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ARTICLE

Challenging but positive! – An exploration into teacher attitude profiles towards differentiated instruction (DI) in Germany

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Abstract

Background: Research has highlighted that personal characteristics such as teachers' attitudes play an important role in the implementation of inclusive education. However, there are only a few studies that have shed empirical evidence on the relationship of attitudes and inclusive teaching approaches, such as differentiated instruction. In this vein, the present study tackles this research gap and aims to explore teachers' attitudes specifically towards the inclusive practice of DI in Germany.

Aims: The present study aimed to investigate teacher profiles based on their attitudes towards differentiated instruction, as well as further to explore whether teachers differentiated instructional implementation varies between the teacher profiles.

Sample: The sample consists of 450 teachers (M_{age} = 42.89, SD = 10.48, 65% female), from different school tracks in Germany.

Methods: A two-step cluster analysis was performed in order to identify teacher attitude profiles concerning their implementation of differentiated instruction. Moreover, an analysis of variance was conducted in order to identify variations in terms of the implementation of differentiated instruction across the three clusters.

Results: Results from the cluster analyses indicate three distinct teacher attitude profiles: Cluster 1 'The valuing-teacher', Cluster 2 'The non-valuing-teacher' and Cluster 3 'The challenged-but-valuing-teacher'. Moreover, the findings reveal gender and school track differences between the three teacher attitude profiles. Lastly, an analysis

of variance indicated that teachers' differentiated instruction practice varied significantly across the clusters.
Conclusions: The findings from the present study indicate that teachers not only perceive the value of DI but also the insufficient resources. Thus, it can be assumed that teachers identify both the 'positive' and the 'negative' aspect of DI, and more importantly, they can recognize both attitude domains towards DI in a similar or different level. Consequently, the results show that attitudes in the context of inclusion cannot be characterised as continuum with two distinct poles.

KEYWORDS
differentiated instruction, inclusive education, teacher attitudes, teacher profiles

INTRODUCTION

Worldwide, inclusive education is a highly important topic of policy debate that 'emphasize the concepts of efficiency, effectiveness, equity, and inclusion as a means of ensuring quality education for all' (Watkins, 2017, p. 1). In this sense, inclusive education entails teachers to embrace student diversity and commit to adapt their instruction in order to meet the learning needs of all students within classrooms. As the successful and effective implementation of inclusive education relies mainly on teachers, it is imperative to understand the underlying elements that have an impact on their instructional behaviour, such as the use of inclusive teaching practices. Many researchers have highlighted that teachers' attitudes play an important role in the implementation of inclusive education. However, there are only a few studies that have shed empirical evidence on the relationship between attitudes and inclusive teaching approaches, such as differentiated instruction (DI; Letzel, Schneider et al., 2020; Hellmich et al., 2019; Savolainen et al., 2020; Schwab et al., 2019). Savolainen et al. (2020) argue that in order 'to understand processes related to teachers' attitudes towards inclusive education, future research must distinguish between different sub-dimensions of teachers' attitudes […] rather than teachers' general attitudes towards inclusion' (p. 12). In this vein, the present study tackles this research gap and aims to explore teachers' attitudes specifically towards the inclusive practice of DI in Germany (Letzel, Pozas, et al., 2020; Letzel, Schneider et al., 2020; Loreman, 2017). Additionally, this study draws on the need to provide evidence on the link between teachers' attitudes and their practice of DI.

THEORETICAL FRAMEWORK

DI

In times of rapid global changes and increasing diversity among the world's society, schools worldwide are facing a highly heterogeneous student population that differs, among others, in readiness, motivation, interests and social competencies (Dijkstra et al., 2016; Maulana et al., 2020; Watkins, 2017). In this context, the concept of inclusion has been shifted from the inclusion of students with special needs to the participation of all students (European Agency for Special Needs and Inclusive Education, 2017; Schwab, 2020). As a result, policymakers urge teachers to make use of inclusive teaching strategies to provide valuable learning for all students within a learning group (UNESCO, 2017). DI is a promising approach that aims to meet students' individual learning needs by maximizing learning opportunities (Gheyssens et al., 2020).

For the purpose of this study, DI is defined as intentional, systematically planned and reflected practices that enable teachers to meet the needs of all learners in heterogeneous classrooms (Letzel, Schneider et al., 2020; Graham et al., 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 the use of tiered assignments or the establishment of homogeneous or heterogeneous subgroups based on learners' performance or interests (Coubergs et al., 2017; Hachfeld & Lazarides, 2020; Maulana et al., 2020). Additionally, Tomlinson (2017) suggests the use of tutoring systems, staggered non-verbal 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 prioritized curricula directed at both high- and low-achieving students (Darnon et al., 2012; Lawrence-Brown, 2004).

DI has been related to positive achievement and non-achievement student outcomes. For instance, multiple studies have reported positive effects of teachers' use of DI on students' mathematics and reading achievement (Bal, 2016; Goddard et al., 2015; Reis et al., 2011). Furthermore, studies by Lindner et al. (2021) and Pozas et al. (2021) indicate that students' perceptions of their teachers' DI use strongly predicted students' well-being, social inclusion and academic self-concept. Likewise, DI has also been reported to foster learners' interest, motivation and self-confidence (Eysink et al., 2017; McQuarrie & McRae, 2010).

DI as a core element of teaching quality

Scientific literature has recognized DI as an important teaching quality domain (Maulana et al., 2020) and a core element of effective teaching that seeks to ensure equity as well as educational justice (Lindner & Schwab, 2020; OECD, 2012; Valiandes & Neophytou, 2018). The implementation of DI is by no means just a normative recommendation, but an important criterion of high-quality teaching (Praetorius et al., 2018). Additionally, DI has been included within prominent teaching quality model conceptualizations and studies regarding the domains of teaching quality (Bell et al., 2019; Hattie, 2009; Praetorius et al., 2018; van de Grift, 2014). Results from a recent comparative study by Maulana et al. (2020) provided empirical evidence that DI may be considered a specific domain of teaching quality in different countries like the Netherlands and South Korea. Thus, it can be assumed that the implementation of DI as a criterion of high-quality teaching is important to be considered at all organizational levels: the macro- (school track), meso- (school) and micro-level (classroom teaching).

However, despite the fact that DI has been identified as a teaching quality domain (Maulana et al., 2020) and teachers recognize the necessity to implement it (Valiandes & Neophytou, 2018), international research reports that teachers rarely make use of DI practices (Neve et al., 2015; Schleicher, 2016). Reasons for the rare implementation could be due to the fact that DI is considered a complex practice (van Geel et al., 2019), that teachers' feel unprepared to meet students' heterogeneity (Idol, 2006; Letzel & Otto, 2019; Pozas & Letzel, 2019; Pozas et al., 2019) or the lack of resources (Goldan et al., 2021). However, being able to offer high-quality teaching, and therefore, address all students' learning needs is also part of teachers' professionalization and competence that every educator should develop during both teacher education and in-service teaching (Baumert & Kunter, 2006; KMK, 2019; Schwab et al., 2021). Teaching competence is a multidimensional construct that subsumes not only knowledge but also personal characteristics such as attitudes (Allday et al., 2013; Coubergs et al., 2017; Savolainen et al., 2020). Thus, the main reason for conducting the current study is based on the fact that teacher attitudes are a domain of teacher professionalization and competence as well as a decisive factor for teachers' DI implementation.

Teachers' attitudes towards DI

Attitudes can be defined as an overall subjective evaluation of certain subjects or objects which are composed of affective, cognitive and behavioural components (Eagly & Chaiken, 1993; Maio & Haddock, 2010). Consequently, attitudes are the expression of a person's opinion that strongly influences their actions (Ajzen, 1991; Haddock & Maio, 2014). This theoretical assumption stems from the social–psychological framework of planned behaviour by Ajzen (1991). The theory of planned behaviour has been used as a framework to investigate the associations among teachers' attitudes, their intentions and use of inclusive teaching practices (Hellmich et al., 2019). Many research using the theory of planned behaviour as a theoretical framework has revealed that teachers holding more positive attitudes tend to implement more inclusive practices (Hellmich et al., 2019; Monsen et al., 2014; Schüle et al., 2016; Yan & Sin, 2014). Nonetheless, research has yielded mixed evidence as studies have reported that teachers hold either positive or negative attitudes towards inclusion or heterogeneity (De Boer et al., 2011; Hartwig & Schwabe, 2018; Heyl & Seifried, 2014; Ruberg & Porsch, 2017). However, such mixed evidence can be a result of the lack of use of precise instruments that focus on the different sub-dimensions of teachers' attitudes (Savolainen et al., 2020), such as the attitude object DI (Letzel, Pozas, et al., 2020) or heterogeneous research contexts.

School tracking system, DI and attitudes towards DI

Given that the German secondary school system is characterized by a strict ability tracking system, secondary schools differ significantly. For the purpose of this study, the following paragraphs introduce a brief description of the legislation and the structure of the German education and teacher training system. Full information can be obtained from the Standing Conference of the Ministers of Education and Culture (*Ständige Kultusministerkonferenz*, KMK). The federal states (*Länder*) are primarily responsible for both teacher education and the education system itself. Given that, Germany implements a formalized tracking system (in which students are assigned at an early age to a secondary school based on academic ability), future student teachers must enrol in different general education programmes that lead to certification for teaching in:

- School with different courses of education (*Schule mit mehreren Bildungsgängen*): general and intermediate secondary school programmes are grouped together under one organizational body.
- Intermediate secondary school (*Realschule*): school track that provides broad education allowing students to move on to courses that lead to vocational education or higher education entrance qualifications.
- Advanced secondary school (*Gymnasium*): school track that qualifies students for entrance to higher education.

Nevertheless, there is no special teacher training for every school track, for example:

- General secondary school (*Hauptschule*): basic general education track preparing students for vocational studies.
- Comprehensive school (*Integrierte Gesamtschule*): the three courses of education (general, intermediate and advanced secondary school) are grouped together under one organizational body.

Teacher training is divided into two stages: a theory-based stage at universities or colleges of education that leads into the 'First State Examination', and a second (preparatory service) practice-oriented phase at ministry-run training institutes ending with the achievement of a 'Second State Examination'. After this second examination, teachers are fully certified and allowed to start teaching in schools. The KMK has released standards for teacher training in Germany that include 11 competencies teachers must

develop within their training (KMK, 2019). The competencies mirror teacher training key aspects, such as 'Differentiation, Integration and Fostering. Diversity and Heterogeneity as conditions of school and teaching' (KMK, 2019, p. 5) as well as 'abilities, skills and attitudes that are needed to handle professional job requirements' (KMK;, 2019, p. 4).

Studies conducted in Germany have reported differences in both pre-service and in-service teachers' attitudes towards inclusion within the different school tracks: In-service teachers working in schools for children with special needs hold more positive attitudes towards inclusion than teachers working in mainstream schools (Feyerer, 2014; Gebhardt et al., 2015; Heyl et al., 2013; Heyl & Seifried, 2014; Kuhl et al., 2013; Seifried, 2015; Trumpa et al., 2014). Moreover, studies from Scheer et al. (2015) and Trumpa et al. (2014) report that pre-service elementary school teachers are more positive towards inclusion than pre-service secondary school teachers. However, to the best of our knowledge, up until now there are no studies that have explored teachers' attitudes towards DI between the different secondary school tracks. Given that research has repeatedly shown that teachers' practice of DI significantly varies across school tracks (Hertel et al., 2010; Letzel & Otto, 2019; Nieder et al., 2011; Pozas & Letzel, 2019; Pozas et al., 2019; Schiepe-Tiska et al., 2013), it seems worthwhile to examine whether such significant differences also hold true for teachers' attitudes towards DI.

The present study

Provided that teacher characteristics are a determining factor for the successful and effective implementation of inclusive education, research has intensively focused on the underlying factors that may have an impact on their instructional behaviour. In light of the aforementioned theoretical background and the mixed evidence on teachers' attitudes, towards inclusion and/or heterogeneity, the present study focuses on exploring teachers' sub-dimensions of attitudes towards the inclusive practice of DI (Savolainen et al., 2020), the interrelationships between the sub-dimensions and the impact on their DI practice. The research questions guiding the study were as follows:

1. Is it possible to empirically identify distinct teacher groups differing in their attitudes towards DI?
2. Do teachers' DI practices differ among these groups of teachers?

METHOD

Participants and procedure

Secondary school teachers within the state of Rhineland–Palatinate were sent an online invitation to participate in the survey during November 2018 to July 2019. The survey was completed either online or in a paper-based form by a random sample of 468 in-service secondary school teachers. After the data cleaning process, 18 teachers were excluded because at least 5% of the data were missing (Bartholomew et al., 2008). Thus, the final sample consisted of 450 teachers (65% female) with an average age of 42.89 (SD = 10.48) and an average professional experience of 13.61 (SD = 9.14). The sample was stratified according to the different school tracks within the German school system: advanced or academic track secondary school (N = 202), intermediate secondary schools (N = 138), comprehensive schools (N = 82), general secondary schools (N = 18) and 10 missing. The sociodemographic variables of the teacher sample used within this study are representative of the teacher population in Germany (OECD, 2021; Statista, 2022).

Instruments

Teachers' attitudes towards DI

Teachers' attitudes towards DI were assessed using the Teachers' Attitudes towards DI Scale (TAT-DIS; Letzel, Pozas, et al., 2020). The TAT-DIS was originally developed in the German language as well as validated within a sample of German secondary school teachers (Letzel, 2021; Letzel, Pozas, et al., 2020) . It consists of two sub-scales embracing the following constructs: *Value of DI* (five items, e.g., 'Differentiated instruction is necessary to address all students'; $\alpha = .88$) and *Perceived Insufficient Resources* (three items, e.g., 'If I had more time, I would differentiate my instruction more often'; $\alpha = .79$). Its items apply a 5-point Likert scale ranging from 1 = *strongly disagree* to 5 = *strongly agree*.

Teachers' self-reported use of DI

Teachers' self-reported use of DI was measured using the scale *Instructional Adaptations* (10 items, e.g., 'Plan different assignments to match students' abilities'; $\alpha = .79$) from the Differentiated Instruction Scale (DIS) by Roy et al. (2013). This scale applies a 5-point Likert scale ranging from 1 = *never* to 5 = *very often*; the reliability of the current sample is acceptable. Important to mention is that the DIS scale was originally in English, and therefore, a back-translation (Brislin, 1970) process was followed in order to translate it into German. In this sense, a bilingual translator blindly translated the questionnaire from English to German, and afterwards a second bilingual translator independently back-translated the instrument from German to English. Finally, the two versions of the questionnaire (English language and back-translated German version) were compared for equivalence. Two of the authors served as consultants during this process and supported by clarifying the meaning of items for translations. Such back-translated version has been used in a previous study showing also an acceptable reliability (Pozas et al., in press).

Data analysis

Statistical analyses were conducted in IBM SPSS Statistics 27. To explore the data, descriptive analyses and *t*-tests were performed. Subsequently, a two-step cluster analysis was conducted in order to ensure the reliability of the clusters. Cluster analysis is a statistical method used to identify and group participants who have similar scores (Field, 2013). As a first step, a hierarchical cluster analysis using Ward's method and squared Euclidean distance was performed to identify the number of possible profiles of teachers (Hair et al., 1998; Yim & Ramdeen, 2015). For the purpose of this study, the two single TAT-DIS sub scales were used as the clustering variables: Value of DI and Perceived Insufficient Resources. The second step consisted of a k-means procedure, with nearest-neighbour assignment for partial data, to assign pre-service teachers to their profile and was followed up by an additional discriminant analysis in order to validate the number of clusters. Further analyses included the examination of the relationship between the affiliation with the particular cluster and the school type in which teachers were currently working. Lastly, mean differences between the clusters on the different DI scales were analysed using one-way variance analyses (ANOVA; Rutherford, 2011).

RESULTS

Descriptive results

Before searching for the teacher profiles, descriptive analyses of teachers' attitudes towards DI and their implementation of DI were undertaken by analysing the means and standard deviations of each scale.

When observing the two attitude scales, the descriptive data indicated that insufficient resources had the highest score ($M = 4.26$; $SD = .85$), whereas the value of DI had a lower score ($M = 3.91$; $SD = .86$). A one-sample t-test analysis revealed that teachers' ratings of both insufficient resources ($t[431] = 30.86$, $p < .001$, *Cohen's d* = .85) and value of DI ($t[431] = 21.94$, $p < .001$, *Cohen's d* = .86) were significantly higher than the theoretical mean of the scale (3). Such results imply that teachers perceive not only high levels of insufficient resources but also hold a high value of DI. Concerning teachers' implementation of DI, results show that teachers' ratings on the scale of the instructional adaptation ($M = 3.49$; $SD = .78$; $t[431] = 12.90$, $p < .001$, *Cohen's d* = .78) are significantly higher than the theoretical mean of the scale (3). Nevertheless, it is important to bear in mind the scaling, as the theoretical mean of 3 would indicate a label of 'sometimes'. Consequently, it does appear that teachers frequently differentiate their instruction, but rather in an occasional manner.

Teacher attitude profiles: Cluster analysis

First, a hierarchical cluster analysis was performed to identify the clusters related to the attitudes towards DI dimensions. The dendrogram suggested a three-cluster solution. A two- and four-cluster solutions were also tested. However, based on the variation between the clusters as well as the theoretical framework on teachers' attitudes towards DI (TAT-DIS), a three-cluster solution was identified and chosen for the sample. Second, in order to assign the teachers to their attitude profiles, a k-means cluster analysis was conducted based on the three-cluster solution. Finally, a discriminant analysis was performed where two discriminant functions were identified. The Box's M value of 191.90 was associated with a p value of .000, which was interpreted as non-significant based on Huberty and Petoskey's (2000) guideline ($p < .005$). The first function showed a canonical correlation of $R = .77$ (eigenvalue = 1.44; Wilks Lambda = .21; $p < .001$; explained variation 59.8%) and the second function showed $R = .70$ (eigenvalue = 0.97; Wilks Lambda = .51; $p < .001$; explained variation 40.2%). In total, 90.2% of the cases grouped by the cluster analysis were correctly classified. Accordingly, 9.8% cases were reassigned which corresponds to 41 persons. The final clusters are composed as follows: cluster 1 included 56 teachers (12%); cluster 2, the smallest, included 49 teachers (11%); and cluster 3, the largest, included 345 teachers (77%). As shown in Table 1, one-way ANOVA with post-hoc analyses indicated that both TAT-DIS scales significantly varied within clusters, and therefore, these profiles were valid.

Description of the clusters

Figure 1 visually presents the teacher profiles as well as a comparison of the means scores within each cluster:

- Cluster 1 '*The valuing-teacher*': Teachers within this cluster scored significantly higher in the domain of value of DI as well as significantly lower in perceiving insufficient resources. Hence, it can be assumed that teachers in this cluster recognize the value and importance of implementing DI rather than focusing on the resources they are lacking.

TABLE 1 One-way ANOVA of the teacher attitudes domains between profiles

	Cluster 1		Cluster 2		Cluster 2			
Domain	***M***	***SD***	***M***	***SD***	***M***	***SD***	***F*(2, 431)**	η^2
Value of DI	4.65	0.40	2.40	0.64	4.01	0.67	180.32**	.46
Insufficient resources	3.02	0.70	3.20	0.94	4.63	0.41	325.05**	.60

**$p < .01$.

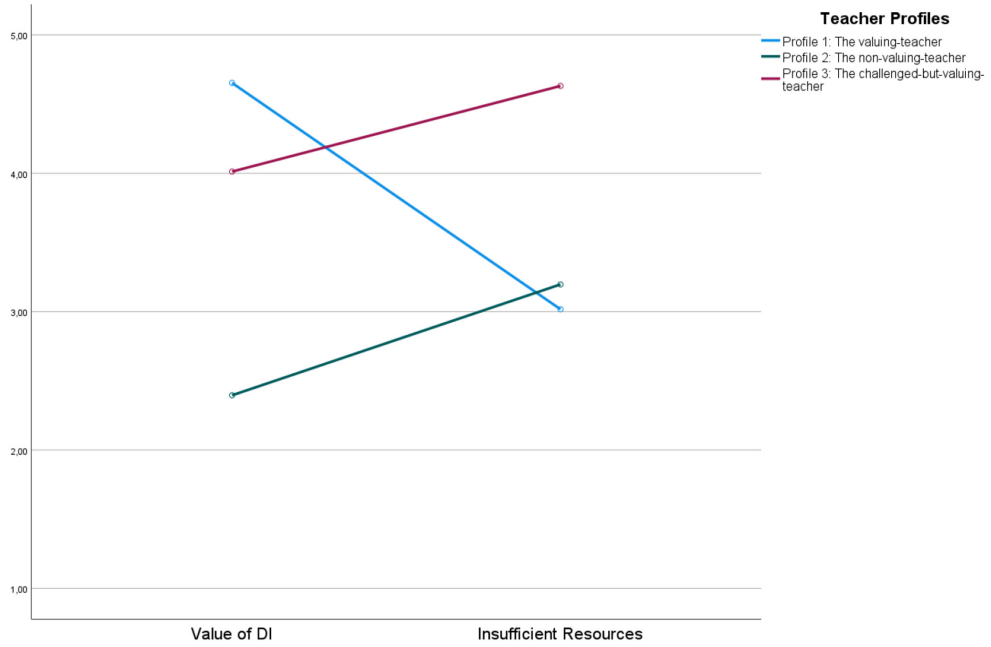

FIGURE 1 Teacher profiles: Attitudes towards DI

- Cluster 2 '*The non-valuing-teacher*': Teachers sorted into this cluster scored the lowest in the domain of value of DI. Compared to cluster 1, these teachers reported a slightly higher level of insufficient resources. Thus, the mean values indicate that teachers in this cluster have a major focus on the resources that they lack in order to implement DI.
- Cluster 3 '*The challenged-but-valuing-teacher*': This cluster could be summarized with the statement: 'I would if I could'. When compared to the other two clusters, these teachers scored the highest in the domain of perceived insufficient resources. Nonetheless, their scores for the domain of value of DI are still significantly high. Therefore, it can be assumed that teachers within cluster 3 identify the challenges that DI convey, however, they still recognize the necessity of implementing DI. Important to highlight is that this cluster is by far the largest (77% of teachers) compared to the other two clusters.

Subsequently, a multivariate analysis of variance (MANOVA) was conducted to explore whether the scores of the separate variables in each of the profiles differed between the clusters. MANOVA has been selected instead of running multiple ANOVAs as a means to prevent the risk of committing a Type 1 error and maintain the relationship between the variables (Field, 2013). The Wilks' Lambda was revealed to be significant highlighting the differences between the clusters, [$F(2, 430) = 8261$, $p < .001$, partial $\eta^2 = .96$]. Finally, chi-square tests of association were used to examine whether there was a relationship between the profiles and the demographic variables. Such analyses showed no significant association among teacher profile, age and teaching experience. However, the analyses did reveal significant results for the relationship between profile and gender, $\chi^2(2) = 7.12$, $p < .05$, as well as school track, $\chi^2(2) = 27.29$, $p < .001$. To explore such results two one-way ANOVA with Bonferroni post-hoc tests were conducted. For the case of gender, the findings revealed profile 2 is significantly different from profile 1 and profile 3 ($p < .05$). As seen from Figure 2, it is possible to observe that both profiles 1 and 3 are mainly represented by female teachers, whereas profile 2 appears to be more balanced. On the other hand, with regards to school track, results indicated that in profiles 1 and 3 more general, intermediate and other school track teachers are represented compared to the profile 2 ($p < .01$, Figure 3).

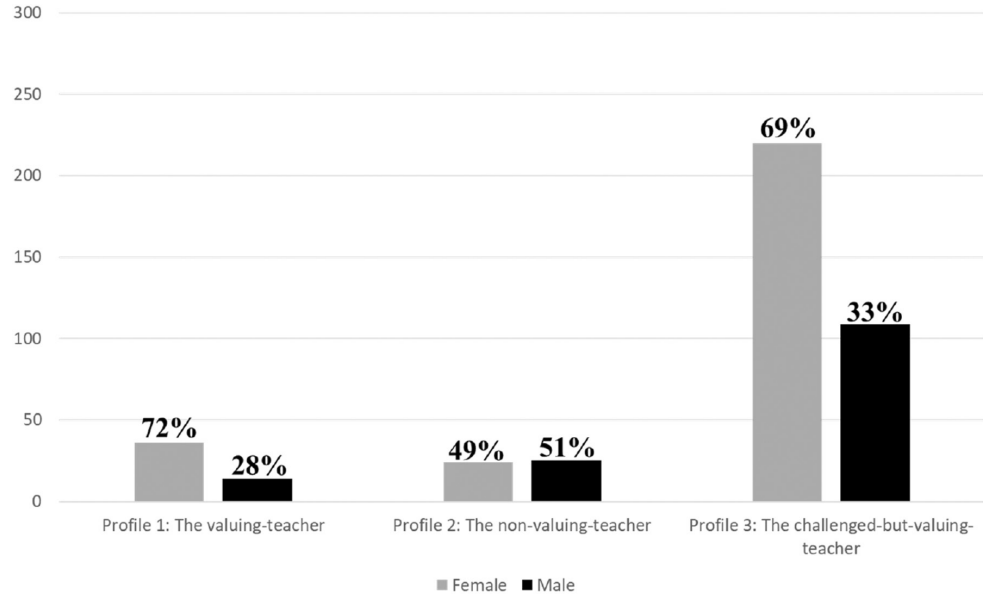

FIGURE 2 Distribution of gender over the different teacher attitude clusters

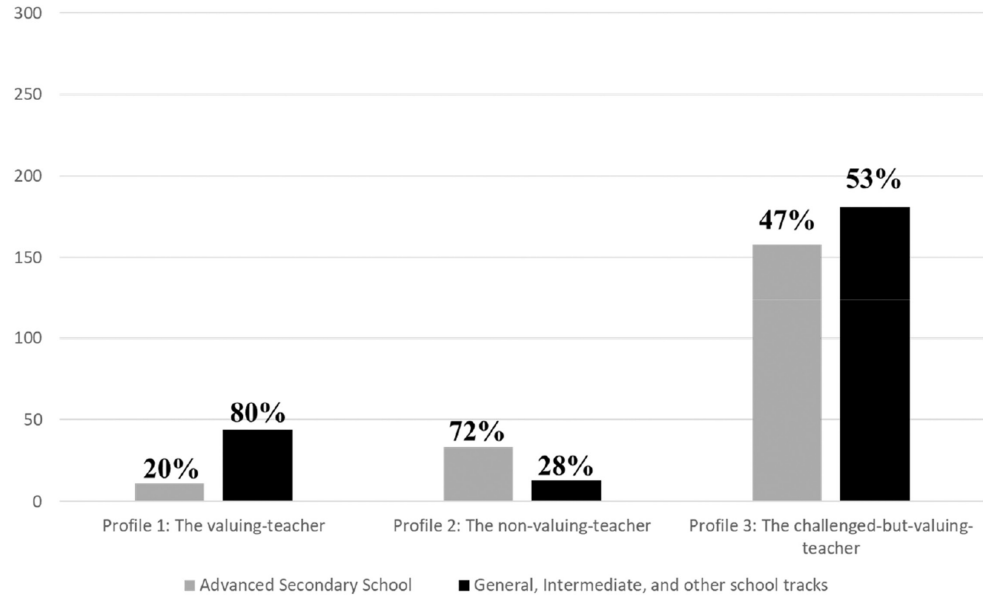

FIGURE 3 Distribution of school track over the different teacher attitude clusters

Comparison of the teacher attitude profiles and the implementation of DI

In order to examine whether teacher attitude profiles differ in their frequency of use of DI, a one-way ANOVA was conducted. A significant main effect of teacher attitude profiles [$F(2, 424) = 26.55$, $p < .001$, $\eta^2 = .11$] revealed that teachers' implementation of DI varies across the three clusters. In detail, Scheffé post-hoc tests showed that all three teacher attitude profiles vary significantly in how often they differentiate their instruction ($p < .001$). In detail, the results indicate that teachers in cluster 1 ($M = 3.98$; $SD = .53$)

implement DI significantly more than teachers in clusters 2 (M = 2.92; SD = .83) and 3 (M = 3.49; SD = .73). Important to highlight is that teachers within cluster 2 implement DI the least when compared to the other two clusters (Figure 4).

DISCUSSION

Teacher attitudes are crucial to teachers' behaviour, such as the use of inclusive practices like DI (Hellmich et al., 2019; Miesera et al., 2018; Schwab et al., 2019). However, there is limited empirical evidence on the link between attitudes and inclusive teaching approaches given that the available instruments do not focus on a specific attitude object such as DI (Savolainen et al., 2020). Against this background, this study aimed to gain deeper insight into secondary school teachers' attitude profiles by using an instrument that specifically measures the attitude object of DI (Letzel, Pozas, et al., 2020). Furthermore, the present study explored differences in DI implementation across the teacher clusters. The results of the study showed first, in great majority, teachers do see a certain value in the use of DI, however, they also perceive insufficient resources when differentiating their instruction. These findings serve as an initial discussion point for why there is mixed evidence regarding teachers' attitudes towards inclusion and/or heterogeneity (De Boer et al., 2011; Hartwig & Schwabe, 2018; Heyl & Seifried, 2014; Ruberg & Porsch, 2017). As discussed in the theoretical section, available instruments have not focused on the sub-dimensions of attitudes (Savolainen et al., 2020). In this context, the study's results strengthen the discussion that examining teachers' general attitudes towards inclusion or heterogeneity, or distinguishing just between positive or negative attitudes might not shed sufficient information on the relationship between teachers' attitudes and their DI use. Consequently, attitudes in the context of inclusion cannot be characterized as a continuum with two distinct poles. More likely, research has to clearly address detailed content to the manifestations of attitudes in order to gain detailed information. Moreover, findings from the present study indicate that teachers not only perceive the value of DI but also the insufficient resources. Thus, it can be assumed that teachers identify both the 'positive' and the 'negative' aspects of DI, and more importantly, they can recognize both attitude domains towards DI on a similar or different level.

Second, the study's results help to gain deeper insight into the general mechanisms of teachers attributing value to the implementation of DI as well as perceiving insufficient resources by clearly categorizing three different attitude profiles. Clusters 1 and 2 can be seen as opposites ('The valuing-teacher' vs. 'The non-valuing-teacher'), as Cluster 1 scored significantly higher in the domain of DI, whereas Cluster 2 scored the lowest, and vice versa with the domain of perceived insufficient resources. In contrast, cluster

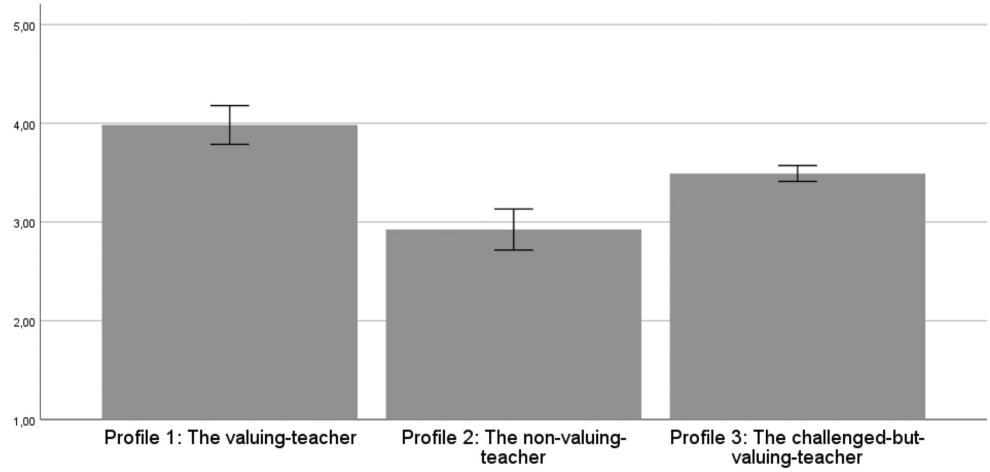

FIGURE 4 Teachers' DI implementation across the teacher attitude towards DI cluster

3 ('The challenged-but-valuing-teacher') could be considered a more balanced profile as both domains scored relatively high and had only slight differences. Moreover, results also show that female teachers mostly composed clusters 1 and 3. Thus, when compared to their male counterparts, it appears that female teachers have higher levels of perceived insufficient resources. On the other hand, interestingly, cluster 3 is relatively balanced among genders. A possible explanation for such results could be related to the fact that female teachers tend to be more job-related stressed, and thus, belong to a risk group (Schaarschmidt, 2005). However, these findings seem to be somewhat contradictory to previous research that has indicated that female teachers hold more positive attitudes towards inclusive schooling (De Boer et al., 2011; Schwab et al., 2021). In-depth qualitative data from female participants could provide deeper information that would help explain these contrasting results. Consequently, it would be worthy of further investigation as Germany has a female-dominated teaching force (Stephan et al., 2019). Nevertheless, it is also important to emphasize that again such research has used instruments that assess teachers' general attitudes towards inclusion. Therefore, it is necessary that future replication studies are conducted in order to validate our findings by independent data collected in different settings or educational/school cultures.

When exploring differences across the teacher DI attitude profiles, results revealed that teachers allocated within cluster 1 make use of DI practices the most. Such a result goes in line with previous studies that have indicated that positive attitudes influence teachers' DI use (Schwab et al., 2021; Schwab & Alnahdi, 2020). Interesting, however, is that cluster 3 ('The challenged-but-valuing-teacher') reported a lower DI implementation use compared to cluster 1. This is necessary to highlight as Cluster 3 has the most teachers ascribed (77% teachers). Such results could point to the fact that there are contextual factors that need to be changed in order to achieve a higher implementation rate of DI in teachers' daily preparation and teaching (Maulana et al., 2020). Hence, it can be assumed that teachers belonging to this cluster would implement DI more frequently if they had more resources. By resources an important element would be to have more time to prepare lessons, more time to implement DI in class and a lower teaching load.

Furthermore, results also indicated school track differences in the allocation of teachers across the clusters, which are in line with recent literature, it appears that advanced secondary school teachers and teachers working at other school tracks, which also goes in line with recent literature (Hertel et al., 2010; Letzel & Otto, 2019; Nieder et al., 2011; Pozas & Letzel, 2019; Pozas et al., 2019; Schiepe-Tiska et al., 2013): Cluster 2, that is 'The non-valuing-teacher', is mainly present in advanced secondary schools. Hence, it can be assumed that teachers working in the advanced secondary school tracks perceive far more insufficient resources while simultaneously not granting much value to the implementation of DI, and, thus, do not implement DI frequently. By taking into consideration that DI indeed is a criterion of high-quality teaching (Praetorius et al., 2018) and attitudes are a characteristic of teacher competence (Allday et al., 2013; Coubergs et al., 2017; Savolainen et al., 2020), this result might point at a weakness in advanced secondary school teachers' inclusive preparation and teaching. Consequently, it seems that teachers have different professional ethos, in which, for instance, advanced secondary school teachers see themselves as the technical experts and thus, not particularly as great educators (Gawlitza & Perels, 2013; König et al., 2008). In this sense, the results give hints into possible future development potential when it comes to improving teaching quality. Teachers working in advanced secondary schools might consider that they do not need to make use of DI as high-track schools tend to teach more high achievers than teachers in intermediate or advanced secondary schools do. However, analyses from Hohn et al. (2013) have already proved that heterogeneity in terms of performance can be found in every school track, also in advanced secondary schools.

Practical and theoretical implications

The present study's results contribute several practical and theoretical implications. First, the teacher attitude clusters identified provide information on the frequency of teachers' DI implementation. Given that the implementation of DI is a criterion for high-quality teaching, the results of the study may have

implications for the educational system's macro-, meso- and micro-level: On a macro-level, it is possible to gather information about the distribution of the three attitudes profiles within the single school tracks. On a meso-level, this also applies to single schools. Such information about the distribution of teachers across the profiles within a certain school is possible; important information can be provided for the different stakeholders: the teachers working in this school will receive information about their own belonging to a certain cluster. Second, principals will be informed about the potential, for example, in terms of teaching quality, the staff already is able to provide. This implies also the possibility to improve the school ethos and culture so that teachers are geared towards adapting learning environments to individual learning needs (Watkins, 2017). Third, parents receive information about the school ethos and may have then the chance to make decisions about their children's school careers. Moreover, the findings also support the need to consider at a meso-level the available institutional resources because a learning environment that is perceived as sufficient can positively influence teachers' attitudes towards inclusive schooling (Goldan & Schwab, 2020).

Additionally, the results also provide information for teacher training at universities, in preparatory service as well as professional development training programmes. For instance, in-service and pre-service teachers can reflect on their own belonging to a certain cluster, thus, trainers could include the information into their evaluation. Moreover, positive attitudes towards DI could be developed through action-focused trainings where both in-service and pre-service teachers can directly plan, implement and evaluate their DI practices.

Concerning the theoretical implications, the present study supports previous researchers that argue that teachers' attitudes should be empirically explored as a multidimensional construct (Savolainen et al., 2020) rather than just by an overall score. This is of great importance because as seen from the findings obtained in this study it can be assumed that teachers do not hold either positive or negative attitudes, but rather there is a complex interplay between the sub-dimensions of teachers' attitudes towards DI. Additionally, the study provides empirical evidence that further supports the theoretical framework of planned behaviour (Ajzen, 1991), as it reveals the key role that attitudes play in teachers' DI implementation.

Limitations and further research

This study carries several limitations. A first limitation is that the present study uses teachers' self-reports. Hence, such responses can inherently be sensitive to overestimation, underestimation or socially desired answers. Nonetheless, a study by Desimone et al. (2010), however, revealed that teachers' self-reports regarding their teaching practices are highly correlated with classroom observations. Taken all together, future research should not only make use of self-reports but also integrate classroom observations as well.

A second important limitation is that this study holds a cross-sectional design. Thus, further longitudinal studies must be designed to identify how teacher attitudes evolve. Furthermore, given that different methods of clustering analysis could yield different results (Field, 2013), it would be important for further research to test such structure in other German teachers as well as conduct qualitative interviews with participants to confirm the link between the respondents and the cluster they were ascribed to (Vanslambrouck et al., 2018). Lastly, considering the unique features of the German education and teacher training system, it cannot be assumed that the results from this study can be replicated or generalized to other countries. Therefore, it is strongly recommended not only to explore this research goal in other countries but also to conduct cross-country studies that can provide insights into differences across diverse educational systems.

AUTHOR CONTRIBUTIONS

Verena Letzel: Conceptualization; data curation; investigation; methodology; project administration; supervision; writing – original draft; writing – review and editing. **Marcela Pozas:** Conceptualization;

methodology; software; visualization; writing – review and editing. **Christoph Schneider:** Supervision; writing – review and editing.

CONFLICTS OF INTEREST

There are no conflicts of interest to disclose.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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