Professional vision as a mediator for inclusive education?

Unravelling the interplay between teachers' beliefs, professional vision and reported practice of differentiated instruction

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Abstract

To ensure inclusion and equity in education, both teacher beliefs and practice are cited as influential. However, the connection between beliefs on student diversity and inclusive practice is often more complex than straightforward. Professional vision is theorised to be important in aligning beliefs with practice. Hence, this study investigates whether teachers' professional vision of differentiated instruction (DI) mediates between teachers' beliefs about teaching diverse learners and teachers' practice of DI, and is unique in investigating these constructs in concert with each other. Data are part of the Potential-project and were collected in a sample of secondary education teachers ($N = 461$) in Flemish schools ($N = 23$). Survey data measuring teachers' beliefs (i.e., growth mindset, professional beliefs about diversity and about differentiating the curriculum) and teachers' self-reported DI practice were combined with video-based comparative judgement data measuring teachers' professional vision of DI. Multilevel models show that both teachers with a more expert professional vision and less expert professional vision implement DI. For a more expert professional vision, beliefs

about teaching diverse learners explain the association. For a less expert professional vision, teachers' reflective and experimental practice explains the relationship. Results suggest that aspects of teachers' competence are related in more complex ways than linear theoretical frameworks propose. Implications for teacher training and professionalization are discussed.

Keywords: professional vision; differentiated instruction; Individualized Instruction; beliefs; teacher attitudes; student diversity

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Introduction

School systems worldwide strive towards equity and inclusion (OECD, 2015) to "overcome barriers limiting the presence, participation and achievement of all learners" (UNESCO, 2017, p. 13). Inclusive classrooms aim to cater to the needs of all students to realize equal educational opportunities (Ainscow, 2005; Forlin, Earle, Loreman, & Sharma, 2011; UNESCO, 2017). Flanders, the context of the current study, ratified UN Article 24 on inclusive education in 2009 (Groenez, Vantieghem, Lamberts, & Van Avermaet, 2018). In inclusive classrooms, students may be different in a variety of ways based on their cultural, linguistic or social backgrounds, abilities, needs and interests (Watts-Taffe, Broach, Marinak, McDonald Connor, & Walker-Dalhouse, 2012). Hence, meeting the needs of a diverse student population requires teachers to provide learning experiences that recognise and utilise these differences (Watts-Taffe et al., 2012). An expedient approach to design instruction fitting diverse classrooms is differentiated instruction (DI) (Gheyssens, 2020; Gríful-Freixenet, 2020; Kyriakides, Creemers, & Antoniou, 2009; Vogt & Rogalla, 2009). Tomlinson and colleagues (2003) define DI as an approach in which teachers proactively modify curricula, teaching methods, learning activities, resources, and student products to address diverse needs and maximise the learning opportunities for each student in the classroom. Hence, DI is not based on a particular instructional strategy but on teachers' ability to select those methods, from an array of effective instructional strategies, that maximally engage a specific student group (Gheyssens, 2020; Watts-Taffe et al., 2012). Studies with both primary and secondary teachers in the US and Flanders show that for the design of DI,

teachers' perceptions about learners are an important guiding factor (Bondie, Dahnke, & Zusho, 2019; Gheyssens, Coubergs, Griful-Freixenet, Engels, & Struyven, 2020). Consequently, researchers warn that even the most advanced didactical methods are likely to be ineffective when applied by teachers holding deficit beliefs about students (Ainscow & Miles, 2008; Bartolome, 1994). However, the link between teachers' classroom practices and beliefs about diverse learners is more complex than a straightforward translation from beliefs to behaviour (Bondie et al., 2019). A concept that has been proposed to mediate between teachers' beliefs and practice is professional vision (Meschede, Fiebranz, Möller, & Steffensky, 2017), which captures teachers' ability to recognise and interpret relevant classroom situations (such as DI practices) (Seidel & Stürmer, 2014; Van Es & Sherin, 2002). Hence, teachers' professional vision of DI may be an important mediator between teachers' beliefs about teaching diverse learners and efforts to DI.

Despite a call for researchers to deepen our understanding of how beliefs and skills on interpretation and decision-making (such as professional vision) are interrelated with actual classroom practice (Blömeke, 2017; Kyriakides et al., 2009), no study has investigated the interplay between teachers' beliefs, professional vision and classroom practice as a whole before. Therefore, the purpose of this study is to test the hypothesis that teachers' professional vision mediates between teachers' beliefs and teaching practice (Meschede et al., 2017). We test this hypothesis in a sample of Flemish secondary teachers. In order to grasp the context and its possible influence on the proposed pathways, we first provide some information on the Flemish educational system and how it has been influenced by the call for inclusion, before delving deeper into the concepts of DI, beliefs and professional vision.

Literature Review

Inclusive education in Flanders

The most well-known use of the concept of inclusive education is tied to the Salamanca statement of 1994 (Unesco, 1994), linking inclusion to the participation of children with a disability in regular education. However, the concept has evolved since then to creating quality education for all students regardless of background or specific educational needs (SEN) (Opertti, Walker, & Zhang, 2014; UNESCO, 2017). To address the international call for more inclusion, Flanders ratified the UN Article on inclusive education in 2009 and implemented several policy measures (Groenez et al., 2018). This includes the Decree on Equal Educational Opportunities in 2002 (FlemishGovernment, 2002), which focused on students with migration and vulnerable social backgrounds by implementing school-based support and reducing school segregation; and the M-Decree of 2014, which focused on increasing access to mainstream schools for SEN students (FlemishGovernment, 2014). These measures were implemented in order to reduce some of the exclusionary mechanisms inherent in the Flemish educational system. While primary education consists of mixed-ability classrooms, secondary education is characterised by extensive tracking with an academic, artistic, technical and vocational-oriented track (Boone & Van Houtte, 2012). When students have not achieved well enough, they can be required to change track or repeat a year. Both Flemish and international research has shown time and again the connection between early tracking and social inequality, indicating that students with a migration and vulnerable socioeconomic background disproportionally end up in the lower esteemed tracks, regardless of ability (De Witte et al., 2013; Thys, 2018). Teachers play a substantial role in the connection between tracking and inequality, as teachers tend to have lower expectations of students in less esteemed tracks, which

contributes to less challenging study content and finally poorer learning outcomes (Van Houtte & Van Praag, 2014). Even though these observations have led to numerous discussions on the need for more comprehensive secondary education in Flanders (Groenez et al., 2018), thorough structural changes in this regard have not yet been made. Furthermore, even though parents can in principle freely choose their child's school, school-based segregation still occurs as schools often provide only study options of one specific track. This segregation extends to SEN students as well, as Flanders historically has a high rate of special education attendance in comparison to other European nations (Ruijs & Peetsma, 2009). Despite this, the minister for education has declared since 2018 that the M-decree will be abolished. Currently, it remains unclear what the new decree that will replace it shall entail exactly (VLOR, 2021).

All in all, while Flanders has made some changes towards more inclusive education, much remains to be done. Insight in how to support teachers in creating inclusion is important as Flemish schools are strongly and increasingly diverse on several parameters (i.e., ethnic & social background, SEN) when compared to other European countries, while teachers report feeling badly prepared on how to effectively teach a diverse class (Siongers, Spruyt, Van Droogenbroeck, Bongaerts, & Kavadias, 2021).

Differentiated instruction (DI)

DI is widely considered an effective method to teach diverse learners (Gheyssens, 2020; Gríful-Freixenet, 2020; Lawrence-Brown, 2004), as it is based on the idea that all learners are different. Through DI, each student can have the opportunity to work at a challenging level while learning together in the same classroom (Coubergs, Struyven, Vanthournout, & Engels, 2017; Watts-Taffe et al., 2012). This is supported by meta-analyses showing small to moderate effects of DI on student achievement in both primary (Deunk, Smale-Jacobse, de Boer, Doolaard, & Bosker, 2018) and secondary

education (Smale-Jacobse, Meijer, Helms-Lorenz, & Maulana, 2019), particularly for students at risk of academic failure as demonstrated in primary schools in Greece (e.g., Kyriakides et al., 2009; Valiande, Kyriakides, & Koutselini, 2011; Valiandes, 2015) and both primary (e.g., Reis, McCoach, Little, Muller, & Kaniskan, 2011) and secondary schools in the US (e.g., Mastropieri et al., 2006).

Suprayogi, Valcke, and Godwin (2017) clarify the different labels that have been given to DI such as 'individualised instruction (Hattie, 2009) or 'adaptive teaching' (Vogt & Rogalla, 2009). Despite nuances in definitions, all labels are based on the same ideas: "(1) coping with student diversity; (2) adapting specific teaching strategies, (3) invoking a variety of learning activities; (4) monitoring individual student needs, and (5) pursuing optimal learning outcomes" (Suprayogi et al., 2017, p. 292). Hence, DI is not one teaching method. Rather, it involves a wide variety of effective methods (Bondie et al., 2019) such as flexible grouping approaches, providing individual support, adapting learning objectives, allowing student choice, or evaluating students through several assessment methods (Bondie et al., 2019; Struyven, Coubergs, Gheyssens, & Engels, 2015). The quality of DI therefore depends not only on the methods used, but on the degree to which these methods are tailored to the specific needs of a student group (Gheyssens, Consuegra, Vanslambrouck, Engels, & Struyven, 2020; Kyriakides et al., 2009). Consequently, effective DI requires teachers to continuously experiment and adjust their teaching strategies in order to meet the needs of their students.

Beliefs about teaching diverse learners

Pohan and Aguilar (2001, p. 160) note that "The role of teacher beliefs […] has been the focus of many educational studies for the past three decades", and continues to be studied as an important explanatory factor in teachers' interpretation of classroom

events and eventually teachers' behaviour (Ozturk, 2021). In this article and in line with Pajares (1992) and Valcke & colleagues (2010), beliefs refer to the conceptions teachers hold or claims they would like to be true. Our focus is on teachers' beliefs about teaching diverse learners, involving the intersection between beliefs about diverse learners and the instructional context. Note that this study adopts a broad definition of diversity, which includes differences between students based on gender, ethnicity, social and linguistic background, as well as interests, motivation or ability. This is in line with both the current view on inclusive education and DI, discussed above, as meeting the needs of a classroom where the intersection of multiple characteristics makes each learner unique.

Studies show that Flemish teachers tend to have more negative beliefs about educating diverse students, such as ethnic-minority students (Vervaet, D'hondt, Van Houtte, & Stevens, 2016), students with low SES (Boone, Thys, Van Avermaet, & Van Houtte, 2018), students that speak another language at home than the school language (Pulinx, Van Avermaet, & Agirdag, 2017), or students with disabilities (Groenez et al., 2018), and that such negative beliefs on diverse students tend to be more pronounced in Flemish secondary than primary schools (Groenez et al., 2018). The finding that teachers tend be more negative about students that have a higher risk of academic failure has been confirmed for several European nations (Fine-Davis & Faas, 2014) and many countries across the globe (de Boer, Pijl, & Minnaert, 2011). These beliefs are implicitly communicated through teacher behaviours, for instance by seeing poor performance of at-risk students as normal or praising good performance less (Brophy & Good, 1970; Murdock-Perriera & Sedlacek, 2018). This process eventually impacts both students' cognitive outcomes (Jussim & Harber, 2005) and well-being (Demanet & Van Houtte, 2012). Hence, it is key to take into account how teachers' beliefs about

diverse learners influence their classroom practices, in order to counter these negative self-fulfilling prophecies for disadvantaged students.

To teach diverse learners effectively, a broad understanding and appreciation of difference is essential (Kugelmass, 2001). However, research on DI often focuses on particular student characteristics such as ability level (Bondie et al., 2019). Roose and colleagues (2019) selected three types of beliefs that are compatible with a broad definition of diversity and that have proven to be key for teaching diverse learners. The first type of beliefs are professional beliefs about diversity, which capture the degree to which student diversity is appreciated within an educational context (Pohan & Aguilar, 2001). The second type of beliefs exploits the potential learning effect of high expectations (Hattie, 2009) and is conceptualised by Dweck (2009) as teachers' growth mindset, defined as the belief that there is room for growth in every students' learning (Dweck, 2009). The third type are teachers' beliefs about the way the curriculum and teaching can be based on learner needs rather than being restricted by school or government expectations (Coubergs et al., 2017).

In sum, the three selected beliefs about teaching diverse learners are complementary to create learner-centred classrooms that value student diversity, express confidence that each student in the class can grow, and are sensitive and responsive towards heterogeneous needs. From a theoretical standpoint, it has been claimed that these are essentially pre-conditions for effective implementation of DI (Tomlinson, 2015), and empirical research has demonstrated that Flemish secondary teachers with a growth mindset and willingness to adapt the curriculum are more likely to implement DI (Gheyssens, Coubergs, et al., 2020). Consequently, we hypothesise that teachers' beliefs about teaching diverse learners will be positively related to teachers' implementation of DI (*H1 - Hypothesis 1)*.

Connecting beliefs and classroom practices through professional vision

Theoretical models often propose a linear relation – either one or bi-directional - between teachers' cognitions (including beliefs and knowledge) and their teaching practice, which in turn influences student outcomes (e.g., Kunter, Kleickmann, Klusmann, & Richter, 2013). According to Blömeke and colleagues (2015), such models create a dichotomy between teachers' thinking and practice, also known as the theory-practice gap in teacher education theory (Korthagen & Kessels, 1999). The competence model proposed by Blömeke et al. (2015) aims to mitigate this gap by conceptualising teacher competence as a continuum from disposition to performance (see Figure 1). Dispositions entail professional knowledge (e.g., general pedagogical knowledge) and affective-motivational characteristics (e.g., beliefs and attitudes about the curriculum content, the purposes of schooling, and job motivational factors) (Blömeke, 2014). The authors hypothesise that dispositions have to be integrated in order to transfer to observable behaviour. Therefore, they assume that an in-between cognitive process mediates between dispositions and classroom behaviour. This in-between process entails teachers' perception, interpretation and decision-making (PID) skills that determine how dispositions are translated into actual classroom practice depending on the particular teaching situation. Hence, through PID skills, knowledge and beliefs become relevant in teaching practice (Santagata & Yeh, 2016).

<< Insert Figure 1 here >>

Different authors propose similar situation-specific concepts bridging the gap between teacher dispositions and practices. The concept of practical knowledge for example, captures how teachers develop a contextualised knowledge through their teaching practice suiting the particularities of their work setting (Jiang, Li, Deng, & Wei, 2013). Others suggest that instructional decision-making skills are best developed through

reflection (e.g. Hargreaves & Fullan, 2015; Korthagen & Kessels, 1999), which involves a conscious examination of instructional situations. For example, reflection-for-action concerns teachers' thinking processes about lessons to come, reflection-in-action concerns teachers' conscious decision-making when facing an unexpected situation while teaching and reflection-on-action concerns teachers' thinking after a lesson is completed (Hargreaves & Fullan, 2015; Kohler, Henning, & Usma-Wilches, 2008).

More recently, the concept of professional vision has been put forward as a link between dispositions and practice (Meschede et al., 2017; Seidel & Stürmer, 2014; Sherin, 2001). Professional vision refers to teachers' ability to observe what is happening in a classroom and make sense of it from a professional perspective (Blomberg, Stürmer, & Seidel, 2011). Definitions of professional vision generally include two integrated subprocesses: noticing and reasoning (Seidel & Stürmer, 2014; Sherin, Russ, Sherin, & Colestock, 2008; Van Es & Sherin, 2002). Noticing involves the identification of classroom events that are significant for effective instructional practice (Huang, Miller, Cortina, & Richter, 2021; Stürmer, Seidel, & Schäfer, 2013; Van Es & Sherin, 2002). In other words, noticing means filtering critical elements in classroom instruction that foster or constrain learning, from irrelevant events. Reasoning entails how noticed events are interpreted. Put differently, it is the capacity to reason about critical events based on one's professional knowledge (Seidel & Stürmer, 2014; Van Es & Sherin, 2002). Professional vision therefore connects teachers' perceptions about teaching and learning to their ability to apply it to specific classroom situations (Stürmer et al., 2013).

Recent studies emphasise the need to investigate these PID skills, such as teachers' professional vision (Blömeke et al., 2015; Huang et al., 2021; Santagata &

Yeh, 2016). However, research tends to focus either on the relationship between professional vision and actual classroom practice on the one hand (e.g., Pouta, Lehtinen, & Palonen, 2021; Sherin & Van Es, 2009; Sun & Van Es, 2015; Van Es & Sherin, 2010) or on the relationship between teachers' beliefs and professional vision on the other (e.g., Keppens, Consuegra, & Vanderlinde, 2019; Meschede et al., 2017; Roose, Vantieghem, Vanderlinde, et al., 2019). Although each of these studies uncovers a link between three crucial aspects of teachers' competence, to our knowledge, no study investigated all three elements (beliefs, professional vision and classroom practice) in a single study and in particular how teachers' professional vision works as a mediator between teachers' beliefs and classroom practice as proposed by the model of Blömeke and colleagues (2015).

Based on the above theorizing, we hypothesise not only that teachers' beliefs about teaching diverse learners will be positively related to DI (*H1 - Hypothesis 1)*, but also that teachers' professional vision of DI is positively associated with teachers' implementation of DI (*Hypothesis 2 - H2*). In addition, we hypothesise that teachers' professional vision of DI is working as a mediator between teachers' beliefs about teaching diverse learners and self-reported DI (*Hypothesis 3 – H3*). Hence, in keeping with the model suggested by Blömeke and colleagues (2015), this study will test a full mediation model between teachers' beliefs about teaching diverse learners, professional vision and implementation of DI. As reflecting on and experimenting with your teaching practice is not just important for effective DI (Kyriakides et al., 2009), but development of professional vision also requires teachers to reflect on what is happening in a classroom and why (Sherin et al., 2008), the extent to which teachers reflect on their teaching practice will be taken into account as a control in the analysis. Additionally, while it is theorized that the proposed pathway of beliefs on student

diversity and practice of DI being mediated by professional vision would be present in all educational contexts, the current research will be conducted with a sample of secondary teachers. As noted in the meta-analysis by Smale-Jacobse et al. (2019), the empirical research on within-class DI in secondary education remains limited. Hence, by taking this focus, the current study simultaneously contributes to the research base on DI in secondary education.

Method

The project "Potential – Power to teach all!"

This study is embedded in the project "Potential – Power to Teach All!". This was an interuniversity project involving six different universities and colleges from Flanders, funded by the Flanders Institute for Innovation and Entrepreneurship (VLAIO), running from 2016 to 2019. The aim of Potential was to investigate and strengthen teachers' competences to create inclusion by A) appreciating and exploiting diversity in the classroom; and B) establishing collaborative teaming within the school team. Employing a quasi-experimental design with mixed methods, the project-team studied the process and effectiveness of a professional development program aimed at these objectives among both pre- and in-service teachers. Monitoring instruments were developed and validated for goal A (i.e., the videography instrument "e-PIC" measuring teachers' professional vision, discussed below) and goal B (i.e., a social network instrument for school teams). This study is situated within goal A by studying how diversity beliefs are connected to teacher practice through professional vision.

Sample procedure & participants

Data were collected in October 2017 in a sample of secondary schools. Schools were selected so each geographical region within Flanders was equally represented, as well as a proportional representation of school denomination and rural versus city schools.

Within these parameters, three random samples were drawn. For each school that refused, a matched school from the next random sample was contacted. In the end, 23 schools participated in the study. All teachers within each school were invited to participate. Following the European Code of Conduct for Research Integrity, all participants filled out an informed consent explaining the research topic, the anonymization of the data, and the voluntary nature of participation. From the 908 teachers (47.6%) that started filling out the online instruments, 461 teachers provided data for all study variables. This equals a response rate of 24.17% and a mean of 39.57 (*SD* = 22.58) teachers responding per school. In our sample, teachers' age ranges from 21 to 63 with an average of 40.49 years (*SD* = 10.73*)* and 33.8% is male. This is congruent with gender and age divisions in other Flemish research (Van Droogenbroeck et al., 2019)*,* indicating the representativeness of the sample.

Instruments

The study combines two data types: survey data and video-based comparative judgement data. Survey scales assess teachers' self-reported DI practice and their beliefs about diverse learners. To measure teachers' professional vision, a quantitative, standardized instrument that measures professional vision of DI was needed (Keppens, Consuegra, Goossens, De Maeyer, & Vanderlinde, 2019; Roose, Goossens, Vanderlinde, Vantieghem, & Van Avermaet, 2018), which at the same time had to be understandable and recognizable for Flemish teachers. Consequently, the e-PIC instrument was selected, which is an online video-based comparative judgement instrument using videoclips of authentic, Flemish classrooms (Gheyssens, Keppens, & Roose, 2017). Table 1 presents the variables' univariate information.

Self-reported practice of DI. The self-reported Adoption of Differentiated Instruction scale was used (Coubergs et al., 2017). The scale consists of 8 items rated on a 7-point

Likert scale (0=completely disagree, 6=completely agree), such as "During my lessons, different students work on different tasks with a different level of difficulty". The mean sum of scores was used to construct the scale, which displayed good internal reliability: $\alpha = .85$. Higher scores on the scale indicate that teachers report more applications of DI.

Professional vision of DI. This was assessed through the e-PIC instrument. In this instrument, teachers compare pairs of videoclips of 1-2 minutes each (Roose et al., 2018). The algorithm in e-PIC randomly selects 10 pairs of clips from a total of 15 videoclips, on the condition that each clip is shown at least once to each participant. After watching a pair of clips, teachers choose which clip is best with regard to DI. e-PIC compares teachers' pairwise comparisons of videoclips to an expert benchmark, which is a rank order based on the aggregated comparative judgements of 30 experts with expertise in educational research, teaching, and pedagogical guidance counselling. The match between the participants' rank order and the expert benchmark is expressed in a so-called Infit score. The validation study of Roose and colleagues (2019) has shown that the Infit measure is a valid indicator of teachers' professional vision of DI. The lower the Infit, the more a teacher matches with the group of experts in comparing the videoclips and hence, the more a teacher has an expert professional vision of DI.

Professional beliefs about diversity. We used a scale by Vantieghem and colleagues (2018), who adapted the Professional Beliefs about Diversity scale of Pohan and Aguilar (2001) to the Flemish context. The scale consists of 14 items rated on a 5-point Likert scale (0=*completely disagree*, 4=*completely agree*) that measure teachers' beliefs on diversity in education. Items include several axes of diversity (ethnicity, language, religion, sexual orientation, disabilities, gender and SES), for example "The school should not allow students from an immigrant background to speak another language than Dutch at school". The scale was constructed using mean sum of scores and

demonstrated good internal reliability: $\alpha = .71$. Higher scores on the scale indicate more positive beliefs about diversity.

Growth mindset. Teachers' growth mindset was measured by the scale developed by Coubergs and colleagues (2017). The scale consists of 4 items rated on a 7-point Likert scale (0=*completely disagree*, 6=*completely agree*), for example "The way a teacher teaches, influences the intellectual capacities of his students". Using the mean sum of scores on the items resulted in a scale with good internal reliability: $\alpha = .85$. Higher scores on the scale indicate a mindset that is more growth oriented.

Beliefs about differentiating the curriculum. Teachers' beliefs about taking students' needs into consideration through flexible adaption of a curriculum, was measured through the ethical compass scale developed by Coubergs and colleagues (2017). The scale consists of 6 items rated on a 7-point Likert scale (0=*completely disagree*, 6=*completely agree*), such as "The curriculum is not providing any flexibility to cope with an individual student". The mean sum of scores was used and the scale displayed good internal reliability: $\alpha = .83$. Higher scores indicate that teachers are more open to differentiate the curriculum.

Experimental and reflective practice. The experimental and reflective practice scale was used (Geijsel, Sleegers, Stoel, & Krüger, 2009). Teachers answered 4 items such as "I use pupils' reactions to improve my classroom teaching" on a 4-point Likert scale (0=*(almost) never*, 4=*(almost) always*). The mean sum of scores was used and the scale displayed a good internal reliability: $\alpha = .70$. Higher scores on the scale indicate that teachers are more likely to experiment and reflect upon their teaching practice.

<< Insert Table 1 here >>

Plan of Analysis

To account for the nested structure of the data, we employed multilevel analysis using the statistical program MLwiN. First, an intercept model was run to ascertain how much variance was located at the teacher versus the school level. Note that, in order to test a mediation model, several steps are needed. More specifically, according to Baron and Kenny (1986), a variable functions as a mediator when it meets three conditions (see Figure 2). First, there is a significant relation between the independent variable (i.e., beliefs about teaching diverse learners) and the presumed mediator (i.e., professional vision of DI), also known as *path a*. Evidence for fulfilling this first condition has been provided within the Potential-project by the study of Roose and colleagues (2019) that used the same sample and measures, with results showing that more positive beliefs on teaching diverse learners are linked to having a more expert professional vision of DI. Second, the mediator (i.e., professional vision DI) is significantly associated with the dependent variable (i.e., self-reported practice of DI), signified as *path b*. Third, when paths a and b are controlled, a previously significant relation between the independent and dependent variable is no longer significant, also known as *path c*.

<< Insert Figure 2 here >>

Consequently, in respectively model 1 & model 2 of this study, we assessed the associations between teachers' self-reported practice of DI with beliefs about teaching diverse learners on the one hand (path c) and professional vision of DI on the other hand (path b). Hence, this allowed us to assess the individual relation of these two aspects of teachers' competence on teachers' implementation of DI. To test for the mediating effect of teachers' professional vision in the relation between teachers' beliefs about teaching diverse learners and implementation of DI, both teachers' beliefs and professional vision were added together in model 3 and compared to the previous

models (model 1-2). In model 4, teachers' experimental and reflective practice is added in order to test whether the relationships between the main study variables change or remain. An overview of the models is presented in Table 2.

Note that only fixed effects were included, since analyses shows that there was no significant random slope variance, indicating that the associations did not fluctuate in different schools. Furthermore, all independent variables measured through a survey scale were standardised to allow for comparability of the fixed effects. Iterative generalised least square (IGLS) estimations were used to estimate the parameters of the models. The significance of the fixed effects was tested using the univariate Wald test (cf. Jones & Subramanian, 2017). The overall model improvement was assessed by calculating the difference in deviance values (-2*log-likelihood) between each model in comparison to the previous model of interest using the Likelihood Ratio Test (LRT).

Results

Null model

First, we examined the results of an unconditional two-level null model. Calculating the Variance Partitioning Coefficient shows that 7.91% of the variance in teachers' self-reported practice of DI lies at the school level and 92.09% at the teacher level.

Model 1: fixed effects of beliefs about teaching diverse learners

In the first model, the three types of beliefs were added to the null model. On the basis of the comparison of deviance, this model fitted the data better than the null model. (χ^2=35.94, *df*=3, *p*<.001). Teachers' professional beliefs about diversity (χ^2=6.93, *df*=1, *p*<.01), beliefs about differentiating the curriculum (χ^2=6.45, *df*=1, *p*<.05) and growth mindset (χ^2=16.21, *df*=1, *p*<.001) are all positively related to teachers' self-reported DI practice. Therefore, the more positive teachers are towards teaching diverse learners, the more likely they are to report practices of DI.

Model 2: fixed effect of professional vision of DI

Second, professional vision of DI was added to the null model as a single predictor. Based on the difference in deviance, adding professional vision of DI did not lead to a significant improvement of the null model (χ^2=1.51, *df*=1, *p*=.219). Hence teachers' professional vision of DI (χ^2=1.51, *df*=1, *p*=.219) is not significantly related to teachers' self-reported DI practice.

Model 3: combined fixed effects of beliefs and professional vision

In a third model, the three types of beliefs and professional vision of DI were added simultaneously, leading to a significantly improved model when compared to model 1 (χ^2=5.38, *df*=1, *p*<.05). Surprisingly, the previously insignificant relationship between professional vision of DI and self-reported practice of DI (*path b*) becomes significant when controlling for beliefs about teaching diverse learners (χ^2=5.42, *df*=1, *p*<.05), indicating a so-called suppressor effect. Note that the coefficient of professional vision is positive (B = .101, *p*<.05), indicating teachers with a less expert professional vision reported more DI practices when holding beliefs about teaching diverse learners constant (Note that, as discussed in the Instruments-section, professional vision is measured through an Infit measure, with a lower Infit indicating a closer match with the expert benchmark and thus a more expert professional vision). Additionally, when comparing model 3 to model 1, we notice that the coefficients of the three types of beliefs become stronger when adding professional vision of DI. This is in line with previous results from the study of Roose and colleagues (2019), that showed that some of the variance in the Infit DI is negatively associated with teachers' beliefs about teaching diverse learners. This means that teachers with positive diversity beliefs are likely to have a more expert professional vision (lower Infit measure) and report more practices of DI. However, beliefs do not explain all the variance of the relationship

between Infit DI and DI self-reported practice. That is, the variance in Infit DI that is remaining in model 3 is positively associated with self-reported practices of DI. So when beliefs about teaching diverse learners are held constant, there are also teachers for whom a higher Infit (less expert professional vision) is associated with reporting more practices of DI. This means that Infit DI entails variance that is both negatively associated with self-reported practice of DI (explained away by teachers' beliefs) and positively associated with self-reported practice of DI (as shown in model 3). Since these two parts of variance in Infit DI cancel each other out, this explains our lack of association and a coefficient close to zero for professional vision of DI in model 2.

Model 4: adding experimental and reflective practice

In model 4, experimental and reflective practice is added to investigate how this influences the relationship between the main research variables. Based on the difference in deviance with model 3, this leads to a significant improvement (χ^2=52.54, *df*=1, p<.001) of the model. Furthermore, a strong and significant relationship is found (χ^2=56.01, *df*=1, p<.001) between experimental and reflective practice and self-reported DI. Furthermore, this relationship explains away the relation between self-reported practice of DI and both Infit DI (χ^2=2.70, *df*=1, p=.101) and professional beliefs about diversity (χ^2=2.90, *df*=1, p=.089). Beliefs about differentiating the curriculum (χ^2=5.27, *df*=1, p<.05) and growth mindset (χ^2=13.59, *df*=1, p<.001) remain significant predictors of self-reported DI practice, though effect sizes have decreased somewhat. These results suggest that the variance in Infit DI that is positively associated with self-reported practice of DI is explained by experimental and reflective practice. Hence, there is a group of teachers for whom a higher Infit (less expert professional vision) goes together with reporting more experimental and reflective practices, which goes together with reporting more DI. In addition, some of the teachers with positive

professional beliefs about diversity also report experimental and reflective practice and therefore implementation of DI (that is, controlling for experimental & reflective practice explains away the effect of professional beliefs about diversity). Here it is interesting to know whether these are the same teachers, so whether a high Infit score that is related to experimental and reflective practice also goes together with more positive professional beliefs about diversity. Calculating the partial correlations between Infit DI and reflective and experimental practice when controlling for the three types of beliefs (r=106, p<.05) suggests that teachers with a high Infit score that goes together with reporting experimental and reflective practice, do not necessarily have positive professional beliefs about diversity.

<< Insert Table 2 here >>

Discussion

While positive beliefs about diverse learners are seen as crucial when designing an inclusive classroom (Gheyssens, Coubergs, et al., 2020), research suggests that beliefs are not necessarily easily translated to practice. Professional vision has been proposed as a mediating link between teachers' beliefs and classroom behaviour (Meschede et al., 2017). Consequently, our study aimed to test the hypothesis that secondary school teachers' professional vision of DI mediates the relationship between their beliefs about teaching diverse learners (i.e., professional beliefs about diversity, growth mindset and about differentiating the curriculum) and their self-reported implementation of DI.

The results from the study of Roose and colleagues (2019), with the same sample and measures, has already shown that the more positive secondary school teachers' beliefs are towards teaching diverse learners, the more likely they are to have an expert professional vision of DI (path a). Hence, one link for testing the mediation effect was already provided. In the present study, we tested the hypotheses that

teachers' beliefs about teaching diverse learners are positively related to DI practice (*H1, path c*), that teachers' professional vision of DI is positively associated with their implementation of DI (*H2, path b*) and that teachers' professional vision of DI is working as a mediator between beliefs and practice of DI (*H3*).

Multilevel regression analysis on data from 461 secondary education teachers in 23 Flemish schools, confirmed our hypothesis (*H1*) that teachers' professional beliefs about diversity, beliefs about differentiating the curriculum and growth mindset are positively related to teachers' self-reported practice of DI. This confirms the results of Coubergs and colleagues (2017) showing that both primary and secondary school teachers' growth mindset and beliefs about differentiating the curriculum are predictors of teachers' self-reported adoption of DI. For teachers' professional beliefs about diversity (Pohan & Aguilar, 2001), our study is the first to show a positive relationship between teachers' appreciation of diversity and teachers' implementation of DI.

Testing the relation between teachers' professional vision of DI and implementation of DI did not confirm our hypothesis (*H2*) that these are related in a direct way. As we will argue further below, the relation between teachers' professional vision of DI and teaching practice is more complex than a bivariate model can explain. Consequently, in a third step, teachers' beliefs about teaching diverse learners and professional vision of DI were added together to a model to test for the mediating role of teachers' professional vision in the relation between beliefs and DI (*H3*). Contrary to expectation, the insignificant relationship between teachers' professional vision of DI and self-reported practice of DI as found in model 2 became significant when controlling for the three types of teachers' beliefs about teaching diverse learners. What was more, the relationship between professional vision of DI and self-reported DI practice went in the opposite direction as was expected, indicating that teachers with a

less expert professional vision reported more DI practices than teachers with a more expert professional vision of DI, when holding teachers' beliefs about teaching diverse learners constant. Taking the evidence from the different models together indicates a so-called suppressor effect, showing that teachers' professional vision of DI is associated in both a positive and negative way with teachers' implementation of DI. On the positive side of this connection, teachers with a more expert professional vision tend to have more positive beliefs about teaching diverse learners (cf. Roose, Vantieghem, Vanderlinde, et al., 2019) which in turn leads to more DI implementation in the classroom (cf. *H1*). When accounting for teachers' beliefs, an opposite association remains between a less expert professional vision of DI and implementation of DI. Adding teachers' experimental and reflective practice helped to shed light on this unexpected finding. When including teachers' experimental and reflective practice (Geijsel et al., 2009), a relatively strong and significant relationship was found with teachers' implementation of DI. What is more, teachers' experimental and reflective practice explained away the unexpected relationship between teachers' professional vision of DI and implementation of DI as found in model 3. This indicates that experimental and reflective practice explains the variance in teachers' professional vision that remained after controlling for teachers' beliefs about teaching diverse learner. Concretely, this means that there is a group of teachers for whom implementation of DI and a less expert professional vision go together with engagement in experimental and reflective practices.

In sum, the most striking result of our study is that teachers' professional vision combines variance that is both positively and negatively associated with secondary education teachers' implementation of DI. Our analysis shows that there are at the same time teachers with a rather expert professional vision and a less expert professional

vision that both report to implement DI (note that these two sides tend to cancel each other out, resulting in the non-significant association as seen in model 2). For teachers with a rather expert professional vision, this relationship is explained by their beliefs about teaching diverse learners. For teachers with a less expert professional vision, this relationship is explained by their tendency to engage more in critical and reflective practices.

All in all, our results did not confirm the hypothesis that teachers' professional vision has the capacity to mediate between teachers' beliefs and actual classroom practice (Blömeke et al., 2015; Meschede et al., 2017). Our study shows that different aspects of teachers' competence such as beliefs and professional vision are related in more complex ways than linear theoretical frameworks such as the ones from Blömeke and colleagues (2015) or Kunter and colleagues (2013) propose. Nevertheless, the authors of these models are not unaware of these complex relations existing in real life. Blömeke and colleagues (2015) propose that researchers should investigate whether different aspects of teachers' competence in their model might compensate for one another, meaning that strength in one aspect could compensate for weakness in another. To this respect, our results show that teachers' engagement in experimental and reflective practice has the ability to compensate for a less expert professional vision. This shows that exploring the complexity within competence models and the possibility of such compensating variables in particular, is a valuable line of research to explore further.

Despite this possibility, we should remain critical of the extent to which actual compensation is happening. That is, we might question the extent to which these teachers, that report more experimental and reflective practice, are mindfully implementing DI with the purpose of providing equity and excellence. Maybe these

teachers solely implement DI because this is expected from them or to keep learning activities 'fun' without exploiting the possibilities of DI to provide equitable learning experiences. Indeed, previous research with Flemish primary teachers showed that DI-strategies are often implemented for practical reasons or to keep students quiet, rather than to optimize the learning potential of diverse learners in the classroom (Gheyssens, Consuegra, et al., 2020). It has been speculated that especially teachers who have not embraced positive beliefs on student diversity run a greater risk of implementing a version of DI that does not live up to its highest potential (Gheyssens, 2020). To this respect, a limitation of our study is that we used teachers' self-reported DI. A mixed-methods approach using direct measures of DI practice would be more appropriate to further unravel the extent to which the DI practices of teachers with a more and less expert professional vision are different from each other. Such an approach might also reveal whether this experimental practice of teachers with a less expert professional vision is either an indicator of a trial and error approach or of a purposeful intention to improve the learning environment for a diverse classroom. Another limitation of our study is that the final model explains 19.74% of the variance in teachers' implementation of DI, showing that there is more variance to explore. One set of beliefs previously proven powerful in predicting teachers' implementation of DI is teachers' sense of self-efficacy (e.g., Dixon, Yssel, McConnell, & Hardin, 2014; Gríful-Freixenet, 2020; Suprayogi et al., 2017). Besides self-efficacy, which is a well-established predictor for teacher behaviour, it would be interesting for future studies to explore variables that have been less commonly related to DI, such as collaboration with colleagues (Sannen, De Maeyer, Struyf, De Schauwer, & Petry, 2021), principal support, or the school assessment policy (Bondie et al., 2019). This might, like our study, widen the evidence base about predictors of teachers' implementation of DI.

Finally, we could wonder about the context-specificity of the findings. While the competence model proposed by Blömeke et al. (2015) purports to describe a robust process of how dispositions and situation-specific PID-skills are translated into actual teacher practice, it is important to remain aware of the contextuality of data. The current data was collected among Flemish secondary school teachers in the fall of 2017. Consequently, we could wonder about the extent to which new initiatives (e.g., professionalisation programs or policy changes such as the possible abolishment of the M-decree) or recent events (such as the COVID-19 pandemic and its influence on education) might alter the associations found in this study. Similarly, professional vision captures how teachers make sense of noticed classroom events (Blomberg et al., 2011), and is thus inherently tied to specific educational contexts. Consequently, it would be interesting for future research to explore possible differences between educational levels, as well as between schools of the same educational level (given that the school-level variation in the current study was almost 8%). Except for Lefstein and Snell (2011), we are not aware of other research considering the extent to which differences in professional vision are related to the context one is teaching in. Interesting avenues for such multilevel research is whether associations between beliefs, professional vision and practice would be impacted by a shared teacher culture or the composition of the student body. Likewise, a cross-national comparison could give us interesting insights into how contexts, with their specific educational realities and policies, shape teachers' diversity beliefs, professional vision and implementation of DI. In the light of a worldwide appeal for more inclusive education (OECD, 2018; UNESCO, 2017), we call for future research to explore the interconnections between beliefs, professional vision and practice given the important implications for teacher professionalisation.

Implications for teacher professionalisation

In the face of the change necessary for inclusive education, teacher professionalism with a continuous commitment to quality teaching can be considered a necessary condition for success (Hargreaves, 2000). This professionalism cannot be achieved solely through pre-service training, but has to be supported through continuous learning throughout the career. Social capital is identified as a crucial factor for this (Hargreaves & Fullan, 2015), as teachers continuously adapt their teaching methods to the needs of the student group in front of them by learning from other professionals. Similarly, a contextualised approach has been identified as decisive in professional development (Darling-Hammond, Hyler, & Gardner, 2017; Hargreaves & Fullan, 2015; Van Mieghem, Verschueren, Petry, & Struyf, 2020), by focusing on teachers' needs within their particular teaching context rather than general sessions provided in an ex-cathedra fashion without attendees' input. Our research confirms the importance of contextualised and situation-specific skills by showing its connection to teacher beliefs and performance. That is, our analyses show that some teachers' beliefs about diversity are connected to (improved) skills in noticing and reasoning about classroom events, which influences their DI implementation in the classroom. Teachers for whom this pathway holds true could benefit from professionalisation initiatives focusing on reflecting on their beliefs on pedagogy and student diversity, and how these shape their perceptions about their own students, interpretations of classroom events and decisions for instructional practices.

At the same time, our results suggest that teachers' beliefs, professional vision and practice are linked in non-linear, multidirectional ways. Hence, while for some teachers the pathway runs from beliefs through vision to practice, our results suggest that for other teachers aspects of competence, such as professional vision and

experimental and reflective practice, can compensate for one another. This suggest that professionalisation initiatives for these teachers should not necessarily focus on challenging stereotypes or deep-held teaching beliefs, as often proposed by educational policy initiatives (Forghani-Arani et al., 2019; UNESCO, 2017), but could be powerful by engaging with experimentation of new teaching practices, irrespective of teachers' beliefs and professional vision. For example, these teachers could first experiment with DI in a context encouraging trial and error, which might stimulate teachers to step out of their comfort zone and learn from immediate practical experiences. In order to marshal the power of social capital discussed above (Hargreaves & Fullan, 2015), these experiences could be video-recorded and used in a video club (Wallin & Amador, 2019), where teachers critically reflect with colleagues on their practices and how these were informed by their beliefs and contextualised decision-making (Gay, 2010). All in all, our results suggest that, much in line with the insights of effective inclusive teaching for students, there is no one-size-fits-all for the professionalisation of teachers either. For some teachers, professionalisation initiatives on heightening DI might be powerful by engaging with teachers' beliefs and professional vision skills, whereas for others this might be achieved through the gateway of experimental and reflective practice.

Conclusion

This study on the relation between teachers' beliefs, professional vision and actual classroom practice is unique because it is one of the first to link these aspects of teachers' competence in a single model. Our results show that beliefs about teaching diverse learners and experimental and reflective practice are important for secondary education teachers' implementation of DI. In particular, our results show that engagement in experimental and reflective practice has the ability to compensate for a lack in teachers' professional vision of DI. Since our results reject the hypothesis that

teachers' professional vision works as a direct mediator in the link between teachers' beliefs and teaching practice, an important direction for future research is to theoretically and empirically re-examine the relationships between teachers' professional vision and other aspects of teacher competence, and more specifically practice. Applying the concepts of beliefs, professional vision and teaching practice to the topic of DI, our research provides fresh insights in teachers' competences for teaching diverse learners.

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Declaration of interests

The authors have no potential conflict of interest.

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Table 1. Means, standard deviations, and ranges of study variables

Variables	Mean	SD	Min.	Max.
Self-reported DI practice	2.64	.962	.00	6.00
Professional beliefs about diversity	2.47	.420	.93	3.57
Beliefs about differentiating the curriculum	3.07	1.246	.00	6.00
Growth mindset	4.11	1.169	.00	6.00
Professional vision of DI	1.41	.540	.366	3.302
Experimental & reflective practice	1.91	.480	.25	3.00

Table 2. Estimated parameters of model 0-4 with standardised regression coefficient and standard error in parentheses

Parameter		***Null model***	***model 1***	***model 2***	***model 3***	***model 4***
Fixed	*Intercept*	2.669 (0.080)***	2.662 (0.082)***	2.663 (0.079)***	2.650 (0.080)***	2.595 (0.083)***
	Teacher level variables:					
	Beliefs student diversity		0.119 (0.045)**		0.129 (0.045)**	0.074 (0.043)
	Beliefs curriculum		0.107 (0.042)*		0.117 (0.042)**	0.092 (0.040)*
	Beliefs growth mindset		0.172 (0.043)***		0.179 (0.043)***	0.149 (0.040)***
	Professional vision			0.055 (0.044)	0.101 (0.043)*	0.067 (0.041)
	Experimental practice					0.356 (0.048)***
Random	*Level 2 - School*	0.074 (0.040)	0.084 (0.042)	0.072 (0.039)	0.078 (0.040)	0.093 (0.043)
	Level 1 - Teacher	0.861 (0.058)	0.792 (0.053)	0.859 (0.058)	0.784 (0.053)	0.694 (0.047)
Model fit	*Deviance*	1258.683	1222.741	1257.175	1217.361	1164.823
	Difference in Deviance		35.942*** (mdl 0)	1.5080 (mdl 0)	5.380* (mdl 1)	52.538 (mdl 3)***
	df		3	1	1	1

Note: *p<*.05*; **p<*.01*; ***p<*.001*
The significance of the fixed effects is based on the Wald test. The significance of the Model Fit based in the Difference in deviance is based on the Likelihood Ratio Test.