prediction of constantly and rapidly increasing special education provision. As one measure the increased state subsidy for SEN students was abolished in 2010 (Pulkkinen, 2019). The ideological pressures came from the international push towards inclusive education which gained much more power after the acceptance of UN Convention on the rights of persons with disabilities (CRPD, 2006), which made inclusive education besides a policy goal, also a human rights issue. Against these developments the rapid increase of identification of students as having special needs in Finland was at least at the face value a contradicting development. More close look into the practices of special education would have revealed, however, that within this increase the changing tendencies were that of all students identified as having SEN the proportion of those assigned to separate special schools declined rapidly while the proportion of students identified but who studied all or most of their time in mainstream class increased rapidly, while the share of students in special classes remained quite stable (Jahnukainen, 2011). These developments have continued and in 2020 of all students identified as having SEN only 6,5% were in special schools, 27,0% were learning full time in special classes and the majority 66,4% learned at least partly in mainstream classes. Altogether 32,1% of students with SEN learned from 80% to 100% of their time in mainstream classes. (OSF, 2020c)

Nevertheless, the result of deliberations in early 2000s was a process by which special education provision was reformed. This process began by new ideas presented in a special education strategy (Ministry of Education of Finland, 2007) followed by changes in educational law (Finnish Law 642/2010) and normative guidelines given in the national curriculum (National Board of Education, 2010). The new strategy proposed a three tiered model of special education where support was divided into *general support*, *intensified support* and *special education support*. While this structure resembles the classical model of prevention in medicine (primary, secondary and tertiary prevention) and many aspects of the Response to Intervention model (RTI), no reference was made to either of these models in the strategy. Compared to the three tiered model used in the USA, the Finnish model is rather an administrative model than a way of diagnosing disabilities. Second difference is that special education teachers' services can be used on all tiers while in the USA that is limited mostly to the third tier (Björn et al., 2016).

As a part of the reform process, also pressures towards more inclusive education were discussed. The new strategy paper argues clearly for increasing inclusion as the universally accepted trend and makes references to international declarations and suggests the new three tiered structure of support. (Ministry

of Education of Finland, 2007). Following this, government began a process of updating the existing law in education and the first proposal that was given for comments to all interested stakeholders mentioned that inclusive education should be the primary choice for all students. However, as a result of the comments round, the Education and Culture Committee suggested changes that make the new law more conservative and more similar to previous laws, leaving the responsibility of decision about inclusive practices largely to municipalities (Tahvanainen, 2011). Thus, the new law text did not provide very strong policy support for inclusion.

According to an interview study, the previous Education and Culture Committee of the Finnish Parliament had been concerned of the increase of special education and openly supported inclusion, but the committee serving at the time of the reform took a more critical stand on these issues. While the committee supported inclusion in principle they ending up promoting pragmatic traditional approaches in special education and saw the aiming for a more full inclusion as an utopian exercise. Scarcity of resources and especially critical statements made by Teacher trade union organizations seemed to have been more influential in the decision making process than the human rights claims of organizations of disabled persons. (Tahvanainen, 2011)

Curiously, while one major argument for the need of the reform was reference to the high costs of increasing special education, the same argument, avoiding too high costs, seemed to affect the decision of not making a policy that would have supported inclusive education more strongly and be more binding to the municipalities.

Three tiered support and inclusion: Intersecting problems and complexities

After the first ten years of experimenting with the new model of three tiered support, there are mixed feelings on how successful the implementation of the model has been. On the one hand, the idea of having to show evidence on results of given support before shifting to more intensive support has been a welcome idea, and has potential to lead into more effective supports given in schools (Kinnunen et al., 2021). However, up to date there has been relatively little research evidence on the efficacy of support given in schools and the practices between municipalities have been varying. The most recent development is that similar model is being adopted also in Early Childhood Care and Education.

One recent qualitative research suggested that schools seem to have difficulties in navigating between the support levels and some teachers feel that their workload has increased and become more diverse than before (Nykänen, 2021). Often the complaints relate to the required paper work related to increasing support from one level to the next. These aspects are repeatedly mentioned

by comments by the Trade Union of Education in Finland (TUEF, 2022). One central fear that seems to be shadowing the effort to maintain good education services is that the ideology of inclusion is used as a rational to save from support services and that children with special needs are “integrated” without adequate support into mainstream classes. Students with challenging behaviours are often mentioned as a primary challenge towards making inclusion work (e. g. IS, 2021). One argument behind these kind of statements is that classroom teachers and subject teachers do not have the necessary skills to teach students with various needs, an argument that has been an element of international critique of inclusion from the early years tens of years ago.

The overall situation with regard to inclusion is complex with tendencies from the past and new approaches forming locally varying interpretations¹. In the following parts of this chapter, I will make an effort to list and analyze some of the forces that affect positively or challenge the development of inclusive education in the Finnish education system currently.

- i. *Overall functioning of the school system.* There is still a well-functioning school system that produces good learning outcomes despite of the worrying signs of downward trends and widening of achievement gaps between genders and poorest and best learners.
- ii. *Resources for supports.* Schools have relatively good learning support resources when calculated as numbers of special education teachers and other support staff available in schools. However, the use of this resource may be limited by understanding of possible roles that special education teachers might have in inclusive education. One structural limitation is having two different special education teacher qualifications where only half of these teachers are officially qualified to teach a class. The three tiered support would make it possible to use resources at whatever level.
- iii. *Teacher profession* is still an attractive option to young people and despite intermittent decline in applications there is still 5–10 times more applicants to teacher education than places offered by different universities. However, discussion in media often emphasizes how demanding teachers’ work is and stories of teachers changing career are not uncommon. Reasons for these challenges refer to varying things in teachers work, but one theme that repeats, more or less explicitly, is inclusive education which is described so that more challenging students are now included in classrooms.
- iv. *Increasing the size of schools.* Over the last twenty years number of comprehensive schools on Finland has been reduced to a half, which means that many schools are today much bigger than before. The prediction is that number of schools will continue decreasing in the foreseeable future. There

1 For an excellent analysis of complexity approach with regard to inclusive education see Walton and Engelbrecht, 2022.

- is no research evidence on how this has affected or may affect inclusive education, but concerns are often raised about the issue.
- v. *Pedagogical approaches in the three-tiered support.* Big challenge in the three-tiered support is that it is mainly an administrative shell where the professional contents vary by municipality or by individual teacher. There are very few support interventions widely available that are based on research evidence.
 - vi. *Evidence based support and decision making.* The logic of three tiered support still largely lacks some elements necessary to be effective and this is evident in the pedagogical documents which contain mainly information supporting identification of student problems, but not that much concrete steps of what intervention will be carried out by whom, and how is the efficacy of the intervention assessed and thereby collected information used in upcoming decision making about the continuance of support.
 - vii. *Dependency in an old understanding of disability.* The challenge of inclusive education is still described as a challenge of student diversity (or disability) instead of understanding it as an interplay between diversity and teacher skills, efficacy and attitudes. This is reflected in a traditional use of language (see Walton and Engelbrecht, 2022) for example in the following ways: 1) students are often referred to as Tier 2 or Tier 3 students, thus using the intensity of support as a label, 2) process of increasing support is often described as transferring student from a Tier to another, where the implication often is that placement of the student will change. The original idea of the support model was that what changes is the intensity of support not the place of the student.
 - viii. *Lack of clear policy – plenty of room for local interpretations.* One probable reason for the confusion about the support model is that decisions about inclusiveness of education were left fully to municipalities, which now show very different practices originating from availability of resources and historical background of organization of support in a specific place. For example, to cite opposites, there are municipalities that do not have special classes, but rather some more flexible small group arrangements and flexible non-permanent grouping based on concurrent needs. Then there are municipalities that have separate special schools which are allocated almost all the additional teachers' assistant resources available in the municipality, and mainstream schools are left next to nothing of these resources. Possibility to adjust supports on the basis of local resources and availability of resources can be a positive idea, but given the differences of interpretations, can be also seen as problematic when inclusion is understood as a human right.
 - ix. *Teacher education* does not optimally prepare the future teachers who will work in inclusive classrooms. While this is a complex issue only two aspects will be mentioned here. First, much of teaching practice of classroom

and subject teachers takes place in University Practice schools, which, by law are not required to enrol students identified with special educational needs (some local exceptions with municipality funding exist). Thus these pre-service teacher students may not be given a chance to practice teaching in such an inclusive classes that most municipalities now have. This may make the jump into ordinary schools' realities a too big of a challenge. Second, perhaps the biggest obstacle for teachers in inclusive teaching – as indicated by research and public opinion – is how to relate to challenging behaviours. While this is a well-known fact a recent review of the curricula of Finnish teacher education degree programs showed that there were almost no course contents on behaviour management in classroom in classroom teacher degree programs. Behaviour management was taken as an issue mainly only in special education teacher degree programs, but even then, more often as an individual support rather than discussing approaches that could be applied in inclusive classrooms (Närhi et al., 2022).

- x. *Challenges in Inter-sectoral collaboration in supports.* Provision of flexibly increasing support in schools assume a smooth co-operation between three-tiered support (governed by law of education) and pupil welfare support (governed by social and health ministry degrees). Pupil welfare support includes universal (collective student welfare) and individual supports and the former matches well the goals of general support in education which is meant to all students and is an essential element in building the ground for inclusive education. Currently schools psychologists and social workers are not available for all schools in many municipalities. Furthermore, while research evidence shows that universal pedagogical interventions are among the most effective in responding to behavioural and emotional problems (Duodecim, 2022), psychologists' work is administratively mostly tied to supporting and diagnosing individual students. At the same time, on the education side, there is still a tendency of referring students to more intensive supports as the first solution, especially if they have behaviour problems (see Paananen, Karhu, & Savolainen, in press).

Conclusion

Finnish education system has many opportunities to continue developing into an inclusive education system. However there are several contradicting trends in recent developments that can tip the balance of development to either positive or negative direction.

A key aspect that requires more attention – in Finland and elsewhere – is the understanding that inclusion is not about placement of students but it is rather building learning conditions and pedagogy from which all students benefit. This is a big challenge for practice in schools but also for inclusive

education research and teacher education. My reading of this recent literature is that inclusive education as a concept lacks theory that would directly inform development of pedagogy in schools that could also be empirically tested. Perhaps this is one of the reasons why we lack comprehensive evidence in research that would convincingly show what kind of effects inclusive education practises have on achievement, social and emotional development of diverse students. Furthermore we should have evidence what does this require from teachers and schools and what implication does implementation of inclusive education have on the professional and emotional development of teachers.

When we accept that inclusive education is the universally accepted approach, a human rights issue, it is high time to shift away from the discussion of what is a proper place to which student into discussing what are the evidence based approaches to support diverse students in mainstream education and to develop new ways to support teachers in inclusive pedagogical approaches and supports as individual professionals and as a collective working community of inclusive schools.

In the context of Finnish education where we currently have several worries on the development of quality of education I would like to turn the discussion away from speculating what has happened to our students into thinking education as the biggest intervention that our society is committed in to support development of new generations. Let us learn, then, from intervention research and what is done when intervention does not yield expected results: we can change the intervention and / or improve the fidelity of its implementation. In Finland there are challenges needing attention in both of these regards.

Attending the first we could perhaps think of inclusion as process where central objective is new kind of pre- and in-service training of teachers in effective pedagogical supports. It is beyond the scope of this paper to discuss this fully, but some direction to consider would be to learn from the latest research on *differentiation in instruction* and from *universal support* approaches that have been shown to be effective in addressing children's academic, social and emotional development. We have experience and some evidence on how effective universal (general support) and intensified support can be implemented as a part of daily school work to prevent negative effects of challenging behaviours and thus the need to exclude student on these grounds (Närhi, Kiiski & Savolainen, 2017; Karhu, Närhi, & Savolainen, 2018).

Addressing the fidelity aspect would require an overhaul of the supports processes of the three-tiered support. This would include stronger commitment to evidence based methods of support, more concrete definitions of the goals of support and concrete plans on who will carry out the supports and how will the outcomes or effects of the support be assessed. Stated in other words fidelity check of support process should include the whole Response to Intervention cycle after which data based decision could be made. The good thing is that we already have the administrative structure for this, just the contents need

more work. Furthermore we undoubtedly have effective supports at all tiers, but with too little attention to the assessment of the effectiveness of these supports. Thus, learning from the available good experiences may be very limited, perhaps remain as teacher's personal knowledge or something that benefits one school only. These supports should include all tiers, beginning from the universal support. Finally, teachers should not be left alone to act as independent experts, but measures should be taken whereby they could benefit from each other's views in collaborative planning and work and possible consultations of the schools' psychology or social work professionals. The latter will require new kinds of administrative decisions that can facilitate collaborative work and agreements between sectoral administrations.

In conclusion development of inclusive education requires understanding the learning supports of various intensity as an essential part of the process of creating welcoming schools for all children. Secondly teachers need good experiences in inclusive practices and pedagogy, beginning from their pre-service education phase, to build their feeling of efficacy and thus more favourable attitudes towards inclusive education. Finally inclusion is always a collective exercise so inclusive pedagogy must be built as a school level activity where professionals actively engage in pedagogical discussions, support each other and also get the support of their superiors for situations where time or resources are needed to respond to children's needs.

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Differentiated Instruction from Russian Research Perspective

Natalya Kalatskaya, Roza Valeeva & Aydar Kalimullin

Abstract

The overall aim of this study is to develop new knowledge about the differentiated instruction in Russian research and practice. This review will identify the essence and main characteristics of differentiated instruction, as well as different approaches to differentiation of education in theory and practice of education in Russia. The study describes the development of the differentiated education issues in Russian school, and teaching methods taking into account the students' differences. As part of the study which has informed this paper a complex variety of research and analytical methods, complementing each other, was used. This includes analysis and synthesis of the research papers, monographs and text books on differentiated education, as well as the educational policy documents, reviews and reports of funded research for major funding bodies and research councils of Russia, and papers on differentiated education practice in Russian schools.

Introduction

A characteristic feature of the modern period of pedagogical theory and practice development in Russia is that research teams, individual scientists and schools responding to the social order of the Russian society and the state offer different innovations in education. Most of them are based on the leading idea formulated by Bondarevskaya (2001): an emerging personality has the right to be included in a personality-oriented pedagogical process of humanistic type. According to this idea, firstly, students should be given a certain freedom in choosing the direction of education and in determining its content. Secondly, the student's individual and demographic characteristics should be taken into account in teaching, which points to the need of justifying a differentiated approach in the educational activities of the teacher.

In the last three decades, a number of scientists research and develop concepts, models, and technologies for a differentiated approach to learning. Klarin (1984) and Rezvitsky (1984) note in their works its necessity in the context of student-centered learning, since differentiation contributes to the individual's development and to the satisfaction of his/her educational needs. The learning

process in terms of differentiation becomes as close as possible to the cognitive needs of students and their individual characteristics (Teplov, 1961). The axiological and person-centered approaches occupying a dominant position in Russian theory of education bring to the forefront differentiation of education (Belukhin, 1996; Demakova, 2009). But differentiated instruction is still under development although research on the issue is ongoing, seriously and deeply touching on different sides of the problem theoretically and methodologically (Alekseev, 1995). The analysis of the state of differentiated learning in Russia's school practice shows that uniformity and an average approach to schoolchildren in teaching prevail in a general education school. Differentiation of teaching in the classroom is carried out only sporadically and largely depends on the pedagogical skills of the teacher (Agoshkova, 2008).

This is the reason why, the present study, set out this problem baseline within the Russian pedagogy.

One of the aspects of the differentiated approach as a pedagogical problem in Russian pedagogy is the justification of two levels of educational content:

- Basic education, which forms the core and allows for the achievement of the main objectives by all;
- The expanded general secondary education on the basis of differentiated teaching in order to increase the level of students' development.

The content of basic education shall be accessible to all and assimilated to the best of their abilities. The differentiated part is designed to satisfy everyone's aptitudes, to encourage those who stand out with their abilities and to strengthen the overall intellectual potential of the country (Kushnir, 2010). According to (Yakimanskaya, 1996), the choice of an individual-differentiated system of education is conditioned by the necessity and possibility of achieving the following goals:

- Creation of favourable conditions allowing for the fullest development of each child's potential in accordance with his/her abilities and psycho-physiological characteristics, the wishes of the student and his/her family;
- Unlocking the intellectual potential of the child's personality;
- Ensuring the harmonious physical development of children and adolescents;
- Identification of the best conditions and ways of harmonizing the educational and training programmes for children in kindergartens and schools;
- Identification of the optimum conditions for implementing the idea of continuity and continuity in upbringing, education and development of pupils at all levels (kindergarten – primary school – basic school – secondary school).

The possibility of implementing these objectives of an individual and differentiated learning system, as well as new approaches to the organization of differentiated learning, are based on the provisions of person-centred education

(Shiyanov, 1999). That's why we have chosen the person-centered approach as the methodological approach on which the chapter is based.

The overall aim of this study is to develop new knowledge about the differentiated instruction in Russian researches and practice.

The three objectives of this review are to:

- Identify the concept essence of differentiated learning in Russian researches.
- Explore the theoretical and practical prerequisites for the development of differentiated education in Russian researches, to determine the historical development of differentiated approach in the theory of Russian education.
- Provide an overview of the main forms and types of differentiation, which is currently represented in the educational process in Russia.

As part of the study which has informed this paper a complex variety of research and analytical methods, complementing each other, was used. This includes analysis and synthesis of the research papers, monographs and textbooks on differentiated education, as well as the educational policy documents, reviews and reports of funded research for major funding bodies and research councils of Russia, and papers on differentiated education practice in Russian schools.

The paper is structured around its objectives. Section 2.1 considers the essence of differentiated learning in Russian researches (relating mainly to the first objective). Section 2.2 addresses for the development of differentiated education in Russian researches and is organised according to the three stages of forming and the historical development of differentiated approach in the theory of Russian education (relating to the second objective). Section 2.3 provides an overview of the current strengths, weaknesses of the main forms and types of differentiation in Russia. The paper concludes with a summary of findings identified in the literature. Consideration is given to areas that require further investigation and to the methodological challenges of conducting research to examine the links between differentiated instruction and student-centered approach to education.

Differentiated instruction concepts

The concept and essence of differentiated learning.

The problems of differentiated learning have been and are being given considerable attention in Russia since the early 1920s (Chekhov, 1923; Veselov, 1939). The main developer of differentiated instruction in Russia is Blonsky (1923). He proposed dividing students by age into classes and by level of preparedness for learning. He called this process 'furcation' (from the Latin 'distinction, division'). This meant dividing or branching the curriculum in the upper grades

into cycles of knowledge. Blonsky considerably narrowed this notion, considering the main aim of education to be the mastery of modern industrial culture. He also gave an important role to the innate qualities of the individual. According to Blonsky, education was supposed to be divided into cycles of knowledge, with a number of branches: humanities, natural sciences, and industrial. The progressiveness of these ideas lies in the fact that for the first time it is stated about the connection of differentiation of education with regional economic-industrial features. Only then, he believed, differentiation is justified, because it takes into account the already existing life experience of students (Blonsky, 1923). In the late 1950s, the concept of ‘differentiation of learning’ replaced the concept of ‘furcation’.

There are four points of view on the term “differentiated learning” in Russian scientific literature (Drobysheva, 2009).

According to *the first position*, differentiated learning is considered as learning associated with the division of the content of education. Thus, the “Pedagogical Encyclopedia” (1964) calls the differentiated education “separation of curricula and programs in the upper grades of secondary school” (p. 700). In the 1960s, differentiated teaching was understood to be the division of school curricula and programmes in the upper grades.

According to *the second approach*, the concept of “differentiated learning” is interpreted as learning under conditions of *internal and external differentiation*.

Internal differentiation is an approach in which students are not divided into groups, but the teacher, knowing their characteristics, gives them tasks of different levels of difficulty. External differentiation involves the division of students into groups according to certain criteria and is implemented in the setting of specialised classes, classes with advanced study of subjects, elective courses, gymnasiums and lyceums. Intermediate form is a multilevel differentiation within one class, when children in a class are divided into groups, each of which studies the learning material at different levels – basic, advanced and in-depth (Lebedev, 1967). In this regard, Shakhmaev (1982) considers differentiated teaching as “an educational process that takes into account the typical individual differences of students, and learning in this process is called differentiated education.” (pp. 269–270). Selevko (1998) defines differentiated learning in the same context: it is a form of the learning process organisation, when the teacher works with a homogeneous group of learners with common, significant for the learning process qualities. It is a part of an overall didactic system in which the learning specialisation of different groups of learners is achieved (p. 78).

The third concept is equating the differentiated approach with the individual approach to students in the conditions of a class-lesson system. According to Stresilkozin (1966) differentiated learning is “determining for the student the most appropriate and effective *nature of the work* in the lesson according to his/her individual characteristics” (p. 21). Selevko (1998) considers individual learning as one of the main types of differentiation (separation) (p. 79). Proponents

of this approach consider differentiated learning to be an educational process taking into account the individual differences of students, such as attention, capacity for work, nervous system, temperament, character, type, type of thinking, type of perception, breadth of image, type of memory, etc. (Abramova & Markova, 1977). Whereas an individual approach is provided for children with different developmental disabilities. Depending on this, the teacher chooses a different pace of work, a different way of presenting the material, a different nature of homework. In today's mainstream schools, the individualised approach to learning is hardly ever used. This is primarily due to teacher workloads and staff shortages. If individual educational work is undertaken, it is most often as part of extra-curricular activities with students who are behind in their studies or have difficulties in their learning.

Proponents of *the fourth approach* equate differentiated learning with solving a set of problems that arise when establishing different types of secondary education institutions. Using the term 'differentiated education' Yakimanskaya et al. (1991) mean socio-economic, legal, organisational, managerial and didactic aspects of education, such as "the status of different types of schools, recruitment conditions, the content and organisation of the teaching and educational process, study periods, group size, classification, workload, teacher pay, etc." (p. 46).

These approaches appear to be fundamentally different only at first glance. In fact, they all share the characteristics suggested in Osmolovskaya's definition: "differentiated teaching is the organisation of the learning process taking into account the individual and psychological characteristics of the individual, and forms groups of students with different educational content and teaching methods" (Osmolovskaya, 1996, p. 45).

The terminological analysis of the concept of 'differentiated learning' requires consideration in Russian researches of the relevant terms 'differentiation', 'differentiated approach', 'differentiated learning technology'.

Osmolovskaya (1996) considers *differentiation* as a way of organizing the educational process, which takes into account the individual typological characteristics of a person (abilities, interests, inclinations, features of intellectual activity, etc.). Differentiation is characterized by the creation of groups of students in which the elements of the didactic system (goals, content, methods, forms, results) differ.

A *differentiated approach* is understood as a way of implementing differentiated learning in order to determine the level of students' abilities and capabilities, their profile orientation, and the maximum development of each individual at all stages of education. Differentiated approach to education is 1) the creation of a variety of learning conditions for different schools, classes, groups, the purpose of which is to take into account the characteristics of their contingent; 2) a set of methodological, psychological, pedagogical, organizational and

managerial measures that provide training in homogeneous groups (Selevko, 1998, p. 79).

The technology of differentiated learning is a set of organizational decisions, means and methods of differentiated learning, covering a certain part of the educational process (Selevko, 2006). This technology is based on Vygotsky's theory of the zone of proximal development (ZPD) (Vygotsky, 1935). Vygotsky proceeds from the concept of progressive development of personality. He believes that two mental levels are consistently involved here: the zone of actual and the zone of the proximal development. Vygotsky demonstrated that there is a close correlation between intellectual development and a child's learning potential: effective learning is ensured if we take into account the zone of a child's actual development (what he/she can and knows at present) and the zone of proximal development (what he/she can learn on his/her own, in the nearest future, with minimum participation of an adult). The skills acquired first under the supervision of an adult, later become more and more freely and confidently transferred to the child's own well-assimilated experience. New intellectual tasks are then set, which are introduced into the zone of proximal development, and the child is prepared to solve them independently. In this way, experiences are gradually broadened and important mental skills are acquired. The basic principle declared by Vygotsky is that learning must outstrip development. Translated into pedagogical language, it is effective for a child to set tasks that can be solved independently, and the role of an adult should be reduced to a minimum. Vygotsky understood the zone of proximal development as the difference between the level of actual development (based on the difficulty of tasks that are feasible for the child's own intellectual effort) and the level of proximal development (tasks that can be achieved with the help of older people and in interaction with peers) (Vygotsky, 1935).

Thus, in order to determine the zone of proximal development, the teacher should be well aware of the pupils' existing capabilities and draw up a trajectory of future development and learning for each of them. Based on this, the main purpose of differentiated teaching is to determine for each student (group of students) the most effective and appropriate type of learning activity, form of work in the lesson and type of homework, based on their individual characteristics (level of training, development of thinking, cognitive interest in the subject, etc.). The target orientations of differentiated learning are: teaching each student at the level of his abilities and abilities; adaptation (adaptation) of education to the characteristics of different groups of students.

Historical development of differentiated instruction in Russia

According to Zakharenko (2007), the ideas of differentiated education in Russia originated in the 18th century. This was facilitated by the formation of three educational systems (folk, church, secular). The ideas of differentiated educa-

tion were also developed in theory (pedagogy of Tatishchev, state projects of Betskoy and Yankovich). In practice, there were various types of educational institutions: soldier schools, commercial schools, Cadet and military schools, mining schools, Tsarskoselsky lyceum, religious schools (archdiocesan schools, seminaries).

In the Russian education system, the first attempt to implement furcation was the creation under the Statute in 1864 of two types of gymnasiums (classical and real ones). The former prepared students for unimpeded entry to university, the latter for practical work and for admission to special institutions of higher education. By the end of the nineteenth century, a variety of types of general educational institutions had emerged in Russia:

1. Schools of agricultural profile (zemstvo, private agricultural, giving knowledge in agronomy and cattle breeding);.
2. Commercial and law schools (this type of schools included establishments for the training of the professional elite), lyceums implementing in practice the idea of multidisciplinary and single profile schools;
3. Pedagogical schools (gymnasiums, schools and seminaries where, in addition to general education subjects, the disciplines of the psychological and pedagogical cycle were studied).

Based on this experience, the theory and practice of differentiated learning began to take shape in Russia. The formation and development of differentiated learning in Russia can be conditionally divided into five stages

1. Pre-revolutionary stage (19 century – 1916). This period is characterised by the emergence of social differentiation in Russia. In pre-revolutionary Russia there was a stratified system of education: parochial and district colleges, gymnasiums, gymnasiums and real colleges. The social differentiation of education was condemned by the pedagogical community. For example, Kapterev (1982) asserted that “the results of the stratification of education were usually the violence of children’s natural abilities and inclinations, the death of talents... Pedagogically, education should... adapt to different abilities, not to different estates” (p. 183).

During this period there were also attempts to divide students into strong and weak, for example in military gymnasiums. In rural areas craft classes, agricultural schools were organised. However, Vakhterov (1913), Kapterev (1982) and other prominent educators advocated a general education school, which should be adapted to the individual characteristics of children. The attempt to differentiate education was reflected in the projects of A.M. Schwarz through the creation of gymnasiums of three types and P.N. Ignatyev which envisaged the opening of three departments at the upper secondary school, but they remained on paper (Zakharenko, 2007; Temerbekova, 2002).

2. Post-revolutionary stage (1917–1936). After the 1917 October revolution the ideas of differentiated education formed the basis for the construction of the

new school. The “Basic Principles of the Unified Labour School”, published in 1918, noted the possibility of dividing the students. There was a unified school with two stages: 1st stage (for children from 8 to 13 years old) – 5 years of training, 2nd stage (from 13 to 17 years old) – 4 years; polytechnization of schools was introduced.

The new curricula were based on the principle of organising educational material on the basis of social and labour activity. The content and methods of educational work proclaimed in the Declaration demanded that the students’ interests and their activity, the development of children’s creativity, and a close connection between school and life be taken into account. The Declaration pointed to the great educational role of children’s physical labor, recommended productive work of pupils, work on school gardens, their self-service in school. The Declaration also proclaimed respect for children. Pupils were given ample opportunity to take initiative and pupil organisations with broad powers were established (Osmolovskaya, 1998).

The implementation of differentiated education in theory and practice began in the 1920s, with school practice often outpacing theory. In the development and testing of various forms of differentiation experimental institutions *и* Narkompros played a significant role. They tested the idea of differentiated learning by the students’ degree of giftedness. Work was carried out with homogeneous groups of children with a pronounced intellect, as well as with poorly performing children, including the physically impaired.

The attempt to differentiate pupils according to their abilities was combined with a course on work training. For the first stage students who could not cope with the standard curriculum, the general education subjects were reduced, but the number of practical lessons in the school workshops was increased. In addition, due to the differentiation of pupils according to their abilities and interests, in-depth study of individual subjects was introduced in the following areas: natural-mathematical, verbal-historical, etc.

In the early 1920s Narkompros proposed to implement the ideas of differentiated learning through the introduction in Russia of different forms and methods of teaching: Dalton-plan, project method, laboratory-brigade method, research method. Partly borrowed from foreign educators, the “active” methods were supposed to contribute to the development of students’ creative abilities, independence, activity and responsibility, and would also take into account the age and individual characteristics of schoolchildren. Simultaneously with the introduction of “active” methods in schools, the question of differentiation of training through the organization of schools of various types was being developed at state level: school for rural youth – ShKM, school for factory apprenticeship – FZU, factory seven-year school – FZS, general education school with a professionalized second concentration. The curricula and programmes of the schools have been revised several times, in order to make training closer to work, to adapt it to the age and individual needs of the students, and to make

every effort to meet the needs of the state for specialists in the various branches of the economy. Differentiation of learning was carried out by increasing the teaching hours for certain subjects in both the general education and production cycles. This fact indicates that there were different profiles in schools, allowing for “deepening” in a number of disciplines studied (Osmolovskaya, 1998).

The most characteristic type of differentiation for the Soviet school in 1920s and 1930s was the professionalisation of stage II schools and the introduction of vocational bias. The widespread spread of vocational bias was due to both social and pedagogical conditions. On the one hand, difficulties in the country’s economic life, unemployment demanded equipping high school students with a profession, on the other hand the link between school and life, the direct participation of pupils in productive work, made it necessary to professionalize the school. The vocational streams were selected based on the type of work for which general secondary education was of primary importance: training of primary school teachers, librarians, etc. The choice of vocational bias depended on the presence of enterprises and institutions in the immediate vicinity of the school, as pupils had to undertake practical training and receive instruction from specialists working there.

It should be noted that the professionalization in pilot schools of the Narkompros gave a certain result, but when introduced into mass practice, the effect of the work decreased sharply. This was due to the weak material base of most schools, the absence of special training programmes, and the arbitrary distribution of training hours. In addition, the use of teaching time for vocational training worsened the general education of schoolchildren. The level of secondary education was declining, and there was a bias towards vocational training for students.

The end of this period in 1936 was due to the publication of the resolution of the Central Committee of the All-Union Communist Party of Bolsheviks “On pedagogical perversions in the system of the People’s Commissariat of Education”, in which all activities aimed at developing the individual and age characteristics of schoolchildren were practically curtailed. In this regard, the very ideas of differentiation ceased to exist, both in the theoretical and practical aspects of education in Russia (RSFSR, 1918).

3. *Soviet period stage (1950s – 1980s)*. Ideas of differentiation began to be actively developed again. This was facilitated by new social and political conditions – the democratisation of life in the country after the 20th Communist Party Congress. The uniform, rigidly regulated, poorly connected with life school did not correspond not only to the democratic aspirations of society, but also to the requirements of scientific and technological progress. The issues of differentiation arose in that period after the publication in 1958 of the law “On Strengthening the Relationship between School and Life and on Further Development of the System of National Education in the USSR”. According to this law

secondary schools with industrial training were introduced into the Russian education system. These schools provided general and polytechnic education, as well as specialized knowledge and skills for work in one of the branches of national economy and culture. The question arose as to how to construct such a school or system of schools so that both general and polytechnic education and industrial training would correspond to the students' interests and aptitudes. It was necessary to define a system of education in these schools, forms and methods of teaching which would ensure a connection between general education subjects, special theoretical training and training for productive work. In the process of developing these problems the system of differentiated education emerged.

An extensive experiment in differentiation of teaching began in Secondary School No. 710 in Moscow (Head of the experiment – Shakhmaev) and No. 18 in Pavlovsky Posad, Moscow Region (on the initiative of full members of the Academy of Pedagogical Sciences of Russia Arseniev, Goncharov, Melnikov) (Osmolovskaya, 1998, p. 32). The most important in the development of differentiated teaching were the results of experimental work led by Professor Shakhmaev. At first the work on differentiation of teaching in this school was organised in the form of optional classes. However, their low pedagogical effectiveness soon became apparent. The following departments were created for a cycle of subjects: Physics and Mathematics, Biology and Technology, Chemistry and Humanities. Students in these areas were recruited solely on the basis of their interests (Shakhmaev, 1982). The experiment has proved that for the success of classes with in-depth study of a number of subjects, it is necessary to study not just one subject in depth, but a cycle of related subjects. This cycle should include a subject studied in depth, an applied subject which, on the one hand, continues and deepens the subject and, on the other hand, provides practical training based on this subject, a subject close to the main subject, the knowledge of which is important for the study of the main subject. For example, in a class with in-depth physics, it is advisable to study mathematics in depth as well, and radio electronics, lighting engineering as an applied subject.

The Applied subject places a certain emphasis on the study of the major subjects as well. The cycle of subjects formed is internally consistent, the study of some subjects forms the basis for the others, and naturally complements and deepens them. It has been found that it is advisable to deepen the material in the major subject, increasing the depth of the study, rather than expanding and introducing new sections. Labour training in each of the departments was carried out according to the profession related to the profound study of the subjects: in physics – according to the profession of radio technician, in biology – agricultural laboratory technician, etc. All other subjects, apart from those connected with advanced study, were studied in the volume envisaged by national curricula in accordance with the standard curriculum. This distinguished education in classes with in-depth study of a number of subjects from

Furcation, in which in-depth study of some subjects is carried out at the expense of the level of study of others.

Experimental work by Shakhmaev proved the effectiveness of the forms of differentiation of teaching found. It was shown that when students were grouped according to their interests, the quality of their knowledge was improved not only in the subject in which students showed increased interest, but also in all other subjects. An analysis of the students' subscriptions showed that they were reading more supplementary academic and popular science literature. The positive impact of differentiated instruction also manifested itself in the increased social activity of the pupils and the complete disappearance of any serious breaches of discipline. The grouping of pupils according to their interests also had a positive effect on the formation of scientific thinking. The graduates of the experimental schools not only excelled in higher education, but also defended their doctoral theses and some doctoral dissertations in the minimum time allowed. Despite positive results, the experiment at school No. 710 in Moscow was terminated in the early 1970s, which affected other schools as well.

In the 1960s and 1970s, along with the above experience, there were other forms of differentiation of education: elective classes, special classes and special schools with in-depth study of some subjects (mathematics and computer science, physics and agro-biology, humanities, etc.). However, special schools with in-depth study of subjects were established only in large cities, and there were few of them.

In 1970s a period of stagnation began, when differentiation of teaching turned out to be unnecessary, as well as everything new and unfamiliar, which caused a wary attitude. Among the opponents of differentiation was the former President of the USSR Academy of Pedagogical Sciences, V.N. Stoletov, who explained the reasons for banning the experiment in differentiated education as follows: "The bourgeoisie uses differentiation for its class purposes and we do not need it" (as cited in Shakhmaev, 1982, p. 6). It should be noted that the main reason that slowed down the introduction of the idea of differentiated education for many years was the hypertrophied ideologisation of education, due to the corresponding social order of totalitarian society. The ideas of differentiated learning came into clear contradiction with the unified educational system, which purposefully restricted personally meaningful motives for education (Kuvshinova, 2006).

4. Perestroika period (late 1980s). The 1980s were characterised by a sharp rise in teachers' interest in differentiated teaching. This is due to the democratization of society, putting the personality of each pupil in the centre of the educational process, and, consequently, increasing attention to the development of his aptitudes and abilities. At the same time, the problem of overloading of pupils has become more acute and was planned to be solved by introducing it into the school. There has been an intensive development of training and pro-

duction complexes, some of which have been opened at specialised industrial enterprises, and the work of lyceums and gymnasiums has been restructured with a view to professionalising education (Monakhov et al., 1991).

In the late 1980s and early 1990s, new types of schools appeared (gymnasiums, lyceums, specialised schools), oriented towards in-depth study by pupils in their chosen fields (humanitarian, natural and mathematical, artistic and aesthetic, etc.); profession-oriented classes (pedagogical, economic, etc.). Classes with in-depth study of subjects oriented to higher education started to be opened more actively, because it was allowed to conduct school-leaving examinations and entrance examinations to higher education together. Elective courses continued to be popular (however, they were often transformed into extra classes for those falling behind or for the whole class, regardless of their interests, for example, to prepare them for graduation exams). These processes were facilitated by the Russian Federation Law on Education (1992), which enshrined variability of curricula and programmes, alternative textbooks, and allowed the creation of various types of general education institutions (Kuvshinova, 2006).

At the same time, the emergence of psychological services in schools and research into the problems of school maladaptation in children and adolescents (Vinokurov, 1994; Shevchenko, 1996) prompted the organisation of corrective and developmental education (CDE) for children with difficulties in mastering general education programmes through equalisation classes (which later became known as corrective and developmental education classes), compensatory education classes and CDE groups.

By the 1990s, the urgent need to individualise the learning process had not been met by the development of new pedagogical technologies to make the learning process more effective in terms of personal development, mastery of knowledge, skills and abilities. The problem was compounded by a lack of diagnostic tools with a distinctly practical orientation. The principle of educational unity in the former USSR has been reduced to a concept of uniformity, with a lack of individuality in the child and a consequent loss of interest in learning.

5. The period from the 1990s to the present. Since the early 1990s the process of gradual transition from a unitary educational system to a democratic, variable one was initiated. In the early 1990s a huge number of diversified educational institutions (gymnasiums, lyceums, complexes, private institutions), where students are provided with broad prospects of quality education in their chosen direction appeared in Russia. The differentiation of learning has taken hold at all levels of the education system. The radical modernisation of the various structures of the education system has led to the emergence of a new concept of “differentiation of the education system” (Pevtsova, 1994).

The main features of the Russian educational system in the 1990s in terms of the implementation of the new concept of differentiation of education, which were expressed in the following: opportunity to get not only basic education for

further study in future, but also to acquire a profession; emergence of different forms of organisation of study sessions; use of alternative and parallel methodical and teaching aids, development of authorship courses and programmes; development of level differentiation, enabling students to study at accelerated pace, based on “externship” type; differentiation in forming different age groups of students to study certain subjects; differentiation in teacher training; formation of each institution’s own style of teaching (Osmolovskaya, 2002).

However, the lack of a strictly scientific justification for the application of innovations, in particular the central problem of differentiation of education, sometimes leads to negative consequences. The changes in the education system created a contradiction between a common educational nucleus, the need to provide the foundations for general education, and the different levels of development of students, the difference in their individual abilities, capacities and desires (Pevtsova, 1994).

Today, differentiation in the educational process is relevant depending on:

- age (pre-schoolers and schoolchildren, parallels of the same age, multi-age groups);
- gender (classes with only boys or girls as well as mixed classes);
- areas of students’ interest (emphasis on humanities, physics and mathematics, biology and chemistry within a group, class or school);
- the criteria for intellectual development (children with strong or gifted talents, and those who are mentally retarded);
- the threshold of educational attainment (excellent, good, mediocre and poor);
- personal and psychological characteristics (type of thought processes, temperament).

No learning system in Russia is now without a differentiated approach, as teachers rank material and tasks for students in varying degrees (Pribylnova, 2018; Antonova, 2017; Abramova & Mashoshina, 2021). There is now a growing interest in the possibility of differentiating instruction by focusing on the key modality or perceptual channel that is characteristic of the learner (Brown et al., 2016; Smirnova et al., 2021). According to the type of leading modality, individual types of learners are distinguished and analysed: audial, visual and kinaesthetic, which manifest themselves differently in the learning process (Nikitin et al., 2017; Markova et al., 2021; Kovrizhnykh, 2022). In this regard, scientists point out that it is necessary to implement differentiated training, taking into account the learning styles of students, as well as to use different methods of training and education depending on the features of the manifestation of the leading channel of perception (Buldina, 2016; Nasibullov et al., 2015).

New educational institutions that have emerged in the 1990s have highlighted new features of differentiated education. They have integrated such factors as cognitive needs, psychophysiological characteristics, social aspirations, national traditions, religious beliefs, material opportunities of certain popula-

tion groups. However, the implementation of differentiated learning is difficult in Russia for a number of reasons. There is no unity in the interpretation of the concepts of 'individualized', 'differentiated' and 'personality-oriented' learning; 'individual', 'personal' and 'differentiated' approaches to learning in psycho-pedagogical and methodological literature. There is a mismatch between the heterogeneity of the student population and the predominantly mass nature of education. Subject-didactic model of personality-centered pedagogy prevails, which considers the personality as a product of learning impacts, differentiated by the level of complexity and volume of material, but does not consider the subjective experience of students, the possibility of their development and self-development.

Characteristics of the main forms and types of differentiation

In this sector we turn to the practice of differentiation, which is currently represented in the educational process in Russia. Specific manifestations of differentiation we call forms of differentiated learning, which can be combined into types and implemented at different levels. The types of differentiation are determined on the basis of those individual typological characteristics of students that are taken into account in this case. As we have noted in sector 2.1 above, the concepts of 'internal' and 'external' differentiation of learning are distinguished in Russian pedagogical literature. There are also types of differentiation according to the characteristic individual psychological characteristics of children, which form the basis for the formation of homogeneous groups:

- by age composition (school classes, age parallels, different age groups);
- by gender (male, female, mixed classes, teams, schools);
- by personal-psychological types (type of thinking, character accentuation, temperament, etc.);
- according to the level of health (physical education groups, visually impaired groups, hearing, hospital classes).

According to the organizational level of homogeneous groups, differentiation is distinguished:

- by type of schools (gymnasiums, lyceums, colleges, private schools, schools-complexes);
- intra-school (levels, profiles, departments, slopes, flows, etc.);
- in parallel (groups and classes of different levels: gymnasium, compensatory education classes, etc.);
- interclass (optional, combined, mixed-age groups);
- intra-class, or intra-subject (groups within the class). The classification of forms of differentiated learning by types and levels is presented in table 1.

Table 1: Classification of forms of differentiated learning by types and levels.

Levels Types	Micro level (internal differentiation)	Meso level (external differentiation)	Macro level (external differentiation)
By general ability	Performing tasks of various levels of complexity. Dosing the help of a teacher. Level differentiation. Group work within the framework of the model of complete assimilation of knowledge	Gymnasium classes. Classes of different levels of education. Correction-developing classes. General education classes	Gymnasiums
According to special abilities		Group lessons with gifted children	Specialist. schools for gifted children (physical and mathematical, artistic, sports)
According to individual physiologist. features	Accounting for the psychophysiological characteristics of children in the design of the content and organization of the educational process in the classroom		Schools for children with hearing loss, visual impairment, intellectual disability
By interests		Classes with in-depth study of individual subjects. Profile classes Optional courses, circles Choice of variable academic disciplines (elective differential). Flexible composition classes	
According to the projected profession	Fulfillment of creative research tasks related to the interests of the projected profession of students	Classes profiled for the university. Lyceum classes Group classes for university preparation	Lyceums. Colleges. Preparatory courses at universities
According to the national sign			National schools (Armenian, Tatar, Jewish)
By religious affiliation			Orthodox schools, schools of Vedic culture
According to socio-economic status of parents			Non-state educational institutions with a high level of payment

Summary

The overall aim of this review was, *'to develop new knowledge about the differentiated instruction in Russian researches and practice'*.

The findings in relation to the review objectives are summarised in Table 2.

Table 2: The findings in relation to the review objectives.

Objective	Summary of findings
Identify the concept essence of differentiated learning in Russian researches.	<p>Four points of view on the term “differentiated learning” in Russian researches were identified.</p> <p>Proponents of the first position consider differentiated learning as learning associated with the division of the content of education.</p> <p>According to the second approach, the concept of “differentiated learning” is interpreted as learning under conditions of internal and external differentiation.</p> <p>The third concept is equating the differentiated approach with the individual approach to students in the conditions of a class-lesson system.</p> <p>Proponents of the fourth approach equate differentiated learning with solving a set of problems that arise when establishing different types of secondary education institutions.</p> <p>These positions are not fundamentally different. They consider differentiated teaching as organisation of the learning process taking into account the individual and psychological characteristics of the individual, and forms groups of students with different educational content and teaching methods.</p> <p>There are relevant terms to the concept of ‘differentiated learning’ in Russian researches: differentiation’, ‘differentiated approach’, ‘differentiated learning technology’.</p> <p>Differentiation is a way of organizing the educational process, which takes into account the individual typological characteristics of a person (abilities, interests, inclinations, features of intellectual activity, etc.).</p> <p>Differentiated approach is understood as a way of implementing differentiated learning in order to determine the level of students’ abilities and capabilities, their profile orientation, and the maximum development of each individual at all stages of education</p> <p>The technology of differentiated learning is a set of organizational decisions, means and methods of differentiated learning, covering a certain part of the educational process. This technology is based on Vygotsky’s theory of the zone of proximal development (ZPD).</p>

Explore the theoretical and practical prerequisites for the development of differentiated education in Russian researches, to determine the historical development of differentiated approach in the theory of Russian education.

The analysis of the historical development of differentiated instruction in Russia revealed that the ideas of differentiated education in Russia originated in the 18th century. The first attempt to implement furcation was the creation under the Statute in 1864 of two types of gymnasiums (classical and real ones).

Five stages of the historical development of the theory and practice of differentiated learning in Russia have been identified:

Pre-revolutionary stage (19 century – 1916) characterised by the emergence of social differentiation in Russia.

Post-revolutionary stage (1917–1936). After the 1917 October revolution the ideas of differentiated education formed the basis for the construction of the new school taking into account the students' interests and their activity, the development of children's creativity, and a close connection between school and life. In the early 1920s the ideas of differentiated learning were implemented through the introduction in Russia of different forms and methods of teaching partly borrowed from foreign educators: Dalton-plan, project method, laboratory-brigade method, research method. The most characteristic type of differentiation for the Soviet school in 1920s and 1930s was the professionalisation of stage II schools and the introduction of vocational bias. At the end of this period the ideas of differentiation ceased to exist, both in the theoretical and practical aspects of education in Russia.

Soviet period stage (1950s – 1980s). Ideas of differentiation began to be actively developed again. This was facilitated by new social and political conditions – the democratisation of life in the country after the 20th Communist Party Congress. Secondary schools with industrial training were introduced into the Russian education system. Extensive experiments in differentiation of teaching took place in Secondary Schools No. 710 in Moscow and No. 18 in Pavlovsky Posad, Moscow Region. Although the experiments were successful in 1970s differentiation of teaching turned out to be unnecessary, as well as everything new and unfamiliar, which caused a wary attitude.

Perestroika period (late 1980s) was characterised by a rise in Soviet teachers' interest in differentiated teaching. This is due to the democratization of society, putting the personality of each pupil in the centre of the educational process, and, consequently, increasing attention to the development of his aptitudes and abilities. New types of schools appeared (gymnasiums, lyceums, specialised schools), oriented towards in-depth study by pupils in their chosen fields (humanitarian, natural and mathematical, artistic and aesthetic, etc.).

The period from the 1990s to the present is characterized by a gradual transition from a unitary educational system to a democratic, variable one. Differentiation in the educational process is depending on age, gender, areas of students' interest, the criteria for intellectual development, personal and psychological characteristics.

The study of differentiation of education in the previous period (until the 1990s) was generally characterized by attention to the disclosure of the content of the concept of differentiation of learning, which in most cases was understood as the implemen-

	tation of a particular approach to students in the organization of learning activities. The unified education system did not allow us to study differentiation in all its manifestations. Each stage has brought its own characteristics in aspects of a deeper study of the possibilities of differentiation of learning.
Provide an overview of the main forms and types of differentiation, which is currently represented in the educational process in Russia.	Classification of forms of differentiated learning in Russia by types and levels are presented in sector 2.3. The types of differentiated learning are presented according to the general ability; special abilities; individual physiological features; interests; the projected profession; the national sign; religious affiliation; socio-economic status of parents.

At present, the role of differentiation of the educational process in Russia has increased. The Federal Law "On Education in the Russian Federation" (2012) legislates the requirement for educational institutions to create conditions for self-realization and self-regulation of the individual, to ensure its self-determination. Individual and differentiated approaches to learning are called mandatory in the process of education and upbringing. The most important areas of differentiation in Russian education include, first of all, identification and education of talented, gifted schoolchildren. The Russian school lacks objectively necessary systematic policy of target-oriented identification and education of talented children and adolescents. Secondly, of great importance is special education of children with physical and intellectual disabilities. The problem of teaching physically and mentally handicapped children reflects the sad reality of birth of children with various pathologies due to hereditary diseases, alcoholism, and drug addiction of their parents, and defining special education for such children is an important area of pedagogical research. Promising methodologies have been proposed for educating 'learning disabled' children. The third direction is connected with compensatory teaching. This is a special problem of differentiation, defined as an additional pedagogical effort to deal with underperforming pupils. Compensatory education is a response to increasing failure, unsatisfactory training of students. The practice of differentiated teaching could be considered the most effective in comparison with mass teaching, if a higher level of knowledge and skills is ensured with a significant reduction in teaching time. The problem of differentiated teaching is therefore still open and relevant in Russia, the teaching load needs to be normalised and teaching methods need to be further improved. The subject of further research could be a comparative characterization of differentiated and integrated learning in general education institutions in Russia and abroad, analysis of assessment of training of graduates who have been trained in differentiated learning

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Obstacles to Differentiated Instruction (DI)

Reviewing Factors Outside the Classroom that Contribute to Successful DI Implementation

Susanne Schwab & Flora Woltran (shared first authorship)

Abstract

As current trends in education pave the way for inclusive instruction that addresses the needs of all students, differentiated teaching approaches are gaining ground over a “one-size-fits-all” didactics. However, while numerous studies point to the positive effects of differentiation for students, other findings suggest that there are some barriers to successful implementation for teachers. To provide an overview, the current article presents the main obstacles to differentiated instruction cited in recent studies. The results of a scoping literature review indicate that the greatest challenges related to differentiation are beyond the control of teachers and are more indicative of environmental factors (e.g., teacher training, lack of resources) that inhibit teachers’ commitment to inclusive instructional practices. Furthermore, several studies point to the potential risks of homogeneous within-class ability grouping for vulnerable learners due to teacher stereotypes.

Introduction

The publication of the Salamanca Declaration (UNESCO, 1994) and the ratification of the United Nations Convention on the Rights of Persons with Disabilities (UNESCO, 2007) are considered important milestones for the widespread implementation of the concept of inclusion in all spheres of life, including education. Although inclusion clearly calls for equal rights for all individuals, regardless of disability, there is no universal and globally accepted definition or strategy for inclusive education (IE) (Francis et al., 2021). Accordingly, Moberg et al. (2020) point to the fact that the scientific understanding of IE can range from simply placing students with disabilities in mainstream classrooms, to radically transforming an entire educational system. Specifically, two recent reviews (Göransson & Nilholm, 2014; Nilholm & Göransson, 2017) identified four different understandings of IE: (1) student placement, (2) student placement and special supports for students with disabilities, (3) student placement and special supports for all students, and (4) creating inclusive school commu-

nities. In addition to difficulties in defining IE, the current state of research suggests that there is wide variation in how IE is translated into classroom practice through inclusive instruction (Andrews et al., 2021; Molbaek, 2018). According to Molbaek (2018), inclusive teaching includes four key dimensions: a framing dimension, a relational dimension, a didactic dimension and an organizational dimension. Framing refers to a teacher's ability to clearly communicate daily learning activities and objectives. Within the relational dimension, teachers need to strive for communication and collaboration with stakeholders in and around the school. Focusing on the didactic dimension, educators are urged to differentiate their instructions and continuously develop their teaching. Finally, organizational aspects such as school culture and values are seen as central to the success of IE. For the purpose of this review article, special emphasis will be placed on the didactic dimension, specifically differentiated instruction (DI), which can serve as a didactic approach to promote IE when used appropriately (Lindner et al., 2021).

As all learners are unique, teachers have to accompany the learning process regardless of students' individual abilities, skills, backgrounds, personality and learning profiles. To address this heterogeneity in classrooms, DI can serve as an ideal solution when used appropriately (Yuen et al., 2022). DI includes a wide collection of different didactic approaches in which "teachers proactively plan to match instruction, activities, and resources to the diverse needs of the students in their classes" (Scarparolo & MacKinnon, 2022, p. 6). Thus, several studies have examined the benefits of DI on students' academic achievement (e.g., Deunk et al., 2018; Parsons et al., 2018; Smale-Jacobse et al., 2019; Valian-des, 2015), as well as other non-academic outcomes (e.g., social-emotional outcomes) (e.g., Schwab, 2021).

In order to successfully provide academic and non-academic benefits to learners, DI requires teachers to have a high level of knowledge and skills in inclusive didactics (Deunk et al. 2015) and therefore places several demands on educators and schools (De Neve et al., 2015; Essex et al., 2021). In addition, teachers often cite multiple circumstances that stand in the way of fruitful DI implementation, including class size, lack of time, resources, and skills (Roiha, 2014; Prast et al., 2018). Against this background, this chapter aims to highlight some of the key challenges associated with positively developing a shift in mindset in favor of inclusive teaching.

In this review, we argue that while DI is a useful strategy for addressing the needs of diverse learners when properly applied by teachers, there are several factors outside of the classroom that stand in the way of students' right to participate and flourish in inclusive education. We aim to identify several entry points for future improvements in frameworks inside and outside educational institutions by highlighting potential difficulties associated with teachers' efforts to make education more inclusive.

To obtain an overview of current studies on barriers to DI, we conducted a thorough literature review following Peters et al. (2015). The following research question was developed to guide the current scoping review: What are the main barriers to successful implementation of DI in and out of schools? A literature search was conducted in two databases (ERIC and JSTOR) using the following search strings: “Differentiated instruction OR Differentiation”, “Teacher OR Educator”. Inclusion criteria included English-language peer-reviewed journals published between 2012 and 2022. In total, 47 articles were included in the scoping review. To increase the reliability of the data collection, the review was conducted by two researchers.

The challenge of implementing DI

Given the multi-faceted nature of DI, it is not surprising that several findings from different countries (e.g., Portugal, Russia, Ireland) suggest that teachers often fail to adequately address the needs of all students through the use of inclusive teaching practices (e.g., Gaitas & Martins, 2017; Larina & Markina, 2019; McGillicuddy & Devine, 2018). Contrary to this, Godor (2021) takes a drastic view of DI as a development of instructional practices that lead to teacher frustration and undermine effective teaching in terms of appropriate instruction for each learner. This assumption can be refuted in many ways, especially in light of several research findings that point to the positive effects of DI (e.g., Deunk et al., 2018; Steenbergen-Hu et al., 2016). However, it addresses an important point, namely the pervasive gap between students’ individual needs and the basic human right to have them met.

Although there is no doubt that students have a right to an education that addresses their needs, regardless of their backgrounds (UNESCO, 2017), teachers worldwide struggle to implement inclusive teaching approaches (Suprayogi et al., 2017). Accordingly, several findings have linked barriers to implementing DI to aspects on the part of teachers, such as a lack of teacher self-efficacy beliefs (i.e., subjective conviction of one’s ability to cope with challenging situations) (Bandura, 1977; Dixon et al., 2014). Specifically, study results indicate that teacher beliefs and perceived efficacy in implementing differentiation predicts their use of DI in class (e.g. De Neve et al., 2015; Schwab et al., 2022; Suprayogi et al., 2017; Whitley et al., 2019). In addition, teachers’ knowledge of inclusive teaching practices can greatly influence their use of DI (Park & Datnow, 2017; Wan, 2015). Closely linked to this is the issue of a lack of training opportunities. Accordingly, Ko and Boswell (2013) reported that prospective teachers received too little input on inclusive didactics as part of their training and also had too few opportunities to put what they learned into practice. Furthermore, studies point to several other structural factors that may stand in the way of successful DI implementation in schools, such as physical and time resources (Whitley et

al., 2021), low peer support (Smit & Humpert, 2012), class size (Suprayogi et al., 2017), and organizational settings such as school leadership (Bondie et al., 2019).

The risks of organizational aspects of DI: ability-based in-class grouping

The didactic strategy of grouping as a form of DI (Blatchford et al., 2003) can be implemented in a variety of ways, such as dividing the entire class into heterogeneous groups and permanent or temporary homogeneous groups, for all or specific subjects based on students' abilities, performance, interests, or learning profiles (Deunk et al., 2018). However, given the fundamental principle of inclusive instructional practices, namely, taking into account the diversity of student characteristics and avoiding barriers to learning (UNESCO, 2020), the value of homogenous within-class ability grouping can reasonably be questioned.

Some studies suggest that subject-specific homogenous within-class ability grouping appears to have minimal positive effects on the academic achievement for all K-12 learners (Steenbergen-Hu et al., 2016). However, several critics highlight the attendant risks of restricting the opportunity for peer engagement and learning and decreasing school well-being as well as the academic self-concept of disadvantaged or lower-performing students (Belfi et al., 2012). As part of a review study by Deunk et al. (2015) looking at the effects of different forms of organizational differentiation (i.e., types of grouping), two of the studies considered, examined the impact of natural occurring practices versus within-class ability grouping on low-, average- and high-performing primary students in the United States. Thus, the authors found small positive effects for high-ability students but, conversely, small negative effects for low-ability students at the primary level, suggesting that within-class ability grouping might have different effects for different groups of students (Deunk et al., 2015). These results are consistent with a recent meta-analysis by Deunk et al. (2018) on the effects of differentiation on language and mathematics achievement in primary school. Looking at six studies from the United States that included subgroup data, the authors found that grade- and class-wide compositions had marginally significant negative effects on the achievement of low-ability students, but no significant effects on the other two groups of students (i.e., high-ability and average-ability students).

Given that several studies suggest that teachers' perceptions of student performance may be negatively affected for students who represent diversities (e.g., socioeconomic background, disability), potential negative effects of homogeneous within-class ability grouping could potentially be exacerbated, particularly for vulnerable students. Accordingly, Larina and Markina (2019) claim that certain teacher attitudes and expectations, such as a fixed mindset about the immutability of cognitive abilities, may serve as self-perceptual prophecies and negatively influence students' learning outcomes (Larina & Markina, 2019). In line with this, Ready and Wright (2011) examined teachers' inaccuracy about

young students' cognitive abilities and found that they underestimated students' abilities based on their socioeconomic status or ethnicity. For example, the authors point out that assessments of student ability are often based on stereotypical teacher perceptions, and may therefore be systematically biased. As a result, teachers may not provide these students with challenging content, limiting their ability to reach their full potential. In the context of IE (e.g., providing the best possible developmental opportunities for all students and reducing barriers to learning, see, e.g., Pozas et al., 2021), this seems especially problematic. McGillicuddy and Devine (2018) go even further, describing the division of students into different groups based on their academic performance as an act of symbolic violence that reinforces achievement gaps among learners.

In summary, grouping strategies, as a form of DI, although usually applied against a backdrop of addressing diverse learner needs, and promoting in-class interactions and peer learning opportunities can be detrimental to vulnerable students. Specifically, homogeneous within-class ability grouping poses the threat of favoring socially privileged, high-achieving students over socially disadvantaged, low-achieving learners. This results in higher-ability student groups experiencing higher-quality instruction as well as more positive interactions with teachers than lower-ability groups (e.g., McGillicuddy & Devine, 2018).

Barriers within the education system to the successful implementation of DI

Since teachers may differentiate their teaching based on fixed notions of their students' abilities, the impact of differentiated approaches may fall short of the high expectations placed on them (Larina & Markina, 2019). In light of teachers' already heavy workloads, the additional task of continuous differentiation, the time and resources required to do it properly, and meeting both curriculum provisions and individual student needs may be perceived as burdensome (Schwab, 2021; Yavuz, 2020). In this regard, Deunk et al. (2018) emphasize in their systematic review that differentiated approaches always involve an additional time commitment for teachers. Furthermore, not only implementing but also planning and preparing differentiated teaching methods can be seen as a major obstacle for teachers. Accordingly, Whitley et al. (2019) note that teachers expressed the need for more time to plan DI, ideally in collaboration with their colleagues. This is consistent with a study by Smit and Humpert (2012), which highlights the importance of peer collaboration in implementing inclusive practices. For instance, the authors emphasize that younger, less experienced teachers in particular may have difficulty using differentiated approaches if they do not receive support from their more experienced colleagues. As a result, Smit and Humpert (2012) conclude that the absence of any opportunity for exchange with colleagues prior to the implementation

process might have a negative impact on teachers' individual differentiation practices.

In addition, several studies indicate that prospective teachers in particular are often under great pressure because they do not feel adequately prepared for planning and designing inclusive forms of instruction (e.g., Joseph, 2013; van den Kieboom & Groleau, 2022; Wan, 2015). However, findings from a study by Whitley et al. (2019) suggest that in-service teachers also express concerns about competencies and preparation for differentiated instructional practices, as well as the need for preparation and support from the environment (e.g., additional time, flexible scheduling).

A recent study by Bondie et al. (2019), which considered 28 U.S. studies, found that teachers perceive barriers to implementing DI practices in the following two areas: (1) institutional decisions and (2) teachers' decisions about how to implement DI. Thus, participants explicitly expressed the need for sufficient administrative and school leadership support (e.g., creation of a school-wide plan for DI implementation, expansion of resources, mentoring, and coaching) to successfully implement DI. Interestingly, a study by Whitley et al. (2021) found that some school leaders tend to believe that fostering and taking advantage of learning and development opportunities in the area of differentiation is the responsibility of teachers rather than school administrators. For example, several participants reported that the primary barrier to differentiated approaches was a lack of time resources for teacher professional development rather than personal commitment to DI and support of educators through organizing opportunities professional learning. Thus, while many teachers advocate for better school-based supports, such as school-wide plans or expanding resources, some school administrators may feel less responsible for promoting the implementation of DI practices.

Potential negative experiences of teachers in implementing DI need to be considered when discussing the potential disadvantages of instructional approaches designed to meet the needs of all learners. However, the right of students to IE must not be diminished. Moreover, as all the difficulties mentioned above are outside of teachers' direct sphere of influence (e.g., teacher preparation, already high workload, lack of resources), the inadequate conditions for IE in the educational system must be criticized.

Discussion and conclusion

Following our previous notes regarding DI, as it aims to respond to students' diverse needs by modifying teaching, learning, and curriculum (van de Kieboom & Groleau, 2022), it can be considered an important approach to promote IE. DI can provide opportunities for students to learn and progress in their optimal developmental range. However, it needs to be applied properly by teachers. For

instance, ensuring that every student has the opportunity to learn as effectively and efficiently as possible and is supported in achieving their full potential (Marshall, 2016).

Against the backdrop of various factors within the education system, DI can become a challenge for educators. Accordingly, as DI demands high competencies from teachers (i.e., consideration of student readiness, interests, and learning profiles when planning and implementing differentiated strategies) (Deunk et al., 2015), many of them still have difficulty incorporating this form of inclusive didactic intervention into their everyday teaching (Suprayogi et al., 2017).

However, as already pointed out, the causes of these problems tend to lie beyond teachers' sphere of control (i.e., classroom). Thus, with many teachers feeling inadequately prepared to implement DI (e.g., Prast, et al., 2015; van den Kieboom & Groleau, 2022) or reporting time (Whitley et al., 2019) and resource (Pozas et al., 2021) constraints, it becomes obvious that inclusive teaching approaches often fail due to obstacles within the education system. To address these issues related to preparing pre- and in-service teachers for DI, Dixon et al. (2014) point to the use of training programs aimed at equipping educators with processes and procedures that enable effective learning for diverse individuals. In line with this, Pozas and Letzel (2020) suggest a balance between theory and practice in teacher education, as pre-service educators need to be able to apply what they learn theoretically in the classroom, to promote DI implementation. Moreover, the authors emphasize that teachers could benefit from collaboration and the associated opportunity to learn with and from each other, as sharing difficulties related to student diversity can open up opportunities for developing more inclusive teaching practices (Pozas & Letzel, 2020). However, not only the personal competencies of teachers must be considered, but also the resources available (e.g., time, variety of materials, class size, school support staff). Thus, since a lack of resources appears to be the biggest barrier to implementing high-quality IE (Schwab, 2021), all school personnel (e.g., principals, administrators) – not just teachers – are critical to meeting DI requirements. For example, if school leaders do not encourage teachers to receive training in instructional methods that address student needs (e.g., DI), that school will most likely not be inclusive.

Concerning students' outcomes, this paper pointed out a risk of homogeneous grouping strategies, especially for vulnerable students. In addition, given the overarching goal of IE, it would be advisable for teachers to divide students according to other common characteristics, such as readiness (e.g., subject-related knowledge) or interest, rather than ability. Alternatively, teachers may organize DI by creating heterogeneous groups and allowing students to independently distribute learning tasks within the group (McGillicuddy & Devine, 2018), as there is some evidence indicating that students from diverse backgrounds may benefit from collaborative learning approaches (Nokes-Malach et al., 2015). For instance, in the context of multilingualism pedagogy (Vetter,

2012) there are two possible ways of grouping students according to language – having those with similar home languages help each other – and having them support each other cross-linguistically.

Looking at teacher outcomes, there is no denying that implementing DI requires additional time and effort. However, potential downsides of DI can mainly be avoided if teachers are prepared and given resources to implement DI. Thus, the most important aspects for future directional innovations in inclusive education should be to reduce teacher workloads, provide adequate infrastructure, and create an atmosphere that encourages both school administrators and teachers to maximize each student's learning potential. As DI is a key issue in school development around the world, it is also important to note that the implementation of DI, as well as the barriers to DI implementation, need to be reflected upon, taking into account the different education systems and the challenges they face. Thus, the student-teacher ratio varies widely, for example, in European countries or in the U.S. and developing countries (Blatchford & Lai, 2010). With this in mind, Hattie (2005) has already pointed out that teachers perceive different teaching styles to be effective depending on class size. Accordingly, the reality of large class sizes in some countries can be a major barrier to teachers providing differentiated support for students without compromising academic quality for other learners in the inclusive classroom (Materechera, 2020). Furthermore, Meijer and Watkins (2019) emphasize that regulations and policies for inclusive education vary around the world, as do efforts to build teacher capacity to ensure flexible learning environments. In their review on a 2016 study of financing models for inclusive education in 18 European countries, Meijer and Watkins (2019) conclude that policies and strategies must strike a balance between school and needs-based funding approaches. Achieving this balance, the authors note, will require funding strategies and resources to ensure that school teams can include all students, as well as effective support mechanisms to meet the needs of students at risk of exclusion because of their special education needs.

To sum up, even if there are numerous of obstacles for DI, not offering DI is not a solution, as it could also have negative effects on teachers' well-being (e.g., lower job satisfaction, higher stress levels). Therefore, future research should look more closely at what is needed for schools and teachers to be able to adequately implement DI without perceiving it as an additional burden.

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Turkish Primary School Teachers' Implementation of Differentiated Instruction

An Explorative Qualitative Study

Ozge Culhaoglu & Verena Letzel-Alt

Abstract

In order for each student to benefit from schooling, teachers' instruction should be adapted to students' different characteristics and needs. An approach to diversify instruction is to adapt the teaching of the curriculum. However, studies across the globe reveal that Differentiated Instruction (DI) is not implemented frequently in teachers' daily practice. In Turkey, up till now, little research has been conducted into teachers' actual implementation of differentiated practice. In order to explore the existing discrepancy within Turkish primary school teachers' DI implementation, a qualitative approach was used. 15 classroom teachers were interviewed using semi-structured protocols. Interviews were transcribed and analyzed using qualitative content analysis. Whereas some teachers were able to define DI, results indicate that most teachers lack knowledge on what the practice of DI entails. Moreover, it was shown that the Turkish teachers under study are aware of the positive effects as well as of the limitations of DI, and also that they only hold a low variety of differentiation practices and that they mainly implement DI because they want to foster non-achievement outcomes such as students' interest. Additionally, results reveal the urgent need to consider the implementation of DI practices in class stronger in Turkish teacher training and professional development courses.

Introduction

It is a known fact that there are individual differences among students. Students differ from one another in terms of background knowledge, interest, attitude, learning style, and cognitive abilities (Demir, 2021). This diversity among students imposes responsibilities on teachers such as improving classroom management routines and finding different teaching strategies that address the individual characteristics of the students (Pozas & Schneider, 2019). With such challenges, teachers are urged to implement Differentiated Instruction (DI) in order to meet students' diverse learning needs and therefore to fulfill these responsibilities (UNESCO, 2017). Within the Turkish educational research sec-

tor, DI is understood following the definition used in the recent international research context by referring to Tomlinson's (2014) approach of the adjustment of content, process, and product (Demir, 2021). Teachers should make various arrangements according to their students' characteristics (Tomlinson, 2017), such as organizing the structure of curricula by changing the contents, processes, products, and learning environments to reflect students' readiness, interests, and learning profiles (Wan, 2020). In this study, DI is understood as all intentionally planned practices that are implemented in order to meet students' heterogeneity (Letzel et al., 2020). In this vein, teachers can choose between several DI practices according to their intention. Based on the Taxonomy of DI by Pozas and Schneider (2019), DI practices can be classified into categories (category I: tiered assignments, category II: grouping, category III: tutoring systems, category IV: nonverbal material learning aids, category V: mastery learning or category VI granting autonomy to students / measures of open education) (Pozas & Schneider, 2019; Letzel et al., 2020). Some common concrete practices and techniques used to differentiate teaching in Turkey are RAFT (Role of the Writer, Audience, Format, Topic; this practice distinguishes between different roles, products and topics (Taylor, 2015) and can be sorted into the abovementioned Cat. II), tiered instruction (cf. Cat. I), reading circle (grouping of students according to different reading materials (Daniels, 2002); cf. Cat. II), and learning centers (granting autonomy to students; cf. Cat. VI) (Algozzine & Anderson, 2007; Demir, 2021; Tomlinson, 1999).

DI shows positive effects on students: They attend lessons in which DI is implemented in a more motivated manner (Algozzine & Anderson, 2007). Moreover, teachers and students reported that they found DI activities enjoyable and interesting (Lange, 2009; Sondergeld & Schultz, 2008). Additionally, studies show that DI has positive effects e.g. on students' academic achievement, metacognitive skills or self-efficacy perception (Gibon-Ginja & Chen, 2020; Mellesse, 2016; Prast et al., 2018).

Despite these positive effects, research has shown that DI is not incorporated within teachers' daily lesson preparation and teaching performance (Letzel, 2021; Schleicher, 2016). Reasons for this could be hindering factors teachers come across when planning and implementing DI, such as overcrowded classrooms, lack of appropriate educational tools and equipment, classroom settings that are not suitable for DI, and the amount of time and effort they need to spend on differentiated lesson planning (D'Intino & Wang, 2021).

Inlcusive education in Turkey

Inclusive education has been gaining intense attention from governments and educators throughout the world. As a developing country, Turkey has been working on issues related to special education provision and inclusive educa-

tion to improve the quality of services for citizens with disabilities (Melekoglu et al., 2009)¹. Special education services focusing on inclusive education practices have increased rapidly in the last years, especially after the publishing of the Special Education Regulation in 1997. In the last decade, the Ministry of National Education has emphasized the importance of inclusive education and the implementation of inclusion has been spread widely (Kutay, 2018).

When examining the legislation of the Ministry of National Education in Turkey, it becomes obvious that differentiated education is important to fulfil the discourse of raising students who actively participate in education processes (Kutay, 2018). In this context, it is stated that teacher candidates and teachers are given training on differentiated teaching practices (MoNE, 2021), e.g. one-week in-service training given to teachers teaching students with special educational needs in their classrooms (Kutay, 2018). In addition, courses are organized in cooperation with the Ministry of National Education and UNICEF to train teachers for the dissemination of differentiated teaching practices, aiming that trainers are able to inform and train in-service teachers about and in the use of DI in class (MoNE, 2021). In undergraduate teacher-training programs, courses on differentiated teaching practices are also offered. However, some studies have shown that this training is insufficient. For example, in Demirkaya's study (2021) examining classroom teachers' perceptions of efficacy and practice levels towards differentiated teaching, it was concluded that the number of courses related to differentiated teaching in undergraduate programs in Turkey is not sufficient. Behind this background, it is not surprising that recent research within the Turkish educational context shows that DI practices are implemented scarcely. A study by Uysal (2003) revealed that over half of the participating teachers stated that the practice of inclusive education was not useful and the conditions to implement it were not ready yet. In addition, another study conducted by Kargın (2004) reported that 70% of the teachers under study did not offer additional support, 80% of them did not prepare Individualized Education Plans (IEP), instead, they only gave extra homework. The studies about inclusive education in Turkey show that even though measures of inclusion have been implemented since 1983, there are still huge problems to be solved for a more frequent implementation of inclusive practices.

Up until now there is only a limited amount of research into the implementation of DI in Turkish classrooms and the majority of studies only reveal descriptive results of the current situation (Aşıroğlu, 2016; Beler, 2010; Demir, 2021; Karadağ, 2014).

1 For an extensive overview of the development of inclusive education in Turkey, please refer to Kutay (2018).

Research Questions and Methodology

Inclusive education, e.g. implemented by the use of DI practices, is strongly recommended and positive effects of DI on several outcome variables are evident (e.g. Bender, 2012). However, as discussed in the aforementioned theoretical background, DI is not implemented frequently into Turkish teachers' daily teaching practice. In this context, there is a need for research that thoroughly explores the implementation of inclusive education in Turkey.

In order to fill this research gap, this study aimed to explore Turkish primary school teachers' DI implementation in practice. Primary school lasts four years in Turkey. Because of the lack of in-depth studies on DI in Turkey, an explorative approach was used and qualitative research was conducted in order to gain access into this field of research.

The sample consisted of 15 primary school teachers (ten female, five male) who were between 24 and 51 years old. Their working experience varied between one and 34 years. Seven teachers were classroom teachers in the first grade, three teachers in the second grade, three teachers taught in grade 3 and two in grade 4. Four teachers worked in private schools, while eleven teachers worked in public schools. In Turkey, 20,6% of the schools are private (parents have to pay tuition fees) and 79,4% are public schools (MoNE, 2021).

For the purpose of this study, five interview questions were formulated to explore Turkish primary school teachers' implementation of DI.

The questions were: 1) What is DI?; 2) What is your intention when implementing differentiated teaching practices?; 3) Which DI practices do you implement in class?; 4) What are the advantages of DI?; and 5) Which limitations do you come across when implementing DI in class?

To verify whether the questions were suitable for the study, expert opinions were obtained from two faculty members working in the classroom teaching department. Corrections (e.g. concerning language) were made according to expert opinions. Furthermore, a pilot study was conducted with a classroom teacher who was teaching second graders to check the clarity of the questions. This data was not included in the study. The participants were informed that a voice recorder would be used to record the interviews and their consent was obtained. The interviews lasted an average of 15.40 minutes. The interviews were conducted in the Turkish language and translated into English afterwards.

The interviews were transcribed and analyzed by means of Qualitative Content Analysis, which aims to summarize the collected data in small categories with coding based on certain rules (Mayring, 2014; Wellington, 2015). The created text (in form of the interviews) was read several times and the sections that had integrity in terms of meaning were divided into categories. Given the aforementioned necessity to explore teachers' DI implementation in the Turkish educational context, an inductive approach was used to develop the categories. Common extracts were determined from the categories and themes

were created. The data were analyzed independently by another field expert and a consensus was reached regarding the codings (98% agreement which indicates an acceptable reliability, Miles & Huberman, 1994). Categories and themes were arranged within tables and then interpreted.

Results

In total, $N = 121$ codings could be extracted from the material. The number of codings per interview varied between 9 and 22 codings. The majority of codings could be found when teachers were talking about the advantages of DI ($n = 32$) and reasons that limit them from the implementation of DI ($n = 32$). This shows that teachers actually do see the advantages that the implementation of DI brings, however, there are a lot of reasons that limit their implementation. Concerning the definition of DI, $n = 15$ codings could be extracted from the material, the smallest group of codings, followed by the practices that teachers implement in class ($n = 19$) and the intentions when implementing DI ($n = 23$). The fact that the definition of DI as well as the concrete practices build the groups with the least codings, it can be possibly assumed that there is a lack of concrete and more detailed knowledge on DI. The themes and categories will be introduced in the following.

As a starting point, teachers were asked about the definition of DI. The distribution of the answers to the question “*What is DI?*” given by the participants is presented in Table 1.

Table 1: The distribution of the answers given to the question “*What is DI?*”.

<i>Theme</i>	<i>Category</i>	<i>Frequency</i>	<i>Sample statements</i>
Method and technique	Granting autonomy to students	2	“An education method in which children can learn on their own” (T9)
	Providing education suitable for individual differences	11	“An education model that the teacher makes for students individually, considering their learning profiles” (T6)
	Technology use	2	“Enhancing the education of students by using today’s technology tools besides classical learning” (T8)

When the answers were examined, it was seen that the theme of method and technique was formed. This theme is divided into three categories: granting autonomy to students, providing education suitable for individual differences, and using technology. The majority of the participants defined DI as providing education to students according to individual differences, emphasizing the understanding of education in line with student characteristics. Two of the par-

ticipants defined DI as an education in which students can learn on their own according to their individual needs. The students can organize their learning process by themselves. According to these findings, it is interesting that two participants linked DI to the constructivist approach (Dweck, 2007; 2010). Furthermore, it was found that two participants defined DI as the diversification of education by using technology tools such as smart boards. Results show that the participants had a general awareness of DI, however, a few participants were not able to define DI at all.

As stated in the theoretical section, DI can be understood as an intentionally planned approach to address students broad array of learning needs (Letzel et al., 2020). Thus, teachers must have a certain goal in mind when they plan, design and implement DI in their actual in-class teaching. Table 2 shows four different kinds of intention teachers have when implementing DI that could be extracted from the material: increasing attention span, reinforcing understanding, considering interest areas, and reaching all students.

Table 2: The distribution of the answers given to the question “*What is your intention when implementing differentiated teaching practices?*”

<i>Theme</i>	<i>Category</i>	<i>Frequency</i>	<i>Sample statements</i>
Teachers’ Intentions while implementing DI practices	Increasing attention span	3	“I use it mostly to eliminate the monotony of the lesson and to increase the attention span of children.” (T5)
	Reinforce understanding	7	“I use such methods to reinforce their understanding of the acquisitions of the class.” (T11)
	Considering interest areas	3	“I noticed that some students learn by writing poetry and some by painting. I help them explore their interests.” (T1)
	Reaching all students	10	“I use it because everyone’s learning area is different from each other or because their orientation is also different.” (T14)

When the category of increasing attention spans was examined more in detail, an important quote could be identified as a teacher explains their concrete intention as the following: “*I see that the attention spans of students are longer when I apply this teaching compared to plain instruction*” (T7). This shows that differentiating instruction helps to keep the students’ attention more than performing a “one-size-fits-all”-instruction. Moreover, nearly half of the participants stated that they used DI to reinforce understanding during lessons, making sure that every student is able to reach the goal of the lesson.

Three participants stated that they chose DI to meet the interests of students. Explaining the intention of using this method with the expression “*I*

noticed that some students learn by writing poetry and some by painting. I help them explore their interests", T1 drew attention to the fact that each student has different wishes and interests and for this reason, they can learn in different ways. Teachers can realize interest-based teaching e.g. by tiering assignments and materials according to students' interests (Pozas & Schneider, 2019; Letzel et al., 2020).

The majority of the participants stated that they used DI to organize their teaching in line with the needs of all students in the class. Participant T14 said, *"I use it because the learning area of everyone is different from each other or because their orientation is different from each other"*. This is an example of the goal of reaching all students' needs instead of just give general instructions that only meet the needs of certain students within the learning group. As a next step, teachers were asked which concrete practices they implement in class.

The distribution of the answers given to the question *"Which DI practices do you implement in class?"* can be found in Table 3.

Table 3: The Distribution of the answers given to the question *"Which DI practices do you implement in class?"*

<i>Theme</i>	<i>Category</i>	<i>Frequency</i>	<i>Sample statements</i>
Method and technique	Reading circle and station technique	4	"I used the station technique in the class which graduated last year. Now, these are in the first grade. That's why I used the reading circle at 1." (T1)
	RAFT method	1	"I give importance to group work in my class, I usually use the RAFT a lot." (T15)
	Invention method	2	"I mostly use the invention method. I enable students to discover by doing and experiencing." (T14)
Material use	Technology	2	"I use some web applications on the smart-board in my lessons" (T8).
	Tiered assignments and material according to students' interest	3	"I try to make the lessons enjoyable by using different materials with the other students in the class." (T10).
Individual differences	Education appropriate to interests and abilities	7	"I adapt the lesson according to the children's interest and ability." T(13)

Results reveal that the answers can be divided into three different themes; method and technique, use of materials, and individual differences. The method and technique theme was divided into categories presenting techniques that focus on strengths and weaknesses of students, such as the reading circle, and station technique; whereas RAFT and invention method rather focus on interests and abilities. Moreover, the teachers mentioned the theme of material

use with the help of technology and tiering material suitable to the students' interest as well as the theme of individual differences to focus on interests and instruction in line with students' skills. When the findings were examined in detail, it was found that four participants used the reading circle and station technique in their classes, and only one participant used the RAFT Method. Participant T15 said, "*I give importance to group work in my class, I usually use the RAFT a lot*" emphasizing that the RAFT method was effective in group work in the class. Two participants stated that they used current technology tools in their classes, such as smart boards and tablets and three participants stated that they preferred materials suitable to the students' interests.

It is a striking finding that again, teachers mention the intention of providing education according to their students' interests and abilities in their classes. Teachers are willing to implement DI because the approach seems to be advantageous in several ways. In order to explore teachers' motives of their DI implementation, they were asked which advantages they see in their DI implementation.

Table 4: The distribution of the answers given to the question "What are the advantages of DI?"

<i>Theme</i>	<i>Category</i>	<i>Frequency</i>	<i>Sample Statements</i>
Superior sides for the student	Enjoyment	7	"I can say that the children attend the next day or the next lesson in a very pleasant way" (T7)
	Motivation	2	"Children are more motivated and make an effort during the activity" (T1)
	Providing sustainability in learning	7	"I observed that learning is more permanent when I use differentiated instruction method" (T8)
	Supporting cooperative learning	3	"There is a transition to the other station in the station technique, everyone completes the unfinished activity of each other." (T2)
	Increasing self-confidence	4	"As they do an activity themselves, they feel self-confident and they try to do it again in the next activity." (T6)
Superior sides for the teacher	It is easier for students to discover their talents	3	"You can feel which child is successful in what field and what kind of results are produced in the station technique. In this sense, children improve themselves." (T2)
	Enjoying increased success rate	1	"When the success rate is high, I feel happy." (T4)
	Increased job satisfaction	5	"I realize what a great job I am doing when I give education according to the differences of the students and see the positive results." (T12)

Results reveal, that teachers' positive views on DI can be divided into two separate themes as "the superior aspects for the student" and "the superior aspects for the teacher". This shows that there are advantages for both educational stakeholders: Students as well as teachers.

Concerning the students, the superior aspects of DI are enjoyment and motivation, the increased sustainability of learning, the support of cooperative learning, and the increase in students' self-confidence. It is shown that teachers are aware of the positive effects the implementation of DI practices have on their students. Moreover, they experience also that the positive effects on their students have positive effects on their teaching as well, because they "*make more effort and are more motivated*" in the lessons.

The most important aspects for the teachers were divided into the categories of teachers discovering the talents of students more easily, enjoying an increase in-class success rate, and increasing their job satisfaction. The increasing job satisfaction is the category with the most codings ($n = 5$) in the teacher-centered theme.

In order to understand why teachers do not implement DI in a frequent manner, the participating teachers were asked what hinders them from implementing DI despite all the advantages they obviously see in the use of DI. The distribution of the answers given to the question "*Which limitations do you come across when implementing DI in class?*" is presented in Table 5.

Interestingly, the numbers of codings for advantages and limitations are similar ($n = 32$), so that no interpretation in terms of teachers seeing more advantages or limitations can be made.

When the answers given were examined, it was seen that the statements could be divided into four themes: the limitations of the teachers, the students, the parents, and of the physical environment. The theme of limitations related to the teachers included having difficulties in classroom management, worrying about the completion of the curriculum, the fact that they need to make extra effort when they want to differentiate their instruction, and their feeling of lacking knowledge and competence concerning the implementation of differentiated instruction. They clearly point at the need for professional development courses and that the topic of dealing with student heterogeneity in class should be stronger implemented into teacher training.

The theme of limitations related to the students included the refusal to participate in some activities. This category can be connected to what teachers mean when they are talking about their difficulties with classroom management. Also, the implementation of DI brings difficulties because some students show a feeling of inequity because some students get other assignments than others. This result points at the fact that the implementation of DI is demanding and requires an atmosphere of understanding and supporting each other in class. The reason why DI is implemented and the goals and advantages for every student must be made transparent beforehand by the teacher and every

Table 5: The distribution of the answers given to the question “What are the limitations of DI?”

<i>Theme</i>	<i>Category</i>	<i>Frequency</i>	<i>Sample statements</i>
Limitations of teachers	Difficulty with classroom management	2	<i>“I have difficulty in managing the classroom, especially when showing the way for the first classroom practices” (T12)</i>
	Worrying about completing the curriculum	4	<i>“There is a curriculum, which has a deadline. During this time, it can be difficult to do different activities” (T2)</i>
	Additional effort	3	<i>“The teacher must be a little more willing and then sacrifice a little more” (T8)</i>
	The feeling of a lack of professional competence/ knowledge	2	<i>“I have a problem with the students when I do not know the method and technique during the practice” (T11)</i>
Limitations of students	Refusing to participate in certain activities	3	<i>“Since some children are superior, it is simple because of their characteristics. Students do not want to participate in group activities” (T7)</i>
	Feeling of inequity	1	<i>“When I give different activities to some students, they ask me why they are not given the same, they feel more passive” (T4)</i>
	The inability of younger age groups to adapt	5	<i>“It can be a bit tiring to show the implementation of these applications in the First Grade, to establish the rules while you are doing them, and to explain what they will do” (T2)</i>
Limitations of parents	Reacting to different assignments/ activities	3	<i>“Parents come to me and say, if you had done it like this, the child would have understood it better” (T6)</i>
Limitations of the physical environment	Classrooms are small	7	<i>“Our classrooms are too small, we do not have enough space” (T9)</i>
	Noise in classrooms	2	<i>“Sometimes the sound can go too far to other classrooms” (T5)</i>

student must be aware of the role they play within their own learning process as well as of the learning process of their fellow students. On another note, teachers stressed the fact that the implementation of DI is rather difficult with younger students.

The theme of parental limitations included the reaction of students to different assignments/activities. It seems as the parents set their demands on teachers concerning a certain teaching technique that would support their children in a better way. Teachers do feel pressure from parents, that are important stakeholders in the educational process, too. On the other hand, teachers

mention contextual limitations of the physical environment, including small classrooms and the increased noise in the classrooms when implementing some types of DI practices.

Discussion

This study at hand aimed to explore Turkish teachers' DI implementation in practice and makes a contribution to research on inclusive education in Turkey. First of all, the results of this study reveal that some of the Turkish primary school teachers participating in the study were able to define DI as the education provided in line with readiness, interests, or learning profiles of students. Considering that the basis of DI is that all students in class receive the best education suitable for their requirements (Tomlinson, 2017), it can be argued that some of the participants do have a general idea about the definition of DI. This finding is in line with previous results reported in the studies of Ziegler (2010) and Koç and Gürgür (2021) arguing that teachers define DI based on individual differences. Moreover, results reveal that a minority of teachers under study also reflected on autonomous learning for students and the use of technology when being asked to define DI. However, important to note is that some participants were not able to define DI at all. This shows that some teachers lack knowledge on the differentiated teaching approach or have a wrong idea about DI. This finding is also consistent with the results of previous different studies (Bayram, 2019; Clapper, 2011; Killey, 2021; Melesse, 2016). In the study of Killey (2021), it was concluded that although the participants said that they used DI in their classes, they lacked knowledge about the concept of DI and its practices. This is also reflected in the results of this study as the codings within the groups of definition of DI and the concrete practices the teachers implement are the smallest groups of codings. As stated by Demirkaya et al. (2021), one reason for the low awareness of teachers may be the insufficient number of courses related to dealing with heterogeneity in pre-service education. It can be assumed that the insufficient knowledge of the participants about the definition of DI will inherently impact how teachers differentiate their instruction. Hence, more training on DI should be provided for both, pre-service and in-service teachers across the country as it is stated that current teacher trainings are not sufficiently supporting teachers (Demirkaya et al., 2021).

Secondly, results also reveal that Turkish primary school teachers are aware of linking the implementation of DI to certain intentions (Letzel et al., 2020). However, the intentions are related to a general implementation of DI, and thus, no information about intentions behind the use of certain practices could be extracted. Furthermore, the teachers are intending to foster the learning process of all students by differentiating their instruction, thus, they are intending to meet the students' interests (Wan, 2020). It is striking that the teachers strongly

emphasise the adaption of assignments and materials because they want to meet students' interests. They seem to focus rather on non-achievement outcomes as no information could be extracted from the material that connects the implementation of DI practices to student achievement. This result contradicts former results in studies by Deunk et al. (2018) and Deunk et al. (2015), that reveal a strong emphasis on students' cognitive ability.

In line with previous empirical literature, results reveal the positive effects teachers perceive when implementing DI (Algozzine & Anderson, 2007; Lange, 2009; Sondergeld & Schultz, 2008; Gibon-Ginja & Chen, 2020; Melesse, 2016; Prast et al. 2018). In detail, teachers state that the students are more motivated and self-confident and perceive differentiated activities as interesting. However, no information about positive effects teachers perceive on student achievement could be found in the interviews.

The teachers under study did not only perceive positive effects for students, but also for themselves. The majority of codings points at perceiving an increased job satisfaction when implementing DI practices in class and therefore providing adequate teaching to the students. This result is in line with a German study from Pozas et al. (2022) that also reports that the implementation of DI also leads to an increase of job satisfaction.

When being asked about concrete practices, results reveal that although the majority of participants knew how to define DI, they only were aware of a limited number of methods and techniques. The concrete use of RAFT, stratified instruction, learning contracts, reading circle or learning centers was mentioned by the teachers under study (Algozzine & Anderson, 2007; Demir, 2021). Therefore, results reveal that teachers implement tiered assignments and material as well as grouping strategies and practices like station work. These are practices that can be sorted into the DI taxonomy's categories I, II and VI (Pozas & Schneider, 2019). However, practices that could be sorted into the categories III (Tutoring systems), IV (nonverbal material learning aid) and V (Mastery learning) were not mentioned by the teachers, which shows that they are not aware of the full potential of DI. This result is in line with a study by Scott (2012) who reported that there is a profound lack of understanding about how to apply DI.

Considering the results, it is important to note that the majority of the participants who knew about a variety of DI practices worked in private schools. These participants said that they received in-service training from time to time about DI, which shows the importance of regularly professional development courses for every teacher.

Moreover, the study's results provide insight into limitations that prevent teachers from implementing DI. The limitations that the teachers under study perceive are manifold as they identify limitations within their own selves, limitations that derive from students and parents as well as contextual limitations. Teachers do perceive additional effort, when they implement DI into their

teaching. Moreover, the implementation of DI is time-consuming and they fear that they are not able to complete the curriculum. Showing consistency with these findings, some studies in literature reported that DI has limitations such as being time-consuming and challenging, inability to complete the curriculum, misunderstandings in teaching, large class sizes, and difficulties in classroom management (D'Intino & Wang, 2021; Gaitas & Martins 2017, Gibon-Ginja & Chen, 2020; Gülay, 2021; Melesse, 2016; Shareefa et al., 2019; Subban, 2006). However, in literature, factors that can possibly equalize such perceived limitations can be also found, e.g. collaboration between teachers (Letzel, 2021). Such factors should be discussed in teacher training or professional development courses and schools should help to organize such supportive measures. Moreover, teachers state that it is difficult to implement practices in class because of the young age of the students. This result is somehow surprising, as international research shows that DI is more frequently implemented in primary than in secondary school (e.g. Schwab et al., 2019). Future research should focus in the reasons why teachers experience the implementation of DI in primary school as more challenging than in secondary school.

Additionally, teachers feel limited because of their students difficult behavior when they implement certain DI measures. This limitation is connected to the fact that teachers perceive pressure from parents concerning their teaching practices. This finding is interesting as it contradicts results from studies by Gülay (2021), Özkanoglu (2015) and Bayram (2019), that state that parents did not care enough about their children, had difficulties in understanding the purpose of the implementation of DI and did not show the awareness of the necessity of DI. These findings suggest that the consciousness and awareness of parents regarding DI is an important factor in the teaching and learning process and that it is important to not only prepare the students but also the parents for the implementation of DI in order to create a supportive learning environment in which the implementation of DI is accepted and valued.

Limitations, theoretical and practical implications

The study at hand underlies several limitations. As this study uses a qualitative approach, the results need to be interpreted with caution and are not to be taken as representative. However, the exploratory study design provided an insight into an underrepresented field in Turkish educational research. Taken the study's results into consideration, quantitative approaches with bigger sample sizes including standardized instruments should follow in future that either replicate or negate the findings. Moreover, the study only sheds light onto the DI implementation of primary school teachers. Future research should also focus on the implementation in secondary schools. Additionally, this study used teachers' self reports that may lead to biases such as social desirability.

Therefore, future research should also include classroom observations that are seen to be more objective. To summarize, this study explores Turkish primary school teachers' DI implementation. The results clearly point at the need for addressing the concrete implementation of DI practices in terms of dealing with student heterogeneity stronger in teacher trainings and professional development courses. Moreover, the results function as starting point for future lines of research.

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Differentiated Instruction in Practice

Hong Kong Teachers' Experience Participating in a Professional Development Program

Suet-Ying Yuen, Charles Chun-Yin Leung & Sally Wai-Yan Wan

Abstract

The study reported Hong Kong teachers' experience of engaging in a professional development program specially designed to support teachers' implementation of differentiated instruction in the classroom. A qualitative design was employed to understand teachers' professional growth and the perceived supportive elements associated with these changes. Participants included 38 primary and secondary school teachers enrolled in the program and data were collected through post-intervention interviews. Findings demonstrate that teachers' professional growth takes place at various levels and their perceived supportive elements provide insights of the success of the program and future intervention development. The implications for further professional development programs and research are discussed.

Introduction

In today's classrooms, teaching for diversity is a well-recognized issue for educators. New paradigms have shifted power away from teachers to learners and have emphasized their roles as co-creators in the teaching and learning process. Therefore, in the modern classroom, teachers can no longer serve merely as knowledge transmitters; instead, they must also be facilitators of learning to stretch the potential of every student. While the growing complexity of learners has posed significant challenges in schools, teachers have been urged to equip themselves with appropriate knowledge and skills to better meet the needs of individual learners.

Differentiated instruction (DI) emerged as a widely accepted pedagogical approach to handle diversity, which values individual differences and aims to maximize all students' potential by providing various opportunities to explore and demonstrate their learning (Tomlinson et al., 2003). From a practical perspective, DI offers a framework for teachers to manage classroom diversity by modifying the learning environment, content, processes, and products (Tomlinson, 2014). In the differentiated classroom, teachers first need to tailor in-

struction to suit students' abilities, interests and preferred learning styles. With continuous assessment of students' performance, teachers adjust instruction to further develop their potential and encourage them to try new ways of learning. Ideally, as a proactive process, teachers play a central role in transforming instruction into a dynamic approach to teaching. Therefore, to ensure success, their ability to respond flexibly and appropriately to students' needs becomes crucial.

DI is highly recognized and promoted by educators. Over the decades, research has demonstrated DI's benefits, such as elevated student engagement and learning motivation (Johnsen, 2003), enhanced learner confidence (McQuarrie & McRae, 2010), and better overall and subject based performance (Beloshitskii & Dushkin, 2005; Tulbure, 2011). Despite the recorded effectiveness of differentiation, schools and teachers are still reluctant to incorporate the approach into the classroom due to some existing challenges (Wan, 2016).

Lavania and Nor (2020) assessed the barriers that teachers face in a recent systematic review and provided a framework arranging these barriers from internal to external and governable to ungovernable factors. Lack of knowledge was ranked as the most common internal challenge that led to many difficulties in the implementation of DI (Dixon et al., 2014). Without clear direction and sufficient knowledge of DI, teachers may feel insecure and thus not confident in implementing differentiation into practice (Chien, 2015). Another internal barrier is a lack of pedagogical knowledge and skills (VanTassel-Baska & Stambaugh, 2005), such as the ability to identify students' readiness and modify teaching content according to students' needs. Particularly, teachers regard altering learning activities and materials as the most difficult domain in differentiation (Gaitas & Alves Martins, 2017). Furthermore, teachers' personal beliefs or preferred teaching styles seem to play an important role as barriers (Lavania & Nor, 2020). As DI is a highly student-centered teaching approach emphasizing students' needs, teachers who are more inclined toward teacher centered thinking tend to face more obstacles in implementing DI (Wan, 2016; de Jager, 2017). Moreover, if teachers viewed themselves as unprepared, they would see embedding DI in daily teaching as particularly challenging (Pozas & Letzel, 2019; Wan, 2016). In sum, the above-mentioned barriers are the people factors that teachers can manage and modify.

Apart from that, the literature revealed some existing external challenges that are not in teachers' abilities to change, such as the curriculum, school administration, and facilities (Aldossari, 2018; Wan, 2016). However, some external barriers, such as insufficient time for lesson preparation (de Jager, 2017; Merawi, 2018) and the absence of resources and professional support (Aldossari, 2018; Dee, 2010), can be overcome through joint efforts. Loaded with extensive teaching and administrative duties, it is a natural tendency for teachers to instruct using familiar styles, which is a more teacher centered methodology.

To address the obstacles identified in the literature, emphasis should be placed on ways to improve the readiness and competence of teachers to deal with barriers that can be overcome (Wan, 2016). This study aimed to explore Hong Kong teachers' experience participating in a DI professional development program.

Teacher Professional Development in DI

Teachers' professional development (PD) is an ongoing process, aiming to develop teachers' knowledge, skills, and expertise and form their teaching practices (Darling-Hammond & McLaughlin, 1995). Professional learning has been found to be beneficial in DI, as it engages teachers in a series of implementation practices specific to differentiation (Smit & Humpert, 2012). With sufficient professional development opportunities, particularly those offered through a small group, in-service teachers were able to apply knowledge and exchange ideas to enhance their teaching practice (Grierson & Woloshyn, 2013). This method could also help teachers build self-efficacy in implementing DI in their classrooms in a more effective manner (Dixon et al., 2014). Though a wide variety of activities and interactions, ranging from informal discussion in daily work to structured topic-specific seminars, could be considered as PD, Desimone (2009) suggested five elements that make PD effective: content focus, active learning, collective participation, coherence; and duration. Considering the characteristics of effective PD, a tailored DI intervention program was piloted and examined in the present study.

Clarke and Hollingsworth (2002) also noted that to facilitate professional development of teachers, it is crucial to understand the changing process and conditions that support teachers' growth. However, majority of programs fails to take teachers' motives and the process of change into account (Guskey, 2002). As teachers are a determining factor in terms of instructional effectiveness and improvement, that is critical to focus on teachers' needs, motivations, and concerns when designing PD programs (Korthagen, 2017). The Interconnected Model of Teacher Professional Growth (Clarke & Hollingsworth, 2002) offers a framework to study the process of teacher change, suggesting the non-linear structure of change sequence and growth network of individual teachers. They identified teacher professional growth in six interrelated perspectives: training, adaptation, personal development, local reform, systemic restructuring; and growth or learning. The model serves as a starting point to understand the complexity of teacher growth in PD, yet little research has investigated the effectiveness of PD on the topic of DI in the lens of the various perspectives of teacher growth. The present study discusses teachers' perceived change guided by the model, and how teachers' change takes place at various levels.

DI in Hong Kong

In Hong Kong, the government and the local education sector have acknowledged the importance of addressing the needs of diverse learners. According to the recent curriculum guide (Curriculum Development Council, 2017), the policy focus was gradually shifted from a deficit approach of “inclusion of students with special needs” to a more asset-based approach of “embracing learner diversity.” The evolved stance toward learning diversity has urged teachers to equip themselves with the knowledge and skills to address students with different needs in the same classroom. However, understanding of Hong Kong in-service teachers’ readiness for DI was limited in the literature.

Previous studies indicated that local primary and secondary teachers make relatively few adaptations in the classroom to cater for different learning needs of students (Forlin & Rose, 2010; Wan, 2016). Although teachers in Hong Kong were generally positive toward the adoption of DI, lacking confidence and feeling unprepared may hinder differentiation in their practice (Wan, 2017). In Hong Kong, teachers’ initial understanding of DI is mainly derived from preservice training programs delivered along with other theories of curriculum and instruction. They can obtain a quick grasp of the basic principles of DI, yet the knowledge is somewhat superficial. The government has offered limited teacher training workshops for DI. However, these training sessions were usually one offs that were short and decontextualised, which may not enable teachers to build DI into daily practice with limited views about strategies to implement.

Similar to other educational systems around the world, schools and teachers in Hong Kong are facing numerous obstacles in the process of implementing differentiation while some of them are contextual barriers. While the government recommends adjusting teaching according to students’ abilities and interests, existing training sessions have tended to introduce student diversity through a deficit based approach (Cheung & Poon, 2020), such as strategies to cater to students with specific kinds of special educational needs, rather than from an asset based approach to groom a group of students with mixed abilities. Therefore, teachers doubted the feasibility and effectiveness of differentiation as class size is of great concern to cater the diverse needs of students in the big class (Wan, 2016). They were still struggling from a teacher-centred approach in the Confucius heritage classroom to a learner-centred curriculum in DI (Wan, 2016).

Furthermore, as Hong Kong is well known for its examination-oriented culture, teachers are responsible for students’ success in high stakes examinations and therefore lack the incentives to adjust teaching according to individual students’ needs (Chong et al., 2007). Existing training sessions were designed to train individual teacher, there are calls for embedded professional development opportunities to facilitate the DI implementation at different levels, including

classroom, curriculum, and school levels, as improvements may not be sustainable without teachers' collective participation and proper school management infrastructure (Desimone, 2009; Garet et al., 2001; Wan 2016).

University – School Partnerships in DI Professional Development

In response to local teachers' perceived needs and challenges to deal with learning diversity, a university – school partnership program designed with reference to the five effective elements of PD (Desimone, 2009) was launched to build teachers' teaching competencies and confidence in implementing DI in the mainstream classroom. As development and change takes time, the program lasted for two years and was delivered by the Quality School Improvement Project (QSIP), the Hong Kong Institute of Educational Research of the Chinese University of Hong Kong. Six primary and five secondary schools with good readiness to pilot DI selected a core subject to collaborate with the school development officers (SDOs) from QSIP, who are fulltime university staff possessing extensive frontline teaching experiences. The program provided school based onsite support to teachers that involved three stages (Fig. 1).

In the Preparation stage, introductory workshops took place at the beginning of the school year to provide the entire teaching staff with the content

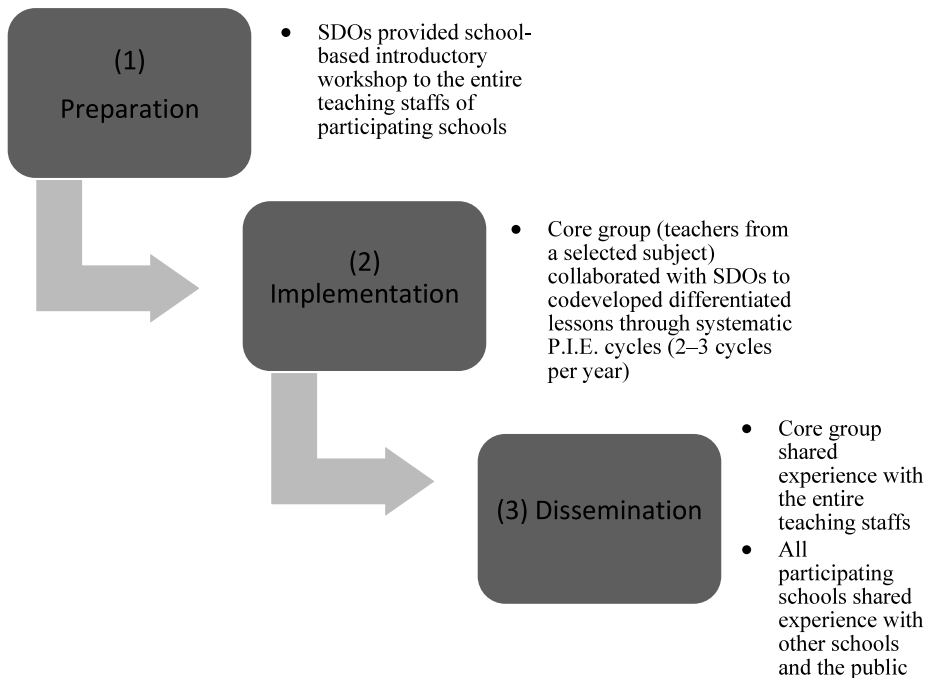


Fig. 1: Overview of the University-School Partnerships Program in DI.

knowledge on the theory and practices of DI. In the Implementation stage, a core group of teachers worked collectively with SDOs to develop differentiated lessons based on school curriculum and educational goals. Teachers engaged in two to three systematic cycles of planning-implementation-evaluation (P. I. E.), which included collaborative lesson planning, trial teaching with lesson observation as well as reflective discussion following observation. Training and support continued throughout the intervention period, with regular meetings and discussion with SDOs who visited teachers at their schools. At the last stage – Dissemination, the core groups shared good practices with colleagues and other schools through internal and public dissemination activities.

Method

Study Objectives

This study aimed to explore the experiences of and outcomes for Hong Kong teachers who participated in the University – School Partnerships Program in DI Professional Development. The study employed a qualitative design to explore teachers' change after joining this program. In addition, identifying elements that supported teachers' professional change from their perspectives could help to improve our understanding of what works for them in the local context. The following questions guided this study: What were the teachers' perceived change / growth after joining this program? From teachers' perspective, what elements support their change / growth as a result of this program?

Data Collection

A total of 38 in service teachers, including subject teachers, vice panel heads, panel heads, and vice principals, from 11 participating schools were recruited voluntarily, and their teaching experience ranged from 1 to 30 years (Table 1). They were invited to join a post intervention interview via purposive sampling. Interviewees went through at least two PIE cycles with the team so that they could comment on the collaboration experience and evaluate the project impacts. A total of 11 individual or focus group interviews were conducted, lasting for about 60–90 minutes in each session (Table 2). All sessions were completed within three months after the end of the program in an online or face to face format. Semi structured guiding questions were designed to obtain extensive information, and they were formulated around four areas: (1) change in beliefs about DI, (2) change in lesson planning, (3) experience in DI implementation, and (4) professional learning and reflections. Interviews were audio recorded with the consent of interviewees and later transcribed verbatim in preparation for analysis.

Table 1: Sample description.

Descriptive	Data
Male / Female	9 male (23.7 %) / 29 female (76.3 %)
Teaching experience (in years)	$M = 12.1$, $SD = 1.30$ (range: 1–30)
Teaching qualification	B.Ed: $n = 23$ M.Ed: $n = 15$
Core teaching subject	Chinese language: $n = 11$ English language: $n = 11$ Mathematics: $n = 6$ General / liberal studies: $n = 6$ Others: $n = 4$
Position	Teacher: $n = 17$ Vice panel head: $n = 4$ Panel head: $n = 10$ SENCO: $n = 3$ Curriculum leader: $n = 3$ Vice principal: $n = 1$

Table 2: Composition of school sample.

School code	Sector	Subject	Participating teachers		Collaboration duration (year)
			Male	Female	
E01	Primary	Mathematics	2	4	2
E02	Secondary	Mathematics	0	1	2
E03	Secondary	Liberal studies	3	2	2
E04	Primary	General studies	1	0	1
E05	Secondary	Chinese language	0	3	2
E06	Primary	English language	1	4	2
E07	Secondary	English language	1	5	1
E08	Primary	Chinese language	0	6	1
E09	Secondary	Chinese language	1	0	2
E10	Primary	Chinese language	0	1	2
E11	Primary	General studies	0	3	2

Data Analysis

A hybrid approach of inductive and deductive thematic analysis was performed, and the data were examined repeatedly by three coders following the six steps

approach proposed by Braun and Clarke (2006): (1) transcriptions were read repeatedly by two coders to familiarize with the data; (2) initial codes were then identified by inductive analysis based on the theoretical framework of teacher professional growth (Clarke & Hollingsworth, 1994); (3) cross-examination of the transcriptions was performed and clustered the codes into broad themes with related subthemes; (4) the third coder was invited to bring in new perspective to review and refine the themes through discussion with the two coders; (5) themes and subthemes were organized into various perspectives to illustrate the relationships and distinctiveness between them; and (6) the overall experience of teachers participating in this program was reported accompanied with sample quotes that could capture the essence of the themes. Table 3 and 4 presents the whole data analysis process and key categories merged in this study.

Table 3: Coding of perceived change / growth of teacher.

	Theme – Change/growth perspective:	Subtheme (no. of teachers mentioning a code)
1.	As receiver	enhanced knowledge (7); clearer concept (8); broadened horizon (3)
2.	As accommodator	improved strategies (4); modified existing teaching plans and materials (5); adjusted mindset (11)
3.	As reflective practitioner	more self-reflection (10); more teaching ideas (7); less struggle about DI (3)
4.	As reformer	conducted more focused collaborative lesson planning (8); motivated to developed new teaching practices (4)
5.	As learner	fostered self-understanding (5); engaged in in-depth exchange (7); shared ideas and materials (6)

Table 4: Coding of elements that support teachers' change / growth.

	Theme – Elements that support teachers' change / growth:	Subtheme (no. of teachers mentioning a code)
1.	Focused training	theoretical concepts (4); readily available strategies (11)
2.	Relevance to daily practices	build on existing practices (9); provide advice and reminders (10); solve problems (3)
3.	External support	support from experienced external agents (19); PIE cycles (4)
4.	Collaborative experience	trial teaching to experiment idea (9); lesson study (3)
5.	Learning community	continuous development (3); sharing platform (4)

Results

Perceived Changes / growth in Teachers

This section reports the teachers' changes after participating in this program. With reference to the theoretical framework of teacher professional growth (Clarke & Hollingsworth, 1994), this research question will be answered by the five levels of change illustrated below, yet they are not mutually exclusive:

Change as training – teacher as receiver

First, participants mentioned that through the systematic training, they have enhanced knowledge (n=7), clearer concepts (n=8) and broadened horizons (n=3) about DI and the diversity of students. This was illustrated by the following teacher:

It was a bit confusing at the beginning. ...as I have never learned about DI during my preservice teacher training...gradually, we all understood more about the concept and how it could be used in daily teaching. (E0804; F; Teacher; 10 years exp)

Change as adaptation – teacher as accommodator

Some teachers reflected that at the beginning, they did not have strong motivation to adopt DI, but as their schools enrolled in the program, they were obligated to fulfill the established requirements, such as attending the collaborative lesson planning sessions. The program clarified some misconceptions they previously had about DI (n=11) and they started to brainstorm about how to adjust existing teaching plans, practices, and materials according to students' needs while ensuring these plans align closely with the school's curriculum (n=5). A panel head explained her experience as follows:

Although we used to have collaborative lesson planning practice, the focus was on how to [help students to] master the subject knowledge...for example, what kind of questions we should ask and how...Now, we think more about how to assess students' readiness...for both more able and less able students with corresponding learning goals...It was so different from the previous approach of setting identical goals for all...[Students] have to memorize all the knowledge...and obtaining high scores... (E0501; F; Panel head; 18 years exp)

Change as professional development – teacher as reflective practitioner

By participating in this program, some teachers mentioned that they were getting into the habit of self-reflection (n=10). The PIE cycles provided teachers with opportunities to try out new teaching ideas, observe students' feedback, and evaluate their strategies' effectiveness with colleagues and SDOs (n=7). Teachers valued this kind of experiential learning experience, which could help deepen their learning and thus motivate them to change their teaching practices. By observing students' responses and learning outcomes through several cycles of implementation, teachers recognized the need to develop new teaching strategies for the sake of their students (n=3). A teacher expressed his changed belief about "fairness":

I used to arrange single activities for all students...with the same set of goals...wishing all students could achieve a preset standard...After joining this program, I was more accepting...by seeing how DI can be implemented with diverse goals in the same task...it was really helpful...and I experience fewer struggles about fairness when designing the learning tasks for my students now. (E0103; M; Teacher; 19 years exp)

Change as school development – teacher as reformer

Since DI is not mandatory in the existing curriculum, participating teachers viewed themselves as reformers in school and initiated and piloted school-based DI practices in the classroom. With the assistance of SDOs, teachers took part in the interactive learning process (n=8), and the successful experience obtained was rewarding, which motivated teachers to continuously bring new insights to classroom and school development (n=4). This was highly appreciated by the curriculum leader, as illustrated below:

It is always painful for teachers who have novel ideas but are unsure of how to turn them into feasible plans...[Through this program] we have the free space to brainstorm ideas...do not have to worry that I have to do it alone...whether I have enough time to implement the new ideas...or if I can afford the workload...so the intervention is really helpful...as you can hear...our colleagues have changed a lot...we performed continuous review during the program...we chose to implement DI in a particular grade this year, but we will slowly expand and apply this experience to other grades in the near future. (E0105; F, Curriculum leader; 24 years exp)

Change as personal growth – teacher as learner

The participants also addressed changes in relation to colleagues. The core group functioned like learning companions, trying out lessons that they cocreated and engaging in open discussion about learning effectiveness and plans for further improvement (n=6). The teachers reflected that the process fostered their self-understanding and personal growth (n=5), as they learned as a member of a community. Additionally, with the intensive exchange (n=7), each member could act as the facilitator of other members' growth. The process enhanced their team spirit, as illustrated by a vice principal:

Colleagues were willing to share their plans and experience...that offered a sense of satisfaction...they have to do some testing and trials...modifications and peer observations... which ignite collaboration...I am grateful to see the [team] spirit grow. (E0806; F; Vice principal; 20 years)

Elements that Support Teachers' Change / growth

In this section, we explore from the perspective of the teachers what elements in this program support their professional growth.

Systematic and focused training

Teachers commended DI's theoretical concepts, related strategies and practices were presented in an organized way in the program (n=4). They could quickly grasp the fundamental knowledge on the topic, allowing teachers to buy into DI strategies when they returned to their classroom (n=11). Though the training sessions were sometimes viewed as intervening in teachers' capacities from a deficit approach, systematic and focused training enabled teachers to build a solid foundation for later implementation. It is especially crucial to lay the same foundation for a group of teachers with various backgrounds. Moreover, it is also beneficial for teachers with less confidence and teaching experience. A teacher highlighted this element as helpful:

The program provided a lot of frameworks and directions...that could guide how to implement DI in the classroom. (E0301; M; Teacher; 1 year exp)

Make learning relevance to daily practices

Aside from the program's introduction of DI, teachers valued the experience of incorporating DI in the classroom. Since the process of implementation can be complex, teachers reflected that they feel more comfortable building on existing curriculum by finetuning teaching plans and practices rather than integrating

a new DI curriculum (n=9). Additionally, teachers believed that with the assistance of SDOs in lesson planning, greater success in classroom implementation could be assured (n=10). As a curriculum leader mentioned:

The SDO provided us with a lot of spiritual and practical support. This powerful support makes colleagues feel at ease when trying out DI teaching. (E0801; F; Curriculum leader; 24 years exp)

In addition, building on the existing curriculum could facilitate teachers' development of DI strategies that fit the school's context and avoid adding to the workloads of teachers. A teacher expressed that the program helped to improve strategies to address students' diverse abilities:

We discussed our curriculum with SDOs, identified concepts with which students had previously experienced difficulties...and in turn formulated strategies to assist our weaker students. (E0602; F; Teacher; 1 year exp)

Continuous and progressive support from external agents

One of the features of this program was to provide ongoing training and consultancy by professionals in university. PIE sessions were led by SDOs who obtained substantial frontline teaching experience and who could serve as role models and coaches in implementing DI practices. Teachers highlighted that feedback received during the post implementation discussion was seen as valuable (n=19). The process allowed critical evaluation, which focused on improving the students' learning but not on evaluating teachers. A curriculum leader pointed out the significant role of SDOs in facilitating teachers' self-reflection as follows:

The professionals from the university do not only use theory, but they are also practical in guiding our thinking to formulate plans...[they] guide us to think ahead...and we could make concrete steps to implement our goal. (E0304; M; Curriculum leader; 10 years exp)

Collaborative professional exchange and experimentation

The program allowed teachers to engage in intensive collaborative learning within the core group, which was formed by external experts and colleagues in the same school. The core group went through several cycles of PIE, where members cocreated differentiated plans, examined those plans, and provided feedback to each other after the observation (n=9). The process allowed teachers to practice what they had learned, which in turn improved teachers' self-efficacy. This experience could promote school-based curriculum development, as illustrated by a curriculum leader:

Our curriculum was undergoing reform...and we were not sure whether it was going on the right track...we experimented with our ideas...and integrated new insights after a post-lesson discussion with the SDO...the process doubled up the learning effectiveness...strengthened our confidence in the school's sustainable development. (E0105; F; Curriculum leader; 24 years exp)

Nurturing teachers' growth as a learning community

Indeed, the implementation of DI will cause teachers to go through a long journey of professional development. The program served as a starting point for teachers to work on selected subjects, to form school-based learning communities and to work collaboratively through recurring cycles of collective inquiry and action research. The teachers saw the meaning of building such a platform in which they were actively engaged in the curriculum development process (n=4). Even though the program has come to an end, a teacher expressed that the learning community has continued to become a usual practice at their school (n=4):

After joining this program, the DI teaching materials were shared among colleagues...and the program created a platform for us to discuss and start the conversation about what strategies have been used by different colleagues for next step planning. (E0703; F; Teacher; 20 years exp)

Conclusions

DI is recognized as an effective pedagogical approach that can cater to learner diversity, however, studies in Asian contexts have not engaged in detailed and specific investigations of its implementation. The present study fills the research gap by examining teachers' growth after participating in a DI PD program in Hong Kong. Guided by the Interconnected Model of Teacher Professional Growth (Clarke & Hollingsworth, 2002), the paper discusses how teachers' change take place at five various perspectives after joining the PD program, from teachers as receivers with equipped knowledge and skills to teachers as reflective learners with enhanced capability to engaged in in-depth exchange with coworkers.

From the "teacher as receiver" perspective, the program prepared teachers with fundamental knowledge through systematic and focused training as they used to deliver differentiation in their own way. In this view, there is an emergent need for the teachers to build a coherent understanding of differentiation by improving their knowledge and skills so as to promote the culture of catering for diversity. From the "teacher as accommodator" perspective, though in reality there are teachers unwilling to teach adaptively, yet they simply can

no longer ignore the growing diversity in today's classroom and are urged to equip themselves with strategies to improve instruction.

Through systematic teaching trials and feedback, some participants viewed themselves growth as "reflective practitioners", constantly developing their skills, abilities and competencies in this program with continuous and progressive assistance from external expertise. From the "teacher as reformer" perspective, teachers perceive they experience professional growth by helping develop a well-supported school infrastructure, including restructuring curriculum, timetable and managing resources and manpower. Lastly, "teacher as learner" perspective demonstrated that teachers viewed themselves as professional learners in face of ever-rising demands in the educational environment.

To summarize, the study highlights the necessity of mapping teachers' needs, beliefs, self-efficacy and concerns when supporting them to make DI into practice (Pozas & Letzel, 2019). We believe that in addition to catering students' diversity, teachers' diversity should be well acknowledged. Taking teachers' perceived needs and challenges into consideration could help to facilitate the DI practice at all-rounded levels, getting teachers with sufficient embedded professional development opportunities and build their self-efficiency in differentiation.

Though there were teachers still conservative about the feasibility of differentiation because of the class size, time and resources constraints (Nicolae, 2014), the results of the present study indicate the positive impact of a PD program to adopt a differentiated approach to teaching and learning in Hong Kong classrooms. In addition, this study attempted to gain insights into the elements that support teachers' growth from their perspectives, which sheds light on the evidence base that can be used to design and implement PD activities that could assist in service teachers to approach differentiation in classrooms confidently. From our findings, the key to ensure PD effectiveness lies in engaging teachers in quality training in a supportive work environment and obtaining support from experienced external agents.

Limitations and Suggestions for Future Research

First, the small sample prevents us from generalizing the results to a wider population within the context. Second, participating schools may have a higher readiness to attempt implementing DI given their own curricula. It is suggested that different context conditions, school climate, motivation of teachers must be taken in consideration in future study. Nevertheless, the present study lays the foundation for future study to understand the change-making process of DI PD programs for primary and secondary schools' teachers. The study also contributes to the understanding of the endurance of teacher change. As a result, PD programs for teachers in the future could be far more effective and powerful.

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The Role of Cooperative Activities for Differentiated Instruction

Robbert Smit, Petra Hecht, Alexandra Taras & Marion Matic

Abstract

Differentiated instruction is increasingly encouraged in inclusive learning settings, but there are still some difficulties with respect to the full implementation of joint learning activities in such settings. We used video clubs as a promising tool to enhance Austrian and Swiss teachers' competencies in noticing core features of their own inclusive teaching. Eight general and special-needs teachers met three times locally and once in a cross-national setting. Our qualitative research focused on patterns of frequencies and differences in the perception of inclusive education by teachers across two different school levels. A model of differentiated instruction incorporated into joint learning activities is presented, and we illustrate the model and results with an exemplary description of a joint learning lesson.

Introduction

Although flexible grouping is part of Tomlinson et al.'s (2003) concept of differentiated instruction, the importance of the role of cooperative activities in inclusion of all learners has not yet received much attention in literature. According to Tomlinson (1999), differentiated instruction encompasses, the efforts of teachers to respond to variance among learners in the classroom. They can differentiate three classroom elements based on student readiness, interest, or learning profile: (1) content – what the student needs to learn, or how the student will get access to the information; (2) process – activities in which the student engages in order to make sense of or master the content; and (3) products – culminating projects that ask the student to rehearse, apply, and extend what he or she has learned in a unit. Inclusive practices are a much broader concept that refers to any strategies/behaviours that teachers use to ensure that students with diverse abilities can learn in regular classrooms (Finkelstein et al., 2021). Differentiated instruction can be part of such inclusive practices (Gheysens et al., 2021). Feuser (1998), a German didactician, pointed out that in addition to individualizing learning by means of differentiation, it is also a matter of thinking about joint learning activities on a common topic in the classroom. Otherwise, there will be separate rather than inclusive learning among indi-

vidual students in the differentiated classroom. In this sense, inclusive teaching requires a differentiated learning environment, in which all available curricular elements (i.e., process, product and content) can be used to enable individual learners to participate as much as possible in joint activities (Loreman, 2017; Tomlinson, 1999). The teacher's task is firstly to enable learners to access classroom activities; secondly, to involve them in the work; and thirdly, to enhance the impact of the work (Suter, 2019).

The background to our study was a professional development (PD) initiative for co-working general and special needs teachers, with the aim of enhancing the quality of inclusive learning settings. A video club (Sherin & van Es, 2009) was held three times in two regions, in which scenes from the teachers' own lessons were viewed and interpreted in a focused way. One target centred on the situational demands that teachers faced (e.g., noticing students' needs, setting individualized goals and designing common learning activities). A second focus was on joint delivery of lessons by general and special needs teachers. Finally, a joint video club took place across the two participating countries. It should be noted that in Austria, secondary school teachers participated, while in Switzerland, primary school teachers were involved.

Video clubs facilitate discourse between teachers, based on what they notice within video excerpts of their lessons, which can lead not only to changes in their noticing but also to instructional changes and adjustments to their management and classroom behaviours (Meadows & Caniglia, 2018).

In the following, first, we present a model of differentiated instruction incorporated into joint learning activities; second, a description of an exemplary case of such a joint learning lesson is presented; and third, we investigated how frequently teachers were able to notice elements of inclusive teaching, and specifically joint learning activities. In our analysis of the content of the video club conversations, we were guided by the following research question: What do teachers notice when they look at their own inclusive practices, and how does this differ between contextually different video clubs? Although the present study was based on a cross-national comparison, ultimately, it was differences between school levels that were found to be more relevant. Such an approach to comparing school levels is in line with research by Gheysens et al. (2021) and Gebhardt et al. (2015), where it was shown that primary school teachers seem to implement inclusive teaching practices more frequently than secondary school teachers. Nevertheless, our study has helped to identify important aspects of inclusive lesson planning for both school levels (Prediger & Buró, 2021). Gheysens et al. (2021) showed that teachers who implement more inclusive practices also provide more differentiated instruction.

Theoretical framework

Professional development with video clubs

Research has shown that video-based noticing and reflection raises teachers' awareness of their own teaching as part of PD (Rosaen et al., 2013; van Es & Sherin, 2008). Noticing has been described as a component of expert practice and is a competence also referred to as professional vision (Sherin & van Es, 2009). Professional vision encompasses the ability of teachers to link general pedagogical knowledge with the components of effective teaching and learning in order to identify and assess important features of classroom teaching, such as inclusive practices (Seidel & Stürmer, 2014). The noticing construct has recently been characterized as consisting of three parts: attending to noteworthy events, reasoning about such events and making informed teaching decisions on the basis of analysis of these observations (Santagata & Yeh, 2016).

Gheysens et al. (2021) could show that teachers who are more proficient at noticing inclusive practices also report applying more differentiation practices, such as flexible grouping or adaptive teaching (Corno & Snow, 1986), compared to teachers who are less able to notice them. However, research has also shown that when teachers watch videos of their own teaching, their attention is initially drawn to issues of classroom organization and general teaching practices (pedagogy, climate or management) rather than subject learning (Colestock & Sherin, 2009; Meadows & Caniglia, 2018).

On the one hand, teaching is planned, but on the other hand, it is also characterized by openness and unpredictability. Thus, the teacher directs what is happening but also spontaneously notices what is happening, makes key decisions and reacts according to the situation. The numerous situational decisions made during lessons cannot usually be discussed and agreed in advance by general and special needs teachers (Mulholland & O'Connor, 2016). General teachers as well as special needs teachers often approach lesson planning from their typical professional perspective and interpret situations in lessons from this specific perspective (Kuntz & Carter, 2021). A general teacher is likely to focus more on the method and task, while a special needs teacher may focus more on the learning path or access to certain learning content. In order for inclusive teaching to succeed, it is therefore necessary to combine the two perspectives, especially with inclusion of learners' perspectives.

Inclusive teaching practices

Inclusive teaching aims to achieve two goals: (1) promotion of individual learning by differentiating "content, process and product" to suit the different abilities of students; and (2) providing joint learning settings in the classroom community, with social goals of equal participation (Janney & Snell, 2006; Krähen-

mann et al., 2019). Joint learning is understood as pedagogical implementation of the general idea of inclusion. It consists of creation of a common learning environment with activities for all (Feuser, 1998). In terms of the instructional design, this can include whole-class activities as well as heterogeneous small-group activities, with all students participating in the same topic area (Prediger & Buró, 2021). As Kuntz and Carter (2021) point out, general educators' lesson planning can have an impact on the opportunities for students to engage and interact within a class. This can be done more productively in cooperation with the special needs teacher (Janney & Snell, 2006). Unfortunately, special needs teachers are not always available for cooperation because, in many countries, they need to divide their support time between several classes, including in the two countries involved in this study (Austria and Switzerland) (Kronenberg, 2021; Schwab et al., 2015). With respect to goal (1) above, differentiation of curricula and teaching practice, as well as learning materials, tasks and approaches such as differentiated instruction (DI), has been recommended (Tomlinson, 1999). However, DI basically differentiates between groups of learners with different ability levels and does not provide suggestions as to how students with or without special needs can cooperate on a joint learning objective (goal (2)) (Krähenmann et al., 2019).

In his dissertation on inclusive task-oriented English teaching, Suter (2019) suggests combining these two goals, being responsive to students' varying abilities in three distinct ways, as follows:

1. Enabling practices: Students should be able (or, if necessary, be made able) to engage in classroom activities and participate in problem-solving interactions.
2. Involving practices: Students should be committed to collaborating and working together (or, if necessary, be given support in order to do so).
3. Enhancing practices: Students should use what they have learned for further learning (if necessary, with support) with regard to development of communicative and intercultural competences; for example, presenting group results to other class members.

The first group of practices relates to support that is needed to compensate for or circumvent weaknesses of students with special needs (Corno, 2008). In their lesson planning, teachers modify the content, process and products to facilitate the participation of all learners in small groups and in the classroom generally (Tomlinson, 1999; Tomlinson et al., 2003). Figure 1 shows how differentiation strategies work together with the three support practices identified by Suter (2019). This support includes, for example, additional materials, peer support or explanations by firstly (but not only) the special needs teacher during the activity itself. The second group of practices builds the nucleus of inclusion activities. Students of different abilities then work and learn together in small groups, completing individual tasks as part of a larger cooperative assignment.

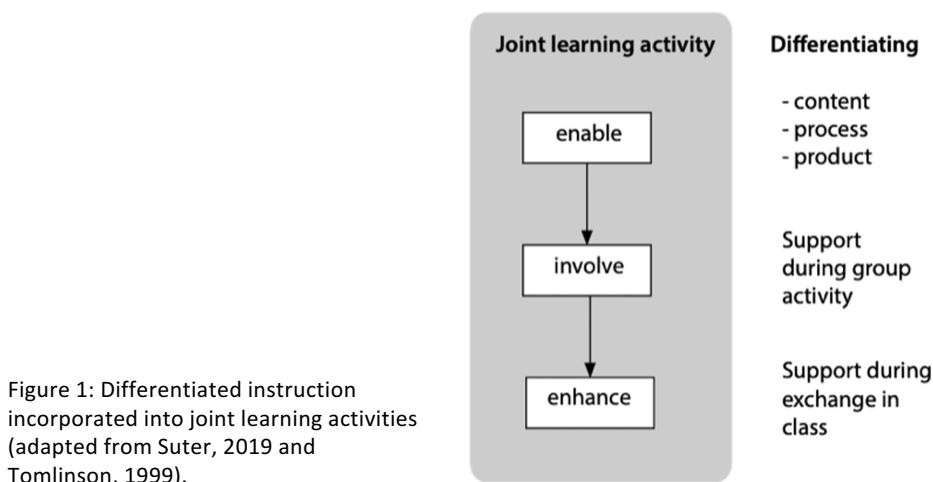


Figure 1: Differentiated instruction incorporated into joint learning activities (adapted from Suter, 2019 and Tomlinson, 1999).

General and special needs teachers actively support this process. Finally, the third group of practices involves presenting the results of the learning process in the group or class, and teachers giving feedback and determining further learning steps. This step relates to cognitive and also social dimensions, producing collective experiences in class which can help establish feelings of inclusion (Garrote, 2017).

These three responsive practices – enabling, involving and enhancing – coincide with the current instructional demands on teachers: in order to provide adequate learning support, teachers need to notice students’ abilities and identify potential challenges in common learning environments with regard to these abilities (Randi & Corno, 2005). Development of such perception competences and the ability to interpret significant learning situations and appropriate teacher support happens optimally in teacher communities, such as video clubs (Santagata & Yeh, 2016). This is because community discourse can influence a practitioner’s teaching decisions and even lead to behaviour that is more at odds with previous understandings of what inclusive practices should look like, and it can help overcome, for instance, the idea that targeted practices should only be enacted in supplemental pull-out groups (Prediger & Buró, 2021).

Based on these considerations, our research question was as follows: What differences in frequency and perceptions of inclusive education were evident among teachers at different school levels and with respect to teaching practice (e.g., pedagogy for inclusion, climate and management)? Specifically, we studied the three different support practices for differentiated learning.

Methods

Research design

Our video study was conducted over the course of one school year. Teachers designed lessons as they would normally and evaluated the “intervention” with the help of facilitated discourse.

In each region, three lessons (each 45 minutes) featuring inclusive teaching were recorded by the research team. Video clips of around 2–3 minutes for teacher meetings were selected by the facilitator. Gatherings – video clubs – were conducted and recorded for further analysis. The meetings (50 minutes) were held at the participants’ school to avoid adding to the teachers’ workload. A final meeting of both groups also marked the end of the PD project. At this point, video clips were shown to the group from the other participating country and discussed, and there was also a general exchange about the conditions and purpose of inclusion. Seven meetings were videoed for further content analysis.

Sample

The sample consisted of four teachers each for grades 3–4 (primary school) and grades 5–7 (secondary school). The participating teachers in grades 3–4 included two special needs teachers and two general teachers from the eastern part of Switzerland, who co-taught third- and fourth-grade pupils in multi-grade classes. All the teachers were female and had differing levels of teaching experience. One general teacher had been teaching for less than 5 years and the other three for 20 years or more. One of the participating classes was made up of 15 students, and of these students, three were receiving special needs education and one was being taught “German as a foreign language”. The other class included 17 students, and of these, six were receiving special needs education, and two were being taught “German as a foreign language”.

The participating teachers in grades 5–7 included two special education teachers (female) and two general teachers (one male and one female) from the western part of Austria. They also taught on a co-teaching basis but in single-grade classes. Three of the four teachers were highly experienced, with more than 20 years experience, while one special needs teacher had less than 10 years teaching experience. One of the participating classes was made up of 24 students, with one student receiving special needs support (20 hours a week). The other class included 22 students, and of these, three were receiving special needs education.

The teachers were from neighbouring regions, they shared the same language – German – and there is a comparable structure of their compulsory school systems. However, in Austria, the transition to secondary school happens two years earlier than in Switzerland (after grade 4).

Analysis

The seven recorded video club meetings were analysed by means of qualitative content analysis, with inductive and deductive category development (Mayring, 2000). The focus of the analysis was on inclusive teaching practices and what teachers noticed from their perspective, without guidance by the facilitator. Our understanding of inclusive teacher practices was relatively broad. They compassed, in line with Finkelstein et al. (2021), organisational and motivational support, as well as assessment and monitoring. The aim of the content analysis was to detect patterns that relate to the concepts of inclusive practices and joint learning activities. For the content analysis, we developed a code manual, which was edited and extended by the research team whenever needed. The main analysis was computer-aided, with use of the MAXQDA program (Kuckartz & Rädiker, 2019), and was consent-coded. For this, the same videoclip was coded by two coders, in accordance with the code manual. Where there were differences of opinion, the sequences in question were discussed until a consensus was obtained, according to which the passage was then newly coded (Richards & Hemphill, 2018). Each event was assigned to exactly one category with few exceptions. Because the language spoken in the video clubs was in Swiss and Austrian dialects, and to avoid losing the subtleties of the respective languages, the dialect affine coder from each country firstly coded their own video club, while the other coder undertook the second round of coding for the same video club. After each iteration, the coders met and discussed sequences where agreement had not been reached. If there was still a lack of agreement, the discussion was opened up to the project leaders.

The code manual comprised eight different categories of noticing for teaching practices (see Table 1). The categories were derived deductively from the literature, for example, De Vroey et al. (2016), Schlüter et al. (2016) and Booth and Ainscow (2002). DI was separated into DI planning and DI performance.

As co-planning and co-teaching are mentioned as being important topics for inclusive teaching in the literature (Kuntz & Carter, 2021), we included the category of *teamwork* as well in our code manual. However, because this category was not often noticed by the teachers, we have refrained from presenting a detailed analysis here. We interpret this finding to mean that cooperation between main teachers and special needs teachers was good in the schools in this study.

Table 1: Video analysis categories with respect to teaching practices.

Noticing category	Definition	References
Curriculum	Pedagogy, curriculum (adapted for students with special needs), DI planning	De Vroey et al., 2016; Tomlinson, 1999
Enable	Students are enabled for activities in classes, with DI performed.	Tomlinson, 1999; Suter, 2019
Involve	Students are involved in the work, and there is a focus on active participation and engagement.	
Enhance	Students' work is reinforced and serves to support development of communicative competencies and problem-solving cooperation.	
Classroom organization	Clear routines and efficiency, peer-assisted learning and co-teaching, individualization, self-instruction, organization of the lesson and classes, and organization of the students (e.g., in group work)	De Vroey et al., 2016
Assessment	Teachers' perceptions about learning levels and/or (mathematical) thinking, reasoning and ideas of the students	Sherin & van Es, 2009
Engagement	Teachers' perceptions about the students' learning engagement	
Social climate	Emotional climate, informal peer support, social interventions by the teachers, positive image and acceptance, self-determination, appreciation from teachers and students, and support among students (solidarity)	Booth & Ainscow, 2002; De Vroey et al., 2016

Results

In the following, we firstly describe a videotaped lesson, to facilitate understanding of the aim of the PD and the results of the study. The results are presented separately for each of the two video clubs and the final meeting. Although a time aspect has often been mentioned in similar studies, we could not detect any significant changes in the categories over time. Therefore, in this study, we focused on differences between the two school levels. The frequencies of codings in categories in the three video clubs were summarized to make the results more salient.

Lesson example

To illustrate the findings and the theoretical concept of a joint learning setting, we will now describe one of the lessons from our study, which took place

in a third- and fourth-multi-grade class. The goal of the mathematics lesson was to be able to estimate weights based on representatives. At the beginning, small groups of four were formed by letting the children draw an animal figure. As learning material, the groups could choose several quartet cards featuring topics such as different horses, trucks or cars. Hence, there was differentiation by interest, but the content and task were the same for all students. All students were basically able to engage in this activity (*category enable*). The target was to order the cards by weight, and the cards only bore information relating to, for example, speed, size or appearance (but not weight). The weight of the representative therefore had to be determined or estimated indirectly.

Within each group, every student had a role: group leader, scribe, time-keeper or presenter. The process of assigning these roles was left to the students. This meant that during the activity, the process was differentiated, but this differentiation was partly random. It was not clear whether all students were able to fulfil their role. The general and special needs teachers observed what was happening in the group and helped with questions. They did not interfere in the process or offer hands-on support for students with special needs. It could be observed that all students were able to collaborate within their group in order to reach the group's target, ordering the cards by weight (*category involve*). Finally, all groups presented their product and explained some of their strategies in class. In one group, the presenter had to be replaced by the group leader because the student with special needs did not want to present herself. The support given to *enhance* had been forgotten and could not be activated in time. Interestingly, this was only noticed by the teachers in the video club when the facilitator pointed it out.

Frequencies of the codings

In the following we report on how inclusive practices were perceived in the two groups (cases), and in particular how the joint learning activities became visible as a concept. Across all categories, *classroom organization* was the most discussed topic, with 26.3% in grades 3–4, 23.5% in grades 5–7 and 38.0% in the cross-national meeting (Table 3). It is important to mention that in the category of *classroom organization*, we coded both organization of the teachers and organization of the students among themselves, e.g., in group work (see also Table 1). The next most frequently occurring categories for grades 3–4 were *assessment* (14.9%) and *engagement* (12.5%), whereas for grades 5–7, they were *curriculum* (19.8%) and *engagement* (18.2%). In the cross-national meeting, after *organization*, the categories of *curriculum*, *assessment* and *social climate* were the next most frequently discussed topics, each with 10.9%. Noticeably, despite their importance for inclusion, the key aspects of *enable*, *involve* and *enhance* were not discussed as much as the ones already mentioned. It was only in the case of grades 3–4 that *involve* and *enhance* (each with 10.2%) seemed to

be of some importance. Furthermore, among the lower grades, *curriculum* was not mentioned so much (5.9%), whereas among the higher grades, *social climate* (5.9%) and especially *involve* (3.7%) were not noticed very often.

Table 2: Coding frequencies for the *practices* category for the two grade levels and cross-national meeting.

Practices	Primary school grades 3–4		Secondary school grades 5–7		Cross-national meeting	
	N	%	N	%	N	%
Curriculum	15	5.9	37	19.8	14	10.9
Enable	21	8.2	16	8.6	9	7.0
Involve	26	10.2	7	3.7	11	8.5
Enhance	26	10.2	12	6.4	6	4.7
Classroom organization	67	26.3	44	23.5	49	38.0
Assessment	38	14.9	26	13.9	14	10.9
Engagement	32	12.5	34	18.2	12	9.3
Social climate	30	11.8	11	5.9	14	10.9
Total	255	100	187	100	129	100

Discussion

In our study, we sought to identify important aspects of inclusive lesson practices for both primary and secondary school levels as research has suggested differences here (Gheysens et al., 2021). Overall, in our video clubs, teachers noticed similar aspects of inclusive teaching as in other studies (De Vroey et al., 2016). In the analysis, it was evident that some aspects seemed to be more salient for teachers than others. The category of *classroom organization* was most frequently noticed. This fits to some extent with the findings of Colestock and Sherin (2009), who found that teachers, especially in the initial meetings, drew attention to issues of classroom organization when they watched themselves in videos. It should also be mentioned that the primary teachers not only noticed their own organization but also that of the students. Such a focus, directed away from the teacher and towards the students, is desirable as their learning can then take centre stage. Proactively noticing individual variances is most effective for differentiated instruction (Tomlinson et al., 2003).

There were some differences between primary and secondary teachers' observations: *curriculum* was more frequently a topic of note in the secondary school video club than in the primary one, whereas *social climate* was focused on more by primary practitioners but not by secondary teachers. These results may be explained by the more subject-oriented focus of secondary school teach-

ers (OECD, 2018), who also perceive their involvement with pupils' emotional life as less central to their task (Tatar, 1998).

A less favourable result was that the important inclusive teaching practices of *enable*, *involve* and *enhance* (Suter, 2019) were not mentioned as often as was hoped, and this was especially the case for grades 5–7. It was only in grades 3–4 that *involve* and *enhance* were noticed more frequently. One reason for the differences between practitioners across grades could be that primary teachers were more used to applying heterogeneous small-group activities in their multi-grade classes. Many of the skills necessary to effectively teach a multi-grade class are similar to those needed for teaching pupils with special needs in any class setting (Tiernan et al., 2018). Overall, it may be assumed that there is still a need for professional development regarding inclusion practices. Teachers might be readily able to differentiate learning materials (*enable*) and stage group work, but if practitioners do not take the opportunity to provide necessary support during an activity, there is a risk that inclusion of pupils with special needs in a joint learning setting will get stuck in the social domain. Subject learning might disappear from the perspective and will be hindered.

Overall, our analysis identified important categories of inclusive teaching, in accordance with the literature. However, the often mentioned topic of “teacher collaboration” – an important dimension of inclusive teaching (Mulholland & O'Connor, 2016) – was not really an issue in our video clubs. We found it surprising that the teachers neither talked about it to any great extent nor talked about challenges associated with collaboration. A possible explanation could be that the teachers might have thought the facilitators expected them to focus on instruction and to leave teamwork aside. Another possibility could be that in the case of the teachers who volunteered, collaboration works well; otherwise, they would not have participated.

This study did have some limitations, which should be mentioned. To start with, the sample was rather small, and there were just three meetings in each video club, meaning that the findings may not be generalizable and may be associated with a degree of uncertainty; on the other hand, we could not detect changes in noticing over time (which might have occurred over a longer time span and which have been reported in other studies) (Sherin & van Es, 2009). Another limitation is due to the different grades and school systems in the two video club groups, making a direct comparison difficult. However, in our study, this was, to a certain extent, an advantage as we could show differences between the two school levels. Although the video clubs were in two different countries, these were neighbouring regions with a shared understanding of pedagogy. It needs to be pointed out that low frequencies in certain categories do not necessarily mean that the teachers did not notice such things; rather, it could mean that these were not issues as such and were therefore not dwelt upon in discourse. In addition, the frequency and what was noticed depended on the lesson sequences in question, which were selected by the facilitator.

Furthermore, although the facilitator held back in leading discussion of observations, the job still entailed giving prompts now and then to make the discussion productive. Thus, the facilitator also had an influence on the choice and frequency of topics.

It was particularly encouraging to find that support for removing obstacles to the participation of students with special needs in classroom activities was acknowledged as a goal by all teachers, and this is one of the notable successes of the project. Recognition of the importance of peer support came into the category of *social climate*, and there was generally a strong focus on this for students from the outset. On the other hand, we demonstrated that joint learning settings were not yet being fully implemented. While adapting teaching practice (e.g., differentiating learning material) was part of the repertoire of the teachers, support during joint learning sessions (e.g., individual scaffolds) needed further professional development. From a theoretical perspective, further improvement in the concept of differentiated instruction is called for. When applying differentiated instruction, teachers should not only align the content, process, and product(s) to different groups independently of one another but also plan moments of exchange between all learners in the class. Otherwise, the full participation of students with special needs in classrooms will remain just a postulate. The model of differentiated instruction incorporated into joint learning activities that we have presented here could be an example of appropriate development in this direction.

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How Experts' Advice Influences Teachers' Implementation of Differentiated Instruction

Wouter Smets

Abstract

This study presents a personal perspective of the role of a teacher-educator and researcher in the endeavor of studying and implementing differentiated instruction (DI) in practice. The three cases discussed examine teachers involved in an action research program in which they sought to implement DI in a superdiverse context. These cases are used to reflect on how the author's role as an expert affected the teachers' efforts to close the gap between the theory and practice of DI. Autoethnography is used in order to achieve a more than strictly (auto)biographical relevance. Each case relies on an epiphany, a turning point that gives insight into the broader structure of the relationship between the teachers and the author. It is argued that experts such as teacher-educators and researchers, when fostering the implementation of DI, must acknowledge teachers' emotionality. Emotional determinants of the nexus between theory and practice in the field of DI are also explored.

Introduction

The gap between educational practice and educational research is a matter of ongoing concern among educational experts. Practitioners, educational administrators, and scholarly experts are concerned about the persisting knowledge gap between the fields of educational theory and practice (e.g. Alexander, 2018; Biesta, 2007; Broekkamp & van Hout-Wolters, 2007; Vanderlinde & Van Braak, 2010). The ambition to reduce this gap has been on the agenda of educational policy makers for decades. There are rational reasons that explain this gap. For instance, practitioners are of the opinion that scholarly research is not sufficiently practical (Broekkamp & van Hout-Wolters, 2007). Research dissemination through scholarly articles is criticized for being ineffective, and communities of practitioners are advocated as a means of intensifying research mobilization (Vanderlinde & Van Braak, 2010). Furthermore, the fragmented character of the research literature complicates the application of research findings into evidence-informed educational practice (Nelson & Campbell, 2017). However, this rational focus on the theory-practice gap does not suffice to gain a deep understanding of the problem. This study aimed to explore the gap between

theory and practice in the educational sciences from within, while focusing on teachers' implementation of differentiated instruction (DI).

Differentiated instruction: a basic teaching competence?

Differentiated instruction is proposed as one of the solutions to addressing issues of heterogeneity in diverse educational settings (George, 2005; Levy, 2008; Smale-Jacobse et al., 2019). It is a teaching philosophy and an approach to teaching that intends to enable teachers to adequately respond to the diverging needs of all students (Tomlinson, 2000). It implies that teachers adapt the content, process, or product of the teaching process to students' differences in terms of their learning profile, interest, or readiness level (Tomlinson et al., 2003). According to many scholars, teachers should engage in evidence-based practice (e.g. Muijs & Reynolds, 2011). In Flanders, where this study was undertaken, two main indicators point to the relevance of addressing differences among students in secondary education. First, there is the (international) tendency to promote inclusive education for students with special needs. Second, there is the recent influx of students with migration background. Even then, it is unclear to what extent the nominal number of students in both situations alters the demographics of educational sociology – educational policy that guarantees the inclusion of students with less traditional profiles – incited many practitioners to rethink their ideas on catering for heterogeneity. In addition to the increasing awareness of students' social and cultural diversity, it is now recommended as evident educational good practice to tailor educational strategies to the heterogeneity among groups of students (e.g. Willingham, 2017). In other words, it is not only because students with special educational needs or students with a migratory background are present in the class that DI is recommended as an educational standard. It is the increasing awareness that a plethora of differences exist among students, and that the effectiveness of learning processes is strongly determined by them, which inherently increases the urgency for teachers attend to these differences. A particular issue for Flanders, where this study was conducted, is that being able to implement DI has been legally seen to be a basic teaching competence for more than a decade (Aelterman et al., 2008).

However, although scholars are advocating the practice of DI, the mobilization of research knowledge with regard to adaptive teaching practices often remains problematic (Dack, 2018). Wan (2016) found concerns about self-efficacy beliefs among pre-service teachers, commenting that “these concerns may be related to practical experiences and confidence as well as expectations upon students” (p. 148). Based on survey data, Gaitas and Martins (2017) summarized five factors of teachers' perceived difficulties in relation to different instructional strategies: 1) activities and materials; (2) assessment; (3) management; (4) planning and preparation; and (5) classroom environment. Overall, it may

be concluded that, across the globe, the implementation of DI is far from evident practice. In other words, a large gap between theory and practice exists in the field. Research has shown that even motivated teachers often do not succeed in implementing DI as it is theoretically proposed by various authors (Piltén, 2016; Smets et al., 2020). Although most teachers succeed to some extent in implementing particular strategies related to DI, the challenge of responsiveness appeared to be common to all participants (Smets et al., 2020). Therefore, DI as a cyclical process of instructional design in which teachers conduct ongoing assessment of students' individual traits requires a higher-order type of teacher competence.

Sutton and Wheatley (2003) argued that teachers' emotions are an integral part of their lives and that they are therefore influencing teachers' cognitions. They defined emotions as multi-component networks of change "including appraisal, subjective experience, physiological change, emotional expression and action tendencies" (p. 329). In this study, this idea was applied to the relationship between teacher-educators and in-service teachers. Hamre and Pianta (2006) stressed how vital student – teacher relationships are for educational processes. Aligned with this, this study focusses on the relationship between teacher-educators and teachers following a professional development program. It was hypothesized that this relationship has a strong emotional component.

Grzymala-Kazłowska and Phillimore (2018) stated that rapidly increasing diversity challenges actors at all societal levels. The term 'superdiversity' is used to describe the current levels of sociological diversity, which are both quantitatively and qualitatively more diversified than in the past (Meissner & Vertovec, 2015). Geldof (2013) described how, in some cities in Flanders, the research context of this study, there is no longer a single ethnic group in the majority. In addition to this, he described the broad variety of cultural, linguistic, socio-economic, and other characteristics that are related to people with migratory backgrounds in a context of superdiversity (Geldof, 2015). This context evidently challenges educational professionals to innovate educationally, in order to accommodate all students' needs (Schleicher, 2013). Research has frequently documented how teachers feel challenged by student heterogeneity in their classrooms (Goei & Kleijnen, 2009). They often feel stressed or uncertain (Liljequist & Renk, 2007); hence, teacher self-efficacy is a crucial determinant of their implementation of DI (Khanshan & Yousefi, 2020). It is, however, relatively unclear how mediators, such as teachers' educators, may help to reduce negative feelings that hamper teachers mobilizing theoretical knowledge into practice.

Scope and aim of the study

Research mobilization that intends to bridge the gap between the theory and practice of DI must not be interpreted as a linear and rational process. Building

on the characteristics of DI, it was stated “that scholarly study of the concept cannot solely rely upon classic reductionist empirical epistemology” (Smets & Struyven, 2018, p. 70). At present, our understanding of how contextual factors influence teachers’ implementation of DI is still limited. It is clear that teachers’ emotions strongly determine their job performance, and that such emotions may not be simply treated as irrationalities (Sutton & Wheatley, 2003). Tsang and Kwong (2017) argued that teachers feel disempowered as a result of educational change. Similarly, Helsing (2007) concluded, “The literature on teacher uncertainty suggests that it is a significant and perhaps inherent feature of teaching and that there are fundamental differences in the ways that teachers describe, interpret and respond to their uncertainties.” (p.1328). Hence, educational professionals who are challenged when catering for increasing diversity often feel uncertain about their professionalism (Grzymala-Kazłowska & Phillimore, 2018; Madalińska-Michalak et al., 2018). Research mobilization aimed at innovating teachers’ practice is influenced by teachers’ emotions. In order to better understand the implementation of DI in practice, this study aimed to apply this conjecture to the field of DI. Evidence was collected of how an expert’s mediation in a professional development program affected teachers’ emotions. More specifically, the study aimed to reflect on how this can facilitate, or rather hamper, teachers who feel challenged by the complexity of DI. Therefore, the following research question was formulated: how does a teacher-educator’s expert advice affect teachers’ emotions while implementing DI.

Methodology

The reflections that are presented are based on the relationship of the author with three participants of an action research program described in two other studies (Smets et al., 2020; Smets & Struyven, 2020). The project included a professional development program for schools in an urban setting. Participants voluntarily followed the program, motivated by a need to cater for increasing heterogeneity in their classes. All participants expressed a desire to engage with innovative teaching approaches in order to better cater for heterogeneity among students in the classroom. The focus of the research project was primarily on scaffolding teachers to implement the principles of DI in practice. A guided but open-ended implementation of such an approach was therefore supposed to give insight into which types of instructional strategies were perceived by the teachers as relevant and accessible, and what dynamics emerged as a result of their intended implementation of DI. The author was in charge of the full professional development program, which implies that he acted as an expert in order to allow participants to ask questions about difficulties arising during the program. However, based on the principles of participative action

research, it was a choice to engage with participants in order to construct a participatory research culture (Kemmis & McTaggart, 2007).

Data collection for this study was initially based on field notes taken by the author during this program. Program participants were interviewed using in-depth semi-structured topic lists, with a focus on the challenges and pitfalls of the implementation of DI. Transcripts of these interviews were produced. Memos were written during the qualitative data analysis. Both field notes and memos were discussed and interpreted in the author's research group. This study used autoethnography to interpret and contextualize the meaningful biographical experiences of the author (Denzin, 2014). According to Chang (2008), self-narratives "can be used as cultural texts through which cultural understanding of self and others can be gained" (p. 13). They play a role that is similar to thick descriptions in classic ethnography (Geertz, 1973). Narratives contain traces of human lives that researchers want to understand. Consequently, narrative research identifies and interprets traces that remain out of focus in a classic research design (Andrews et al., 2013). In the current study, such traces that remained out of focus in both studies that were mentioned above are presented. In autoethnographical research, epiphanies are used as primary empirical data on which research is grounded. Denzin (2014) described them as significant events or "...turning point moments in a subject's life" (p. 12). Data used in this study were anonymized, hence the names used in the case studies are pseudonyms.

Epiphanies of the nexus between theory and practice

The following examples describe epiphanies that altered the author's insight into his relationship with the three participants of the action research programs in which he had a role mediating between the worlds of theory and practice.

Case 1: Aline

Aline is a middle school French and history teacher. At the start of the program, she explicitly referred to the cultural heterogeneity of her students as a significant challenge for her. Hence, she participated enthusiastically throughout the action research program. In an interview near the end of the project, she apologized for repeatedly seeking my confirmation of what she was doing as part of the project. She mentioned her own uncertainty and linked this to her need for confirmation. The moment functioned as a cumulative epiphany. It made me realize how uncertain Aline had been throughout the project. I suddenly realized how often she had been looking for my confirmation and feedback. Regularly she asked if "...what she was doing was ok", or if "...what she was doing was indeed differentiated instruction". I interpreted these statements as

her looking for a more affirmative or supportive approach on my part. Aline seemed not only to need expert counseling, but also a sort of personal confirmation that would provide her with the self-efficacy she needed.

My relationship with Aline gave me insight into the impossibility of my initial aim of being a neutral observer. Aline was more than a subject whom I was observing. We were in a dyadic relationship, and she expected me to be in the position of an expert. The design of the action research program, in which I initially provided three training sessions, was difficult to align with a neutral researcher stance. My relationship with Aline confronted me with the impossibility of acting as a neutral observer. Gradually, it occurred to me that the teacher-participants had expectations with regard to my role. Aline wanted my counseling in order to be able to innovate her teaching. Hence, in addition to being a neutral scholar, I was also supposed to be a mediator between theory and practice. Moreover, I believe my relationship with Aline was strongly determined by the fact that I was in the position of a *supposed-to-be* expert.

At the time, I had only recently begun to study DI. Consequently, I did not see myself as an expert. Nevertheless, despite my efforts to create an equitable relationship with Aline, I do not believe I achieved this. During field contacts, she continued to address me as “sir” and treated me as an expert.

The vulnerability of some of Aline’s comments triggered me to reflect. She claimed to have low levels of self-efficacy, in particular with regard to teaching in heterogeneous settings. This caused her a great deal of concern. I began to believe that, to an important extent, Aline’s implementation of DI depended on our relationship. I wondered to what extent her self-declared uncertainty was related to me. Was it related to my supposed-to-be position as an expert? Was it related to the changing demography in her classes? Could her uncertainty be traced back to the simple fact that she was trying out new teaching methods? I have no clear answers to these questions. However, it seems to me that the emotionality of the process cannot be neglected. Aline’s uncertainty seemed a crucial determinant of her implementation of DI, both by feeling motivated to engage with new teaching approaches, and also by seeking confirmation in reaction to uncertainty. Moreover, it occurred to me that my role as a mediator between theory and practice needed to acknowledge this emotionality.

Case 2: Maarten

In Maarten’s case, I believe that his implementation of DI was also highly influenced by our relationship. Maarten is a middle school mathematics teacher. Initially, he said that he was highly motivated with regard to the project. Maarten’s enthusiasm was put to the test during the implementation phase of the project. He reported disappointment when our action plan for the implementation of DI was discussed with him. Maarten had expected a more detailed

roadmap and was reluctant to engage in decision-making about instructional design. One night he sent a long e-mail asking me for more support. He wrote sarcastically that he "...admitted to being a bit autistic", and hence referred to his need for structure and support.

Maarten's e-mail served as a minor epiphany in our relationship. It made me realize how uncomfortable he felt about the whole process of innovating in terms of his teaching. It occurred to me that it must have been difficult for him to discuss the problems that he was facing, and to switch from high hopes and high expectations to sheer disappointment. Looking back to the first encounters we had, I re-interpreted his enthusiasm as a strong desire for solutions for the problems that he was facing. This is why my colleague and I engaged in making him feel more comfortable by endorsing his professionalism. We also explicitly referred to the open-ended character of the intervention – there could be no "wrong implementation" from the researchers' perspective. I believe that all of this resulted in a less strained atmosphere that permitted Maarten to fully engage in the research project. In an interview at the end of the project, Maarten described that his self-efficacy beliefs had changed during the project, and that he had overcome his initial fear.

The epiphany of Maarten's e-mail made me reflect on the emotionality of the process of engaging with educational innovation. According to Maarten, his colleagues were almost never interested in any innovation. My interpretation of Maarten's position as a teacher in a superdiverse context prompted me to reflect on my own past as a teacher. This helped me to give meaning to Maarten's doubts and concerns. A few years earlier, I had been teaching in comparable conditions. I was at the time also a relatively young teacher. I had already had enough experience to feel comfortable in class; however, I was also challenged by the changing demographics in my classroom. Relating Maarten's experience to my own, I wondered to what extent Maarten needed a teacher-educator at a critical distance in order to inspire him with innovative ideas and practices. I considered to what extent all the ideas and practices that were proposed were threatening from his point of view, rather than inspiring. Hence, I also wondered to what extent my role as a teacher-educator and researcher had to change in the light of these ponderings. Could Maarten's discomfort diminish as a result of acknowledging the difficulties of translating theory into practice? And, hence, could his implementation of DI be stimulated by doing so?

Case 3: Annabel

The case of Annabel adds to and contrasts with the first two cases. My effort to establish a relationship of trust between us was unsuccessful, and this seemed to affect Annabel's implementation of DI. Annabel is a high school history teacher. She is the chair of the group of teachers at her school who were en-

gaged in the research project. During an intake interview she stated that she was motivated, but also critical with regard to the possibility of applying DI in her subject. She repeatedly questioned suggestions that I made throughout the project, finding them, for instance, impractical or not applicable for her students. Some of her direct colleagues supported Annabel's remarks, but nevertheless were willing to implement some of the suggestions. Annabel continually postponed initiating the DI strategies. Being a former teacher, I remembered moments when I had also struggled with time management. Consequently, it was not difficult for me to invest in a positive relationship with her. I confirmed the difficulty of implementing theory into practice. I also repeatedly tried to stress that she had the freedom to apply the theory in any way she felt comfortable.

A discussion at the end of the project made me re-interpret her role. She apologized because she was not teaching based upon policy-imposed standards. She said, "I know it shouldn't be, but I actually don't use the standards". She stated a willingness to proceed slowly while innovating in terms of how she taught. I reflected extensively on this moment. It made me re-interpret the effort she had made in the project, and thus also the various statements about how busy she was with other activities at school. It made me realize that her difficulty with regard to implementing DI was not only based on the practical conditions in which she worked, but also on a more deeply felt discomfort. I related this discomfort to the (policy-)imposed strategies, with regard to which she had repeatedly demonstrated a critical distance. Hence, the moment was an epiphany that gave me insight into the problematic character of our relationship. Once more, this epiphany urged me to reflect on my own biography as a teacher-educator and as a former teacher. My perception of Annabel proved inaccurate. I gradually realized that my role as a (former) peer could also have been threatening to her. I had taught the same subject, in similar conditions. Hence, I wondered whether and how these similarities had mediated her intention to implement DI.

My relationship with Annabel illustrates the complexity of my role as a mediator between the theory and practice of DI. Initially, I thought I would be a sort of peer to her, and therefore hoped to make her feel comfortable by seeking convergence with her. Grounded on my own background as a history teacher, I had assumed this feeling of comfort to be a fostering condition that would help her to engage with the proposed innovations. Later, however, I had the opposite indication, namely that she found our proximity threatening. Hence, once again, these indications suggest that Annabel's implementation of DI was affected by the relationship between us.

Cross-case differences and similarities

In each of the three cases that have been described, my embodiment of the nexus between theory and practice was different. The hybrid and dyadic role that I took in the action research illustrates the complex relationship of the participants with the world of theory (Cochran-Smith et al., 2014). The design of the action research program did not permit me to adopt a researcher's position in which I acted solely as a neutral observer. It is common practice for anthropologists and ethnographers to reflect on their position as observers. In anthropology, the idea of an observer being an individual who collects data without influencing the subject is a fairly uncommon researcher stance. It is even criticized as being an impossibility or unethical (Denzin, 2009; Kawulic, 2005). In the educational sciences, however, it is still a common belief among many researchers that the best way to collect data remains one in which the researcher observes subjects without any researcher interference (Packer, 2010). In this study, Aline expected the teacher-educator to be an expert. In addition, Maarten had explicit expectations toward the teacher-educator-researcher. It is my interpretation that my efforts to invest in the emotional aspects of my relationships with Aline or Maarten were worthwhile. These teachers were facing uncertainty as a result of increasing diversity in their classes and felt challenged by the educational change ahead. It was a deliberate choice to facilitate the teachers' implementation of DI through acknowledging the emotionality of the context. In particular, feelings of uncertainty seemed to be prevalent. Important indications point to a comparable analysis for the case of Annabel. Her reluctance to engage with DI was interpreted as a lack of ease with the proposed educational innovations. Despite an effort to make her feel comfortable, she kept postponing her efforts to implement DI. Once more, a role as a teacher-educator and as a researcher interfered with the participant's emotionality.

Across the three cases, it can be stated that the teachers' emotions affected their implementation of DI, and that some of these emotions were related to the expert as a mediator. Participants were not only, or not always, seeking rational counseling or expert advice. Although the type of emotions varied, nevertheless, emotions to a certain extent interfered with the expert-researcher. Figure 1 summarizes the emotions that were described in the three cases.

Discussion and conclusions

Grzymala-Kazłowska and Phillimore (2018) stated that rapidly increasing diversity challenges actors at all societal levels. The term 'superdiversity' is used to describe the current levels of sociological diversity that are both quantitatively and qualitatively more diversified than in the past (Meissner & Vertovec, 2015). Geldof (2013) described how, in some cities in Flanders, the research context of

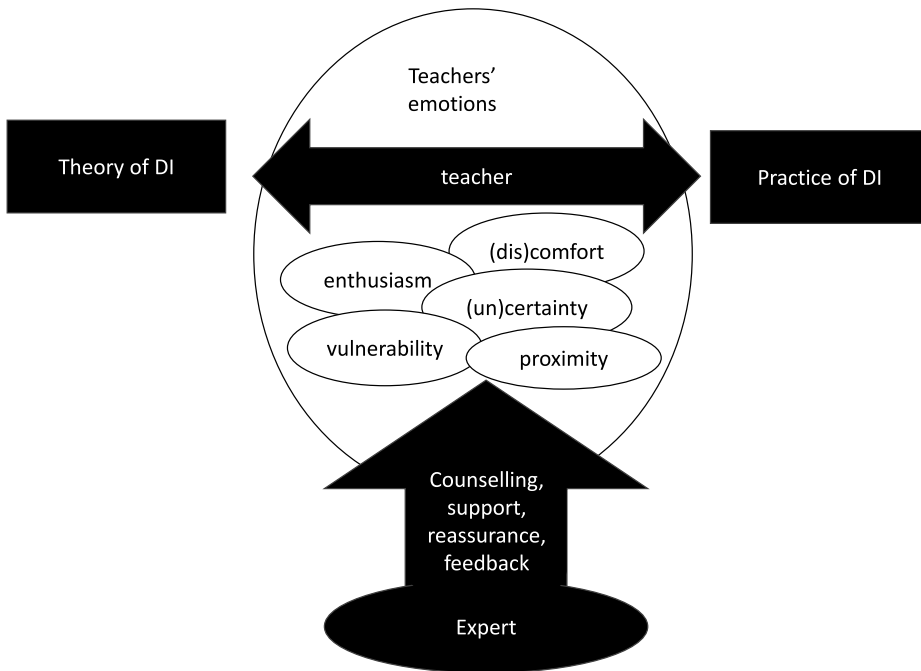


Figure 1: How teachers' emotions influence the gap between theory and practice of DI.

this study, no single ethnic group holds the majority. In addition, he described the broad variety of cultural, linguistic, socio-economic, and other characteristics that are related to people with migratory backgrounds in a context of superdiversity (Geldof, 2015). This context evidently challenges educational professionals to innovate in order to accommodate all students' needs (Schleicher, 2013). The demographic challenge of superdiversity entails strong emotions for teachers who intend to adapt their teaching to this changed societal context.

Important research has dealt with the role of teachers' emotions and how they influence teaching and learning. It is clear that teachers' emotions strongly impact on their job performance, and that such emotions may not be simply discarded as irrationalities (Sutton & Wheatley, 2003). "The complexities of emotion provide a useful means of guiding how teacher emotion should be studied." (Fried et al., 2015, p. 431). Research mobilization aimed at innovating teachers' practice in a context of superdiversity is, consequently, influenced by the complexity of teachers' emotions.

Data presented in this autoethnographical study indicate that the participating teachers' implementation of DI was importantly affected by uncertainty. The study has described the complexity of the role of a teacher-educator and researcher as a mediator between the theory and practice of DI. The participants in this study demonstrated how the otherness of the world of theory may be used as a resource that can provide the certitude they needed. They also

indicated that a teacher-educator or researcher can be a threat to a teacher's professional self. The participants in this study were not solely motivated by an urge to innovate with regard to their teaching. Other basic needs, such as a need for confirmation, influenced their implementation of DI. Experts such as teacher-educators and scholarly researchers can both foster and impede the successful mobilization of research knowledge in their relationship with teachers. Some teachers seek structure and support in the paradoxical professional culture that surrounds them. This makes them welcome professional advice and counseling. Others act inversely, and their emotional associations with the world of theory may impede a fruitful nexus between theory and practice.

Limitations and implications

It was not the aim, nor the claim, of this study to be able to pinpoint the exact emotions that the teachers in this research program experienced. Data collected in this study were insufficient to fully understand how these emotions aided or hampered the teachers' implementation of DI. They do, however, give insight into how experts' mediations are more than strictly neutral or rational interventions. The implications of this study for teacher-educators are important. Aligned with Hamre and Pianta (2006), who stressed the importance of teacher – student relationships for the effectiveness of learning, this study argues that it is vital to understand and acknowledge the relationship between teachers and teacher-educators. With regard the implementation of DI, teachers experience various emotions, which can be triggered by teacher-educators. Therefore, strong reflection on the part of teacher-educators is needed to adequately respond to this emotionality.

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Investigating Effects of Differentiated Instruction From Students' Perspective With the Experience Sampling Method

Mireille Krischler, Margarita Knickenberg & Carmen L. A. Zurbriggen

Abstract

Inclusive education aims to support every student's achievement as well as their social and emotional development. However, empirical evidence on the impact of differentiated instruction on students' socio-emotional outcomes is scarce. The aim of this study was to investigate how students perceive different aspects of tiered assignments, and how these aspects are linked with their emotional and motivational experience during lessons. To this end, the Experience Sampling Method (ESM) has been employed, allowing for an ecologically valid recording of characteristics that vary considerably over relatively short periods of time. In our study, 142 fifth-grade students (59,5% male, $M_{\text{age}} = 10.98$ years, $SD = 0.89$) reported at 23 measurement occasions on their emotional experience as well as on their perceptions of the current teaching situation. The ESM questionnaire comprised very short, easy to understand questions about the students' current emotional and motivational experience and their perceptions of central aspects of tiered assignments (e.g., level of requirement, possibility to choose between tasks, enough support provided). Results showed that students are more motivated and less stressed when they know how to continue their task, and when they perceive having enough time and enough support to finish their current activities in class. Besides, having enough time and support in class as well as knowing how to continue working had a positive effect both on students' flow experience and their task usefulness assessments. The limitations of the study are discussed and recommendations for future research are given.

Introduction

Inclusive classrooms offer rich social and individualized learning opportunities for every student (Lindner & Schwab, 2020; Tomlinson, 2014). Adhering to a general individualized definition of inclusion (Göransson & Nilholm, 2014), differentiated instruction is an important means of achieving inclusive education. Based on such a broad understanding of inclusion, differentiated instruction can be described as a collection of instructional strategies that enable teachers

to ensure that all students, regardless of their individual characteristics, have positive and successful learning processes (Loreman, 2017).

Differentiated instruction's effectiveness is often associated with optimal learning outcomes at the level of academic performance and achievement. As such, research on effects of differentiated instruction has largely focused on students' achievement outcomes. However, differentiated instruction not only aims to encourage the academic achievement of all students, but also, to foster their socioemotional development (Zurbriggen et al., 2021). Furthermore, most research overlooks students' perspective on differentiated instruction. As there is a risk of self-serving over-reporting tactics when investigating classroom phenomena by simply focusing on the teachers' perspective (Göllner, et al., 2018; Wallace, & Ruzek, 2016), it may be possible to avoid a distortion of the inclusive reality in classrooms by prioritizing students' voices in educational research.

The student perspective is of particular importance in relation to emotional and social outcomes, since research has shown that the accuracy of teacher judgement of several aspects of students' subjective well-being is – in contrast to the judgement of academic achievement – relatively low (Praetorius et al., 2010; Urhahne & Zhu, 2015). For instance, Venetz and colleagues (2019) found that the agreement between teacher reports and the students' self-reports was higher for the academic self-concept than for emotional well-being and social inclusion. This could be due to the fact that students' academic self-concept is closely linked to their academic accomplishments (Huang, 2011), which can be observed and estimated more easily by teachers. Emotional well-being and social inclusion are more difficult to infer from an external perspective (i.e., other reports), which explains the limited accuracy of teacher assessment. Hence, students' self-reports are recommended when their subjective well-being and socio-emotional development are concerned. This particularly applies to constructs that cannot be observed directly – i.e., internal states such as emotions. Thus, the person is considered as the expert when reporting on his or her emotional or motivational experience.

Against this backdrop, the present study takes a closer look at differentiated instruction from students' perspectives. More specifically, the aim of this study is to exploratively investigate for the first time how students perceive different aspects of tiered assignments as one important approach of differentiated instruction, and how these aspects are linked with students' emotional and motivational experience during lessons. To this end, we apply the Experience Sampling Method (ESM) to gain in-depth and genuine insights into students' subjective experience of selected aspects of tiered assignments in inclusive classrooms.

Theoretical background

Tiered assignments

In light of the significant growth in students' learning needs within inclusive classrooms, the recommended advice teachers receive to handle student heterogeneity in their daily teaching practice is to provide differentiated instruction. Pozas and Schneider (2019) proposed a comprehensive taxonomy of the differentiated instruction practices known in literature and practice. The identified categories of their taxonomy are: (1) tiered assignments; (2) intentional composition of student groups; (3) tutoring systems within the learning; (4) staggered nonverbal learning aids; (5) mastery learning; and (6) open education – i.e., granting autonomy to students. According to Pozas and Schneider (2019), tiered assignments are the most applied differentiated instruction practice. They focus on a specific learning goal or topic and provide different instructional alternatives for students to achieve understanding and to address their preferences, learning profiles and motivation (Pierce & Adams, 2004). Differentiation may refer to the topic, task or work partner choice as well as to open time-management (Richards & Omdal, 2007). It needs to be stressed that the term “assignment” does not imply that the tasks need to be assigned by teachers (Pozas & Schneider, 2019). In foregrounding a more learner-centered approach, students can select, for instance, between different tasks.

Effects of tiered assignments on student outcomes

Most studies on effects of differentiated instruction have focused on academic outcomes, while studies related to students' emotional, social or motivational outcomes are rather scarce. A study by Pozas and colleagues (2021) provided evidence of the significant role that teachers' use of differentiated instruction can have on fostering students' socio-emotional outcomes. More specifically, their results have indicated that students' rating of their teachers' differentiated instruction practice is positively related to their emotional well-being, social inclusion and academic self-concept. Similarly, the results of a study by Alnahdi and Schwab (2021) showed that students' perception of their teachers' use of differentiated instruction strongly predicted students' perceived emotional well-being and social inclusion as well as their academic self-concept. According to the authors, a possible explanation for this result might be the fact that students feel more appreciated and included in the social emotional and academic classroom setting when they perceive their teachers' ambition to provide adequate teaching and learning stimuli for them.

Chen (2007) explored students' perspectives on differentiated instructions, specifically on tiered assignments. His study indicated that tiered assignments were successful in boosting the students' motivation, efforts, and English skills

as well as their confidence. In this vein, a study by Hung and Chao (2021) showed that the students perceived that tiered assignments enhanced their learning motivation, yielded effective learning outcomes, and encouraged collaborative learning. According to Richards and Omdal (2007), differentiated instruction in general and tiered assignments in particular can have positive and encouraging effects on learners' language and an improvement in communicative skills. In their study, the low achievers benefited most from the tiered assignments. Pourdana and Shahpouri Rad (2017) concluded that the teachers can lower the language learning affective filters and anxiety level by choosing the tiered assignments method because the tasks the learners receive are compatible with their proficiency level and consequently make the students feel more confident and less stressed.

Emotional and motivational experience and the relevance for learning in differentiated instruction

After the cognitive turnaround in the early 1970s, the question of learning conditions was for a long time viewed primarily from a more cognitive point of view and focused on theories of motivation and learning (Heckhausen, 1989; Pintrich & Schunk, 1996; Steiner, 2001). In about the last two decades, there has been a growing body of theories and research dealing with the relationship between emotions and learning (Pekrun & Linnenbrink-Garcia, 2014). A prominent model in pedagogical-psychological research describes which factors have an important impact on learning outcomes (Krapp, 2005). In this model, it is assumed that emotions are internal (personal) factors which have – combined with other internal or external (environmental) determinants – an important impact on the learning process. If a task matches the needs of the students, they will probably work with greater commitment, perseverance and intensity, which in turn leads to better learning outcomes (Lazarides et al., 2019). Learning outcomes do not only include the acquisition of competences and the performance development, but also the training of self-determined motivation, positive emotions, self-regulated learning and other interdisciplinary and socio-emotional characteristics. Until recently, research on the relationship between emotions and learning mainly focused on stress and school anxiety (Krohne, 1996; Schnabel, 1998; Schwarzer, 2000).

Rakoczy and colleagues (2022) showed that students are more intrinsically motivated the more their own ideas are incorporated into the art lesson and the more they can participate in decision-making in class. Both of these are important and together with the feeling of knowing what is required of one in class, they are also associated with a stronger sense of autonomy.

Research questions

The research questions guiding this study are as follows: How do students perceive different aspects of tiered assignments? How are the student-perceived aspects of tiered assignments associated with students' emotional and motivational experience during lessons? To assess aspects of tiered instruction from the students' perspective, we focused on two core characteristics: (1) having the choice, for instance, between different tasks; and (2), on the question of whether the learning settings are appropriate. Based on previous research discussed in this paper, it is hypothesized that students' perception of tiered assignments is positively associated with their emotional and motivational experience during lessons.

Method

Sample and procedure

The sample comprised a total of 142 fifth-grade students (59.5% male) from six classes of inclusive secondary schools in North-Rhine Westphalia, Germany. The students' average age was 10.98 years ($SD = 0.89$).

Data was collected using both conventional questionnaires and the experience sampling method (ESM; Hektner, et al., 2007). The ESM allows for an ecologically valid recording of characteristics that vary considerably over relatively short periods of time – such as a person's emotional experience (Mehl & Conner, 2012). With the ESM, it is possible to draw a representative sampling of emotional snapshots of a person's everyday life in situ. As such, this relatively innovative method offers the opportunity to collect information on students' experiences and subjective perceptions in situ and thus with fewer retrospection effects (i.e., recall bias) than conventional questionnaires (Zurbriggen, Jendryczko, et al., 2021).

In the present study, students were asked to report on their emotional and motivational experiences as well as on their perception of the current teaching situation at 23 measurement occasions during a school week. For this, students were equipped with tablet computers. The randomly selected signals (4–5 signals per day) were transmitted via an offline application called *movisens* (www.movisens.com) on the tablet computers. When the signal sounded, all students completed a short questionnaire, which took about 3–4 minutes. The questionnaires were always the same and referred to the moment just before the signal was transmitted. In total, 3,204 short protocols were collected within a school week.

Measures

Due to the high frequency of measurements and the short duration for filling out each questionnaire, the ESM questionnaire and the questions themselves need to be short and easily comprehensible, without long introductory texts (for a practical guide to design ESM questionnaires, see e.g. Eisele, et al., 2022). At each signal – meaning at each measurement occasion of the experience sampling – students were asked to reflect on five items corresponding to aspects of *tiered assignments*, which were operationalized in an easy to understand and child-friendly way (Table 1). The first two items considered student choice as one main characteristic of tiered assignments. More specifically, students were asked to rate whether they had free choice to select a working partner (item 1) and the choice between different tasks or topics (item 2). To estimate whether the tasks (chosen by students or assigned by teachers) were appropriate to the student's level, we asked whether they know how to continue the task (item 3), whether they had enough support (item 4) and whether they had enough time (item 5). These five items had a closed answer format in which a decision could be made between “yes” and “no”.

Students' *emotional experience* was assessed with the scales positive activation (PA) and negative activation (NA) by Schallberger (2005). Every scale (PA and NA) was assessed by each four bipolar items (e.g., “How did you experience the activity just before the signal?” – PA: “excited vs. bored”, NA “stressed vs. relaxed”). High positive activation means being excited or highly motivated and low positive activation refers to being bored or tired. Furthermore, high negative activation means being stressed or worried while low negative activation equates to being relaxed or calm. The items of the PANA scales were explicitly designed for ESM contexts, which is why they are short and easily comprehensible. Answers were provided on a 7-point Likert-scale ranging between two contrary adjectives respectively.

Students' *motivational experience* was operationalized with two scales containing three items each. First, the scale “flow” described how students are involved in their scholarly activities (e.g., “How did you experience what you did just before the signal?” – “Time flies by.”). For the present study, the items were adapted following Rheinberg and colleagues (2003). Second, the scale “task usefulness” assesses how worthy or useful students evaluate their current task or activity in class (e.g., “What I did just before the signal was for me: ...” – “important”). Students made their assessments on a 7-point Likert-scale.

Analyses

To examine how students perceive selected aspects of tiered assignments, descriptive statistics were calculated by means of SPSS version 28.

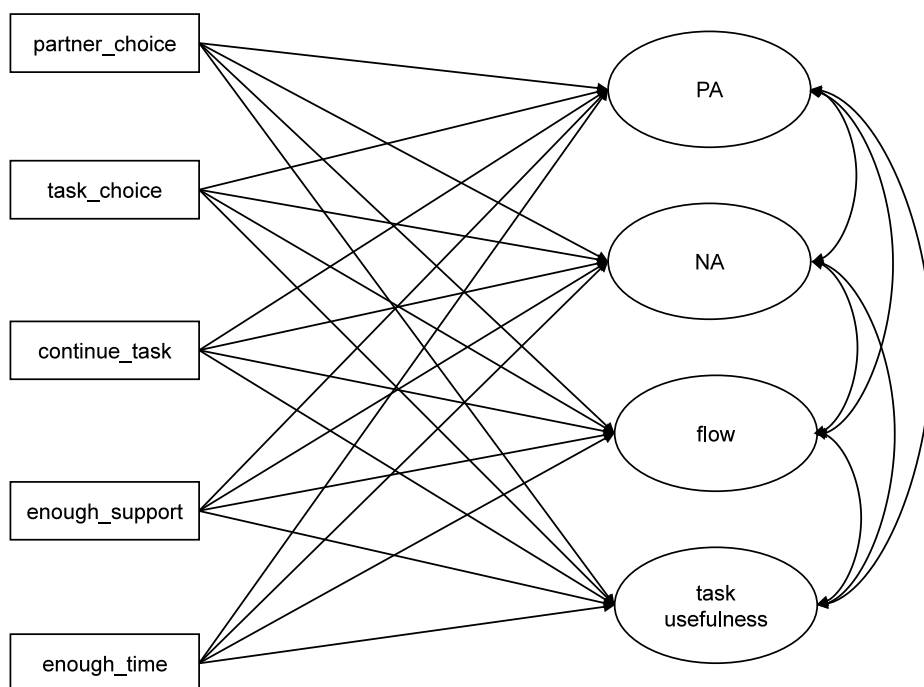


Figure 1: Hypothesized SEM with five aspects of tiered assignments regressed on positive activation (PA), negative activation (NA), flow and task usefulness.

Effects of the student-perceived aspects of tiered assignments on students' motivational and emotional experiences were modelled in *Mplus* version 8.4 as structural equation models (SEM). Since the signals (i.e., measurement occasions) were nested in persons (i.e., students), we considered the hierarchical structure of the data (multilevel SEM). The five items regarding tiered assignments were included as manifest independent indicators each, whereas the students' emotional and motivational experiences (PA, NA, flow, task usefulness) were specified as latent dependent variables. The postulated structural equation model is presented in Figure 1 (as part of preliminary analyses, different models with different versions of operationalizing the tiered assignments items were previously checked; due to model fit and theoretical and logical reasons, this model was finally chosen).

Results

The results show that in about a quarter of the measurement occasions, the students were able to choose who they worked with (Table 1). Furthermore, they reported that in an average of 28.3% of the measurement points they could choose between different tasks or topics. In general, the students knew how to

continue their current activity (69.3%). The results also indicate that in most cases the students had both enough help or support (76.1%) and enough time (76.5%) to finish their tasks in class.

Table 1: Students' perceptions of the five selected aspects of tiered assignments.

Item		"yes"	proportion		Z	p
partner_choice	Could you choose who you work with?	24.7 %	male	.22	-3.25	$\leq .001$
			female	.28		
task_choice	Could you choose between different tasks or topics?	28.3 %	male	.30	1.63	$> .05$
			female	.27		
continue_task	Do you know how to continue your task?	69.3 %	male	.67	-3.53	$\leq .001$
			female	.74		
enough_support	Do you have enough support to finish your task?	76.1 %	male	.74	-2.61	$< .01$
			female	.79		
enough_time	Do you have enough time to finish your task?	76.5 %	male	.75	-2.79	$< .01$
			female	.80		

Notes. $N = 142$ students; $N = 3204$ measurement points

To investigate how these aspects of tiered assignments are linked with students' emotional and motivational experience during lessons, multilevel SEM were specified. Intraclass coefficients (ICC) for the PA and NA items indicate that 27% to 39% of the total variance ($.27 \leq \text{ICC} \leq .39$) can be traced back to situational variations within persons. The ICC for the flow items range between $.32 \leq \text{ICC} \leq .41$ and for the task usefulness items range between $.34 \leq \text{ICC} \leq .40$, indicating that a large proportion of the items' variance depends on the situation. The ICC's extent illustrates the necessity of taking into account the hierarchical data structure and in particular the frequent measurement of situational experiences. Confirmatory factor analyses of these four latent variables PA, NA, flow and task usefulness revealed a good model fit ($\chi^2 = 200.37$, $df = 65$, $p \leq .001$; RMSEA = .03, CFI = .97, TLI = .96, SRMR = .03). The variables' latent correlations are significant (NA with PA: $r = -.88^{***}$; flow with PA: $r = .69^{***}$; flow with NA: $r = -.60^{***}$; task usefulness with PA: $r = .57^{***}$; task usefulness with NA: $r = -.50^{***}$; task usefulness with flow: $r = .81^{***}$).

In a further step, regression coefficients of the dependent variables on the five items regarding tiered assignments were included. The model fit statistics indicate a good fit to the data ($\chi^2 = 284.34$, $df = 115$, $p \leq .001$; RMSEA = .03, CFI = .97, TLI = .96, SRMR = .03).

The multilevel SEM's findings can be summarized as follows: Neither the free choice of working partners (partner_choice) nor of tasks or top-

ics (task_choice) have a significant effect on students' emotional and motivational experiences. Students experience significantly more PA ($\beta = 11^{**}$, $SD = .04$) and less NA ($\beta = -.15^{***}$, $SD = .04$) when they know how to continue their task (continue_task). They are also more motivated and less stressed when they perceive having enough time (enough_time; PA: $\beta = 14^{**}$, $SD = .04$; NA: $\beta = -.22^{**}$, $SD = .04$) and support (enough_support; PA: $\beta = 14^{**}$, $SD = .04$; NA: $\beta = -.16^{**}$, $SD = .04$) to finish their current activities in class. Simultaneously, they also report a higher flow experience ($\beta = 15^{***}$, $SD = .04$) and task usefulness ($\beta = -.22^{**}$, $SD = .04$) in measurement occasions in which they know how to continue working (continue_task). The perception of having enough time and support in class also has a positive effect both on students' flow experience (enough_support: $\beta = .13^{***}$, $SD = .04$; enough_time: $\beta = .11^{***}$, $SD = .04$) and on their task usefulness assessments (enough_support: $\beta = .15^{***}$, $SD = .04$; enough_time: $\beta = .14^{***}$, $SD = .04$).

Discussion

First, our descriptive findings showed that about one third of the students reported being allowed to choose between different tasks or topics. Furthermore, most of the students knew how to continue their current activity, received enough support and had enough time. This indicates that according to the perception of the students, a large part of their teachers used methods of tiered assignments to diversify students' learning processes. Second, our findings revealed that students experienced significantly more positive activation and less negative activation when they knew how to continue their task and when they perceived having enough time and enough support to finish their current activities in class. More specifically, having enough time to finish their current activity had the most pronounced effect on negative activation, that is, students were more relaxed and less nervous. The perception of having enough time and support in class also had a positive effect both on students' flow experience and their task usefulness assessments. Simultaneously, students reported more flow experience and task usefulness in situations in which they knew how to continue working. However, this does not necessarily mean that there is a causal relationship between the constructs, because our data is limited in that it is only from a cross-sectional pilot study. Furthermore, the results solely reflect the perspective of the students. How teachers perceive their implementation of the mentioned tiered assignments in class or if and how the assignments are actually implemented cannot be deduced from this data.

Consistent with this, intervention studies on tiered assignments have revealed significant positive effects on student achievement. Students were guided toward alternative ways of processing knowledge through tiered activities (Richards & Omdal, 2007). On the one hand, this allows low-achieving

students to engage in meaningful learning and to enhance their academic performance. On the other, it allows high-achieving students to widen and deepen their knowledge and to apply it to new topics (Tomlinson, 2001; 2014). Consequently, as students' learning needs are satisfied, this may lead to successful learning experiences and positive emotional reactions as well as an increase in learning motivation.

By contrast, the free choice of working partners and the possibility to choose between tasks or topics had no significant effect on students' emotional and motivational experiences. This finding is surprising as this kind of differentiation in respecting the students' preferences tends to promote students' engagement and motivation in order to bring them closer to topics and content that they find meaningful (Pozas et al., 2021). One possible explanation for a lacking positive impact of student choice could be that students were not allowed or unable to select tasks corresponding to their actual ability level, or to select the partner with whom they can work together most productively. Moreover, the unexpected finding might be due to differential effects, meaning that high achieving students tend to perform better in more open instruction formats (Chandra Handa, 2009), whereas low achieving students may easily be overloaded by the autonomy they are given in open settings (Bohl, et al., 2012) and tend to benefit more in structured settings (Blumberg, et al., 2004). However, as we did not collect the performance or the achievement level, we cannot verify this assumption.

When interpreting the present results, it should be noted that this study has several limitations. First and foremost, the present study was a (first) cross-sectional pilot study exploring the student perspective on different aspects of tiered assignments and the corresponding associations on students' emotional and motivational experience in the classroom. Consequently, further longitudinal studies are required to investigate the causal influences. Additionally, students' academic achievement and other characteristics should be included in future research. This would allow for an exploration of the relationships between teachers' differentiated instruction practice and students' achievement and socio-emotional outcomes in more detail. Another important limitation of our study is that we included only the student perspective, despite the fact that surveys addressing students' perspectives are economic, valid and generally recommended in research (Butler, 2012). It needs to be stressed that students were not asked to evaluate which differentiation approaches their teachers implemented, but to assess several teaching characteristics based on our operationalization of tiered assignments. Thus, future research may include both students' and teachers' perspectives. Furthermore, a combined study methodology, such as quantitative data (e.g., surveys) and qualitative data (e.g., interviews and systematic observations), would help to obtain a more in-depth understanding. Teacher interviews, for instance, could allow insights about how teachers plan and implement differentiated lessons. This could reveal more

about the motivations or objectives of teachers who use specific differentiated instruction techniques.

Summary

Inclusive education aims to support every student's achievement as well as their social and emotional development. However, empirical evidence on the impact of differentiated instruction on students' socio-emotional outcomes is scarce. Thus, the aim of the present study was to examine students' perspective on differentiated instruction and the association with their emotional and motivational experience at school. More specifically, we investigated how students perceive different aspects of tiered assignments, and how these aspects are linked to their emotional and motivational experience during lessons. To this end, the ESM was employed. A total of 142 fifth-grade students reported on 4–5 randomly assigned occasions per day during one school week on their emotional experience as well as on their perceptions of the current teaching situation, which resulted in 3,204 occasions in total.

Our results indicate that students are more motivated (i.e., high PA) and less stressed (i.e., low NA) when they know how to continue their task, and when they perceive they have enough time and enough support to finish their current activities in class. Furthermore, having enough time and support in class as well as knowing how to continue working had a positive effect both on students' flow experience and their task usefulness assessments.

To conclude, it needs to be stressed that our study was a small-scale pilot study with an exploratory character, which is why only preliminary conclusions can be drawn. Nevertheless, our study offers some new insights regarding how students perceive differentiated instruction and how it affects their emotional and motivational experience in the classroom. Future (longitudinal) studies might benefit, for instance, from combining the students' perspective with the teachers' perspective and from including other measures such as achievement, in order to gain a more in-depth understanding of effects of differentiated instruction on students' learning and their emotional-motivational development.

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Experimentation and Differentiated Instruction in Biology Lessons

Examining the Effects of Incremental Scaffolds on the Students' Interest

*Svea Isabel Kleinert, Kris-Stephen Besa, Darius Haunhorst & Matthias Wilde**

Abstract

Science courses are characterized by a heterogeneous student body. Besides the students' heterogeneity, a decline in interest during the school career was observed in biology. The implementation of experiments could face this decline in interest. However, complex experimentation causes difficulties for students, especially if students have different learning backgrounds. Incremental scaffolds could be used as instructional and internally differentiating instruments to enable autonomous experimentation in biology lessons. Additional incremental scaffolds in mathematics lessons could further address the difficulties in mathematical evaluation of complex experiments. The present study investigated the influence of incremental scaffolds during experimentation in biology and mathematics lessons on the students' situational interest. 75 students (55.2% female; $M_{age} = 16.50 \pm 0.80$ years) conducted an experiment on the subject of osmosis and were taught on the subject of linear functions in mathematics lessons. Data on students' individual and situational interest in biology classes was collected. The results of a multivariate analysis of covariance showed significant effects of the treatment on the *value-related* component of students' situational interest and descriptive differences regarding the subscales *emotional* and *cognitive* in favor of the students who used incremental scaffolds during the biological experiment. Thus, the use of incremental scaffolds during experimentation could provide a useful support to promote students' interest in biology.

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Introduction

The promotion of biological interest can be described as an important goal of biology teaching. However, a strong decline in interest in biology lessons can be observed (Krapp & Prenzel, 2011). This could be countered, for example, through the stronger Please adapt this word to American English as follows: contextualization of lesson content and the inclusion of student-oriented forms of work, such as inquiry-based learning and experimentation (Minner et al., 2010). Inquiry-based learning allows learners to be actively involved in the problem solving process and thus can foster learners' engagement (Abd-El-Khalick et al., 2004; Darling-Hammond et al., 2020). Encouraging students to be active learners is in turn associated with the promotion of interest (Mitchell, 1993). However, open and complex experimental tasks cause a variety of challenges for the students in biology lessons (Arnold et al., 2014; de Jong & van Joolingen, 1998). These problems are more pronounced when learners have different learning backgrounds (e.g., different prior knowledge, motivation, etc.) (Furtak et al., 2012; Kalyuga, 2013). Such challenges can be addressed by means of instructional support (Kalyuga, 2013). The implementation of incremental scaffolds could provide this instructional guidance. While the learners are offered a learning-strategic or content-related prompt for processing the task in a first step, they receive the possible task solution in a second step (Hänze et al., 2010). In particular, the difficulties during the evaluation of experiments that result from learners' lack of mathematical competence (Wellnitz & Mayer, 2013) could be addressed by additional incremental scaffolds in mathematics classes. The mathematical content could then be used in biology classes during the analysis and interpretation of the data from the experiment. From a learning psychology perspective, the incremental scaffolds thus offer instructional guidance while promoting independent work (Arnold et al., 2014). As internally differentiating means in biology and mathematics classes, the incremental scaffolds might contribute to promoting interest.

Theoretical background

Inquiry-based learning and experimentation

Inquiry-based learning can be described as a central goal in science education (KMK, 2020). Due to the student-centred character of inquiry-based learning, learners are actively and collaboratively involved in the learning process (Abd-El-Khalick et al., 2004; Hmelo-Silver et al., 2007). Inquiry-based learning enables learners to fully engage in the scientific research process by independently developing research questions and hypotheses, selecting and applying research methods, and interpreting results (Furtak et al., 2012). In this way,

students can develop an understanding of the nature of science (Abd-El-Khalick et al., 2004). Based on a meta-analysis by Pedaste et al. (2015), the following five phases of inquiry-based learning can be distinguished: *Orientation*, *Conceptualization*, *Investigation*, *Conclusion*, and *Discussion*. The orientation phase focuses on stimulating interest and curiosity about a topic. This phase results in a problem definition. Based on the developed problem, the research questions or hypotheses are formulated in a theory-driven manner in the phase of conceptualization. In the subsequent phase of investigation, explorations or experiments are planned and carried out, and the data obtained are analysed and interpreted. During the conclusion phase, conclusions are drawn from the collected and interpreted data, which are related to the questions and hypotheses that have been formulated. The discussion phase consists of a communication phase, in which the results are presented to others, and a reflection phase, in which the process of inquiry-based learning is critically reflected (Pedaste et al., 2015). One method of scientific inquiry is experimentation (Osborne et al., 2003). As a complex problem-solving process, experimentation can be described as cognitively demanding for the students (Abd-El-Khalick et al., 2004). Various empirical studies have shown that open and complex experimentation causes a variety of challenges for students in biology lessons. In addition to the development of research questions and hypotheses as well as the planning of experiments, students show particular deficits in the evaluation of experiments (Arnold et al., 2014; de Jong & van Joolingen, 1998). In this context, students lack mathematical competencies to evaluate experiments in biology classes (Wellnitz & Mayer, 2013). Furthermore, students show deficits in explaining and interpreting experimental results (Germann et al., 1996). If the tasks are too demanding, they could have a negative effect on the learning process of the students. Too high cognitive load could lead to a reduction in learning success (Paas et al., 2003), this could also be accompanied by a loss of motivation (van de Pol & Elbers, 2013). The perception of task difficulty depends on the students' individual learning prerequisites (e.g., prior knowledge) (Kalyuga, 2013). For this reason, the described difficulties during open experimentation may be more pronounced in heterogeneous learning groups. To address these deficits and to enable working on complex tasks, such as open experimentation (Abd-El-Khalick et al., 2004), in heterogeneous learning groups, means of instructional support adapted to the students' individual learning background should be implemented (Blanchard et al., 2010; Kalyuga, 2013).

Instructional support during experimentation and incremental scaffolds

Based on the degree of structure and guidance, different forms of instructional support during experimentation ranging from direct instruction to open discovery learning can be distinguished (Sadeh & Zion, 2012). However, both direct instructions and open designed minimal instructions can lead to a decrease in

students' learning process (Kirschner et al., 2006; van de Pol & Elbers, 2013). On the one hand, direct experiment instructions contradict the learning idea of constructivism and thus reduce the authentic character of experimentation (Hmelo-Silver et al., 2007). On the other hand, minimal instructions cause high cognitive challenges for the students during inquiry-based experimentation (Kirschner et al., 2006). In order to provide support and structure in the experimentation process and to preserve the authentic character of experimentation, scaffolding could be implemented in science lessons. Scaffolding offers an opportunity to address the learners' individual learning backgrounds (e.g., subject-specific prior knowledge) (Kame'enui et al., 2002). Scaffolding elements can thus be classified as means for initial differentiating. According to Letzel et al. (2020), internal differentiation is defined as a collective term for various homogenizing measures to compensate for different learning requirements of students as well as for measures for individual support considering the heterogeneity of the learning group.

Incremental scaffolds can be described as one type of scaffolds (Schmidt-Weigand et al., 2008). They were developed explicitly for science teaching and complex tasks such as experimentation (Leisen, 2010). Incremental scaffolds provide instructional guidance while encouraging learners to work independently on complex experimentation tasks (Hänze et al., 2010). Based on a concept of Leisen (2010), incremental scaffolds consist of two parts. In the first step, the students can receive content-related or strategic prompts to work independently on the experimental tasks. These prompts include strategies for learning and problem solving, such as paraphrasing, elaborating subgoals and activating prior knowledge (Schmidt-Weigand et al., 2008). In the second step, learners can compare their own partial solutions with example solutions (Hänze et al., 2010). Due to the character of incremental scaffolds, they play an important role as methods for individualising learning processes in heterogeneous learning groups (Schmidt-Weigand et al., 2008). Based on a taxonomy of differentiated instruction by Pozas and Schneider (2019), incremental scaffolds are categorized as *staggered nonverbal learning aids*. They define this form of differentiated instruction as sequential learning aids with varying levels of difficulty. These learning aids contain information that learners can use to solve a problem (Pozas & Schneider, 2019). While working on the task, learners can use the assistance of the incremental scaffolds in a self-regulated manner according to their own perceived difficulties. Against this background, learners of different ability levels can benefit from the use of this support (Schmidt-Borcherding et al., 2013). Higher-performing learners who do not need guidance on how to work through the task can use the sample solution to compare with their own solution (Schmidt-Weigand et al., 2008). Lower-performing students can use the prompts to support them in creating an answer on their own. These students can then also use the sample solution for comparison (Schmidt-Weigand et al., 2008). The initially differentiating character of incremental scaffolds has al-

ready been confirmed in various empirical studies. Großmann and Wilde (2019) showed that both students with a high level of subject-specific prior knowledge and students with little subject-specific prior knowledge could benefit from the use of incremental scaffolds during experimentation in biology lessons.

Incremental scaffolds and interest

In addition to the described positive effects on the students' knowledge acquisition in biology classes (Großmann & Wilde, 2019; Stiller & Wilde, 2021), the use of incremental scaffolds can be associated with an increase in the experience of competence and autonomy (Hänze et al., 2010; Kleinert et al., 2022). In this context, Hänze et al. (2010) describe incremental scaffolds as a compromise between "do it yourself" (p. 71) and "really being able to" (p. 71). According to the self-determination theory of motivation, the experience of competence and autonomy can be described as basic psychological needs. Furthermore, the satisfaction of these basic psychological needs can be related to the development of intrinsic motivation (Ryan & Deci, 2017). Based on these assumptions, empirical studies have already shown positive effects of the use of incremental scaffolds during experimentation in science classes on the students' intrinsic motivation (Kleinert et al., 2022; Schmidt-Borcherding et al., 2013). In addition, the satisfaction of basic psychological needs can be accompanied by an increase in learners' interest (Krapp, 2005). Interest can be defined as a person-object relationship according to Hidi and Harackiewicz (2000). Interest is also characterized by an emotional, intrinsic, value-related, and cognitive component (Krapp, 2010). The *emotional* component of interest includes positive feelings and qualities of experience during engagement with the object of interest. These emotions during an interest-based activity include pleasure and joy, excitement, and engagement (Krapp, 1999, 2007). The *value-related* interest component involves the subjective meaningfulness of an object or action of interest to a person. Personal significance is accompanied by active engagement and identification with the object of interest (Krapp, 1999). The *cognitive* component is based on the close relationship between cognitive processes and interest. Interest in an object or activity results in a pronounced willingness to acquire new knowledge and competencies in the area of interest (Krapp, 2007).

Renninger and Hidi (2016) distinguish between individual and situational interest based on the stability of interest. As a motivational disposition, learners' individual interest can be described as stable and long-lasting, whereas situational interest exhibits less stability (Mitchell, 1993; Renninger & Hidi, 2016). In contrast to individual interest, situational interest can be influenced by external conditions of the learning environment (Hidi & Harackiewicz, 2000; Renninger & Hidi, 2016). To influence situational interest, Mitchell (1993) proposes the implementation of activating work methods in the classroom. Furthermore, interest-promoting learning contexts should foster the experience of the basic

psychological needs for autonomy, competence and relatedness (Harackiewicz et al., 2016; Potvin & Hasni, 2014). Interest plays a significant role in successful learning as it is positively related to the use of deep processing learning strategies (Isaak et al., 2022).

However, to our knowledge, there is a lack of empirical studies investigating the effects of the use of incremental scaffolds on learners' situational interest during experimentation in science lessons. Therefore, the aim of the present study is to examine these possible correlations between the use of incremental scaffolds during the experimentation process and the expression of situational interest.

Research questions

Inquiry-based experimentation as a student-oriented form of work could promote students' interest in science classes (Minner et al., 2010). Experimentation as a complex problem-solving process might require the use of instructional support measures. For instructional guidance during experimentation, the described incremental scaffolds could be implemented (Schmidt-Weigand et al., 2008). They encourage students as active learners during the problem solving process (Hänze et al., 2010). This could be accompanied by the promotion on students' interest (Schraw et al., 2001).

Research question 1: Does the use of incremental scaffolds during the evaluation of the experiment promote the situational interest of students in biology class?

Especially during the evaluation and interpretation of an experiment, students show difficulties (Arnold et al., 2014). These deficits can be explained by the learners' lack of mathematical competence (Wellnitz & Mayer, 2013). To address these difficulties, additional incremental scaffolds could be used to support the mathematical evaluation process.

Research question 2: Does the use of incremental scaffolds in mathematics class in addition to the use of incremental scaffolds during the evaluation of the experiment additionally promote the situational interest of the students in biology lessons?

Methods

Sample

75 eleventh-grade students of an experimental grammar school (55.2% female; $M_{age} = 16.50$ years, $SD_{age} = 0.80$ years) participated in the current study. The school's concept is oriented towards a heterogeneous student body. For this reason, the school also accepts students who do not have a qualification for the grammar school (approx. 30% of the students in the introductory phase). The students were divided into the experimental group I (incremental scaffolds in biology lessons; $n = 23$), the experimental group II (incremental scaffolds in biology and mathematics lessons; $n = 26$) and the control group (without incremental scaffolds in biology and math lessons; $n = 26$).

Test instruments

Individual interest in biology was measured using the PISA questionnaire *Enjoyment and interest in natural sciences* (Frey et al., 2009). The scale consisted of five items. Situational interest in biology was assessed with a self-developed questionnaire consisting of three subscales (*emotional*, *value-related*, *cognitive*). The questionnaire included 15 items. Both scales were measured on a five-point rating scale (0 = *strongly disagree* to 4 = *strongly agree*). To check the factor structure of this questionnaire a major axis analysis was performed. The Kaiser-Meyer-Olkin value (KMO) of the calculated major axis analysis was 0.911. The factor analysis indicated a three-factor structure. 75.76% of the variance were explained by the three factors (*emotional*, *cognitive*, and *value-related*). The items had factor loadings ranging from .38 to .84. Furthermore, the internal consistencies of the (sub-)scales and the selectivity of the items were in a good range (Table 1).

Table 1: Number of items, example item, and internal consistency for each subscale of situational interest in biology lesson.

Subscale	Number of items	Example item During the biology lesson ...	Internal consistency (Cronbach's alpha)	Selectivity of items
<i>Emotional</i>	5	... I enjoyed the subject.	.91	.73 – .85
<i>Value-related</i>	6	... I found the topic personally relevant.	.92	.62 – .88
<i>Cognitive</i>	4	... I wanted to learn more about the topic.	.89	.70 – .84

Test design

The current study followed a quasi-experimental design and was embedded in an interdisciplinary teaching unit between the subjects of biology and mathematics. While the students were taught about osmosis in biology, the mathematic lessons dealt with the subject of linear functions (Kleinert et al., 2020).

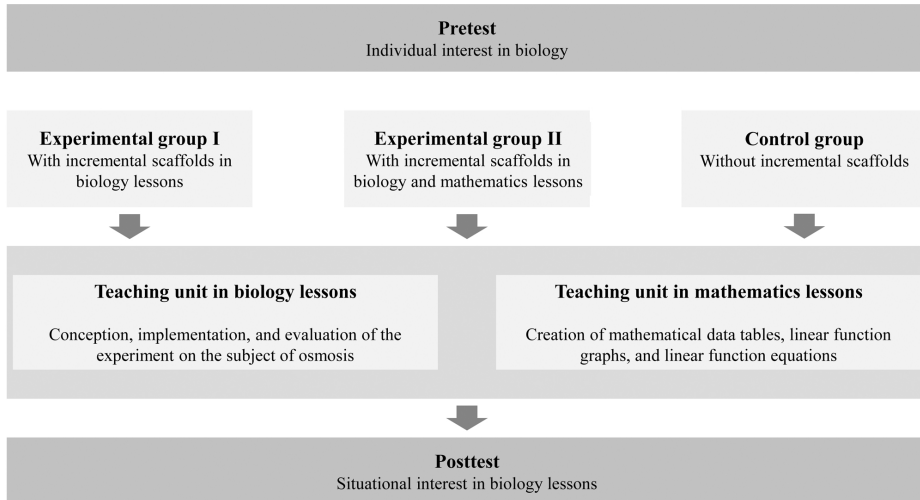


Figure 1: Test design of the current study.

In the pretest at the beginning of the teaching unit, the students' individual interest in biology was assessed. Afterwards, the students participated in the classroom intervention. The teaching unit in biology lessons included the conception, implementation, and evaluation of the experiment "*The osmotic effect of common salt – A student experiment to determine the cell sap concentration in different types of vegetables*" (Schumacher et al., 2020). The students developed their own research questions and hypotheses. These developed research questions and hypotheses were then discussed in the plenary session. The students investigated the following research question "*How high is the cell sap concentration?*" and hypothesis: "*The studied vegetable species have different cell sap concentrations.*". To test this hypothesis, the students planned the experiment. The experiment was then carried out independently in groups. The data obtained from the experiment was used by the students to evaluate the experiment. The students created tables of values, calculated mean values and error measures in order to plot them in a diagram (Schumacher et al., 2020). For the evaluation of the experiment, the students in the experimental groups I and II had the opportunity to use incremental scaffolds (Bekel-Kastrup et al., 2020). The learners in the control group worked without incremental scaffolds. The incremental scaffolds in biology lessons were designed for the following evaluation steps: determination of the relative mass difference, determination of the mean values

of the measured values, creation of the diagram, explanation of the diagram with reference to the theory of osmosis, drawing of a compensation line, and determination of the cell sap concentration (Bekel-Kastrup et al., 2020). As an example, the incremental scaffolds for creating a diagram shall be described. In a first step, learners can view a strategic prompt that should stimulate their prior knowledge to design a suitable diagram. In this context, the students can use impulses for axis scaling and axis labeling. In a second step, the learners can receive a possible diagram as a solution (Bekel-Kastrup et al., 2020). At the same time, the students attended a teaching unit on the subject of linear functions in mathematic lessons. This unit includes the creation of mathematical data tables and function graphs. In addition, the students learned how to develop linear function equations from function graphs. The students could use these contents for the creation of function graphs and the formulation of function equations for the evaluation of the experiment in biology class (Kleinert et al., 2020). While the students in experimental group II were able to use incremental scaffolds to create a linear function equation (Hamers et al., 2020), the learners in the control group and experimental group I worked without incremental scaffolds in mathematics lessons. The incremental scaffolds for determining the slope of the function graph are presented here as an example. The students can receive a strategic prompt that is connected to their prior knowledge regarding the creation of slope triangles. In the sample solution of these incremental scaffolds, learners can view a slope triangle constructed for the function graph (Hamers et al., 2020). After the teaching unit, the students' situational interest in biology lessons was assessed in the posttest.

Statistical analysis

A multivariate analysis of covariance (MANCOVA) was conducted to investigate the difference in situational interest in biology lessons between the students in the treatment groups. Since the students' individual interest in biology can be described as predictor for the situational interest, it was applied as covariate. All requirements of the MANCOVA were checked. Normal distribution was fulfilled for the subscales *emotional* ($p = .200$), *value-related* ($p = .185$), and *cognitive* ($p = .197$). The first requirement for including the covariate, i.e., independence of the covariate from the study group, was fulfilled ($F(2,72) = 0.71$, $p = .493$, $\eta^2 = .019$). In addition, the second requirement for inclusion of the covariate (the homogeneity of the regression slopes) was met for each subscale (*emotional*: $F(2,69) = 0.09$, $p = .911$, $\eta^2 = .003$; *value-related*: $F(2,69) = 0.29$, $p = .749$, $\eta^2 = .008$, *cognitive*: $F(2,69) = 0.60$, $p = .551$, $\eta^2 = .017$). If the MANCOVA showed significant effects of the treatment, simple contrasts were performed.

Results

The comparison of the individual interest of the students in the three study groups, as surveyed in the pretest, showed no significant differences (Table 2).

Table 2: Means (M) and standard deviations (SD) for the individual interest in biology for the students in each treatment group.

Experimental group I $M \pm SD$	Experimental group II $M \pm SD$	Control group $M \pm SD$	Main effect of treatment group
1.74 \pm 0.73	1.59 \pm 0.77	1.49 \pm 0.67	$F(2,72) = 0.71$, $p = .493$, $\eta^2 = .019$

The results of the MANCOVA showed significant effects of the covariate (*individual interest*) on the subscales of situational interest in biology lessons with medium to large effect sizes (Table 3 and 4). For the comparison of the three study groups, significant differences were found in the subscale *value-related* with medium effect size (Table 3 and 4). A contrast analysis revealed significant differences between experimental group I and experimental group II as well as between experimental group I and the control group in favor of the students in experimental group I (Table 3 and 4). Furthermore, significant differences between the control and the experimental group II in benefit for the students in the control group were shown in the contrast analysis (Table 4). For the subscales *cognitive* and *emotional*, descriptive differences in comparison of the treatment groups were found (Table 4). While the learners of experimental group I showed the highest values regarding these subscales, the learners of experimental group II showed the lowest values (Table 3).

Table 3: Means (M) and standard deviations (SD) for the subscales of situational interest in biology lessons.

	Experimental group I $M \pm SD$	Experimental group II $M \pm SD$	Control group $M \pm SD$
<i>Emotional</i>	2.01 \pm 0.99	1.51 \pm 0.76	1.84 \pm 0.61
<i>Value-related</i>	1.74 \pm 0.79	1.17 \pm 0.77	1.56 \pm 0.68
<i>Cognitive</i>	1.64 \pm 1.05	1.05 \pm 0.70	1.41 \pm 0.78

Table 4: Results of the MANCOVA (covariate: individual interest in biology) for the subscales of situational interest in biology lessons as well as the results of the simple contrasts.

	Effects of the covariate	Effects of the treatment	Simple contrasts		
			Experimental group I and control group	Experimental group I and experimental group II	Control group and experimental group II
<i>Emotional</i>	$F(1,71) = 8.70$, $p = .004$, $\eta^2 = .11$	$F(2,71) = 2.52$, $p = .087$, $\eta^2 = .07$	–	–	–
<i>Value-related</i>	$F(1,71) = 7.82$, $p = .007$, $\eta^2 = .10$	$F(2,71) = 3.87$, $p = .025$, $\eta^2 = .10$	$t(47) = 1.92$, $p = .04$, $r = .22$	$t(47) = 2.33$, $p = .024$, $r = .31$	$t(50) = 1.95$, $p = .03$, $r = .26$
<i>Cognitive</i>	$F(1,71) = 11.84$, $p = .001$, $\eta^2 = .14$	$F(2,71) = 3.01$, $p = .055$, $\eta^2 = .08$	–	–	–

Discussion and conclusion

The aim of the study at hand was to investigate possible connections between the use of incremental scaffolds in biology and mathematics lessons and the students' situational interest. With the help of the first research question, it was to be answered whether the use of incremental scaffolds during the evaluation of the osmosis experiment in biology lessons is accompanied by a promotion of learners' situational interest. The results of the MANCOVA showed significant effects of the students' individual interest and the use of incremental scaffolds during the evaluation of the experiment on the learners' situational interest in biology lessons with medium to large effect sizes. With regard to the significant influence of learners' individual interest in biology on the dimensions of situational interest (*emotional*, *value-related* and *cognitive*) the results of the present study support the findings of previous empirical studies. In this context, the investigation of Desch et al. (2016) revealed positive effects of the individual interest on the learners' situational interest in biology classes.

The significant effects of using incremental scaffolds during the evaluation of the experiment on the *value-related* component of situational interest as well as the descriptive highest values regarding the *emotional* and *cognitive* components in favor of experimental group I can be justified by the character of the incremental scaffolds. These elements of scaffolding allow the subdivision of the complex experimental task into different parts. In this way, they structure the learning environment for the learners (Hänze et al., 2010). By presenting the prompts gradually, learners are actively engaged in the learning

process throughout the experimentation. Scaffolding elements thus encourage students to be active learners (White & Frederiksen, 1998). According to Schraw et al. (2001), this is accompanied by an increase in situational interest in the classroom. In the context of strategic scaffolding, Rotgansa and Schmidt (2011) have already shown that learners' situational interest can be increased. For the use of worked-examples as a related concept of incremental scaffolds, similar effects were evident (Yaman et al., 2008). By providing step-by-step instructions for problem solving and activating learners in the learning process, situational interest could be promoted (Schraw et al., 2001). In addition to the structuring and activating character of scaffolding elements, incremental scaffolds enable students to connect to prior knowledge through the prompts, which is an essential factor in increasing situational interest in the classroom (Schraw et al., 2001). Furthermore, incremental scaffolds highlight the task relevance to learners. Strategic prompts designed to encourage paraphrasing, focusing, or elaborating on the task can emphasize the relevance of the task to learners (Schmidt-Weigand et al., 2008), which may also be related to promoting situational interest in the classroom (Schraw et al., 2001).

With regard to the specific results on the dimensions of situational interest, the significant differences concerning the subscale *value-related* can be explained in particular by the described function of the incremental scaffolds to focus the task relevance. The descriptive differences regarding the *emotional* and *cognitive* dimensions of interest could be explained by the structuring character of the incremental scaffolds. As means of instructional support, they might equally support students' experience of competence and autonomy during experimentation (Hänze et al., 2010; Kleinert et al., 2022). The experience of competence and autonomy is in turn associated with the *emotional* and *cognitive* dimensions of interest (Krapp, 1999). In this context, Krapp (2005) found a positive relationship between the fulfilment of basic psychological needs and positive *emotional* qualities during an interest activity. Furthermore, it was shown that an autonomy and competence supportive learning environment, as represented by learning environments with incremental scaffolds (Hänze et al., 2010; Kleinert et al., 2022), increases the willingness to acquire knowledge in terms of the *cognitive* interest dimension (Niemic & Ryan, 2009). Conversely, the lower expressions of situational interest in the control group compared to experimental group I could be explained. It can be assumed that the lack of instructional support in the control group might be associated with an increased cognitive load for the learners during the evaluation of the experiment (Arnold et al., 2014; Germann et al., 1996). In this context, Schmidt et al. (2019) have already shown that open experimentation can lead to an increased extrinsic cognitive load compared to experimentation with incremental scaffolds (Kirschner et al., 2006). An increased cognitive load could restrain the students' learning process and thus decrease the engagement with the learning object (Paas et al., 2003; van de Pol & Elbers, 2013). Against this background, the described results

of the control group regarding the situational interest might be explained. In follow-up studies, the influence of cognitive load on the students' situational interest should therefore be investigated.

The second research question was to answer whether the additional use of incremental scaffolds for the topic of linear functions in mathematics lessons, in addition to the use of the incremental scaffolds during the evaluation of the experiment, can additionally promote the learners' situational interest. Contrary to our assumption, the results of the present study indicated that the use of incremental scaffolds in mathematics lessons has no additional effect on the expression of learners' situational interest in biology lessons. This finding might be explained by the design of the incremental scaffolds in mathematics lessons. As part of a pilot study, it could be shown that the learners did not perceive the tasks on the subject of linear functions as difficult and complex enough for working with incremental scaffolds (Hamers et al., 2020). The low complexity of these tasks might have led to students being underchallenged during the mathematics lessons. As a consequence of this lack of complexity, Paas et al. (2004) assume a limitation of the learning process and a decrease of students' experience of competence (van de Pol & Elbers, 2013). It can be assumed that this learning environment, that did not support students' competence, might explain the low level of situational interest of the learners in experimental group II (Harackiewicz et al., 2016; Potvin & Hasni, 2014). Regarding further empirical studies, the task format in mathematics lessons should therefore be adapted. Based on the adapted incremental scaffolds, possible effects of the additional use of the mathematical incremental scaffolds on the learners' situational interest could then be examined.

Despite the described results, some limitations of the current investigation should be addressed. A limitation of the present study is the small sample size. Against the background of the small sample size, a beta error might have been occurred with regard to the subscales *emotional* and *cognitive*. For these subscales, the medium effect sizes might hint that an increase in sample size could lead to significant differences in the comparison of the treatment groups (Field, 2018). Based on the low sample size, the quasi-experimental design could also be described as problematic. Due to the non-randomized assignment of the students to the treatment groups, differences between the groups could already be present before the intervention. However, the comparison of the students in the different study groups did not show any significant differences with regard to their individual interest. Nevertheless, the positive effects of using incremental scaffolds during biological experimentation on the students' situational interest in biology lessons found in the current study should be examined in future studies with an increased sample size. The present study focused on the phase of evaluation during the experimentation process. To what extent the positive effects of the use of incremental scaffolds on the students' situational interest during the evaluation of the experiment can also be transferred to

further phases of inquiry-based learning should be investigated in follow-up studies.

The aim of the present study was to investigate possible effects of the use of incremental scaffolds in biology and mathematics lessons on the promotion of students' situational interest. To summarize, the implementation of incremental scaffolds as instructional support during experimentation could contribute to an interest-promoting learning environment. Therefore, the use of incremental scaffolds during inquiry-based experimentation could address the decrease in interest in biology lessons.

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“From My Perspective”

Differentiated Instruction in Mathematics According to Lower Secondary School Mexican Students

*Marcela Pozas, José Antonio Palacios Tovar, Lucía Pozas Guerra,
Laura Reneé Rivera Armendariz & Ana Sofía Lomelí Zubiría*

Abstract

Even though students are considered to be recipients of teachers' inclusive pedagogical decisions, and thus key stakeholders in inclusive education, up to now research considering learners' perspectives in inclusive classrooms is limited. Against this background, the present study examines students' experiences of their mathematics lower secondary teachers' differentiated instruction practice. Moreover, it also explores potential differences between inclusive and non-inclusive classrooms. Results from a mixed analysis of variance indicated that students perceive that their mathematics teachers implement mainly variants of mastery learning as a means to differentiate their instruction, indicating that their teachers hold a rather low variance in their DI practice. Additionally, significant differences in teachers' DI practice between inclusive and non-inclusive classrooms were found. Implications of the results and further lines of research are discussed.

Introduction

Teachers are confronted with a highly diverse student population that differs not only in academic readiness, but also cultural background, language competence, learning styles, and motivation, as well as social, methodological, and self-regulatory competencies (Honkimäki & Kálmán, 2012). Thus, with the increasing student diversity, policy makers worldwide call to shift “from focusing on the inclusion of students with special educational needs, to the inclusion, participation and development of all learners” (Schwab & Alnahdi, 2020a, p. 1). Consequently, in order to develop an inclusive classroom environment, teachers are urged to adapt their instruction to address the differences between all students (UNESCO, 2017). DI has been recognised as a pedagogical approach that acknowledges differences among all students by meaningfully responding to their varying learning needs and maximizing learning opportu-

nities (Gheysens et al., 2020). With this background, DI has been considered a core element of effective teaching (OECD, 2018).

Given that teachers play a significant role in the implementation of teaching practices and strategies, they are responsible for providing students with equal access to optimal learning situations. Accordingly, research has mainly focused on examining teachers' perspectives on their use of differentiation. However, far less attention has been paid to explore learners' perspectives about their perceptions of education in inclusive classrooms. Several recent studies have stressed the necessity of considering student experiences in inclusive education research (Lavín et al., 2020a; Schwab & Alnahdi, 2020b; Schwab et al., 2019), as students are to be considered the experts of their own learning (Charteris & Smardon, 2019). Moreover, as Skerritt et al. (2021, p. 3) highlight, "student voice in the classroom is significant because students and teachers experience the classroom differently". Following this line of thought, the present study focuses on exploring lower secondary school students' perceptions of their mathematics teachers' actual DI practice.

The following sections will briefly describe the Mexican educational system and its inclusive education regulations. Afterwards, it will elaborate on the topic of DI and the available research on the topic in Mexico.

Education in Mexico

The Mexican education system

Mexico's education system is organized into three education levels (OECD, 2019): a) basic education including pre-school education (total of 3 years; 3- to 5-year-olds), primary education (total of 6 years; 6- to 11-year-olds), and lower secondary education (total of 3 years; 12- to 15-year-olds); b) upper-secondary education with options between general or vocational programmes (for 15- to 18-year-olds), and lastly, c) higher education. School attendance is obligatory from pre-primary to upper-secondary education (Santiago et al., 2012). Students in Mexico are first formally streamed into different educational pathways before they enter upper-secondary education at the age of 15 (OECD, 2018).

The Mexican education system caters to the educational needs of a large and highly diverse population (Forlin et al., 2010): more than 800,000 students attending indigenous education speak 68 Indigenous languages and over 360 dialects (OECD, 2019). Additionally, more than 20% of the population lives in rural areas, while more than half of the schools have teachers that serve multi-grade classes (SEP, 2012). Students with special education needs (SEN) attend mainstream basic schools or specialized institutions (García-Cedillo et al., 2015). Although certain policies and practices such as delayed tracking and limited ability grouping are implemented, reports from OECD (2018) indicate

that Mexico ranks amongst the countries with the lowest level of inclusion. However, in comparison to other Latin American countries, Mexican students perform above average in mathematics and reading (García-Cedillo et al., 2015).

More than 90% of students attending public schools (OECD, 2019) have access to free education. In contrast, private schools are not publicly subsidised and thus, are tuition-based (Santiago et al., 2012). With this context, most private schools are attended by middle and high socioeconomical status students (García-Cedillo et al., 2015). Although, private schools require the authorization of the state educational authorities and follow the national curriculum established by the Secretariat of Public Education (Secretaría de Educación Pública, SEP), they are independent as to how they manage and implement their choice of teaching and learning approaches. Hence, teaching processes are implemented differently in public and private schools (Lavín et al., 2020).

Inclusive education in Mexico

In 2006, Mexico adopted the Salamanca Statement and the United Nations Convention on the Rights of Persons with disabilities. However, it was until 2011 that the president established a law requiring the inclusion of students with disabilities in the education system (Diario Oficial de la Federación [DOF, Official Gazette of the Federation], 2011). Moreover, in 2012, a constitutional reform established quality education as a right for all Mexicans (OECD, 2018). Within this new reform, Mexico promoted a New Educational Model (2017) which was set to take place during 2018/19. This educational model established inclusive education and equity as main priorities and focused to “strengthen the capacities of schools and educational services that serve indigenous children, migrants and students with SEN” (OECD, 2018, p. 9). This process was done through financial and academic support as well as improving the infrastructure of disadvantaged schools (OECD, 2018). In addition, Mexican law states that private schools cannot deny admission to students with SEN (DOF, 2011).

There are three models of education in Mexico established to meet students’ needs (García-Cedillo et al., 2015; SEP, 2006): a) multiple attention centres (CAM), b) general education support units (USAER) which provide support to students with disabilities in inclusive education settings (classrooms), and c) participation of students with disabilities in inclusive education settings without USAER support. CAMs are non-inclusive special education schools for children with SEN that cannot engage in the general education curriculum (García-Cedillo et al., 2015; SEP, 2006). On the other hand, the USAER provides educational support such as curricular adaptations and accommodations to students with disabilities in inclusive settings by collaborating with parents, teachers, and school personal (SEP, 2006). Students with SEN are first identified through teacher observations taken place during in-class teaching and learning (Santiago, 2009). After identification of a potential SEN, students are then eval-

uated by a psychoeducational team, which detects the student's educational needs as well as is supported accordingly by a medical team (Lujambio et al., 2010).

Even though, Mexico has established the USAER model to provide students with disabilities appropriate support, Romero-Contreras et al. (2013) argue that inclusive education in Mexico is still unsatisfactory. Shockingly, out of the 15 % of students who have a disability, only 2.85 % receive inclusive education (DOF, 2018). Numerous barriers contribute to this situation. For instance, the lack of infrastructure, financial resources and certified personnel results in students, parents and school staff having to find their own way through inclusive education (García-Cedillo et al., 2015). Moreover, given that private schools operate without any government funding, many students with SEN are left without appropriate support for their specific learning needs as they would need to pay private school tuition as well as the additional support required within these school settings (García-Cedillo et al., 2015).

Differentiated Instruction: A national and international perspective

DI is an inclusive instructional approach that enables teachers to meet the needs of all learners in heterogeneous classrooms by implementing a set of intentional, systematically planned and reflected practices (Graham et al., 2020; Letzel, 2021). In order to differentiate their instruction, teachers should modify the content, processes, and products in correspondence to their students' readiness, interests and learning profiles. In this sense, teachers can implement DI through a variety of instruction behaviours such as tiered assignments, homogeneous or heterogeneous subgroups based on learners' performance or interests (Maulana et al., 2020). Additionally, Tomlinson (2017) suggests the use of tutoring systems, staggered nonverbal learning aids such as helping cards, and diverse open education practices such as project-based learning or portfolios. On the other hand, literature has also recommended variants of mastery learning strategies such as jigsaw puzzles, enrichments or prioritised curricula directed at both high and low achieving students (Darnon et al., 2012).

Teachers' DI practice has been found to have positive effects on students' outcomes (Deunk et al., 2018; Valiandes, 2015). Besides being considered a promising inclusive pedagogical practice, DI is also conceptualized as an important domain of teaching quality (van Geel et al., 2019). Results from a recent comparative study by Maulana et al. (2020) indicated that DI can be empirically considered as a specific domain of teaching quality in distinct countries like Netherlands and South Korea.

Recent research has reported that teachers worldwide struggle to differentiate their instruction and rarely adapt their teaching according to their students' characteristics (van Geel et al., 2019). Furthermore, studies also indicate that teachers hold a low variance in their use of DI practices (Lindner et al., 2019) as they mainly differentiate by means of tiered assignments and flexible grouping (Smit & Humpert, 2012). Interestingly, results from PISA 2015 revealed that students in Mexico reported that their science teachers adapt their instruction far much more frequently than the OECD average, and thus, ranks among the highest in OECD countries when it comes to DI (OECD, 2016). Furthermore, findings from a by Lavín et al. (2020b) indicated that Mexican school teachers commonly make use of DI practices such establishing high expectations for all students, personalizing curriculum, individualizing schedules and routines, allowing students to work on their own pace, as well as establishing goals and continuous monitoring of student progress to inform teaching strategies. Similarly, Campa-Álvarez et al. (2020) indicated that Mexican teachers generally differentiate their instruction by means of personalizing and adapting curriculum. Consistent with studies on teachers' self-reported DI practice, findings from a recent small-scale study by Pozas et al. (2021) show that students perceive that their teachers tend to differentiate their instruction by means of mastery learning, tutoring systems, and heterogeneous grouping formats (i.e. differences in abilities and interests).

The present study

When differentiating their instruction, teachers' plan, design and evaluate learning situations in order to meet their students' educational needs. Therefore, students can be considered as recipients of teachers' pedagogical decisions and interventions. In this line of thought, it seems necessary to consider students' perspectives while investigating teaching and learning processes (Scarparolo & MacKinnon, 2022). However, even though international research has highlighted importance of considering students' perceptions about inclusive education there are very few studies that have included student voices on aspects of inclusive education, and in particular, on their experiences of DI (Scarapolo & Mackinnon, 2022). Therefore, the aim of the study was to examine student perspectives on their mathematics teachers' DI practice. Mathematics was selected because according to results from the PISA study, although Mexican students have shown to have an increase in their mathematics scores, they still score significantly lower than the OCDE mean (Santiago et al., 2012). Moreover, teachers teaching within advantage schools (such as private schools) tend to implement more often cognitive activation strategies within their mathematics classes than disadvantaged schools (OCDE, 2016). With this background, the research questions guiding this study were:

- (1) Which practices do lower secondary school students perceive their mathematics teachers to apply in order to differentiate their learning?
- (2) Do students' perceptions of their teachers' implementation of DI practices vary across inclusive and non-inclusive classrooms?

Method

Participants and procedure

Following convenient sampling, a total of 602 Mexican lower secondary school students (52 % female) with a mean age of 13.20 years participated voluntarily in the study. While 34% of the students were taught in an inclusive classroom (with and without USAER support), 66 % were educated in a non-inclusive classroom. Out of this sample, all students attended private schools and 15 % were diagnosed as having SEN. The participants completed a voluntary online survey, which took approximately 15 to 20 min. The online survey was conducted during school hours and the authors of the study were available onsite to support students with any questions. Given that students were underaged, informed consent from their parents or tutors was obtained from all participants completing the questionnaire. Additionally, the research project was approved by the School of Psychology's Ethical Committee of the University of Monterrey.

Instrument: DI practices

The student questionnaire concerning teachers' actual in-class DI practice was developed based on the teacher DI practice perspective questionnaire by Letzel (2021). This questionnaire stems from previous work by Pozas and Schneider (2019). Within their study, the authors provide a categorization of the DI practices that seeks to bridge the gap between educational theory and daily instructional practice (for a detailed description of the taxonomy please refer to Pozas & Schneider, 2019; Pozas et al., 2019). The Taxonomy of DI practices is framed within the current DI literature and research, and identifies six DI categories of practices: tiered assignments, intentional composition of student groups, tutoring systems, staggered non-verbal aids, mastery learning, and open education/granting autonomy to students. The teacher perspective questionnaire by Letzel (2021) was reviewed and adapted to assess teachers' actual DI teaching practices from students' perspectives. In a recent small-scale study conducted by Pozas et al. (2021), the scale has been previously back-translated from German to Spanish.

Table 1: Means and standard deviations for all DI items.

	Inclusive classroom		Non-inclusive classroom	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
1. Tiered assignments: extra tasks	1.50	1.10	1.44	.94
2. Tiered assignments: more time	2.39	1.36	2.11	1.29
3. Tiered assignments: more challenging tasks	1.55	1.12	1.41	.89
4. Tiered assignments: different tasks (representation)	1.68	1.19	1.70	1.11
5. Heterogeneous ability grouping	2.54	1.40	2.35	1.38
6. Heterogeneous interest grouping	2.38	1.34	2.34	1.31
7. Homogeneous ability grouping	2.26	1.30	2.09	1.15
8. Homogeneous interest grouping	2.36	1.29	2.24	1.18
9. Tutoring systems	2.37	1.47	2.12	1.32
10. Staggered nonverbal learning aids	2.20	1.39	1.98	1.31
11. Mastery learning	3.67	1.38	3.62	1.36
12. Open education	2.07	1.31	1.84	1.12

The items could be responded by students using a five-point Likert scale (1 = never to 5 = very frequent) (see Table 1 for descriptive statistics) and were as follows:

Instruction: “How often does your mathematics teacher use the following practice during the lesson”

- Category I. Tiered assignments: “Some students receive extra tasks”.
- Category I. Tiered assignments: “Some students receive more time to finish their assignments”.
- Category I. Tiered assignments: “Some students receive more challenging tasks than others”.
- Category I. Tiered assignments: “Some students receive different tasks, some tasks for example, have images instead of text”.
- Category II. Intentional composition of student groups: “My teacher forms groups of students with different capabilities”.
- Category II. Intentional composition of student groups: “My teacher forms groups of students with different interest”.
- Category II. Intentional composition of student groups: “My teacher forms groups of students with similar capabilities”.
- Category II. Intentional composition of student groups: “My teacher forms groups of students with similar interests”.
- Category III. Tutoring systems: “My teacher assigns students as tutors to which I approach during the school year for support”.

- Category IV. Staggered non-verbal learning aids: “My teacher provides a series of helping cards when I need support”.
- Category V. Mastery Learning: “My teacher sets a goal for all students to achieve in a topic before starting a new topic”.
- Category VI. Open education/granting autonomy to students: “My teacher allows me to choose the format of my lessons (e.g. free work, station work)”.

Analyses

In order to answer the research questions, a mixed analysis of variance was undertaken to determine if significant differences existed between students' ratings of their teachers use of DI practices based on their school setting (inclusive vs. non-inclusive classroom). All DI practices items were submitted to the mixed ANOVA as dependent variables, while school setting was included as an independent variable. With regard to assumption considerations for the mixed ANOVA, it is important to note that the sphericity assumption was violated and the Greenhouse-Geiser ϵ exceeded .75, indicating that variances of the differences between all combinations of the groups are not equal. Thus, the Huynh-Feldt corrected test statistic is reported for the within-subjects factor and the interaction.

Results

The mixed ANOVA test of between-subject effects reported a significant main effect of school setting, $F(1, 598) = 4.55$, $p < 0.05$, partial $\eta^2 = 0.01$. In detail, it appears that students in inclusive classrooms rated their mathematics teachers' use of DI practices significantly higher than students in non-inclusive classrooms. The tests of within-subject effects showed significant variations within students' ratings of their mathematics teachers' implementation of the single use of DI practices, $F(8.37, 598) = 172.69$, $p < 0.001$, partial $\eta^2 = 0.22$. In detail, students perceive that their mathematics teachers tend to differentiate their instruction mainly by implementing mastery learning. In contrast, students' ratings show that their mathematics teachers rarely differentiate by using tiered assignments such as providing additional tasks, assigning more challenging tasks or with different representations as well as open education (Figure 1). Lastly, the tests of within-subject effect do not report a significant interaction effect of the single DI practices and school setting, thus indicating that mathematics teachers' frequency use of the single DI practices is similar across inclusive and non-inclusive classrooms.

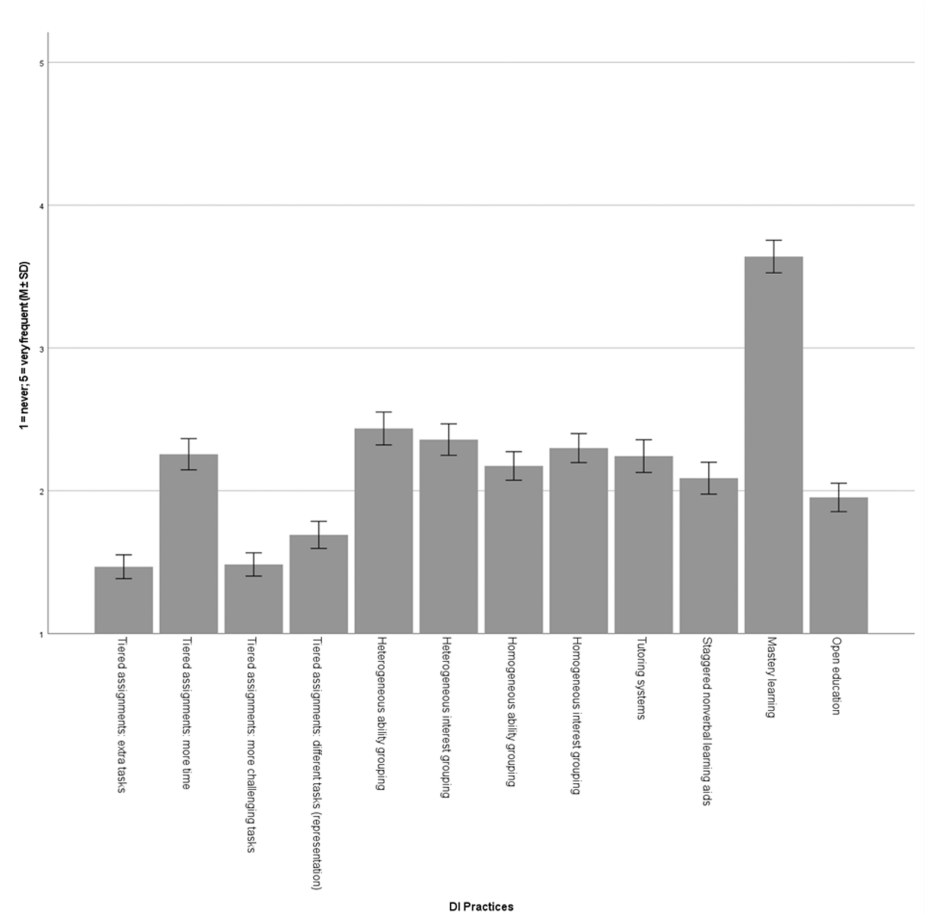


Figure 1: Differences among DI practices.

Discussion

Students are recipients of teachers’ inclusive pedagogical decisions, and thus key stakeholders in inclusive education. Nevertheless, at present, research considering learners’ experiences and perspectives about education in inclusive classrooms is scarce (Scarparolo & MacKinnon, 2022). In order to tackle this gap in empirical research, the study has analyzed mathematics lower secondary school teachers’ DI practices by means of students’ reports. Moreover, it also considered classrooms factors, such as the school setting, in order to explore potential differences between inclusive and non-inclusive classrooms. With regards to the first research question, the findings indicate visible differences within student ratings of the distinct practices that their teachers employ to differentiate their instruction. In detail, it appears that students perceive that their mathematics teachers mostly implement DI by means of mastery learning.

As discussed in the theoretical background, recent studies revealed that Mexican school teachers' main strategy to differentiate their instruction are in fact variants of mastery learning such as adapting and personalizing curriculum as well as establishing expectations and goals for all students (Campa-Álvarez et al., 2020; Lavín et al., 2020a, 2020b). In contrast, the least frequently reported DI practices are variants of tiered assignments, such as providing extra and/or more challenging tasks as well as varying the activities' visual representation. Although these results are surprising, as there is numerous international research that has shown that tiered assignments are by far the most applied DI practice (Pozas et al., 2019; Smit & Humpert, 2012), they are in line with results from a previous Mexican student sample (Pozas et al., 2021). However, it is important to mention that, contrary to the results within this present study, other studies conducted in Mexico using teacher and student samples have indicated that teachers also commonly make use of DI practices such as tutoring systems and the establishment of intentional grouping formats (Naranjo, 2019). Thus, more research exploring in combination both perspectives are further needed to explore such differences.

Other important findings to highlight are that, (1) in general, mathematics teachers rarely apply DI practice in their in-class instruction, and thus is far away from recommendations for successfully dealing with heterogeneity (Moon et al., 2002), and (2) teachers hold a rather low variance in their DI practice as they mainly differentiate by means of mastery learning. Even though numerous international investigations have also pointed out at a low variance in DI practices across other teacher samples (Lindner et al., 2019; Smith & Humpert, 2012), Ritzema et al. (2016) have previously reported that Mathematics teachers tend to implement DI practices more often. Moreover, studies conducted in Mexico have pointed at a high frequency of DI use by in-service and pre-service teachers (García, 2014; Cedillo et al., 2015; Flores Barrera et al., 2017). However, all of these studies refer to pre-pandemic times. Hence, it is possible that these contradicting results can be due to the impact of the COVID-19 pandemic on the educational landscape and the changes and challenges brought to teachers to establish inclusive educational practices (de Klerk & Palmer, 2021; Guzmán Villa, 2021). Consequently, it is urged for further research to continue exploring the educational impact of the pandemic on teachers' teaching practice and students academic and non-academic development.

Concerning the second research question, although within-subject results indicate that teachers in both inclusive and non-inclusive classroom settings do not significantly differ in their single DI practices use (hold a similar pattern of use of DI practices, i.e. use of mastery learning), the between-subject results, however, do indicate significant differences. In detail, it appears that teachers in inclusive classrooms generally differentiate more often (however slightly) their instruction compared to their counterparts in non-inclusive settings. Although such finding is consistent with previous research (Paseka & Schwab,

2020), it is important to highlight that this difference has a very low effect size. Consequently, this result can be limited in its practical application. Hence, this finding must be considered with caution and inherently calls for further research to explore potential differences across educational settings.

Taken all together, findings from this study contribute to the current state of research on inclusive education in Mexico. Interestingly, and more importantly, in comparison to other countries (i.e. Germany), it appears that Mexican school teachers employ instructional practices such as variants of mastery learning, which according to Hattie (2009), have strong and positive effects on students' achievement. Thus, it can be assumed that these results suggest important country-specific differences when it comes to the overall practice of DI.

Limitations

The present study holds several limitations. First, even though surveys addressing students' perspectives are economical, recommended in research, and possess validity (Butler, 2012), it might be very well possible that students could incorrectly assess their teachers' differentiation practice given their lack of didactical knowledge. In this context Fauth et al. (2014) argue that different dimensions of instructional practices cannot be observed in the same way. Thus, it is strongly suggested that future studies integrate all stakeholders' perspectives, that is students and teachers, and make use as well of classroom observations. Additionally, it would be important to further conduct teacher interviews that could shed light into how they plan and design a differentiated lesson. This might provide deeper insights into teachers' purposes or intentions using particular DI practices. Additionally, although convenient sampling (as used in this study) is a common research strategy that possess great advantages (e.g., least time-intensive and simple to conduct), it also carries important disadvantages. One of these is that the results obtained from such samples have generalizability only to the sample under study (Bornstein et al., 2013). Hence, the findings from this study must be considered with caution. Second, information regarding teacher (e.g., teaching experience, attitudes) and classroom characteristics (e.g. class size) were not collected within the study. Considering that previous studies (e.g., Lindner et al., 2019) have shown the relations between such characteristics and students' ratings of their teachers' DI practice, it would be important that further research incorporate such data. Third, even though the student-specific instrument has been previously used, it has up to now, not been validated within the Mexican context, nor explored for measurement invariance across different groups of students. This is of particular importance because of the limited reading comprehension abilities of students with SEN that could inherently result in the same items being understood quite differently (Schwab & Helm, 2015).

Third, given that the sample consistent of only students attending private schools, it was not possible to examine differences between school type (private vs. public schools). As discussed with the theoretical section, teaching processes are implemented differently in public and private schools (Lavín et al., 2020b). Research comparing both school types has indeed observed differences regarding the teaching practices implemented (Pozas et al., 2021; Sánchez-Escobedo & Lavadores, 2018). Additionally, there are potential differences across public schools (i.e. some public schools in Mexico do indeed have tuition fees), and as such it is necessary to see whether there are other various factors influencing teachers' use of DI. Finally, the results from this study cannot be generalized to other school subjects and/or educational stage (i.e. primary schools). Considering that the ways in which DI practices are employed among different school subjects can be different (Ritzema et al., 2016), it is of utmost importance that future research concentrates on exploring potential differences not only across school type, but also among school subjects. Finally, the present study only explored lower secondary school students' perceptions of their mathematics teachers' DI practice. Previous research has shown that as a result of the different the curriculum, teaching practices in primary and secondary classrooms are quite diverse, resulting in variations in the frequency of implementation of DI (Sánchez-Escobedo & Lavadores, 2018). Thus, taken together, future research should not only incorporate and explore differences between school subjects but also across educational stages.

Conclusions

Based on the outcomes, and given the fact that comparative research on inclusive education is still scarce (García-Cedillo et al., 2015), this paper calls for educational researchers to conduct cross-cultural investigations on how differentiated instructions is not only designed and implemented in general education, but as well to conduct in-dept analyses on different stakeholders' perspectives, in particular students' perceptions and experiences of DI. By examining students' perspectives on their experiences of DI "we may gain insight into what they deem to be valuable" (Scarparolo & Mackinnon, 2022, p. 7) which can in return, inform teachers' lesson planning and inclusive teaching.

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Evaluating South African Secondary School Teachers' Effective Adaptive Teaching Practices in Developing Students' Critical Thinking Skills

Thelma de Jager

Abstract

In a developing country where various transformation initiatives in education have taken place, large numbers of students from disadvantaged schools still drop out before completing grade 12 and graduate without the ability to apply critical thinking skills in solving real-life problems. A reason could be that teachers' ineffective teaching practices do not always enable students to reach the course outcomes. To detect secondary school teachers' effective teaching practices and the milestones they have reached in their teaching careers, a quantitative approach was used to evaluate classroom practices of secondary school teachers (N = 313) of 34 public schools. The observed teachers were evaluated mostly in rural areas where class sizes vary between 47 and more students. Results showed that inadequate training in teaching and managing large class sizes could significantly affect the application of adaptive teaching practices; teachers used their time for effective learning inefficiently; neglected to allow students extra study and instruction time, did not always monitor learners to ensure they had completed the activities, and do not always adjust their instruction to relevant inter-learner differences.

Introduction

South Africa's history of inequality and discrimination has contributed to a legacy of barriers to learning that have resulted in many students not completing grade 12 (Baldry, 2016). Before independence in South Africa, curriculum design and instruction were characterised by passive learning of content, where students were mostly not involved in interactive class activities and critical thinking activities (Makina, 2010). After the end of apartheid in 1994, and in reaction to the post-apartheid state of special needs and support services in education and training, various policies to develop students' problem-solving abilities and critical thinking skills that could contribute to more innovative entrepreneurs and skilled citizens were implemented to promote access to educational opportunities for previously disadvantaged students (Department of Basic Education,

2020). One of these policies was the White Paper 6: Special Needs Education to address students' diverse needs (Republic of South Africa, 1996).

However, despite the implementation of White Paper 6 to take accountability in addressing students' needs, many students are still experiencing learning barriers. Various studies indicate that teachers are not adequately trained to include all students actively in their lessons and do not receive sufficient district support services to assist them with students encountering learning barriers (Adewumi & Mosito, 2019; Simelane & Schoeman, 2016).

Notwithstanding the transformation process, critical thinking remains unattainable for many students. Many undergraduate students, mostly from disadvantaged schools, are still graduating without the ability to apply critical thinking skills in solving real-life problems (Halpern & Dunn, 2021). The reason might be that teachers are not always willing to change their traditional (talk and chalk) teaching methods to critical thinking and problem-solving methods, fearing that they might not complete the curriculum in the specified timeframe or that large student groups might become undisciplined when they work interactively (Wilmot & Merino, 2015). The results of the application of traditional teaching methods can be seen in the learner dropout figures in South Africa, which have become a national crisis. It is estimated that 60% of first-graders will drop out from school before completing grade 12 (Weybright et al., 2017). To prevent students from not completing their schooling career it is essential to evaluate teachers' teaching practices and detect what teaching and learning approaches may be effective in retaining these students.

Bearing in mind the socio-economic status of most South African students and the need to develop critical thinkers that could solve real-life problems, teachers need to adapt their instruction methods to accommodate the diverse learning needs of their learners (de Jager, 2017). However, limited studies have been conducted to establish the effective application of adaptive activities that could provoke secondary school learners' critical thinking in solving problems they encounter in their daily lives.

The aim of this study was to observe and evaluate what milestones teachers have reached in applying effective adaptive teaching methods and strategies during their professional careers as secondary school teachers teaching mostly in rural schools. The study sought to answer the following questions in order to develop teachers for 21st-century student needs:

- *How do teachers manage their classes?*
- *How do secondary school teachers adjust instruction and learner processing to inter-learner differences?*
- *How effective are teachers in applying teaching and learning strategies to develop learners' critical thinking skills?*

In understanding the need for adaptive e-teaching and the development of critical thinking skills the social constructivist theory is applied in the study.

Theoretical framework

Teachers' ability to apply diverse interactive and adaptive teaching methods and strategies related to learners' social context is imperative for effective teaching and learning (Bodrova, 1997). Vygotsky's social constructivist theory emphasises the importance of social interactions where learners are actively engaged in their learning activities and not passive receivers of new content (Vygotsky, 1978). Moreover, Vygotsky propagates that effective learning is influenced by learners' cultural contextual experiences (Bodrova, 1997). Thus, it is important to consider students' cultural context when planning the teaching of content and creating adaptive assessment activities (Anderson, 2007). This is supported by Freire, who proposes that before teachers plan a lesson, they should include learners' cultural needs in their lesson (Dos Santos, 2009). The aim is to assist learners to learn as much as possible about their own contextual environment and to be able to engage in critical thinking discussions to find solutions to problems, which includes anthropological, social, and political issues. Additionally, Finkelstein et al. (2021) emphasize an inclusive community and inclusive classroom where teachers adapt their instruction to address the social/academic needs of all learners.

The social constructivist theory is also applicable for the professional development of teachers, where they can learn how to improve their classroom practices through interaction with their colleagues and training facilitators within their social context (Harland, 2003). Vygotsky's concept of the zone of proximal development (ZPD) and mediation refers to what teachers can learn through mediation with someone more knowledgeable using a tool. In this study an observation instrument was used to evaluate and improve participants' teaching practices (Harland, 2003). Thus, the principles of social constructivism were significant to this study in the sense that observers who evaluated teachers' lessons discussed the observed evaluations with the teacher at the end of the lesson and pointed out strong and weak evaluations where teachers could improve their teaching practices.

Background

The economy of South Africa is dependent on highly skilled citizens and is experiencing many challenges in executing effective education for developing critical thinking skills (World Bank, 2018). This contributes to a high unemployment rate as students do not acquire the relevant skills needed for a growing economy. The failure to develop sufficient skills and the application of problem solving and critical thinking skills in real-life situations stems from education outcomes not achieved in an inclusive South Africa. The socio-economic status of students contributes significantly to effective education as students in rural

communities are still achieving lower education outcomes than students in urban areas (Branson & Leibbrandt, 2013). Additionally, Spaull (2016) points out that 70% of South Africa's students (mostly black students) attend dysfunctional public (mostly no-fee) schools and achieve outcomes below national and international standards. He adds that students from poorer backgrounds tend to fail their grades due to inequalities deriving from the socio-economic status of students. Isdale et al. (2017) found that 81% of students attending no-fee schools did not have the minimum knowledge and skills needed to complete their grade, compared to 38% in fee-paying schools. Additionally, if students do not acquire relevant knowledge and skills in primary schools, the gap widens in secondary schools. The lack of critical thinking and problem-solving skills is evident in the comparison and evaluation of South African grade 4 students' mathematics skills with 49 countries, scoring the lowest in the Trends in International Mathematics and Science Study (TIMSS) tests. A group of 39 grade 8 and 9 South African mathematics and science students was ranked last (grade 8) and second last (grade 9) in the TIMSS test scores. Other developing countries such as Swaziland, Botswana and Kenya scored higher than South African learners in reading and mathematics (Isdale et al., 2017). Moreover, 78% of the grade 4 learners could not read adequately in any language (Howie et al., 2016). A substantial part of the low rates of retention is caused by learning deficits acquired at the primary level due to the low quality of education. In addition, ineffective education has a snowball effect as the learning deficits encountered in secondary education make the transition from secondary education to higher education complex. In 2015, more than 25% of students enrolled for higher education dropped out in their first year of study (Isdale et al., 2017).

Contributing to ineffective education is the transfer and reinforcement of knowledge using a single textbook. Spaull (2016) adds that 37% of poor students have to share a textbook as they do not have one of their own, which could contribute to ineffective learning. Cuttler (2019) opposes the use of a single textbooks as most of them do not always include content that relates to the real-life situations of students. An innovative school curriculum requires that students should be taught indigenous content within the context of their societal and cultural knowledge, and that students should be able to apply the acquired knowledge and skills in real-life situations (Mawere, 2015). Moreover, effective education is also influenced by English second language instruction (de Jager, 2019). When adapting teaching strategies to include all students' needs, teachers spend more time on explaining English words using code switching, where a concept has to be explained in two languages – the home language and English (Van der Berg, 2015).

Teachers play a vital role in effective adaptive education. However, Mbiti (2016) argues that, like other developing countries, South Africa is challenged with teachers' absenteeism and low rates of content knowledge, accountability, and motivation, especially in rural areas. Reddy et al. (2012) claim that 60% of

students indicated that their teachers' absenteeism was a challenge for their learning. They add that in mostly black schools, 33% of the teachers are absent during month end and 20% are usually absent on Mondays and Fridays. Principals who need to manage teachers are often not adequately qualified and trained as teachers when they are assigned to fulfil managerial and administrative duties of complex and large schools (Van der Berg & Hofmeyr, 2017).

Evans and Popova (2016) engaged in a comprehensive review of international studies in developed countries and identified three wide-ranging categories where intervention was needed, as follows: pedagogical interventions were needed to adapt to students' diverse learning needs, a continuous long-term teacher training programme associated with differentiated instruction should be followed, and teacher accountability should be encouraged using teacher performance incentives to enhance effective education. In agreement with these findings, Conn (2017) asserts that pedagogical interventions have the greatest impact on learner performance.

South Africa's policymakers should consider implementing more intensive, continuous, and localized teacher training. According to McEwan (2015), who meta-analysed 77 studies that investigated the impacts of various educational interventions, it was found that teacher training improved learner performance. A study by Evans and Popova (2016) also found that teacher training interventions had a considerable effect on learner performance, while findings by the Department of Basic Education (2020) confirmed that older teachers had better subject knowledge while younger teachers applied more innovative teaching methods and strategies. In developing countries, pedagogical intervention could assist teachers in how to apply adaptive teaching strategies despite large class sizes, curriculum demands and time constraints (Amsler, 2014). Teachers need to shift away from a pedagogy of exclusion towards a pedagogy of inclusion that considers learners' learning barriers, and diverse learning styles and strengths (Department of Basic Education, 2013). Thus, it is imperative to ensure differentiated instruction of the curriculum to enable access to learning for all students.

Tomlinson (2015) states that most teachers lack the knowledge, skills and training necessary to implement diverse teaching strategies and methods of instruction that address students' needs and interests. A learner-centred approach should be followed where learners are actively involved in the acquisition of content to reach the lesson outcomes (Kemp, 2013). Thus, students need to be properly informed of the aims of the lesson before interactively engaging in the lesson. De Jager et al. (2017) point out that interactive learning activities not only develop students' self-confidence but also enable them to work collaboratively with others in finding solutions to problems. Therefore, teachers need to instruct relevant content that students can relate to their everyday experience when seeking solutions for solving problems.

According to Tomlinson (2015), differentiated instruction includes organised but flexible ways of adjustment of teaching and learning methods to accommodate students' diverse needs and learning preferences to reach the lesson outcomes. To include all students in the learning activities regardless of their learning abilities, teachers need to apply adaptive and supportive teaching methods, strategies and assessment activities (de Jager, 2012) and understand how students assimilate and understand concepts in their social context.

Additionally, Sabel et al. (2017) emphasise that cognitive and meta-cognitive instruction can effectively be applied in enhancing students' diverse learning abilities. Cognitive learning strategies encourage students to reflect on acquired content and how to apply it to current and future contextual situations. When students are engaged in hands-on approaches, they develop a deeper understanding of the content and simultaneously develop problem-solving and critical thinking skills which they could apply in real-life situations (Martin & Bolliger, 2018). Craig et al. (2020) propagate that metacognitive strategies enable students to recognise and understand diverse cultural experiences while interactively finding solutions to problems and conceptualising new content. In addition, engaging students as active participants in class activities could assist them in developing the ability to analyse their own learning and become self-directed learners (Martin & Bolliger, 2018).

Teachers' ability to apply diverse interactive teaching methods and strategies related to students' social context is imperative for effective teaching and learning (Bodrova, 1997). Vygotsky's social constructivist theory emphasises the importance of social interactions where learners are actively engaged in their learning activities and not passive receivers of new content (Vygotsky, 1978). Moreover, Vygotsky propagates that effective learning is influenced by students' cultural contextual experiences (Bodrova, 1997). Thus, it is important to consider students' cultural context when planning the teaching of content and creating differentiated activities and assessment (Anderson, 2007). This is supported by Freire, who proposes that before teachers plan a lesson, they should include students' cultural needs in their lesson (Dos Santos, 2009). The aim is to assist students to learn as much as possible about their own contextual environment and to be able to engage in critical thinking discussions to find solutions to problems, which includes anthropological, social, and political issues.

In line with the social constructive theory the study focuses on the professional development of teachers in using an observation tool to evaluate their adaptive teaching practices in the development of learners' critical thinking skills. Trained observers evaluated teachers' teaching practices in class, followed by discussions on possible improvements on teaching practices.

Iglesias-Garcia et al. (2020) state that the evaluation of teachers' teaching practices can be applicable for teacher training programmes and to support professional development that could enhance effective teaching practices. Thus,

the findings of the study regarding teachers' teaching practices inside the classroom can be used by researchers, teacher educators, and educational experts to develop teacher training programmes relevant to the 21st-century needs of students.

Sample

A quantitative approach was used to evaluate secondary school teachers (N = 313) of 34 public schools situated in the Gauteng, KwaZulu-Natal and Mpumalanga Provinces of South Africa. These schools were mostly situated in rural areas (76.85%). After completing a consent form participating teachers were voluntarily observed and evaluated by trained lecturers and education specialists. The participants included male (53.11%) and female (46.89%) secondary-school teachers with diverse teaching experience ranging from less than three years (26.23%), three to five years (18.21%), six to 15 years (27.78%) to above 15 years (27.78%). Concerning the subjects they taught, 11.75% taught computer and technology subjects, 28.79% taught science subjects (i.e., mathematics and physical sciences), 24.36% taught languages and 19.50% economic and business management subjects. Most participants indicated they taught large class sizes varying between 47 and more students (23.29%) and 36–46 students (39.44%). Permission to conduct the study in selected schools was granted by the Gauteng Department of Education and the principals of the schools.

Instrument

Teachers' practices were observed and evaluated using a quantitative approach. The original English version of the ICALT observation instrument was used to evaluate secondary school teachers. The observation instrument had been tested by Maulana et al. (2014) in previous studies conducted in developing countries with a similar social context as South Africa.

The observers applied scores according to their observations of effective teaching practices by rating each dimension on a 4-point scale, varying from 1 (mostly weak) to 4 (mostly strong). Scores of 1–2 represented low-quality teaching skills (weak) and scores of 3–4 indicated high quality (strong) and were grouped together in the results.

"Efficient organisation" (Domain 1[D1]) and "Teaching learning strategies" (Domain 3 [D3]) were treated as independent variables and "Adjusting instructions and learner processing to inter learner differences" (Domain 2 [D2]) of effective teaching practices as dependent variables. The three domains were extracted from the observation instrument because a pre-evaluation study of secondary school teachers (n=424) of the Gauteng Province indicated that these

two domains (D1 and D3) could indicate if teachers are actually applying adaptive teaching strategies (D2) in their classes that could affect effective adaptive teaching and the development of students' critical thinking skill development (de Jager et al. 2017).

The reliability and validity of the observation instrument used showed internal consistency in all variables of the three domains, > 0.70 (using Cronbach's alpha).

Procedure

Qualified education lecturers and specialists ($N = 5$) volunteered as observers and received intensive observation training. Observations were conducted in English as the official language of instruction, therefore there was no need to translate the instrument. Training included an in-depth explanation of the observation instrument and how to observe and evaluate effective teaching practices and apply appropriate judgements to ensure consensus of scores. As only five observers were involved in the observation of teachers' teaching practices the evaluations are considered valid and reliable as their evaluations were in agreement 97% during the training. One observer observed one teacher's lesson at a time.

Observations were scheduled with voluntarily participating secondary school teachers and lasted for approximately 30–45 minutes. The observations were executed mostly in the early (41.05%) and late mornings (30.56%), within a period of three months at the beginning of the second semester.

In answering the research questions Stata V14 statistical software was used to analyse the data. Frequencies and percentages were used to summarise the data, and in answering the research questions, descriptive analysis was applied.

With the predictive validity, regression was applied and tested for normality first and all variables were normally distributed if D2 is made a dependent variable, while D1 and D3 are independent variables.

Results

Tables I, II and III below reflect the descriptive results for efficient classroom organisation, adaptive teaching practices and teaching and learning strategies. Descriptive statistics were applied to detect the observed frequency (indicated in percentages) of effective classroom organisation and the application of adaptive teaching practices in developing students' critical thinking skills. The frequency of the results was illustrated using percentages to summarise the highest and lowest scores observed for "strong" and "weak" teaching practices of teachers in a meaningful manner.

Table 1: Domain 1: Efficient organisation.

Criteria	Frequencies	Percentage
OBS 1...ensures the lessons proceed in an orderly manner		
weak	N = 50	15.93%
strong	N = 263	84.07%
OBS 2....monitors to ensure learners carry out activities in the appropriate manner		
weak	N = 82	26.12%
strong	N = 231	73.88%
OBS 3....provides effective classroom management		
weak	N = 79	25.24%
strong	N = 234	74.76%
OBS 4....uses time for learning effectively		
weak	N = 89	28.34%
strong	N = 224	71.66%
OBS 5... encourages learners to think critically		
weak	N = 95	30.45%
strong	N = 218	69.55%

The evaluation for efficient organisation of classrooms showed that 28.34% (N = 89) of teachers mostly did not use their time "...for learning effectively", followed by teachers (26.12% [N = 82]) who monitored "...their learners to ensure they complete the activities" and (25.24% [N = 79]) provided "...effective classroom management". In contrast to the weak scores, teachers strongly (84.07% [N = 263]) ensured their lessons proceeded in an orderly manner.

Table 2: Domain 2: Adjusting instruction and learner processing to inter-learner differences.

Criteria	Frequencies	Percentage
OBS 6...evaluates whether the lesson aims have been reached		
weak	N = 114	36.45%
strong	N = 199	63.55%
OBS7...offers weaker learners extra study and instruction time		
weak	N = 134	42.77%
strong	N = 179	57.23%
OBS8...adjusts instruction to relevant inter-learner differences		
weak	N = 126	40.19%
strong	N = 187	59.81%
OBS9...adjusts the processing of subject matter to relevant inter-learner differences		
weak	N = 123	39.43%
strong	N = 190	60.57%

Table 3: Domain 3: Teaching learning strategies.

Criteria	Frequencies	Percentage
OBS10...teaches learners how to simplify complex problems		
weak	N = 94	29.91%
strong	N = 219	70.10%
OBS11...stimulates the use of control activities		
weak	N = 102	32.48%
strong	N = 211	67.53%
OBS12...teaches learners to check solutions		
weak	N = 78	24.84%
strong	N = 235	75.16%
OBS13...stimulates the application of what has been learned		
weak	N = 87	27.79%
strong	N = 226	72.20%
OBS14...encourages learners to think critically		
weak	N = 95	30.45%
strong	N = 218	69.55%
OBS15...asks learners to reflect on practical strategies		
weak	N = 91	28.94%
strong	N = 222	71.06%

It was alarming that teachers (42.77% [N = 124]) inadequately offered "...weaker learners extra study and instruction time" and only 57.23% (N = 179) strongly implemented this. In addition, only 59.81% (N = 187) of the participants strongly adjusted "...instruction to relevant inter-learner difference", while 40.19% (N = 126) were mostly weak. It seems that teachers were content driven, as they strongly established whether the "...lesson aims have been reached" (63.55% [N = 199]) and strongly (60.57% [N = 190]) adjusted "...the processing of subject matter to relevant inter-learner differences" to ensure learners stayed abreast with the content matter

Observation of participants' teaching and learning strategies show that only 29.91% (N = 94) of teachers were evaluated as weak for teaching "...learners how to simplify complex problems", while 70.1% (N = 219) were strongly motivated. Teachers (67.53% [N = 211]) stimulated "...the use of control activities"; 75.16% (N = 235) taught "...learners to check solutions"; 72.20% (N = 226) stimulated "...the application of what has been learned"; 69.55% (N = 218) encouraged "...learners to think critically" and 71.06% (N = 222) asked "...learners to reflect on practical strategies". Teachers found it difficult to engage students in critical thinking activities as they tended to be reluctant to change traditional teaching methods of talk and chalk to adaptive teaching (Makina, 2010; de Jager, 2012). In addition, content was not always relevant to the socio-economic context of

students, which makes the development of problem-solving skills difficult as they cannot always relate to the problem at hand (Craig et al., 2020).

In summarising the results, a strong relationship was detected between the independent Domain 2 OBS6 "...evaluates whether the lesson aims have been reached" (63.55 %) and the dependent variables D1 OBS4 "...uses time to learn effectively" (71.66 %), D3 OBS10 "... teaches learners how to simplify complex problems" (70.10 %) and D3OBS14 "...encourages learners to think critically" (69.55 %). This could result in learners not achieving the learning outcomes to apply critical thinking skills in simplifying complex problems, because learners' needs were not adequately addressed during lesson activities.

Table 4: Relationship between independent variables and dependent variables.

Independent variables: Domain 2	Dependent variables: Domains 1 and 3
D2 OBS6	D1 OBS4
	D3 OBS10
	D3 OBS14
D2 OBS7	D3 OBS11
	D3 OBS15
D2OBS8	None
D2OBS9	D3 OBS13
	D3 OBS15

The results also showed a strong relationship between "...offers weaker learners extra study and instruction time" (57.23% [D2OBS7]) and "...stimulates the use of control activities" (67.53 % [D3OBS11]) and "...asks learners to reflect on practical strategies" (71.06 % [D3 OBS15]). Although no relationships to the other domains were detected regarding "...adjusts instruction to relevant inter-learner differences" (59.81% [D2OBS9]), a strong relation was detected between "...adjusts the processing of subject matter to relevant inter-learner differences" (60.57 % [D2 OBS9]) and "...stimulates the application of what has been learned" (72.20% [D3 OBS13]) and "...asks learners to reflect on practical strategies" (71.06% [D3 OBS15]).

The strong relationship between the above variables shows that many of the dependent variables are not always strongly applied in classes, which could contribute to ineffective adaptive instruction and students not developing critical thinking skills to solve real-life problems.

Discussion

During the apartheid regime in South Africa, instruction was characterised by passive learning of content with limited opportunities for interactive class and critical thinking activities. Despite various transformation processes in the education system many students' needs and learning barriers have still not been addressed, which causes many students to drop out from school, not completing grade 12 (Simelane & Schoeman, 2016; Department of Basic Education, 2013).

Although the study detected that most of the participating teachers had teaching experience of six to 15 years (27.78%) and above 15 years (27.78%) and 84.07% ensured that their lessons proceeded in an orderly manner, most teachers were still unable or unwilling to adapt their teaching methods and strategies to the needs of their students. This could mean that teachers are still not adequately trained to adapt their teaching methods and strategies (Simelane & Schoeman, 2016). It could be argued that more experienced teachers could have acquired more content knowledge during their teaching experience but may lack a willingness to adapt their teaching practices or are not always sufficiently trained in how to create adaptive class activities (Adewumi & Mosito, 2019; Conn, 2017). Therefore, teachers are inclined to teach as they were initially trained, using teacher-centred methods.

Moreover, most participants involved in the study were science teachers (28.79%) (i.e., mathematics and physical sciences). These teachers could find adjusting their teaching and learning methods difficult to teach English second language learners as they need to clarify unclear or new abstract concepts in a second language. Van der Berg (2015) supports this in stating that teaching English second language students could be time consuming as teachers need to explain English words using code switching, where they explain the concept in two languages – the home language and English – to ensure students understand the concepts. This could contribute that teachers do not have sufficient time to engage in activities where learners can develop critical thinking and problem-solving skills during lessons.

The observed teachers were evaluated mostly in rural areas (76.85%) where class sizes vary between 47 and more students (23.29%) and 36–46 students (39.44%). According to Amsler (2014), these large class sizes could significantly affect the management of classes and the application of adaptive teaching practices. Additionally, the results reflected that teachers inefficiently used their time for effective learning 28.34% ($N = 89$) or allowed students extra study and instruction time (42.77% [$N = 124$]), they did not always monitor learners to ensure they had completed the activities (26.12% [$N = 82$]), and only 59.81% ($N = 187$) of the participants adjusted their instruction to relevant inter-learner differences. The reason could again be connected to the large class sizes which makes it difficult to monitor learners' activities and inadequate training in how to manage large classes and apply interactive lesson activities. Evans and

Popova (2016) add that another reason could be that the curricula is still exam driven and teachers not adequately trained or willing to adapt their teaching practices according to learners' needs. In addition, teachers are often late for class or absent from school (Van der Berg & Hofmeyer, 2017), and do not always use their time effectively for adaptive instruction methods.

A literature review (Halpern & Dunn, 2021) shows that teachers are not always willing to change their traditional teacher-centred teaching methods to critical thinking and problem-solving methods in fear that they might not complete the curriculum in a given timeframe or large student groups might become unmanageable when they work interactively. This was also detected in the study: only 69.55 % (N = 218) of the participants were encouraging their learners to think critically and 71.06 % (N = 222) required their learners to reflect on practical strategies. Learning deficits acquired in primary education due to ineffective education have an impact on secondary and tertiary education and contribute to students eventually dropping out from their schooling. For example, as shown above, 78 % of the grade 4 learners could not read in any language (Howie et al., 2016) and the failure to develop critical thinking and problem-solving skills was evident in a comparative study conducted with 49 countries, where South Africa scored the lowest in the TIMSS tests.

It is recommended that pedagogical intervention is needed to assist teachers in how to apply adaptive learner-centred teaching practices where students actively engage in relevant culturally orientated content despite the curriculum demands, time constraints and large class sizes (Amsler, 2014). These interactive learning activities are important to encourage students to work collaboratively in finding solutions to real-life problems and at the same time develop their self-confidence (Maulana et al., 2014). There is a need to engage learners in hands-on activities so that they can develop a deeper understanding of the content, to teach and learn relevant content that they can relate to their everyday life experiences, and to apply critical thinking and problem-solving skills in finding solutions. Thus, as most secondary students grow up in rural areas it is important to relate teaching content to their real-life experiences.

It can be concluded that teachers need to shift away from a pedagogy of exclusion towards a pedagogy of inclusion to enable effective access and learning for all students. Pedagogical intervention is essential and could take place in the form of a continuous long-term teacher training programme on how to apply effective adaptive instruction in class. In addition, teacher accountability could be encouraged using teacher performance assessments and incentives to enhance effective education.

The reliability and validity of the observers' evaluations could add value to this study in establishing teachers' effective teaching practices and their professional development to address 21st-century students' needs. The five observers were education specialists, and their evaluations were mostly in consensus with one another during the observation training sessions.

This study also shows some limitations. Qualitative data would be significant in understanding teachers' experiences and challenges in class that contributed to weak scores. Additionally, observed teachers participated voluntarily and it could be that more positive and professionally trained teachers were evaluated than the actual weak teachers in the education system. The observed teachers represented public schools of three provinces and did not include private schools and the other provinces. Therefore, results should be interpreted from this perspective and cannot refer to the entire South African teacher corps. However, this study compares well with other international studies that used the same observation instrument and detected that teachers inadequately apply adaptive teaching strategies.

The results of this study could add value to the limited international studies concerning the milestones that experienced teachers have reached in applying effective adaptive teaching practices in developing critical thinking skills. Furthermore, the observation instrument could be used by tertiary teacher training institutions to develop student-teachers' effective adaptive teaching practices in pedagogy classrooms by assessing the improvement or evolution experienced by those teachers who have previously participated in training experiences and guide teachers professionally in effective teaching practices (Iglesias-Garcia et al., 2020).

Well-trained beginner teachers can again train experienced teachers in how to create and manage effective classroom practices and enhance professional development of those who are not yet prepared to address the needs of 21st-century students in developing countries.

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Teachers' Retrospective Evaluation of Changes in Adaptive Teaching During COVID-19

Christoph Helm, Stephan Gerhard Huber, Louis Preisig & Alexandra Postlbauer

Abstract

Many studies have documented the negative effects of school closures on students' learning time, academic achievement, and psychosocial well-being. In contrast, little is known about how specific aspects of instructional quality, such as adaptive teaching, were impacted by school closures related to the COVID-19 pandemic. In the present study we examined, on the basis of retrospective assessments of German and Austrian teachers ($N = 3,150$), whether and to what extent adaptive teaching changed during different phases of the pandemic in 2020 and 2021. We did this by using latent growth curve modeling. The results largely confirmed our assumption that the degree of adaptive teaching declined significantly throughout the pandemic; however, these losses in quality differed depending on the degree of adaptive teaching before COVID-19, the extent of teacher collaboration, and the composition of the school's student body. First, declines were higher when teachers reported higher initial adaptive teaching before COVID-19. Second, in contrast to our expectations, schools with higher levels of teacher collaboration had higher losses in adaptive teaching. Third, as expected, schools with a more challenging student body (i.e., a higher proportion of students left behind, i.e. students not unattainable students) had a significantly higher drop in adaptive teaching. We discuss these findings in light of the limitations of the study (e.g., retrospective assessment of changes in adaptive teaching) and the practical implications for future teaching (e.g., support of teacher collaboration and the use of digital media to promote adaptive teaching).

Introduction

The COVID-19 pandemic led to repeated periods of school closures worldwide. Many studies have documented the negative effects of school closures on students' learning time, academic achievement, and psychosocial well-being (e.g., König & Frey, 2022; Schlack et al., 2020). In contrast, little is known about how specific aspects of instructional quality, such as adaptive teaching, were impacted by the COVID-19-related school closures.

Early descriptive research on adaptive teaching during COVID-19 – related distance learning (e.g., Letzel et al., 2020; see Helm et al., 2021, for an overview) showed that, to the vast majority (60% – 100%) of students and parents, differentiation, and individualization in distance learning through assignments (60% – 80%) and working groups (over 90%) rarely or never took place (see Helm et al., 2021). In contrast, teachers rated differentiation and individualization as being much more pronounced. Regardless of this, teachers seemed to succeed in adapting learning tasks to the students' level. A high percentage of students (about 50% – 70%) reported feeling that the learning tasks were not too difficult. Although these descriptive results mirror different perspectives on adaptive teaching during COVID-19, little is known about the extent to which adaptive teaching has changed as a result of the shift to distance learning. Moreover, because research indicates that teacher collaboration is a central school development capacity in times of crisis (e.g., Bremm et al., 2021), for innovation (e.g., Gräsel, 2010), and for school development (e.g., Stoll et al., 2006), we were interested in learning whether teacher collaboration is related to (changes in) adaptive teaching during distance learning. Drawing on theoretical assumptions and findings from professional learning communities (PLCs), we argue that teacher collaboration represents a central resource of adaptive teaching during the pandemic. Furthermore, in light of the findings on school composition effects, we assume that adaptive teaching during the pandemic was also related to the composition of the student body at the school site (specifically, the proportion of students left behind, i.e., unattainable students).

In short, our aim in this study was to investigate changes in retrospectively perceived adaptive teaching (as one central aspect of school quality) during central phases of the pandemic and to explore whether pre-COVID-19 adaptiveness, teacher collaboration, and the composition of a school's student body predicted changes in adaptive teaching.

Theory, Research and Hypotheses

To clarify the conceptual, theoretical, and empirical foundations of our empirical study, in this section we review the definition of adaptive teaching as well as theoretical assumptions and findings on the role of teacher collaboration and school composition in implementing adaptive teaching during the pandemic. From this, we derive the hypotheses of our study.

Adaptive Teaching – A Challenging Endeavor in Times of Distance Learning?

Meeting individual students' needs and characteristics represents a core principle of instruction that can be traced historically back to antiquity. The Socratic method, for example, is based on individual student dialogue. John Locke, Jean-Jacques Rousseau, and John Dewey also repeatedly pointed out that teaching and learning essentially only work if they are adapted to the individual needs and characteristics of the students (Thomas, 1992). Locke, for example, highlighted that the choice of teaching method must consider the individual minds, temperaments, different inclinations, and particular defaults of the learners. Similarly, Rousseau urged teachers to adapt their measures to the abilities of their students. Likewise, Dewey called on teachers to be sensitive to learners' mental state (e.g., boredom, feigned attention). He expected the teacher to be sensitive to the abilities and weaknesses of each child so that individual capacities could be developed and individual limitations could be overcome.

Recent educational research (Brühwiler & Vogt, 2020; Gebhardt et al., 2014; Hachfeld & Lazarides, 2021; Jang et al., 2022; Schipper et al., 2020; Wang, 1980) has also described individual student needs as a starting point for individualized or adaptive teaching. The concept of *adaptive teaching* refers to the "use of alternative instructional strategies and resources to meet the learning needs of individual students" (Wang, 1980, p. 122) and adapting "learning tasks and learning contexts (i.e., the time allocated for a learning task) to the individual prerequisites of the student" (Brühwiler & Vogt, 2020, pp. 121). Hence, adaptive teaching comprises instructional designs and technologies that "adapt school learning to the different abilities, experiences, interests, and socio-economic backgrounds of children" (Wang, 1980, p. 122). Therefore, teachers need to assess students' individual "capabilities, and to match instruction, as directly as possible, to those assessments" (Wang, 1980, p. 122). Thus, diagnosing and monitoring student learning progress is a central feature of adaptive instruction. Recently developed measurement instruments for assessing individualized teaching are also oriented towards the concept of adaptive teaching. For instance, Gebhardt et al. (2014) developed an "individualized teaching scale" comprising the dimensions of "differentiated assignments," i.e., the extent to which teachers respond to students' strengths and weaknesses in assignments, and "teachers' individualized responses," i.e., the perception and consideration of heterogeneity in terms of students' achievements, interests, and aspirations.

Closely related to the concept of individualized and adaptive teaching is *student-centered teaching*. The relevant literature often defines student-centered teaching according to Baeten et al. (2013):

Students are actively involved in the learning process by constructing knowledge for themselves. Additionally, teachers only act as coaches and facilitators to help the students with any questions. Last but not least, [student-centered

learning] promotes the use of authentic assignments, such as case studies. (Leow et al., 2021, p. 1857)

In line with this, Hannafin and Land (2000) defined student-centered learning environments as those that “provide complimentary activities that enable individuals to address unique learning interests and needs ... They often use technology to enable flexible methods through which important cognitive processes can be scaffolded to both augment and extend thinking and learning” (pp. 3 & 5). Current measurement instruments are also essentially based on this conceptualization (e.g., Wibbecke et al., 2016).

Against the background of these scientific descriptions of individualized, adaptive, and student-centered teaching, in the present study we investigated the extent to which teachers’ perceptions of how they addressed students’ needs (in distance education) changed during the pandemic.

During the pandemic, the role of digital technologies in implementing adaptive teaching became central. Some early empirical reports suggested that individualized teaching was largely missing during the pandemic (e.g., Huber et al., 2020; Letzel et al., 2020). Even though individualized teaching was not very common before the pandemic (e.g., Altrichter et al., 2009, p. 347), distance learning made individualization (and differentiation) in the classroom even more challenging for teachers, presumably because it was initially unclear to many teachers how adaptive teaching could be implemented in distance learning using digital tools. Hence, our first hypothesis is as follows:

Hypothesis 1 (H1): We assumed declines in the degree of adaptive teaching as perceived by teachers throughout the pandemic.

Although we assumed a general decline in adaptive teaching throughout the pandemic, we postulated an adjustment effect, that is, less decline in adaptive teaching during the second lockdown (winter 2020–2021). At the beginning of the first lockdown (spring 2020), many teachers were overwhelmed by the situation because many had not yet built up sufficient digital competencies for distance learning – especially regarding the implementation of adaptive teaching via online tools. However, quite a few teachers probably compensate for this because a large number of continuing professional development programs for teachers in the digital field took place. Therefore, it seems plausible that, in the later lockdowns, teachers were able to implement adaptive teaching in the classroom to a higher degree again – also because presumably many other issues related to distance learning had been remedied in the meantime and extensive experience had been gained from the first lockdown. Hence, our second hypothesis was as follows:

Hypothesis 2 (H2): Losses in the perceived degree of adaptive teaching were more strongly pronounced in Lockdown 1 (i.e., school closures in spring 2020) than in Lockdown 2 (i.e., school closures in winter 2020–2021).

In an early publication on COVID-19 and schooling, Huber et al. (2020, w.p.) assumed increased “Matthew effects” among students, parents, and within and between schools: that is, in a time of crisis, existing school qualities (e.g., teaching quality, teacher cooperation) before the pandemic became even more important for the development of school quality during and after the pandemic. In other words, existing differences in school quality were magnified (Huber et al., 2020). These differences may increase over time if the schools do not succeed in agreeing on common actions and thus on the minimum and regular standards. Possible reasons for the widening of the gap during the school closures are assumed to include the different levels of teachers' motivation and competence in using digital media in distance learning at different school locations (Huber et al., 2020, p. 107). In the present study, we assumed that this was particularly true for adaptive teaching. Schools with low levels of adaptive teaching before COVID-19 were assumed to have less expertise regarding adaptive teaching and thus to be less prepared to adequately handle the challenges raised by school closures, that is, to compensate for corresponding negative effects. Thus, the gap between schools with a high level of adaptive teaching and schools with a low level of adaptive teaching is assumed to increase throughout the pandemic (Matthew effect). Therefore, our third hypothesis was as follows:

Hypothesis 3 (H3): We assumed that for the perceived degree of adaptive teaching throughout the pandemic, higher initial values were associated with lower losses.

Teacher Collaboration – A Precondition Conducive to Adaptive Reaching?

The COVID-19-related school closures were enacted almost overnight in Germany and Austria, and hit most schools and teachers unexpectedly and without preparation. Teachers had to adapt to distance learning in a very short time. Especially at the beginning of the pandemic, the teaching staff represented the only support for overcoming this challenge. Therefore, we assumed that teacher collaboration played a central role in the implementation of adaptive teaching in distance learning. How, exactly, is teacher collaboration linked to adaptive teaching? Teacher collaboration is regarded as a significant resource for adaptive teaching because it is conducive to many helpful, if not necessary, conditions for adaptive teaching (e.g., Gräsel et al., 2006; Jang et al., 2022; Schipper et al., 2020):

- Teacher collaboration leads to an exchange of knowledge and expertise in the field of adaptive teaching and thus to professional teacher development. Dur-

ing the pandemic, new knowledge about the use of digital tools in adaptive teaching was gained primarily through contact with experienced teachers who had already used digital media for teaching before COVID-19. This is especially true if adaptive lessons are jointly planned and adaptive learning materials are jointly developed, discussed, and reflected.

- Teacher collaboration contributes to the exchange of adaptive learning materials and lesson planning and thus to a reduced workload. This was particularly helpful in times of distance learning because not only does adaptive teaching generally mean more work, but school closures also require teachers to complete additional tasks (e.g., the COVID-19 test regime).
- Teacher collaboration offers the possibility to exchange teachers' experience with students. Collaboration makes student learning more visible to the teachers; that is, teachers might gain access to information about how students respond to different teaching situations, methods, and materials. Hence, teachers may develop a greater awareness of students' diverse learning needs.
- Teacher collaboration can foster teachers' self-efficacy and motivation. Especially in the difficult times of the pandemic, moving closer together can provide a sense of social inclusion and increased control over the uncertain situation.

Empirical research on the concept of PLCs proves that teacher collaboration is positively linked to adaptive teaching. PLCs are groups of teachers who share and continuously critique their (teaching) practice to develop themselves and their skills (Rone, 2009, p. 4). Teachers who are more involved in PLCs differ from other teachers not only in their lesson planning (Supovitz, 2002), but also, according to Louis and Marks (1998), in their teaching behavior, especially in those aspects that are usually subsumed under adaptive teaching:

- According to Penner-Williams et al. (2017), PLC teachers are more responsive to learners' background knowledge, use more scaffolding techniques (e.g., providing support to connect the current learning task to prior knowledge), and support more collaborative learning.
- PLC members are more authentic, provide more social support, and promote deeper understanding by using real life problems, among other things. In addition, their teaching is described as more appreciative and friendly (Louis & Marks, 1998).
- According to Fulton and Britton (2011), teachers who engage in PLCs also use more inquiry-based teaching methods, such as student experiments, and encourage learners to use problem-solving strategies.
- Warwas and Helm (2018) extended this research by the finding that the lessons of teachers who cooperate more intensively are experienced as more application oriented and problem oriented; they also use simulation-based learning tasks or teaching methods more frequently.

- Finally, van den Bergh et al. (2014) proved that feedback provision, a key instructional practice, benefits from teacher collaboration.

This list of findings is consistent with Vescio et al.'s (2008) conclusion that members of PLCs teach in a more student-centered way. Thus, one could argue that PLCs play a pivotal role in how teachers become more aware of students' different educational needs during distance learning and how they address these needs accordingly. In times of crisis, teacher collaboration is of particular importance. The literature (e.g., Bremm et al., 2021) postulates that teacher collaboration is a central school development capacity in times of crisis. The shift from face-to-face teaching to distance learning made the coordination and orchestration of learning opportunities within individual schools central (Bremm et al., 2021, p. 119). The COVID-19-related school closures made it necessary to redefine the space and time for coordination and exchange within the staff and the school community as a whole beyond the school building. ... Thus, at least within a school, demands on students and communication channels with students and parents should be determined uniformly for each school level (cf. Jesacher-Rößler & Klein, 2020) and underpinned by school-specific concepts and regulations. To implement these concepts and regulations, teachers need to cooperate. (Bremm et al., 2021, p. 119, translated by the authors).

Given the high relevance of teacher collaboration in times of crisis, we assume that teacher collaboration is positively related to (changes in) adaptive teaching during distance learning. Hence, our fourth hypothesis was as follows:

Hypothesis 4 (H4): A higher degree of teacher collaboration was positively associated with higher degrees of adaptive teaching before the pandemic and caused lower losses in adaptive teaching throughout the pandemic.

Student Composition – A Constraint on Adaptive Teaching?

Empirical research has demonstrated that school and classroom composition characteristics are related to teachers' instructional behavior (see, e.g., Harker & Tymms, 2004; Maulana et al., 2014; Mostafa et al., 2018; Rjosk et al., 2014; Scharenberg et al., 2015). However, empirical research regarding the effect of composition characteristics on adaptive teaching is still scarce. The few existing studies suggest that there is a positive relationship between the proportion of students perceived as challenging and the degree of adaptive teaching. For instance, Rjosk et al. (2014) found that classes with a higher proportion of students with German as their first language reported more often a student-oriented climate. In line with this, Scharenberg et al. (2015, p. 105) found that a heterogeneous student body requires teachers to be more supportive, individualized, and engaged. Finally, the international report on PISA 2015 data (Mostafa et al., 2018) concluded that teacher feedback is related to the composition of a school's student body:

The results show greater exposure to TFSL [teacher feedback in science lessons] in schools where more than 30 % of students have an immigrant background ... or who speak a language other than the language of assessment than in schools where less than 30 % of students have an immigrant background. (Mostafa et al., 2018, p. 78)

For the period of the COVID-19-related school closures, education researchers (e.g., Huber et al., 2020) argued that schools with a high proportion of disadvantaged students faced particularly significant challenges, leading to increased inequalities. The reasons certainly include various interacting aspects, such as (1) poor technical conditions (poor equipment with devices and a lack of up-to-date software) that socioeconomically disadvantaged students, parents, and teachers (i.e., those teaching in socially disadvantaged schools) face; (2) the spatial situation at home (e.g., many people living in a small space); (3) less time and fewer emotional resources of parents or siblings, and so on. Schools face a great challenge in compensating for the increased inequality among students.

Given that the pandemic challenged socially disadvantaged schools more than the privileged ones, we assumed that, throughout the pandemic, schools with a larger share of students left behind observed higher losses in various dimensions of school quality (e.g., adaptive teaching). Hence, our fifth hypothesis was as follows:

Hypothesis 5 (H5): The share of students left behind was negatively associated with higher degrees of adaptive teaching before the pandemic. Throughout the pandemic, schools with a larger share of students left behind observed higher losses in adaptive teaching.

Control Variables

Studies of distance learning have shown that online teaching in primary schools was very limited, whereas in (upper) secondary schools the use of digital tools during school closures was more strongly pronounced (e.g., Helm et al., 2021). Similarly, the regional location of a school (rural, urban) might play a role because, for instance, schools in urban areas are more likely to have a more challenging student body in terms of ability and social class. For these reasons, we added school type and region as control variables to our analyses. Finally, teachers' sex and age represented further control variables.

Method

Sample and Data Collection Process

To test our hypotheses, we collected data from primary and secondary teachers in Germany and Austria using an online survey. The online questionnaire was sent out via mailing a list provided by the Institute for Management and Economics of Education at Teacher University Zug, Switzerland. Participation was voluntary. The questionnaire was conducted from December 1, 2020, to August 9, 2021. Three thousand, one hundred and fifty teachers (53% female, age: $M = 45$ years, $SD = 10$ years) participated in the survey.

Measures

To assess changes in the degree of adaptive teaching over the different phases of the pandemic, we asked participants to retrospectively rate the single-indicator construct “adaptive teaching” for each of the following five phases: 1 = before the COVID-19 pandemic (December 2019, January and February 2020), 2 = during the first school closure (March, April, and May 2020), 3 = in the summer before the vacations (May, June, and July 2020), 4 = in the summer/fall of the new school year (August, September, and October 2020); and 5 = in the winter (November 2020 – March 2021). More precisely, teachers were asked to rate the item “Please rate the consideration of different student needs during ...” using a 5-point scale ranging from 1 (low) to 5 (high). We used single-indicator items instead of scales with multiple indicators to keep the questionnaire short and to avoid participant overload by evaluating similar items multiple times retrospectively for the different phases of the pandemic.

In addition, participants were asked to estimate mutual teacher support at their school before the COVID-19 pandemic (December 2019, January and February 2020) to get information on a school's general level of teacher collaboration. Finally, to obtain information on the share of students left behind during the pandemic, we asked participants to estimate the percentage of students in their school who had lost contact with their learning (response options were 10% – 100% in 10% increments).

Analytic Procedure/Tested Model

Using structural equation modeling, we tested a latent growth curve model with time-invariant and time-varying covariates; see Figure 1.

Although the loadings of the intercept factor were fixed to 1, the loadings of the s factor were freely estimated (except the loading on y_1 is fixed to 0, and the loading on y_5 was fixed to 1). Hence, we did not assume a linear change throughout the pandemic, but rather phases of decline and recovery. To test

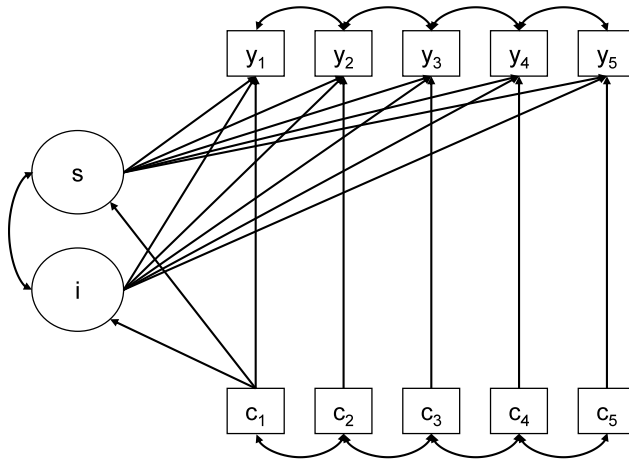


Figure 1: Tested model.

Note. s = slope, i = intercept, y_{1-5} = indicator of the degree of adaptive teaching for Phases 1–5 before and during the pandemic, c_{1-5} = covariate (teacher collaboration, share of students left behind) for Phases 1–5 before and during the pandemic.

H1, the latent mean of the slope factor(s) of the growth model was of interest. Regarding H2, we estimated the difference between the loss during lockdown 1 (phase 1 to phase 2) and the loss during Lockdown 2 (phase 4 to phase 5). Concerning H3, the correlation between intercept (i) and slope factor (s) of the growth model was investigated. Finally, to test H4 and H5, the effect/path of teacher collaboration/share of students left behind (c) on the intercept and slope factor (s) of the growth model was estimated.

Estimation was done in Mplus 8 (Muthén & Muthén, 1998–2017). To account for the hierarchical structure of the data, the standard errors were calculated using Type=COMPLEX and teachers' school affiliation as cluster variable.

Results

The latent growth curve model showed a good fit according to widely used evaluation criteria (see, e.g., Little, 2013): Parameters = 28, comparative fit index = .990, Tucker-Lewis Index = .983, root mean square error of approximation = .030 (95% confidence interval [CI] [.024, .036]), standardized root mean square residual = .012.

Hypothesis 1

The data confirmed our assumption that adaptive teaching declined significantly throughout the pandemic ($\beta = -.742$, $SE = .099$, $p < .001$). As expected, teachers reported lower degrees of adaptiveness in the latter phases of the pandemic (mean values for Phases 1–5 = 4.06, 2.70, 3.64, 3.92, and 3.48, respectively).

Hypothesis 2

The data confirmed that the drop in adaptive teaching was significantly less pronounced in Lockdown 2 than in Lockdown 1 ($b = .495$, $SE = .062$, $p < .001$). Although the predicted drop in adaptiveness was .798 units (on a scale from 1 to 5; $SE = .098$, $p < .001$) in Lockdown 1, it was .303 units (on a scale from 1 to 5; $SE = .042$, $p < .001$) in Lockdown 2.

Hypothesis 3

Surprisingly, the analysis revealed a negative correlation between the intercept and slope ($\beta = -.503$, $SE = .029$, $p < .001$); that is, in schools with higher levels of adaptive teaching before the pandemic, increases were lower and losses were higher. Thus, H3 was not confirmed.

Hypothesis 4

Teacher collaboration positively predicted adaptive teaching prior to the pandemic ($\beta = .273$, $SE = .032$, $p < .001$); that is, in schools with higher teacher collaboration before the pandemic adaptiveness also tended to be high. Surprisingly, teacher collaboration was associated with higher losses in adaptiveness during the pandemic (see the negative regression coefficients of teacher collaboration on the slope factor: $\beta = -.187$, $SE = .032$, $p < .001$). Although the effect was small, H4 must be rejected.

Hypothesis 5

The share of students who were left behind during lockdowns – that is, who did not participate in distance learning – was not correlated with the degree of adaptive teaching at a school before the pandemic ($\beta = -.005$, $SE = .020$, $p = .799$). However, as expected, the share of students left behind negatively predicted changes (losses) in the degree of adaptive teaching ($\beta = -.188$, $SE = .023$, $p < .001$); that is, a higher share was associated with more negative (lower) values in the changes (more losses). Although the effect was small, H5 was confirmed.

Control Variables

Teachers' sex was significantly related only to the intercept factor, but the effect size was minimal ($\beta = .042$, $SE = .020$, $p = .032$). For a subsample of 868 teachers, additional demographic information was available on age, school level, school type, and school location (urban, rural). Rerunning the analysis reported based on this subsample demonstrated that the above-reported findings did not change significantly; that is, the associations were even marginally higher. Regarding the predictive power of the control variables, only the intercept factor, not the slope factor, was predicted by additional teacher demographic variables; that is, primary school teachers ($\beta = .162$, $SE = .032$, $p < .001$) and teachers from private schools ($\beta = .097$, $SE = .040$, $p = .016$) were more likely to report higher adaptive teaching prior to the pandemic, whereas upper secondary teachers reported significantly lower degrees of adaptive teaching before the pandemic ($\beta = -.168$, $SE = .048$, $p < .001$). Changes during the pandemic were not affected by the control variables. These additional analyses underpin the stability of the findings reported above.

Discussion

The retrospective assessments of 3,150 teachers confirmed our hypothesis regarding an average decrease in adaptive teaching during the pandemic (H1), which was assumed to be higher in the first than in the second lockdown (H2), and which was assumed to be more pronounced in schools in challenging circumstances (i.e., schools with a high share of students left behind; H5). In contrast, our assumptions that COVID-19-related losses in the degree of adaptive teaching would be lower for schools with high adaptiveness before COVID-19 (H3) and for schools with a high degree of teacher collaboration (H4) were rejected by the data.

Our findings extend the state of research on (the development of) teaching quality during the pandemic. Several cross-sectional studies (e.g., Helm & Huber, 2022; Holzer et al., 2021; Steinmayr et al., 2021) have shown that teaching strategies that address individual student needs during distance learning are conducive to learning motivation and self-assessed academic progress during school closures. However, to the best of our knowledge, our study is the first to analyze retrospective teacher evaluations of adaptive teaching at different stages of the pandemic. Although our data are not longitudinal, they allow us to look back at the development of adaptive teaching from the teachers' perspective. Hence, the present study provides the first insights into possible changes in teaching during the pandemic.

The finding that teacher collaboration was positively related to pre-pandemic adaptive teaching is consistent with the results of existing studies (e.g.,

Fulton & Britton, 2011; Penner-Williams et al., 2017; Vescio et al., 2008; Warwas & Helm, 2018). In contrast, higher teacher collaboration was unexpectedly associated with a decrease in adaptive teaching during the pandemic. Possible explanations for this unexpected finding are that teachers in schools with high teacher collaboration may be more sensitive to reductions in school quality aspects and so to adaptive teaching. Moreover, the statistical phenomenon of regression toward the mean may also explain the unexpected findings.

Finally, we found that a higher share of students left behind (student body composition) was related to higher losses in the degree of adaptive teaching. This negative relation was expected because socially disadvantaged schools (as indicated by the share of students left behind) may have fewer resources for providing adaptiveness during online teaching (e.g., technical equipment), and teacher-student, as well as teacher-parent contact, may be more challenging in these schools. This finding adds to the still-sparse body of research in this field. The result is consistent with those of Hachfeld and Lazarides (2021) but contradicts those of other studies (e.g., Rjosk et al., 2014) that have found a positive relationship. Further research is needed here.

Limitations

Because of the challenges that the pandemic and school closures have caused for researchers, our study has limitations that need to be considered when interpreting the results.

First, regarding the questionnaire, it must be noted that the teachers were asked retrospectively about their perceptions of distance learning. The temporal distance of the survey from the pandemic phases could have distorted the assessments. Accordingly, the data are not true longitudinal data.

Second, adaptive teaching was measured as single-indicator construct, and therefore no reliabilities can be reported. However, the item was tested within the framework of the School Barometer Study (Helm & Huber, 2022) and was sensitive to the school closures (both over time and across German-speaking countries). However, adaptive teaching is assumed to represent a construct that is composed of several facets (e.g., Baeten et al., 2013). Follow-up studies should therefore analyze this in a more differentiated way across several items and dimensions to be able to take into account measurement error and subdimensions.

Third, the student composition at the school was measured by the percentage of students who could not be reached. In addition, the analysis of further background characteristics (e.g., students' socioeconomic background, migration background) would be particularly informative in subsequent studies.

Fourth, our study was cross-sectional in design; hence, no causal statements can be made. Nevertheless, cross-sectional studies can provide meaningful insights into the possible longitudinal relations of variables if statistical analyses

are based on solid theoretical assumptions about predictors and outcomes, and if central control variables are modeled. In the present study, we claim both. Nevertheless, future studies should be longitudinal (see, e.g., Schober et al., 2020).

Fifth, our sample represents an ad hoc sample that is not representative. Therefore, strictly speaking, the findings cannot be generalized beyond our sample. However, in COVID-19-related educational research, representative samples are rare (only about one-fifth of the 97 studies identified in the review by Helm et al. (2021) were based on representative samples).

Implications

To avoid a decline in adaptive teaching (e.g., individualization, differentiation) in times of crisis, it is necessary to promote those teacher competencies that allow teachers to implement adaptive teaching in distance learning via online video conferences and suitable learning materials (e.g., Hannafin & Land, 2000). To be prepared for future school closures, it is therefore necessary to invest in appropriate continuous professional teacher development and to create appropriate conditions at school locations (e.g., adequate technical equipment, time for teacher collaboration, exchange of materials).

Even if the postulated associations between teacher collaboration and adaptive teaching could not be observed, the majority of studies show that teacher collaboration represents a central aspect of school and teacher effectiveness (Scheerens, 2008, 2016). Establishing conditions that promote teacher collaboration should therefore be a matter of concern for all actors in the education system. Education policy, authorities, school administrators, teachers, parents, and others, can contribute to the support of teacher collaboration. For instance, Warwas et al. (2019) showed that supportive school leadership behavior significantly promoted working in professional teams, which in turn was associated with teaching quality (Warwas & Helm, 2018). Further research is needed in this area.

The results of the German School Barometer Special (forsa, 2021) showed that schools with a high share of socioeconomically disadvantaged students are significantly less likely to have a binding distance learning concept, a higher need for improvement in the technical equipment of the school – that is, insufficiently fast internet access at school – and are less prepared for teaching via videoconferencing. In total, therefore, teachers in socially disadvantaged schools feel less often adequately prepared for renewed distance learning. Even in the second year of the pandemic, these schools lagged behind in regard to the mentioned aspects (forsa, 2021). Thus, school policy and administration are called to act.

In particular, the digitization of education, which is booming because of the pandemic, has great potential for adaptive teaching. Adaptive teaching is based

on diagnosing and monitoring students' learning progress and diverse student needs (e.g., individual cognitive and non-cognitive capabilities, prior knowledge and experience, interests, cultural and socio-economic background). New technologies that come with the use of digital media, such as online quizzes, computerized adaptive testing, or artificial intelligence, can help make these diverse needs more easily accessible and visible to teachers. Moreover, adaptive teaching requires adaptive lesson planning and adaptive learning materials. In this respect, digital tools such as learning management systems and open educational resources (e.g., MOOCs) represent helpful devices. Finally, a central characteristic of adaptive teaching is the use of authentic assignments. Simulations, virtual and augmented reality, three-dimensional-capable printers, etc., may help teachers more easily implement realistic problems and learning tasks in classroom settings. All in all, digital tools have the potential to substantially reduce the workload associated with adaptive teaching.

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Differentiated Collaborative Online-Learning

A Practical Example From Croatia

Katarina Marciuš Logožar

Abstract

This paper presents a practical example of the use of differentiated tasks in online teaching of German as a foreign language for a group of seventh grade students in a primary school in Zagreb, Croatia. It is described how collaborative and differentiated learning can be achieved simultaneously with the help of the so-called “breakout rooms”, and what needs to be considered. The phases of differentiated online learning and the role of the teacher and the students are also described. The data were collected by the teacher, the author of this paper.

Introduction

The years 2020 and 2021, marked by the COVID-19-pandemic, had a major impact on our lives. Many of our daily activities were shifted to the Internet. These changes affected not only adults, but also children and young people, who were deprived not only of their social contacts, but also of the opportunity to go to school and learn the way they were used to. From one day to the next, they were faced with new, more complex demands – they had to create their own daily schedule and plan their own learning process, which required a lot of support from their parents, who in turn perceived this as additional stress and burden (Improve, 2020; Lilek, 2020).

With the introduction of distance education, teachers were forced to design their lessons in a completely different way. Feeling less competent in content creation and digital problem solving (European Commission, 2019; Sunara, 2021; Šejtanić, 2018), many teachers also faced significant challenges.

If students do not understand something in the traditional classroom, they can simply ask the teacher. However, the online learning environment requires both teachers and students to be adaptable and to have certain competencies and skills. In order to help teachers find their way and guide them in the desired direction, the Ministry of Science and Education of the Republic of Croatia issued a document in August 2020 entitled “Models and Recommendations for Work in the Conditions of COVID -19 for the Pedagogical Year 2020/2021” (hereinafter “Models”). These are guidelines for planning face-to-

face and online instruction that focus on achieving “key educational outcomes / instructional content, student activities, and strategies and forms of teaching and learning that can be successfully delivered in both face-to-face and online instruction” (Models, p. 45). For the guidelines to be effective, teachers must have certain knowledge and skills. According to the results of the international survey TALIS 2018, also listed in Models, “teachers in Croatia have the greatest need for professional development in the area of individualized learning and the use of ICT in teaching” (Models, p. 47). If we consider the results of the PISA 2018 survey, which show that “more than one-third of teachers do not have the technical pedagogical skills to use ICT in the classroom” (Models, p. 47), we can conclude that online teaching itself is a major challenge for a large number of teachers. These findings are also confirmed by Sunara (2021). The complexity of the situation becomes even more evident when we include content adaptation in this context. Therefore, one of the most important questions that arise is how technology and instructional content can be put at the service not only of achieving educational goals, but also of meeting the needs of each individual student.

Curriculum adaptation is one of the most important issues in the curriculum reform that started in Croatia in 2019. According to the Plan for the Development of the Education System 2005–2010 (2005) and the Act on Primary and Secondary Education of the Republic of Croatia (2020), the term “students with special educational needs” refers to students with difficulties of various degrees and impairments, as well as gifted students. Therefore, students with special needs are not only students with disabilities, but also gifted students.

The offer of teaching content suitable for students with disabilities is sparse in Croatia, but it is increasing year by year, while content that would be suitable for gifted students is almost non-existent. Therefore, it is up to teachers to adapt the content on their own, which requires special knowledge, skills and time. And the more time teachers need to prepare content, the less likely they are to choose it (Jennek et al., 2019; Letzel, 2021). As the study by Idrus et al. (2021) shows, which to the knowledge of the author of this paper is the only study that addresses the issue of DI in online instruction, the implementation of DI in online instruction also requires time and training.

The implementation of DI online is relatively new (Idrus et al., 2021). A practical example is presented in this paper. The focus is on the online implementation of DI in a group of seventh-grade students at a primary school in the Croatian capital Zagreb, learning German as a second foreign language.

Learning

In order to adapt instructional content to students, we need to know their abilities, their preferred learning styles, the concepts they have adopted, and their interests (Cowley, 2018), but it is equally important to be familiar with the basics of learning.¹

Our ability to learn has enabled the survival and progress of our species. Our brain loves to learn. Moreover, it is designed to learn. Learning is therefore natural and innate to us. So how do we learn and what is the best way to learn? There are several learning theories that try to answer this question. Harasim (2017) classifies them as follows:

Table 1: Learning theories according to Harasim (2017).

Learning theories in the 20th century	
Behaviorist learning theory	<ul style="list-style-type: none"> – starts from the basic principles of classical and operant conditioning – deals with methods and ways that encourage desired behavior (rewarding students) and help combat undesired behavior (punishing students)
Cognitivist learning theory	<ul style="list-style-type: none"> – was developed in response to behaviorist learning theory – focuses on mental processes that occur in an individual's brain after a stimulus and precede the response (memory, thinking, reasoning, problem solving)
Constructivist learning theory	<ul style="list-style-type: none"> – is based on the research of Jean Piaget and Lev Vygotsky – views learning as an active process in which students construct their own knowledge through their (cognitive and physical) activities, learn in their own way, based on their own experiences and individual abilities and preferences (Marciuš-Logožar, 2021) – sees the teacher as a “facilitator and moderator, diagnostician, motivator and advisor, anticipator and long-term planner” (Bonnet, 2009, p. 7) – emphasizes the importance of interaction and collaborative learning
Learning theories in the 21th century	
Connectivism ²	<ul style="list-style-type: none"> – places technology and network intelligence at the centre of the learning process
Collaborativism aka online collaborative learning theory	<ul style="list-style-type: none"> – with the help of different tools the students come together to a solution of the problem – the role of the teacher is to engage the learners, to motivate them

As we can see, learning theories have evolved over time. During industrialization, the labor market needed fast, efficient workers who were not expected to know why they were doing something, only how to do it. Today, most workers

¹ Most authors define learning as a process that leads to certain changes in an individual's behavior. Mayer (2011) defines learning as a change in the learner's knowledge due to experience.

² The authors of the theory are George Siemens (2004) and Stephen Downes (2005), but it has not been empirically or practically confirmed.

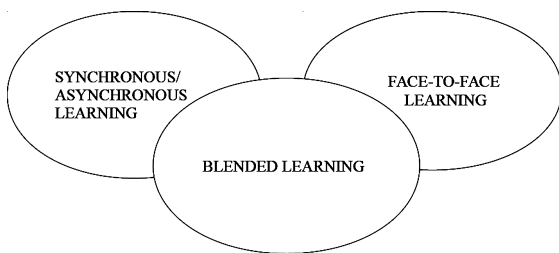


Figure 1: Synchronous/ asynchronous and blended learning.

are not expected to follow predetermined instructions, but to use their creativity, critical thinking, openness, and collaboration with other team members to help create a new, more advanced product. This leads to the conclusion that the teaching model must also change (Dryden & Vos, 1999).

According to Hendarwati et al. (2021), research has shown that instruction that applies constructivist principles encourages students to become active learners who are able to learn independently, collaboratively, and contextually. Both constructivism and collaborativism see students as active participants in the learning process and require a paradigm shift in teaching – it is not important if the teacher completes his or her lesson plan, but if he or she manages to reach his or her students. To accomplish this, it is necessary to determine the point at which the individual student is and help him or her move in the desired direction (Cowley, 2018). And the “toolbox,” which contains various procedures that attempt to adequately meet the needs of each student, is seen by Letzel (2021) as differentiation.

Distance learning

Distance learning is based on e-learning³ and ICT (Sun et al., 2014). When we talk about distance learning, it should be mentioned that there are three models according to which it can take place: synchronous, asynchronous and blended learning (Figure 1).

Their characteristics are shown in Table 2.

In the first year of the pandemic, the most common model of distance education in Croatia was asynchronous, especially among elementary school students who followed classes on television.

For upper elementary school students, high school students, and college students, classes were mostly organized through various educational platforms

³ Clark & Mayer (2016) define e-learning as “instruction delivered on a digital device (such as a desktop computer, laptop computer, tablet, or smart phone) that is intended to support learning” (p. 8). E-learning refers to web-based education, digital learning, interactive learning, computer-assisted teaching and internet-based learning (Aljawarneh, 2020; Lara, Aljawarneh, & Pamplona, 2020).

Table 2: Models of distance learning.

Model	Type of instruction	Tools
Synchronous learning	Online (at the same time)	Chats, video- or audioconferencing
Asynchronous learning	Online (at different times)	Emails, multimedia content, learning resources
Blended learning	Combines face-to-face teaching and online instruction.	

such as Microsoft Teams or Google Classroom. Initially, these platforms were used almost exclusively for asynchronous instruction, but teachers soon realized that many students did not take this type of instruction seriously and that virtual classrooms had become a “data graveyard” that almost no one used (Kerres & Nattland, 2007; as cited in Marciuš-Logožar, 2021). Therefore, in addition to asynchronous, a synchronous model of online instruction – video instruction – was introduced. Video instruction took place through the listed educational platforms or the Zoom platform. In the 2020/2021 school year, most of the instruction was delivered in a hybrid model, depending on the epidemiological situation. This practice was continued in the 2021/2022 school year.

Over time, isolation and self-isolation have become an integral part of our lives, and there has been a growing concern among educators, especially psychologists, for the psychological and social development of children (Ristić-Dedić & Jokić, 2020). One of the ways in which teachers attempted to reduce feelings of anxiety due to reduced social contact among students was through the introduction of collaborative and cooperative⁴ online learning.

Collaborative online learning

Collaborative learning is based on students working together. There are many studies that confirm that a collaborative approach to learning promotes higher order cognitive processes (see Garrison, 2016, for more). In order to work together to find a solution to a problem, students need to be aware of prior knowledge and concepts acquired from their experiences, cooperate with each other, know how to present their suggestions and arguments to solve problems, but also accept the views and opinions of others, be critical of themselves and others, and know how to communicate assertively (Cowley, 2018). For collaboration to be successful, students must have certain knowledge, as well as social

⁴ Dillenbourg (1999) emphasizes the difference between collaborative and cooperative learning by stating that “in collaboration, partners do the work together, “whereas” in cooperation, partners split the work, solve sub-tasks individually and then assemble the partial results into the final output” (p. 11).

and communication skills. These are best acquired and practiced in situations where social contact occurs. The connection between the cognitive processes and the social activities of the individual was highlighted by Vygotsky, who believed that social interaction plays the key role in the cognitive development of the child.

The importance of social contacts for the development of human personality and learning itself has been emphasized by Spitzer (2002), who stresses that learning is closely connected with the creation of positive experiences and that for humans this means first and foremost social contacts (Spitzer 2002; as cited in Marcijuš-Logožar, 2021). Man as a social being or “zoon politikon”, as Aristotle called him, learns best in interaction with other members of society, because this is natural and innate (Marcijuš-Logožar, 2021). This particular way of learning was denied to students by the introduction of distance education.

Table 3: Tools for collaborative e-learning (Latchem & Jung, 2010, p. 120).

Form			Description	Applications
Asyn-chronous	Threaded Boards Wikis Emails	Discus-sion	Message boards in which related comments are presented in threads.	Large group discussions on specific topics
		Individual	A number of learners communicate by text or audio at different times	Small group discussions with different or same topics
		Group (Listservs)	Fully editable tool to create collaborative websites	Post-class comments
			Individual mail sites used for receiving and sending messages	Collaborative creation of online materials
			Two or more learners exchange emails at different times	Adding to, modifying or editing existing online materials
			Group email where teachers or learners receive messages from, and send messages to, everyone on the mailing list	Teacher-learner communications/knowledge-building
				Learner-learner collaborative learning/problem-solving/project work
				Large group discussion
				Class announcements
Syn-chronous	Chats Web confe-rencing Video- or audio-confe-rencing		Two or more learners communicate by text or audio at the same time	Collaborative projects
			Learners communicate with each other and/or their teacher or other moderator	Used in addition to the learners' normal social networks, or when there is no chance of their ever meeting
			Graphics or data files can also be exchanged	Group discussions/problem-solving based upon readings, lectures, presentations by guest presenters, etc.

Table 3 shows that there are many tools available for teachers to use to enable students to use collaborative online learning. It is up to each teacher to select the tools they deem appropriate in light of the model by which online instruction is being delivered, the specifics of the students, the educational goals, and the instructional content itself.

Hendarwati et al. (2021) highlight the importance of online learning in “breakout rooms” and meeting platforms, which have also proven to be the best online tool for differentiated instruction for the author of this paper.

Differentiated Instruction

Let us imagine a hypothetical situation: A teacher comes to class and brings chocolate ice cream to the students. The general opinion is that all children love chocolate and ice cream, so the teacher expects that the combination of the two will elicit a positive response from the students. This is true, at least for most of them. However, to the teacher’s surprise, some students do not respond as expected. Some students also show signs of disappointment.

Would the situation be the same if, before buying chocolate ice cream, the teacher had asked her or his students what kind of ice cream they liked and whether they liked ice cream at all? Probably not. When we want to cheer someone up or help them, we generally take their wants and needs into account. They say that love goes through the stomach. Then you could also say that learning goes through the heart. The fact that positive emotions enhance cognitive processes has been confirmed in many studies (Jung et al., 2014; Um et al., 2012; Wammes et al., 2016). And while teachers around the world wonder how to foster these positive emotions, how to motivate students, Spitzer (2002) points out that the question is not how to motivate someone, but why someone is demotivated (p. 193). Just as the teacher in our hypothetical situation is not wondering how he or she can get all the students to eat the ice cream, she or he is confused and wondering why some of them were not happy about the ice cream.

It is inevitable that students differ from each other. If we approach each student with her or his predispositions, needs and affinities in mind, we will show her or him that she or he is equally valuable to us. One way to accomplish this is to implement differentiation. Many studies support the implementation of DI and confirm its benefits for performance (Bal, 2016; Coubergs et al., 2017; Goddard et al., 2015) and student motivation (Eysink et al., 2017; Guay et al., 2017; Tulbure, 2011). The author of this paper came to a similar conclusion when implementing DI in the classroom. However, differentiation is rarely used in the classroom (Letzel, 2021; Schwab et al., 2015; Smith & Humpert, 2012), and teachers find differentiation even more difficult and challenging to implement in online classes (Idrus et al., 2021). Pozas’ and Schneider’s (2019) taxonomy

of DI (Table 4), which was also used by the author in the practise example shown in this paper, can also play an important role in helping teachers plan and implement DI.

Table 4: Pozas' & Schneider's (2019) Taxonomy of DI-

Categories of DI practice Description	
Tiered assignments	qualitative and/or quantitative variation of materials and tasks according to challenge level, complexity, outcome, process, product, and/or resources
Intentional composition of student working groups	establishing decidedly homogeneous or heterogeneous subgroups based on performance, readiness, interests, etc.
Tutoring systems within the learning group	high ability students take up the role of teacher assistants and tutor low ability students
Staggered nonverbal learning aids as a scaffolding practice	carefully and purposely designed series of learning aids that range in complexity level. The learning aids must only contain the minimal information necessary for a student to overcome an obstacle. If they still are unable to deal with the task, a second aid with additional information and guidance is provided.
Mastery learning	all instructional practices which ensure that all students achieve at least minimum standards (in combination with higher standards for the more advanced students). This involves close monitoring of students' learning progress
Open education / granting autonomy to students	Students are responsible for their own learning process and may autonomously decide on materials to work upon.

The following example describes an online lesson designed and implemented in accordance with the proposed taxonomy.

Differentiated online learning of the German language – a practical example

This paper presents a model of differentiated online teaching of German as an elective subject in an elementary school in Zagreb. It describes a lesson in a seventh-grade class from December 2021, in which instruction took place exclusively online (according to Model C⁵). The class consisted of 12 students learning German. Four of them had been learning German in a foreign language

⁵ In Models (2020) three possible teaching models are envisaged: Model A (face-to-face teaching), Model B (mixed model – a combination of face-to-face teaching and distance learning) and Model C (distance teaching) (p. 14).

school for 3–6 years, and two were learning according to a regular program with an individualized approach.

The topic of the lesson was “Living” and it was designed in two main phases: asynchronous (according to the Flipped Classroom Model⁶) and synchronous, both preceded by lesson planning and preparation by the teacher (Table 5).

Table 5: Stages of conceived DI online lesson.

	Planing / preparation of lesson	Phase		
		Asynchronous	Synchronous	
Conducted by	Teacher	Students	Students	Teacher
Includes	Preparation of the pretest, test Setting learning objectives / outcomes (in terms of vocabulary, grammar, cultural specifics). Preparation of learning content for synchronous ⁷ and asynchronous ⁸ phase. Publishing the content on Microsoft Teams	Solving and sending the pretest to the teacher Watching the video, matching the sentences to the gaps in the text / matching the picture to the text	Asking questions about the video/text Choosing the task Working in groups in breakout rooms (choosing an activity, collaborating with other team members). Solving the task (20 min.) Presentation and discussion of results	Answering questions Giving tasks Forming and leading groups in “breakout rooms” Providing support (verbal, nonverbal) Evaluation

The differentiation of the synchronous lesson itself is explained below (Table 6) following the proposed taxonomy of DI (Pozas & Schneider, 2019).

6 The concept of Flipped Classroom Model was first brought up by Jonathan Bergmann and Aaron Sams (2012). The concept is that students study at home the content that teachers prepare in advance in the form of video lectures, and the lesson is used to determine and apply knowledge.

7 Short video “Where we live” (revision of vocabulary (house / apartment, rooms, furniture) and grammar (local prepositions, articles, declension) + four short texts with pictures (matching sentences to gaps in text, matching picture to text)).

8 Tiered assignments (made by teacher), pictures, drawings, photographs.

Table 6: Lesson explained in accordance with the proposed taxonomy of DI.

Tiered assignments	<p>At the beginning of the synchronous lesson, students were offered to choose one of the three tasks:</p> <ol style="list-style-type: none"> 1. Your grandmother moves into your apartment / house. You have to convert a 10 m² study into a room that will be functional and safe for your grandmother. Grandmother loves to read and watch television. She walks hard and has a bad vision. What will the room look like? 2. At a school fair, you sold clothes you no longer wear. In total, as a class, you earned 200.00 Eur. You have decided to use that money to redecorate your classroom. What will you buy? (Consider the budget, student preferences, and usability of the furniture.) What will the classroom look like? 3. What do you see in the picture? For which country is this type of traditional house specific? Find some more names for traditional houses in that country. Describe the furniture and appearance of the space in one such house.
Intentional composition of student working groups	<p>At the beginning of the class, the students received a short description of the offered tasks from the teacher and independently chose which task to solve collaboratively. After that, according to their choice, they were divided into three groups in “breakout rooms”. In the first group there were four students (none of them learned German outside of school, but one was more academically successful than the others. Two students in that group are educated with an individualized approach, but the difficulties are not intellectual.). In the second group there were five students (two of them studied German at a foreign language school, one for three, the other for four years). In the third group there were three students (two students who studied German for 4–6 years and one student who did not learn German outside of school, but is highly motivated, academically successful and shows great interest in other cultures).</p>
Tutoring systems within the learning group	<p>There was at least one student in each group who could help others and who encouraged other students to participate. They helped weaker students to express themselves (vocabulary, use of prepositions and correct grammatical structures) and coordinated chosen activities.</p>
Staggered nonverbal learning aids as a scaffolding practice	<p>Depending on the needs, the teacher gradually made additional non-verbal materials (photographs, pictures, drawings) available to the students. The third group has among others received a photo of the traditional Japanese house “minke”, on which the task was based.</p>
Mastery learning	<p>The teacher was present throughout the collaborative work, entering from one “breakout room” to another and providing support to students, both verbal and nonverbal (photographs, pictures, drawings). The students had the most questions regarding the suitability of a particular piece of furniture, whether it is possible to buy / restore used furniture, etc.</p>
Open education / granting autonomy to students	<p>The students themselves chose the materials and sources of information (internet) with which to work and they took responsibility for the results of their work. They also chose the activity within the group, for which they were responsible (finding prices / informations how to restore old furniture on the internet, price calculation, drawing, designing the bedroom for grandmother).</p>

Conclusion

Many studies have shown that differentiated teaching has positive effects on student achievement (Bal, 2016; Coubergs et al., 2017; Goddard et al., 2015) and motivation (Eysink et al., 2017; Guay et al., 2017; Tulbure, 2011). On the other hand, differentiation in teaching is rarely used (Letzel, 2021; Schwab et al., 2015; Smith & Humpert, 2012). Differentiation in online education is considered even more challenging and difficult to apply by teachers (Idrus et al., 2021). The author of this paper acknowledges that it requires more complicated preparation and more time, but the results are worth it. All three groups performed the task and presented interesting and creative solutions to their chosen problem. Collaborative work in the “breakout rooms” showed that students who are otherwise more competitive, encouraged other students in the group to participate in order to achieve the best possible results for the group. In addition, free choice of problems to solve and group activities had the effect of motivating students.

The proposed taxonomy of DI provides teachers with useful guidance for planning and implementing DI, whether it is online, face-to-face, or blended learning. The lesson example presented in this paper encourages teachers to plan and design differentiated lessons and implement DI in the classroom. This is a rare practical example that shows that DI can also be implemented in an online environment using the so-called “breakout rooms”. However, it would be good to objectively measure student motivation and performance levels. It would also be interesting to see how teaching in other subjects can be designed according to the proposed taxonomy. We hope to see more practical examples of the implementation of DI in the future, not only in online but also in face-to-face and blended learning.

This study was carried out following the guidelines in accordance with the Article 13 of the EU 2016/679 Law, and acts in accord with the European General Data Protection Regulation (GDPR).

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Epilogue

A Set of Challenges for Differentiated Instruction

John Hattie

Differentiation must be among education's most contested, confused, and convoluted concepts. It can mean a process, a way of thinking, a set of activities, a heuristic, or an algorithm, and the aim typically is to enable all students to maximize their learning no matter where they start. This book shows this variation in meaning, and the editors (and I) hope one outcome might be more agreement about what differentiation is *and* is not. This will require some linguistic analyses, an agreement that DI serves the student's best interests (rather than the teacher's), and a call for further research to ascertain the optimal understanding, use and benefits of differentiation.

When the editors asked if I would contribute an Epilogue to this book on DI around the world, I jumped at the opportunity. DI is the core of my work in schools, but we rarely use the term because of its mixed meanings and misunderstandings. As readers of this book, what a gift we have of the contrasting and similar views of DI throughout our world, and we owe much to Verena Letzel-Alt and Marcela Pozas and the many contributors for raising the core issues.

This book, and almost every Chapter, starts with the obvious – all students are unique. Diversity is the norm. Perhaps we could stop here and not talk about DI but instead talk about the impact of effective teaching, as all teaching should acknowledge this diversity. Many of the methods commonly claimed to be affixed to DI are indeed similar to excellent teaching: assessing and activating prior knowledge, gradual release of responsibility, matching to assessment data, providing clear, unambiguous learning intentions, modelling, multiple opportunity, continual checking for student understanding, backward design, guided and independent practice – hardly ever focus on teaching the strategies. No wonder DI is seen as an “umbrella term” (Scarparolo & Subban) and aims to acknowledge and address student heterogeneity (Pozas & Schneider, 2019). However, as Savolainen noted, DI is about building learning conditions and pedagogy from which all students benefit.

But there is a problem! The current grammar of schooling is based on the teacher upfront, the students being compliant, all working on the same tasks, and teachers' desire to reduce student variability to make their work easier. The current grammar of schooling is based on teachers talking (about 90% of the time), asking 150+ questions a day requiring less than three words response,

and focusing on facts, facts, and facts. Teachers assess to see that students heard the facts, we ask students to “do” activities and assignments that need to be handed in on-time, neat and preferably long, and we grade and give feedback about right or wrong. We group students in classes of 20–40, label those that do not fit the ‘norm’, have age-based curricula even when so many students are not working at this age level (many above, many below), and we often introduce national tests and are surprised that variance is the norm! This may be a parody, but variations of this grammar have long dominated classes, although it was severely disrupted by COVID protocols. What a(n unfortunate) natural experiment. We could not talk to students online 90% of the time. We had to adjust, learn how to triage and listen, and ensure we taught our students to learn alone and with others. The five meta-analyses already published at the time this article was written on the effects of COVID around the world show the overall effect size was minimal (about $-.15$) – and this is notwithstanding death, illness, unemployment, equity issues, and so much more. This low average effect indeed attests to the expertise of teachers to make significant adjustments (Hattie, 2021).

Many authors used COVID to explore the notion of DI (see Marciuš Logožar). For example, Helm et al. noted that German and Austrian schools with higher levels of teacher collaboration and adaptive teaching had higher losses in adaptive teaching and less differentiation and individualization during COVID. They explained that these teachers might be more sensitive to reductions in school quality. Because distance learning invites greater use of DI, it would be fascinating to discover more studies about the role and effects of DI during COVID (such as Letzel et al. 2020).

In this epilogue, I want to take up the editors’ challenge to work towards a common ground that can guide and direct DI research. I agree that too often, DI is based on a one-dimensional approach, and too often, DI is reduced to a set of instructional practices typically involving grouping students. I pose eight propositions aimed at using the work in this book to continue the debate about the meaning and benefits of DI.

1. The role of expectations in differentiation

Many years ago, Christine Rubie-Davis was undertaking her PhD on teachers with low or high expectations. Her fundamental argument was that teachers with high expectations tend to have them for all students with consequential high impact on students (see also Lawrence-Brown & Abkowitz). Sadly, those with low expectations tend to have them for all students and have a low impact on students. Indeed, she found that the effect size of the highs was 1.50 to 1.44, and the lows were $-.03$ to $.20$ on student achievement. Students with high-

expectation teachers make much greater academic progress than students with low-expectation teachers.

High-expectation teachers think of their role as change agents and not facilitators, have growth not fixed notions of ability, are more mastery than performance goal-oriented, have a better balance of open and closed questions and challenges, and are focused on learning more than 'do-ing activities', are more explicit about the nature of success more than a procedural focus on completing tasks, give more effective feedback to students and are more open to receiving feedback from students about their interests and prior knowledge. High-expectation teachers ask more open questions for all learners, scaffold them to answer if unsure, do not use within-class ability grouping, have learning goals that are progress focused, focus on skill development rather than peer comparison, create warm supportive classrooms where errors and not knowing is welcomed, and monitor the progress of all students from where they start to the transparent and challenging learning goals.

What was most surprising is that high-expectation teachers rarely mentioned DI, but it was cited frequently by the low-expectation teachers. Rubie-Davies returned to interview the teachers about what they meant by differentiation, and therein were the major differences. The high-expectation teachers argued that while they recognized students started at different points, the aim was for all students to attain the success criteria of the lesson and that differentiation means different times and ways of attaining success. The low-expectation teachers, however, saw differentiation in terms of grouping, different activities, different levels of challenge, and different opportunities. We should be wary of teachers who see DI as a method of grouping, or involving different activities and assignments for different groups of students.

In particular, we have to consider the effects teaching has on students (e.g. Krischler et al.). The students *know* why they are assigned to different groups, despite our creativity at naming and disguising. Indeed, the effect size of student expectations is very high ($d = 1.23$) and far more influential than teachers' expectations. Put the two together, and the effects can be accelerating or toxic. Students know about the teacher's expectations, feel it in their grouping within the class, and soon 'know' their 'place' in the school's learning environment. The teachers' role is to help each student exceed above what they think are their expectations, not reify them; create opportunities for all to flourish, and not provide mundane or repetitive activities that maintain instead of raising their level of achievement. All students need to accelerate and not purposely be given tasks so they remain left behind.

Differentiation thus needs as an underlying premise, a clear statement about the implications for teachers' and students' expectations. Differentiation must accelerate the learning and allow for different ways and times to succeed more than assigning tasks that have reduced opportunity to learn and all students enabled to attain the success criteria of the lessons.

2. The role of labelling in differentiation

We are very good at inventing labels and assigning students to ‘groups’ – furthermore, funding often is attached to these labels. The problem is that the labels can lead to low expectations for students in the group, that every child is seen as “equal” with these labels and within these groups, and we then personify the problem as the students’ (or home or resources) problem. Hettelman (2019) has written a damning indictment of the problems of mislabeling the disabled. He is passionate about services for students with special needs, and decries the many students ‘labeled’ in need of special resources who have been failed by regular class instruction and often take resources and attention from those with diagnosed disabilities. Further, the Productivity Commission (2022) showed that 75 % of students needing to accelerate to meet year-level standards are *not* in designated equity groups. There is no simple answer, but the love of labels needs to be checked, as lower expectations often have devastating consequences.

Labeling can be powerful when it is part of diagnosis and the first step to intervention. But in schools, labeling often is used to “explain why the child cannot” and why they need accommodation which can lead to reduced cognitive challenge, lower expectations, and more tasks at the current level of performance rather than in the zone of proximal development. Instead, there is an urgent need to invite students to progress “plus one” step higher or deeper from where they are currently. The Singapore school system refuses to use many labels preferring to consider ‘low progress students,’ which is a step in the right direction. Even so, this term also can be a proxy for blaming the child, code for special needs, low SES, or migrant backgrounds.

Differentiation needs to see labels as the first step in diagnosis leading to worthwhile interventions and not the reason to segregate students such that they receive lesser quality and quantity of instruction.

3. Tracking/streaming is the most destructive form of differentiation

There have been 14 meta-analyses on tracking or streaming, with an overall effect size of .09, which is tiny relative to other interventions. Nevertheless, differentiating classes by ability grouping remains popular worldwide, especially in math classes. For example, the OECD (2010) reports that 46 % of students across OECD countries were grouped by ability into different classes – and 75 % receive instruction in at least one subject in an ability-grouped class in Australia, Canada, Hong Kong, Ireland, Israel, Malta, New Zealand, Singapore, Thailand, the United Kingdom, the United States, and Vietnam. These very low effects do not vary for high- (.06), medium- (-.04), or low-ability students (.03;

Steenbergen-Hu et al., 2016). The overall effects on mathematics and reading were similarly low (reading $d = 0.00$, mathematics $d = 0.02$), and Castejón and Zancajo (2015) noted a negative relationship between student motivation levels and the degree to which systems sort and group students into ability groups. So why do we persist with a failed intervention? Who benefits? Not the students.

The most influential in-depth study of teaching and learning in tracked classes, conducted by Oakes (2005), found that many low-track classes are deadening and non-educational environments, and they limit students' schooling opportunities, achievements, and life chances. When tracked, the composition effects of peers working together can reinforce the lower performance levels (Thrupp et al., 2002). Shanker (1993, p. 24) argued that "Kids in these [lower] tracks often get little worthwhile work to do; they spend a lot of time filling in the blanks in workbooks or ditto sheets. And because we expect almost nothing of them, they learn very little." The teachers' unions in New Zealand recently advocated for the abandonment of tracking, as it is harmful and discriminatory. They claim that tracking "creates and exacerbates inequity" and minority "students bear an inequitable burden" from the harms of streaming. Italy has regulated that all students must be exposed to the same curriculum, quality, and quantity of instruction (Dupriez et al., 2008; Duru-Bellat & Mingat, 1997).

The effects of tracking equity outcomes are more profound and damaging. Oakes and Wells (1996) claimed that tracking guarantees the unfair distribution of privilege in that white and wealthy students benefit from access to high-status knowledge that low-income students and students of color are denied. Oakes et al. (1990) found that minority students were seven times more likely to be identified as low-ability than high-ability students. Braddock (1990) found that schools with more than 20% of their rolls from minority groups were more likely to track than those with fewer minority students. Modica (2015) noted that academic tracking strengthened racial boundary-keeping and reinforced the idea among students that Whiteness and academic success are correlated in a fixed and natural way. Datnow and Park (2018) concluded that

"problematic practices of tracking and ability grouping with long-term consequences continue to abound in schools and are legitimated with data. In fact, tracking remains one of the most enduring practices in American high schools, despite a robust research base denouncing it" (p. 148).

Let us seriously stop tracking: no student is the winner. Therefore, *differentiation should not lead to tracking with the invidious equity consequences and little to no effect on achievement. Instead, variance should be welcomed and seen as an opportunity for more effective teaching and learning in every classroom.*

4. Personalization and individualization are not the essence of differentiation

Whenever differentiation is mentioned, there is a sense that it requires teaching plans that are unique to each student. But strategies based on individualization or personalization have relatively low effects (12 meta-analyses, 793 studies, $d = .22$). Cooperative learning beats individualized learning, hands down. More specifically, there are five meta-analyses on cooperative vs. individual learning based on 959 studies with an effect size of .55. One of the fallacies of differentiation is that we need separate plans, activities or learning progressions for each individual – and this is beyond the capacity of most teachers in most classrooms to devise let alone execute. Students learn in and from groups of peers, hear others' thinking and learning strategies, learn from how others make and correct mistakes, and work together to make connections and relations between ideas.

There is, however, the importance of case management or focusing on the centrality of each student. Such centrality requires building each student's learning skills, their "I" and "we" skills when working with others, mapping their progress and success, understanding their skills, wills, and thrills (motivations) to learn, and knowing how, when, and whom they should work with to resolve learning issues. For example, when students (e.g., in low-track classes) are deprived of hearing and working with others, when one person dominates the group, and when students (e.g., in high-track classes) do not learn the skills to empathize and understand why others may get a problem incorrect and work through these mistakes – all students lose.

Differentiation pertains as much to teaching students to work cooperatively, maximizing the variance among students to assist all to learn.

5. Differentiation is not a set of activities

Schwab and Woltran argue that DI includes a wide collection of different didactic approaches in which "teachers proactively plan to match instruction, activities, and resources to the diverse needs of the students in their classes" (Scarparolo & MacKinnon, 2022, p.6). Pozas and Schneider (2019, p.74) similarly defined DI as "any instructional practice that enables teachers to address student heterogeneity adequately and thereby support student learning." This notion seems dominant in text books, teacher education programs, and so much of the literature. Further, it is built into the Finnish three-tiered activities (Savolainen). Likewise, Pozas et al. use the DI Taxonomy (Pozas & Schneider, 2019) to identify the use of differentiated instruction *methods* in Mexican schools. This Taxonomy includes e.g. tiered assignments and small groups.

There are three problems with seeing DI as a set of activities. First, the range of suggested activities is vast and can be applied successfully with all students. But their success depends more on the skills and expertise of teachers to implement them well at the right time in the learning cycle and to evaluate the impact of their teaching on the students – and switch to other strategies if the first does not work. So, there is no need for a concept of DI if the demarcation of meaning is based on sets of strategies. Second, there is an implicit (and in some writing explicit) assumption that direct teaching and teaching to the whole class is not part of DI, when indeed it can be. Third, some teaching methods are more aligned with teaching the facts, content, the ‘knowing that’, while others are more aligned with relating ideas, deeper conceptual thinking and transfer. Students need both, not either. Hence, teaching strategies can differ in their effectiveness more related to where they fit in the student’s learning cycle, and there is no one set of strategies optimal for both (Hattie, 2023).

6. Differentiation is more related to the time and different ways to make progress

Consider a GPS. It does not care where you start but wants to know where you want to end up. It then calculates the optimal route from where you begin to your destination – optimal is usually the fastest route, but you could choose the route with the least highways, traffic lights, meander through villages, and take side trips. No one route is right. It does not discipline you for not following the recommended route, and allows you to stop for lunch, visit the beach, and have ice cream. Too often, progression in school is designated as the right way, prescribed in curriculum documents (usually devoid of any evidence that this is how students progress), and students are seen as lesser if they do not speed along the superhighway as outlined. The essence of DI relates to seeing progression in learning akin to a GPS.

Tomlinson (2017) argued that differentiated instruction is student-aware teaching, whereby teachers vigilantly monitor student proximity to the lesson goals throughout a learning cycle, such that the teacher adapts teaching plans to allow multiple ways and times for students to reach success criteria and enhance student efficacy and ownership of learning. This involves skills to anticipate roadblocks, *cul de sacs*, and students going down the pathways in different directions. Hence, the importance of realizing there are multiple progressions to success. All of these require a deep understanding of the curricula, knowing how to advance learning in multiple ways from ‘knowing that’ to ‘knowing how’ to ‘knowing with,’ and knowing how to detect where students are on their roads to success optimally to focus next. Kleinert et al. hint at this GPS notion of progression, recommending breaking down the success criteria into

incremental scaffolds. This incremental scaffolding involves content-related or strategies that promote working independently and learners comparing their partial solutions with example solutions (see also Pozas et al.).

Thus, a fundamental notion of differentiation allows for different times and multiple pathways to success.

7. Differentiation involves an intentional alignment of knowing that, knowing how, and knowing with for all students

It is important to distinguish between knowing that (the content, facts, ideas), knowing how (relations, depth), and knowing with (transfer to new contexts). Throughout the chapters, no author claims that differentiation only pertains to one level of cognitive complexity. However, there are many studies where groups are assigned different tasks based on complexity – the lows getting more content-focused, the highs getting more complexity. All students need both, and a major detriment of DI is where some are assigned the ‘knowing that’, others the ‘knowing that’ *and* ‘knowing how and with’, thus further holding back the learning for the first set of students. DI does not mean that appropriate complexity should be compromised.

The Intentional Alignment model (Hattie, 2023) demands all three levels of knowledge complexity and notes that teaching methods, activities, feedback, learning strategies, and assessment may need to be different depending on the level of complexity. Further, students should be clear about the required level of complexity for the assigned tasks. Mixing them often leads to some only focusing on the content to their detriment, while others focus on all three levels. Differentiation, therefore, is more related to the choices of teaching methods, assessments, activities, feedback, and learning strategies provided by teachers than to any attributes of the students. De Jager emphasized that teachers need the ability to apply diverse interactive teaching methods and strategies and to take the culture and backgrounds that students bring to the class into account. She found about 60% of the best teachers in her South African sample adjusted instruction to relevant inter-learner differences (compared to 40% of the weaker teachers).

Differentiation is related to teaching choices relative to the levels of cognitive complexity of the tasks and ensuring all students are appropriately exposed to rich, challenging, and complex ideas.

8. DI is more related to how teachers think than what they do

A fundamental claim is that DI relates to a way of thinking. In the Visible Learning research, we have explored the mind frames of teachers, leaders, parents, students, and the culture and climate of the class. The premise is that how educators think about what they do matters more than what they do.

Schwab and Woltran illustrate how teachers think. They use the work of Molbaek (2018) and argue that inclusive teaching includes four key dimensions: a framing dimension, a relational dimension, a didactic dimension, and an organizational dimension. Framing refers to teachers' ability to communicate daily learning activities and objectives. Within the relational dimension, teachers must strive for communication and collaboration with stakeholders in and around the school. Focusing on the didactic dimension, educators are urged to differentiate their instructions and continuously develop their teaching. Finally, organizational aspects such as school culture and values are seen as central to the success of IE. All four pertain to decisions and evaluations made by teachers – much more than merely focusing on implementing various teaching methods.

It also helps explain the results by Yuen et al. The authors aimed to change teachers' beliefs about diversity, change the lesson plans, monitor DI implementation, and invite teachers to reflect on their practice. Despite initial resistance to changing their current practice, teachers moved from teaching content to evaluating student readiness, setting multiple goals towards the success criteria. They clearly learnt much from the collaborative confidence of working with other teachers implementing DI. The conclusion was that it was adjusting the teacher's needs, beliefs, self-efficacy, and concerns that mattered – that is, how they thought, evaluated, and focused on their impact. Similarly, Scarparolo and Subban noted that differentiation is more than a strategy or set of strategies – it's a way of thinking.

Smit et al. show the power of teachers engaging in video analyses of their teaching to enhance the power of DI in classes. One session centered on the situational demands that teachers faced (e.g., noticing students' needs, setting individualized goals and designing common learning activities), a second focused on the joint delivery of lessons by general and special needs teachers, and a third was a joint video club that took place across the two participating countries. These videos facilitated discourse between teachers based on what they notice within video excerpts of their lessons, which can lead not only to changes in their noticing but also to instructional changes and adjustments to their management and classroom behaviours. The professional learning pertained to how they thought, evaluated, noticed, and dialogued much more than learning about particular learning strategies (see also Gheysens et al., 2021).

If the major focus of DI relates to how teachers think, then it is perhaps not surprising that there are many observations throughout this book acknowl-

edging the difficulty of implementing DI in schools. Yuen et al. note that this difficulty can relate to teacher lack of knowledge and pedagogical skills, leading to teachers feeling insecure and thus not confident in implementing DI (Chien, 2015). Likewise, Smets points at a gap between theory and practice. Further, there can be external barriers such as insufficient time and resources – although I note that those teachers who implement DI strategies have the same time and resources as those who do not. It is priorities, not time, that make the difference. Savolainen noted studies showing that implementing DI can increase teacher workload and can be difficult with students with challenging behaviours and special needs students (indeed, the point of DI). Kalatskaya et al. noted that DI is carried out only sporadically throughout Russia and largely depends on the pedagogical skills of the teacher (similarly in Turkey, see Culhaoglu & Letzel-Alt). Schwab and Woltran argued that since teachers may differentiate their teaching based on fixed notions of their student's abilities, the impact of differentiated approaches may fall short of the high expectations placed on them (Larina & Markina, 2019).

Conclusions

Classrooms are places where variance has become the norm. There are fewer classes where all the students are of similar ethnicity, achievement, socio-economic background, and the same age working at an age-appropriate curriculum. Thus, DI needs to be the major principle in all teaching, and excellent teaching thus encompasses the claims about DI. Educators have continued to look for ways to reduce this variance to make it easier (and they claim more effective to teach), but no longer can homogeneity be considered the norm. So, let's bring on and welcome diversity. Note how Hong Kong moved from 'inclusion of students with special needs' to a more asset-based 'embracing learning diversity' (Yuen et al.).

Let's start backward. If an aim is for every student, no matter where they start, to make at least a year's progress for a year's input, then teachers need to be adaptive, evaluative, have multiple strategies, know when to use various strategies, be clear about what success looks like, and attend at all times to their impact on every student. As Kalatskaya et al. argue, the basic principle declared by Vygotsky (1935) is that learning must outstrip development. The zone of proximal development is the difference between the level of actual development (based on the difficulty of tasks that are feasible for the child's intellectual effort) and the level of proximal development (tasks that can be achieved with the help of older people and in interaction with peers).

I trust you have enjoyed reading this book as much as I have and that it has helped move your thinking forward in understanding differentiated instruction from across many countries. The book aims to foster a more robust debate about

DI, and this epilogue makes eight provocations to help the continuing debate and research.

1. Differentiation needs as an underlying premise a clear statement about the implications for teachers' and students' expectations. Differentiation must accelerate the learning and allow for different ways and times to succeed more than assigning tasks that have reduced opportunity to learn.
2. Differentiation needs to see labels as the first step in diagnosis leading to worthwhile interventions and not the reason to segregate students such that they receive lesser quality and quantity of instruction.
3. Differentiation should not lead to tracking with the invidious equity consequences and little to no effect on achievement. Instead, variance should be welcomed and seen as an opportunity for more effective teaching and learning in every classroom.
4. Differentiation pertains as much to teaching students to work cooperatively, as maximizing the variance among students to assist all to learn.
5. Differentiation is not a set of activities.
6. Differentiation allows for different times and multiple pathways to success.
7. Differentiation is related to teaching choices relative to the levels of cognitive complexity of the tasks and ensuring all students are appropriately exposed to rich, challenging, and complex ideas.
8. Differentiation is more related to how teachers think than what they do.

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Last name, title and first name	Affiliation	Country
Büssing, Dr. Alexander	Leibniz University of Hannover	Germany
Demo, Prof. Dr. Heidrun	Free University of Bozen-Bolzano	Italy
Demski, Dr. Denise	Ruhr-University of Bochum	Germany
DeVries, Dr. Jeffrey	Technological University of Dortmund	Germany
Frohn, Dr. Julia	Humboldt-University to Berlin	Germany
Gehrer, Dr. Karin	Leibniz Institute for Educational Trajectories Bamberg	Germany
Gordt, Dr. Simon	University of Trier	Germany
Hartwig, Dr. Svenja	University of Witten/Herdecke	Germany
Hassani, Dr. Sepideh	University of Vienna	Austria
Helker, Dr. Kerstin	Eindhoven University of Technology	Netherlands
Holzinger, Prof. Mag. Dr. Andrea	Pedagogical College (PH) Styria	Austria
Jennek, Prof. Dr. Julia	University of Potsdam	Germany
Johnson, Frederick	University of Trier	Germany
Kahmann, Rebecca	Radbound University Nijmegen	Netherlands
Karhu, Dr. Anne	University of Eastern Finland	Finland
Kast, Dr. Julia	University of Vienna	Austria
Khanolainen, Daria	University of Jyväskylä	Finland
Klomfaß, Prof. Dr. Sabine	University of Trier	Germany
Kottmann, Prof. Dr. Brigitte	University of Paderborn	Germany
Koutselini, Prof. Dr. Mary	University of Cyprus	Cyprus
Linder, Dr. Katharina-Theresa	University of Vienna	Austria
Martens, Prof. Dr. Helge	University of Kassel	Germany
Nusser, Dr. Lena	Leibniz Institute for Educational Trajectories	Germany
Porta, Dr. Tom	University of Southern Queensland	Australia

Porsch, Prof. Dr. Raphaela	Otto-von-Guericke-University of Magdeburg	Germany
Pulkkinen, Dr. Jonna	University of Jyväskylä	Finland
Quenzer-Alfred, Dr. Carolin	University of Siegen	Germany
Schneider, Lisa	University of Siegen	Germany
Schneider, Prof. Dr. Christoph	University of Trier	Germany
Sharma, Prof. Dr. Ramesh C.	Ambedkar University Delhi	India
Simonis, Laura	University of Trier	Germany
Smale-Jacobse, Dr. Annemieke	University of Groningen	Netherlands
Wilkes, Theresa	Saarland University	Germany