Where does culture belong at school? Exploring the role of individualism and power distance in school belonging across cultures

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Abstract

The relationship between culture and school belonging has rarely been examined relative to student and school-level factors. This study explored whether culture, measured through individualism and power distance, plays a role in school belonging across countries. The study, designed to separate the effects of within-school teacher support from country-level effects, was conducted on a cross-cultural sample of 413,575 students drawn from 53 countries. Initial analysis of the 2018 PISA survey data and Hofstede's cultural dimensions suggested that individualism and teacher support were negatively associated, whereas power distance was positively associated with teacher support. However, although higher teacher support was linked with higher levels of belonging, both culture measures had a negative total association with belonging. Further analysis indicated that teacher support was positively associated with belonging within schools, while at a country level, students reported lower levels of belonging in countries with higher teacher support. The overall negative relationship between power distance and belonging could be attributed to the negative indirect effect of country-level teacher support. Moreover, results showed that students' perception of cooperation at school, experiences of bullying, and perceptions of a disruptive disciplinary climate were all significant predictors of school belonging. Findings also indicated that individualism and power distance at the country level also had significant effects on school belonging. These findings underscore the need for multifaceted interventions to improve school belonging. This includes enhancing teacher support, fostering a cooperative school environment, mitigating bullying, and advocating for equitable education policies with full consideration of context-specific implications. This study illuminates the complex interplay between school belonging, teacher support, and cultural factors, emphasising the importance of distinguishing between within-school and country-level effects.

Keywords School belonging · Cross-cultural research · Power distance · Teacher support

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Introduction

Belonging is a universal human need that exists across cultures (Baumeister & Leary, 1995). Researchers, however, have noted that there are important cultural nuances in what it means to belong (Carson, 2009; Hunter et al., 2019; Neville et al., 2014). In the context of education, *school belonging* refers to a student's sense of being included and supported within the school environment (Goodenow & Grady, 1993), and this sense of belonging that adolescents derive from their secondary education can shape their future lives as adults (Chhuon & Wallace, 2012). Despite evidence of a global decline in students' levels of school engagement and belonging (Organisation for Economic Co-operation and Development [OECD], 2019), there is a gap in the literature exploring school belonging across cultures and nations to understand this trend comprehensively.

According to socioecological theory, our social environments, such as home, school, or the wider society in which we live, can be places of belonging (Allen et al., 2016, 2018; Bronfenbrenner, 1977, 1979). By this notion, cultural or societal factors are likely to contribute to the level of belonging that individuals experience in their own personal context (Allen et al., 2016). *Culture* is the "collective programming of the mind that distinguishes the members of one group or category of people from others", occurring on both a societal level (e.g., gender, generations, social classes) and an occupational level (e.g., school culture, work culture) (Hofstede, 2011, p. 51). This programming can be understood as occurring through unconscious and conscious practices, in the case of societal and occupational cultures, respectively. Previous research has outlined the significance of belonging to school for adolescents in terms of their wellbeing (Arslan, 2018; Chhuon & Wallace, 2012; Ibrahim & El Zaatari, 2019; Šeboková et al., 2018) and academic motivation (Butler-Barnes et al., 2015; Gillen-O'Neel & Fuligni, 2013; Kiefer et al., 2015; Murphy & Zirkel, 2015). However, the sociocultural background to students' experience of schooling has been given little theoretical attention to date.

Bronfenbrenner's socioecological theory of development (1977, 1979) provides a useful lens to consider school belonging as a multi-dimensional construct (Allen et al., 2016). School belonging is associated with factors operating at multiple levels, through immediate interactions (e.g., with teachers) and distant interactions (e.g., broader social norms). Previous literature has extensively outlined that relationships with peers and teachers (mesosystems) have a strong association with school belonging (Allen et al., 2018, 2022a, b; Kiefer et al., 2015; Wang & Eccles, 2012). However, the influence of broader culture (macrosystem) on school belonging is less-established (Chiu et al., 2016; Cortina et al., 2017).

Two exceptions are studies by Chiu et al. (2016) and Cortina et al. (2017). Using Programme for International Student Assessment (PISA) 2000 data, which drew on studies of 15-year-olds from 41 countries, Chiu et al. (2016) found that collectivism was not linked to student belonging. In contrast, perceived power distance, defined as the degree to which the less powerful members of organizations and institutions accept and expect that power is distributed unequally (Hofstede, 2011), exhibited a negative association with a lower sense of belonging. Mediating this relationship was the student–teacher relationship (including but not limited to perceived teacher support) which was negatively associated with power distance, but strongly and positively associated with school belonging. Chiu et al.'s (2016) conclusions are similar to those of Cortina et al. (2017) who used 2003 PISA data from 31 countries and concluded that power distance is a better predictor of belonging than collectivism, confirming that teacher support predicted belonging. Neither of these studies, however, quantified the extent to which national cultural differences are directly linked to school belonging (the direct effect of culture on belonging)

or the extent to which this link is mediated by perceived teacher support (the indirect effect of culture on belonging).

The current study seeks to address this gap in the literature and contribute to the school belonging literature in three ways: 1) quantify the direct and indirect effects of culture (through perceived teacher support) on school belonging; 2) separate the within-school effect of teacher support on school belonging from the between-school and between-country effects; and 3) revisit the link between national cultural differences and school belonging using the most recent PISA data that includes a greater diversity of participant countries than the two original studies (Chiu et al., 2016; Cortina et al., 2017).

Belonging and culture

A sense of belonging is essential for developing a concept of self (Maslow, 1943). As social beings, humans seek out membership with others and form *in-groups,* from which an individual derives a sense of belonging (Tajfel, 1974). While the need to belong to groups is accepted as a human universal drive (Baumeister & Leary, 1995), there appear to be cultural nuances in the way individuals relate to others and how belonging is experienced and maximised (Markus & Kitayama, 1991; Mason, 2020; Neville et al., 2014). Two such cultural nuances have been studied in relation to school belonging: individualism vs collectivism, and power distance (see Cortina et al., 2017; Chiu et al., 2016; Cemalcilar, 2010; Chen et al., 2021; and Ozcan & Bulus, 2022). These two constructs form part of a 6-dimensional model for cultural comparison, developed by Hofstede (Hofstede, 2011; Hofstede et al., 2010), with both serving as important factors which could interact with school belonging across countries.

The degree to which an individual or society values *individuals'* pursuits—over those of the group—has been shown to vary predictably between countries and cultures. *Individualistic* countries are those in which individuals' pursuits are prioritised above that of the group or prevailing culture, while the opposite is true in *Collectivist* countries. Markus and Kitayama (1991) found that a collectivist interaction style is more common in East Asian cultures, while individualism tends to be more typical of Western cultures. However, Hall (2018) emphasises that this construct is more a matter of culture than of strict geography.

Power distance, as described by Hofstede et al. (2010), is a valuable concept in understanding how individuals connect and establish a sense of belonging, as it reflects the unequal distribution of social power within societies. This concept measures the extent to which individuals anticipate differences in status between themselves and those in positions of authority (Hofstede et al., 2010; Wong et al., 2018). To provide a more concrete example, Chiu et al. (2016) further described power distance as a measure of a culture's preference for hierarchical structures over egalitarian ones. This preference becomes

evident in various interpersonal interactions. For instance, Cemalcilar (2010), observed that in environments characterised by high power distance, such as some traditional educational settings, there exists a notable gap in authority between students and teachers. In such cases, it might not be deemed appropriate for teachers and students to engage in informal social interactions during class due to the high levels of power distance between them. This reluctance to interact arises from the substantial power distance between students and the school environment, where teachers hold a significantly higher position in the hierarchy. Consequently, the concept of power distance sheds light on the dynamics of social interactions within a cultural context, influencing how individuals relate to and belong in their respective environments.

School belonging

School belonging refers to feeling accepted and included in the school environment (Goodenow & Grady, 1993). Belonging is essential for adolescents during their high school years as they develop their own sense of identity (Chhuon & Wallace, 2012; Gillen-O'Neel & Fuligni, 2013; Tanti et al., 2011). In terms of student wellbeing, students who reported feeling included and accepted at school were more likely to show higher wellbeing (Arslan, 2018; Šeboková et al., 2018), while low levels of school belonging are a strong predictor of adolescent depressive symptoms (Parr et al., 2020) and future outcomes in adulthood such as education and employment (Parker et al., 2022). One reason that schools are a particularly salient environment for belonging is due the multitude of social interactions that schools can provide. The interactions between students and their peers, parents, teachers, and staff all influence a student's sense of belonging towards school (Allen et al., 2023).

School belonging across cultures

Cemalcilar (2010) noted that there is an overrepresentation of students from the United States in studies on school belonging, potentially limiting the insights gained from other cultural contexts. To bridge this gap, the PISA survey, conducted by the OECD and involving a globally stratified sample of 15-year-old students, measures school belonging across various cultural settings among secondary school students. Notably, the latest survey revealed a global decline in school belonging over the past decade (OECD, 2019), underscoring the importance of comprehending school belonging trends within diverse cultural landscapes. While lower socioeconomic status (SES) among schools and students has been associated with reduced levels of school belonging, it is worth noting that SES alone could not account for the lower countrywide averages in school belonging observed in countries such as Thailand, Hong Kong, and Vietnam (OECD, 2019). This suggests that factors beyond SES contribute significantly to these variations.

In a similar vein, Chiu et al. (2016) found a significant negative correlation between Gross Domestic Product (GDP) and power distance, yet GDP did not exhibit a significant association with school belonging. This finding implies that national cultural differences, as measured by power distance, are directly linked to disparities in national averages of school belonging, rather than being primarily influenced by socioeconomic factors. Hence, one compelling rationale emerges for considering socioeconomic status (SES) as a control variable when assessing the impact of culture on school belonging. The PISA survey, while providing valuable insights into school belonging trends globally, may not offer an in-depth exploration of cultural differences, such as power distance, which could underlie national variations in school belonging. Consequently, there is a need for further research in this regard.

Mikk and colleagues (2016) posited that, when comparing countries on characteristics such as school belonging, it is important to understand what may be occurring at lower system levels within those countries, such as at the student or school level (i.e., micro- and mesosystems; Bronfenbrenner, 1977, 1999). Mikk et al. (2016) observed an *ecological fallacy* in the PISA dataset, whereby a false correlation is established between characteristics of individuals and the groups they form (Brewer & Venaik, 2014). Specifically, when analysing factors at the student level, teacher rapport was positively correlated with achievement; however, when country averages were analysed, these factors were no longer significantly correlated. One explanation given was that cultural differences within a country may shape the way that students perceive their teachers, which can make country-level scores misleading. Despite this nuance, the PISA report assumes that students universally find value in belonging to their school for social support, however this has been minimally explored through past literature (Chiu et al., 2016; Cortina et al., 2017). A key feature of the PISA survey was a stratified sample that involved *nested data*, meaning that the students who participated are nested within schools within countries. Hence, investigative models need to address the nested data through a multi-level design. Two recent studies have accounted for this by not only analysing student ratings of their teachers and their sense of belonging at the individual level, but also by correlating these factors with power distance, a metric assessed at the country level (Chiu et al., 2016; Cortina et al., 2017). Using hierarchical models, these two studies found that up to 89% of the variation in school belonging was accounted for by factors at the individual level, with approximately 5% of variance uniquely explained by country-level variables (e.g., power distance; Chiu et al., 2016; Cortina et al., 2017). The findings revealed that power distance was inversely related to school belonging, suggesting that students in countries with lower power distance (i.e., more egalitarian societies) are more likely to experience a greater sense of belonging in school. This offers preliminary evidence that the likelihood of

experiencing school belonging may vary by nation, even when accounting for individual and school-level factors. However, these results have not been replicated in more recent OECD data, nor have they been confirmed through larger-scale statistical modelling.

Conversely, Chiu et al. (2012) noted that within-country factors, such as increased cultural diversity due to large-scale immigration, could render between-country comparisons on school belonging less meaningful. Immigrant or international students serve as an example of how school belonging can be experienced differently for some students when their home culture differs from the culture where they attend school (Chiu et al., 2012; Mason, 2020). Meanwhile, individuals who have been traditionally or historically marginalised due to the historical effects of colonisation or enslavement may experience disadvantages related to a sense of belonging in schools (Booker, 2006; Dunstan et al., 2017). Whilst nations do not form homogenous cultures, schooling is often governed by practices that correspond with the dominant national ideology (Child, 2016). As such, students may experience a dissonance between their home and school culture which affects their experiences of school belonging, mental health, and achievement. Hence, understanding how individual and school level systems contribute to or interact with culture is an important part of the equation in exploring school belonging.

Teachers and school belonging

While the concept of power distance is influential in shaping school belonging, it is by no means the sole determinant. The way teachers interact with students also plays a crucial role in shaping their sense of belonging in school (Chiu et al., 2016; Cortina et al., 2017). Specifically, teachers can adopt interaction styles that may diverge from the prevailing cultural norms, both at the national and school levels. In fact, student perceptions of teacher support have been widely linked to feelings of school belonging (Allen et al., 2018; Cemalcilar, 2010; Kiefer et al., 2015; Wang & Eccles, 2012; Wong et al., 2022). This support extends beyond just academic support to also include emotional support, with Allen et al. (2018) defining teacher support as a combination of both emotional and educational support of students. Furthermore, teacher attitudes towards linguistic diversity can impact the sense of belonging among multilingual students. For example, Van der Wildt et al. (2015) found that teachers who practiced tolerance and acknowledged the value of multilingualism in the classroom positively influenced their students' feelings of belonging.

Similarly, *teacher rapport,* a construct related to teacher support, has been recognised as a strong contributor to school belonging (Chhuon & Wallace, 2012; Cortina et al., 2017; Ibrahim & El Zaatari, 2019). Chiu et al. (2012) found that immigrant students had a higher sense of belonging at school when their teachers developed strong rapport with them,

which could buffer against the effects of cultural barriers experienced by immigrant students (e.g., racial discrimination). Similarly, teacher rapport mediated the relationship between power distance and school belonging, which indicated that students in egalitarian cultures are more likely to develop strong rapport with their teachers and, therefore, develop a higher sense of belonging at school (Chiu et al., 2016). Teachers' dual relationship as educator and personal supporter is not fully recognised in the PISA survey, as the index of teacher support only measures academic assistance (OECD, 2019). Other studies using the PISA surveys, however, have found teacher support to be associated with school belonging across cultures (Akgul et al., 2016; Chiu et al., 2012).

Factors impacting school belonging

To fully investigate the cultural perspectives of school belonging, it is necessary to consider a range of interpersonal and systemic factors, some of which have been captured in the 2018 PISA data. The first, and arguably foremost interpersonal factor, is the influence of the teacher. The relationship that a teacher forms with the student is strongly associated with school belonging (Allen et al., 2021). This relationship holds when that relationship is measured as 'teacher support' (Allen et al., 2018; Cemalcilar, 2010; Kiefer et al., 2015; Wang & Eccles, 2012), 'teacher rapport' (Chhoun & Wallace, 2012; Chiu et al., 2012; Cortina et al., 2017; Ibrahim & El Zaatari, 2019), or 'teacher interest' – the student's perception of the teacher's level of interest in the student. Teacher support is also positively associated with improved academic outcomes (Dunlosky & Rawson, 2015), and higher happiness and life satisfactions ratings (see Suldo et al., 2009; Guess & McCane-Bowling, 2016).

A second significant interpersonal factor that directly affects an individual's sense of school belonging is bullying (Allen et al., 2022a; Arslan et al., 2021). Bullying has long been established as a causative factor impacting a student's subjective well-being (SWB) (Davis et al., 2019). However, more recent research has shown that the relationship between bullying and SWB can be mediated by students' feelings of belonging (Doumas & Midgett, 2019; Seon & Smith-Adcock, 2021; Xu & Fang, 2021). Such findings show the influence of bullying on a student's sense of belonging and demonstrate the multifaceted nature of this issue, whether an individual is a bully, a victim, or both, and the need for comprehensive studies to explore these dynamics.

A third interpersonal factor, parental involvement, yields similar effects on an individual's school belonging. Extensive research, as cited by the OECD (2018), has consistently shown that parental involvement is positively correlated with various positive outcomes, including improved academic performance (Castro et al., 2015), enhanced social skills (Sheridan et al., 2012), the cultivation of positive relationships and overall mental health (Garbacz et al., 2018). These

findings point to the influence on an individual's sense of belonging within the school context. Moreover, Ahmadi and Ahmadi (2020) provide empirical evidence demonstrating how parental involvement significantly affects a student's life satisfaction, with this effect being mediated by the level of school belonging. This suggests that parental involvement can play a pivotal role in shaping a student's overall wellbeing and their sense of belonging within the school environment.

At the school cultural level, two specific climates have been identified as significantly impacting school belonging. The first is the cooperative vs competitive climate. Research has consistently shown that teacher practices encouraging cooperative interactions among students lead to more positive peer relationships, an effect observed across multiple countries and diverse cultural contexts (Slavin, 2015). Further, a cooperative school environment has been found to not only enhance inter-student relationships but also to increase school attachment (Johnson et al., 1981; Roseth et al., 2008). Cortina et al. (2017) have theorized that students, irrespective of whether they are from Eastern or Western teaching traditions, are more likely to prefer cooperative learning, a preference that correlates positively with higher levels of school belonging.

The second climate of importance is the school disciplinary climate, which has also been found to be associated with school belonging (OECD, 2017a). In the context of this study, disciplinary climate encompasses factors such as noise and disorder in the classroom, the degree to which students listen to teachers, and students' ability to concentrate on academic tasks (PISA, n.d.). Its influence on school belonging appears to be quite universal, demonstrated consistently across 41 countries (Chiu et al., 2016). In the context of Canada, it was identified as the single most significant systemic factor affecting school belonging among Grade 8 students (Ma, 2003). Additionally, some evidence suggests that the disciplinary climate may serve a mediating role in influencing school belonging (Dempsey, 2008; Hodges et al., 2018). This indicates that a more orderly classroom environment, characterized by fewer disruptions and greater teaching and learning opportunities, is positively associated with school belonging, aligning with the framework provided by the report (OECD, 2017).

The current study

The relationship between school belonging and various cultural factors is not yet definitively understood. This study aims to shed light on how dominant national cultural traits—specifically power distance and individualism—might significantly influence students' sense of belonging in schools. The possible mediating roles of interpersonal and other sociocultural elements are also examined. We base our analysis on student response data collected in the 2018 PISA survey, conducted by the OECD. The research questions guiding this study are as follows:

RQ1: What is the relationship between school belonging and the cultural values of individualism and power distance across countries?

RQ2: To what extent are those relationships mediated by perceived teacher support, teacher interest, exposure to bullying, disciplinary climate, cooperation at school, and parental involvement?

RQ3: Are these relationships linked to student experiences of perceived teacher support, teacher interest, exposure to bullying, disciplinary climate, cooperation at school, and parental involvement, or to country-level differences in these variables?

Materials and methods

This study draws on secondary data from the PISA 2018 student and school questionnaire, Hofstede Dimensions (version 12/08/2015), and country-level official statistics that were merged by country.

PISA 2018 data

The 2018 PISA survey targeted full-time secondary school students around the age of 15 (average age = 15.80 years, SD = 0.23), born in 2002. Students with cognitive impairments were not included in the survey. The study involved a substantial dataset, comprising 612,004 students and 21,903 schools across 80 different countries and economies. Students were selected through a stratified sampling method, and the OECD conducted the survey within a carefully chosen set of schools in each participating country to ensure a representative sample (OECD, 2009).

Hofstede's cultural dimensions

Hofstede and colleagues (2010) conducted a study on cultural differences across 76 nations, focusing on key measures such as individualism/collectivism, uncertainty avoidance, power distance, long-term orientation, and intimacy/desire. While the specific sampling methods were not detailed in Hofstede et al. (2010), the researchers surveyed a combination of IBM employees and non-IBM employees to calculate mean scores for each cultural dimension in every participating country. Subsequent research has expanded these scores to include additional countries. Updated data on Hofstede's cultural dimensions, including power distance and individualism/collectivism, is publicly accessible for 80 countries and regions (https://www.hofstede-insights.

com/product/compare-countries/). For this study, we relied on the version compiled on December 8, 2015. It should be noted that not all the countries and regions included in Hofstede's database participated in the PISA 2018 survey.

Country-level statistics

We collected additional country-level characteristics from The World Bank's comprehensive data bank, which consolidates various indicators from the statistics bureaus of countries and economies worldwide (The World Bank, 2023). Whenever necessary, we supplemented this data with information from sources such as the United Nations Development Program's data center (United Nations Development Program, 2023) and other official sources, as indicated in Table 6.

Measures

This section outlines the various measures and variables employed in the study.

Index of sense of belonging

The OECD PISA study calculates an index of school belonging based on six items on a four-point Likert scale, from *strongly disagree* (1) to *strongly agree* (4). Participants rated the following statements: "I feel like an outsider (or left out of things) at school" (reverse scored), "I make friends easily at school," "I feel like I belong at school," "I feel awkward and out of place in my school" (reverse scored), "other students seem to like me," and "I feel lonely at school" (reverse scored) (OECD, 2019). Students from Israel, Lebanon, and Macedonia did not answer these items and hence are not included in this study. This scale has a good scale reliability (average Cronbach's $\alpha = 0.79$ across PISA participating countries; OECD, 2020).

Index of teacher support

The OECD calculates this index based on students' reports of the frequency with which their teacher did the following: the teacher "…shows an interest in every student's learning"; "…gives extra help when students need it"; "…helps students with their learning"; and "… continues teaching until students understand" (OECD, 2019). Students rated the frequency on a scale of 1 (*never or hardly ever*) to 4 (*every lesson*). A higher score indicates that students rated their teacher to be more supportive in their learning. Students from Canada, Lebanon, Macedonia, and Ukraine did not include this set of items and therefore are not included in this study. This scale has a good internal consistency (average Cronbach's $\alpha = 0.86$ across PISA participating countries; OECD, 2020).

Additional control and mediating variables

The analysis includes a set of additional control and mediating variables with the aim of minimising potential confounding factors in the relationship between school belonging, cultural values, and teacher support. The PISA 2018 data includes many contextual student, school, and teacher variables. Nonetheless, participant countries/economies can decide to not ask certain questions, resulting in some gaps in the data. For example, only 19 countries distributed teacher questionnaires and parents' emotional support was only collected for 91,232 of the 612,004 students who participated in PISA 2018. This situation creates a trade-off for research like the one presented in this paper, since including a larger number of variables in the analysis necessarily implies a reduction in the number of available observations.

The strategy for this paper was to select the variables that most closely measure relevant constructs, as discussed previously, while selecting the variables with the fewest missing observations. The variables included in the analysis were: gender, migration status, socioeconomic background, age, grade, self-concept, perceived teacher interest, perceived cooperation at school, exposure to bullying, perceived disciplinary climate, school type, school principal's perception of staff shortages, disruptive teacher behaviour, parental involvement, number of equity policies, availability of creative extra-curricular activities, number of certified teachers and shortage of educational material, the country's Human Development Index (HDI), duration of compulsory education, proportion of the gross domestic product spent by the government on education, primary school starting age, and Gini coefficient (see Table 6).

As outlined in the introduction, variables such as bullying, perceived teacher support, teacher interest, disciplinary climate, school cooperation, and parental involvement are considered potential mediators in the relationship between cultural values and school belonging. Other variables serve as controls; they may predict school belonging but are not hypothesised to be influenced by cultural values. In this study, an OECD index for each of these potential moderators was chosen as an acceptable proxy of the construct (OECD, 2020): BELONG (Table 9) for sense of belonging, TEACHSUP (Table 10) for Teacher Support, TEACHINT (Table 11) for teacher interest (also referred to as Teacher Enthusiasm in Chapter 5; OECD, 2020), BULLYING (Table 12) for student's experience of being exposed to bullying, TCDISCLIMA (Table 13) for disciplinary climate, PERCOOP (Table 14) for perception of co-operation at school, and CURRSUPP (Table 15) for parent involvement. The technical parameters, along with the questionnaire items for each variable, are included in Appendix 4.

Hofstede measures

Power distances The power distance index (PDI) was created using data from answers from IBM employees in similar positions based in 53 different countries (Hofstede et al., 2010), and was later extrapolated to generate power distance scores for 76 countries and regions. Participants were asked:

(1) "How frequently, in your experience, does the following problem occur: employees being afraid to express disagreement with their managers?" Participants rated the frequency on a five-point scale, where 1 indicated "very frequently" and 5 indicated "very rarely."
(2) To select a description that best matched their boss's actual decision-making style. Scores were coded as the percentage of participants who selected an autocratic or paternalistic decision-making style, or a "none of these" option.
(3) To select a description that best matched the decision-making style that they preferred to see their boss demonstrate. Scores were coded as the percentage of participants who preferred an autocratic or paternalistic decision-making style, or a "none of these" option.

Hofstede et al. (2010) transformed the raw item scores and then combined the scores to create a total score on the power distance index. The scores on the PDI range from 0–100, where a lower score indicates less power or status difference between ordinates (employer) and subordinates (employees). The PDI has an adequate internal consistency (Cronbach's $\alpha = 0.84$; Hofstede, 2013).

Individualism index The individualism index (IDV), which measures students' degree of individualism or collectivism, was created using data collected from the IBM employee samples in 40 countries before being extended to 76 countries (Hofstede et al., 2010). The survey questions related to a set of 14 work goals such as "try to think of those factors that would be important to you in an ideal job" and "disregard the extent to which they are contained in your present job," were followed by 14 items that were scored using a scale from 1 (most important) to 5 (least important). The results for these 14 items were then used to produce factor scores that were further transformed to generate IDV scores ranging from 0 for high collectivism to 100 for high individualism. Subsequent improvement of the index allowed approximation formulae to be used to directly compute IDV values based on the mean scores of only four of the work goals (Hofstede, 2013). The current study used this latter formula.

Ethics statement

Participants provided their consent in the PISA survey by proceeding with the questionnaires; therefore, consent forms were not given. Data in the PISA survey was de-identified before being made publicly available so that no single participant or school can be identified. Permission to use the data for secondary analysis is provided in that the dataset is publicly available on the OECD website (OECD, 2018). Hofstede's cultural dimension scores for power distance can be accessed for secondary analysis in Hofstede et al. (2010). Scores at the country-level are reported and thus no participant can be identified in the summation of country scores. Ethics approval for the present study was provided by the institutional Human Research Ethics Committee.

Procedure

Data preparation

Stata 16 was used for data management and analysis. The OECD (2020) calculates probabilistic weights to make the sample representative of participant countries and economies. This study uses a normalised version of such weights throughout the analysis, as recommended by OECD (2020). The use of these weights ensures that the estimated parameters, including standard errors, are adjusted for the clustered nature of the data and survey design.

The PISA 2018 student data was merged with Hofstede Dimensions data using country identifiers for both datasets. As a result, 62 PISA countries and economies were assigned a value for power distance and collectivism. Hofstede Dimensions data was not available for the following PISA participating countries and economies: Albania, Bosnia, Belarus, Brunei Darussalam, Dominican Republic, Georgia, Iceland, Jordan, Kazakhstan, Moldova, Macedonia Republic, Montenegro, Azerbaijan, and Ukraine. As noted previously, not all countries and economies collected data on the variables included in the analysis. The final sample includes 243,375 students from 10,246 schools from 48 countries and economies. Table 5 shows the countries and economies that are included in the analysis.

Data analysis

The analysis is based on four parallel multiple mediation models (Hayes, 2017). The first two models test the overall relationships, while the second two models follow a contextual effects model specification to estimate within-country and contextual relationships, as described below. The language used to describe the findings from these models is inherently causal, as direct and indirect relationships between variables are called direct and indirect effects, respectively. While this paper adheres to the convention of describing these relationships as 'effects', the reader is reminded that this paper does not provide causal evidence of the link between belonging, culture, and other variables.

Model 1 tests the basic path hypothesis: Cultural differences have a direct and an indirect effect on school belonging mediated by the following: being bullied, teacher support, teacher interest, disciplinary climate, cooperation, and parental involvement. Model 2 tests if these direct and indirect effects prevail after accounting for other student, school, and country characteristics. For all models, confidence intervals for the individual indirect effects of mediating variables are estimated via bootstrapping with 1,000 iterations (MacKinnon et al., 2004).

The coefficients measuring the relationship between school belonging and mediating variables estimated by models 1 and 2 are then separated into the within-school effect, and the school and country contextual effects of each mediating variable on school belonging using Model 3, a contextual effects model (Mundlak, 1978). As Mundlak (1978) demonstrated, the parameters estimated by this model can be interpreted as a within-school effect (for the coefficients associated with student-level characteristics) and contextual effects (for the coefficients of average school and country characteristics). The within-school effect is the average relationship between school belonging and teachers' support for students attending the same school. While the school and country contextual effects represent the average change in school belonging given a one-unit increase in the average school and country mediating variable, respectively, over and above the students' own value of the mediating variable, this correlation shows the importance of these variables in fostering a strong sense of community among students. This model is used to estimate the direct and indirect effect of cultural differences via country differences in the mediating variables, allowing for a more nuanced understanding of this relationship than the one that the literature has provided so far.

Finally, Model 4 includes student, school, and country characteristics to assess whether these direct and indirect effects persist after accounting for these additional factors. This step aims to determine if a contextual effects model is more appropriate than a conventional model by testing whether the within-school effects are statistically equivalent to the corresponding contextual effects. If these are equal, it implies that a single student-level variable is enough to summarise the relationship between school belonging and the mediating variable at the student, school, and country levels, but if the within-school and contextual effects are different, it is more appropriate to separate these relationships (Mundlak, 1978).

As cultural values are measured at the country level, a modelling strategy including country fixed effects to capture all between-country variation is not possible, as this would also capture the variation linked to cultural characteristics, resulting in perfect multicollinearity.

All the variables of interest in the models have been standardised so that the estimation results correspond to effect sizes. The models also include normalised weights to account

for PISA's complex sample design when estimating the model coefficients and standard errors. The use of sampling weights also implies that fit indices must be based on standardised residuals to be valid. Therefore, not all conventional fit indices are available (e.g., information criteria, RMSEA, or comparative fit index). The results section reports the standardized root mean squared residual (SRMR) and the coefficient of determination (CD). A smaller SRMR and a larger CD value indicate a better model fit (Iacobucci, 2010).

Data, materials and code The data that support the findings of this study are openly available in the PISA 2018 database at https://www.oecd.org/pisa/data/2018database/ and other sources as disclosed previously. Stata 16 files to replicate the analysis are included in the supplemental material for this paper.

Transparency and openness We have cited all data and other methods developed by others. Data access, analytic code, and study materials have been transparently reported. We report how we determined our sample size, all data exclusions, all manipulations, and all measures in the study. The study design and analysis plan were not pre-registered.

Results

Descriptive analysis

Figure 1 explores the relationship between the average level of school belonging in each country and their power distance, individualism, and average potential mediators: being bullied, teacher support, teacher interest, disciplinary climate, cooperation, and parental involvement. Countries who belong to the OECD are shown in grey. Being part of the OECD is positively correlated with the HDI of a country ($r = 0.58$, $p < 0.0001$) and government expenditure in education ($r = 0.32$, $p = 0.028$), and negatively correlated with the country's Gini coefficient ($r = -0.45$, $p = 0.001$). This categorisation is useful as a summary representation of these characteristics and their link with belonging, power distance, individualism, and teacher support. However, this variable is not included in the models because its inclusion with other country characteristics led to perfect multicollinearity problems.

As shown in Fig. 1, OECD countries and economies tend to have higher levels of school belonging. The figure also shows that countries with a higher average sense of belonging tend to have a higher level of individualism, and a lower power distance and less exposure to bullying. The average levels of other mediating variables are less variable than individualism and power distance, and there is no clear relationship with the country average of school belonging.

Figure 2 shows that countries with higher average levels of individualism tend to have lower average levels of teacher
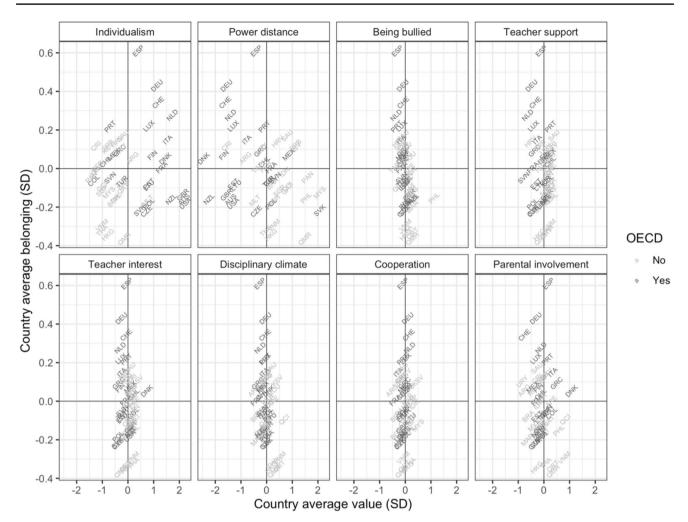
Fig. 1 Relationship between the country average belonging level and its average individualism, power distance, exposure to bullying, teacher support, teacher interest, disciplinary climate, cooperation, and parental involvement. Note: Countries belonging to the OECD are shown in dark grey. Each country is shown as a label

support, teacher interest, and disciplinary climate, but no clear relationship with exposure to bullying, cooperation, and parental involvement. The relationship between these variables and power distance is less clear. Hence, there is the possibility that the relationships between school belonging and individualism and power distance are mediated by their relationship with these variables. That is, while the direct effect of exposure to bullying, teacher support, teaching interest, and disciplinary climate on belonging is expected to be smaller than the effect of these cultural dimensions, it is expected that some of these relationships are linked to the relationship between these variables and the cultural dimensions.

Estimation results

Overall relationships

Table 1 shows that, according to Model 1, students in countries with higher levels of individualism do indeed have lower

average levels of perceived teacher support, teacher interest, disciplinary climate, cooperation, and parental involvement, and higher levels of exposure to bullying, given their country's level of power distance. Students living in countries with a higher power distance also have on average, higher perceived levels of exposure to bullying, teacher support, cooperation, and parental involvement, and lower levels of disciplinary climate, given their country's level of individualism. These relationships are weak but statistically significant, while the relationship between power distance and perceived teacher interest was not found to be statistically significant. After accounting for differences in exposure to bullying, perceived teacher support, teacher interest, disciplinary climate, cooperation, and parental involvement, students reported higher average levels of belonging in countries with higher levels of individualism and power distance. Students with higher levels of perceived teacher support, teacher interest, and cooperation reported on average higher levels of belonging and lower average levels of exposure to bullying and parental involvement,
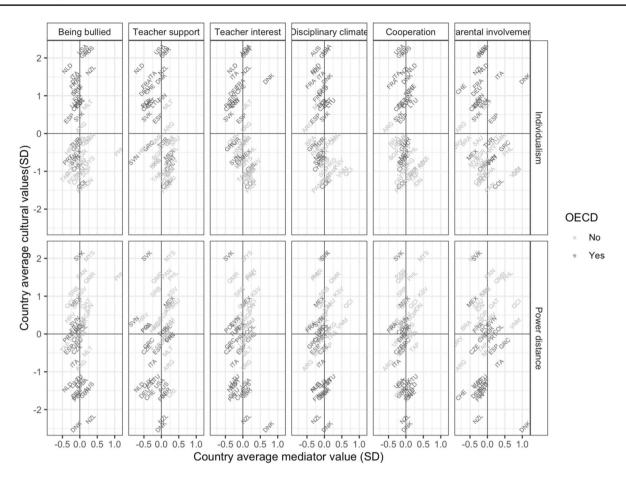
Fig. 2 Relationship between the country's individualism and power distance and its average exposure to bullying, teacher support, teacher interest, disciplinary climate, cooperation, and parental involvement.

Note: Countries belonging to the OECD are shown in dark grey. Each country is shown as a label

after accounting for cultural differences. Model 2 shows these relationships between belonging, teacher support, and culture after including control variables.

These results are similar to Chiu et al. (2016) and Cortina et al. (2017) in that higher teacher support is associated with higher levels of school belonging. However, we find that the stronger relationship between belonging and power distance is explained by student, school, and country characteristics. To better understand these differences, Table 2 presents the indirect and total effects, as estimated by Models 1 and 2. As Table 2 shows, both individualism and power distance have a negative total effect on belonging. Put simply, countries with greater individualism and power distances tend to have students that experience lower levels of belonging. However, these relationships are far from straightforward.

In the case of the relationship between belonging and individualism, the negative indirect effect is larger than the total effect, which explains the positive direct effect of individualism on belonging shown on Table 1. Nonetheless, this relationship is also linked to multiple control variables, which is why, once control variables are introduced, the direct effect

of individualism on belonging is negative (Table 1), as are the total and indirect effects of individualism on belonging (Table 2). In fact, after accounting for student, school, and country characteristics, the indirect effect of individualism on belonging accounts for 52% of this relationship. As shown in Table 2, this indirect effect is a combination of positive influences of individualism through perceived teacher interest and negative influences through exposure to bullying, and perceived disciplinary climate and cooperation. For example, after accounting for differences in student, school, and country characteristics, more individualistic countries have on average higher levels of teacher interest, and a higher teacher interest is associated with higher average levels of belonging. Hence, there is a positive indirect effect of individualism on school belonging via perceived teacher interest.

In contrast, after accounting for differences in student, school and country characteristics, more individualistic countries have on average higher levels of exposure to bullying, which are associated with lower levels of belonging. Therefore, there is a negative indirect effect of individualism on school belonging via exposure to bullying. There was

Table 1 Estimated direct effects on mediating variables and belonging according to models (1) and (2)

	(1)							(2)						
	Belonging	Bullied	Teacher support	Teacher interest	Disciplinary climate	Cooperation	Parental involvement	Belonging	Bullied	Teacher support	Teacher interest	Disciplinary climate	Cooperation	Parental involvement
Individualism	0.037*** (0.005)	0.135*** (0.006)	-0.069*** (0.005)	-0.047*** (0.005)	-0.111*** (0.005)	-0.069*** (0.005)	-0.017*** (0.000)	-0.063*** (0.007)	0.309*** (0.008)	0.010 (0.007)	0.059*** (0.007)	-0.029*** (0.007)	-0.033*** (0.007)	0.007*** (0.001)
Power distance	0.025*** (0.004)	0.287*** (0.005)	0.043*** (0.004)	0.001 (0.004)	-0.097*** (0.004)	0.062*** (0.004)	0.086*** (0.000)	0.057*** (0.005)	0.230*** (0.006)	-0.001 (0.005)	-0.051*** (0.005)	-0.139*** (0.005)	0.053*** (0.005)	0.035*** (0.001)
Bullied	-0.217*** (0.004)							-0.213*** (0.004)						
Teacher support	0.043*** (0.005)							0.044*** (0.005)						
Teacher interest	0.093*** (0.006)							0.082*** (0.006)						
Disciplinary climate	0.005 (0.005)							0.014** (0.005)						
Cooperation	0.184*** (0.005)							0.174*** (0.005)						
Parental involvement	-0.012** (0.004)							-0.010* (0.004)						
Constant	-0.078*** (0.004)	0.078*** (0.005)	0.087*** (0.004)	0.092*** (0.004)	0.044*** (0.005)	0.004 (0.005)	-0.005*** (0.000)	-0.022*** (0.004)	-0.076*** (0.004)	-0.025*** (0.004)	-0.009* (0.004)	0.049*** (0.004)	0.031*** (0.004)	0.005*** (0.001)
Includes control variables	No							Yes						
Var(e. Belonging)	0.770*** (0.008)							0.750*** (0.008)						
Var(e. Bullied)	1.067*** (0.008)							1.013*** (0.007)						
Var(e. Teacher interest)	0.881*** (0.005)							0.854*** (0.006)						
Var(e. Teacher support)	0.894*** (0.006)							0.841*** (0.005)						
Var(e. Disciplinary climate)	0.927*** (0.007)							0.878*** (0.006)						

Table 1 (continued)

	(1)							(2)						
	Belonging	Bullied	Teacher support	Teacher interest	Disciplinary climate	Cooperation	Parental involvement	Belonging	Bullied	Teacher support	Teacher interest	Disciplinary climate	Cooperation	Parental involvement
Var(e. Cooperation)	0.942***							0.896***						
	(0.005)							(0.005)						
Var(e. Parental involvement)	1.012***							0.900***						
	(0.000)							(0.001)						
N	243,375							243,375						
Discrepancy	-1,479,237.89							-4,165,050.49						
SRMR	0.105							0.032						
CD	0.087							0.375						

*** $p < 0.001$, ** $p < 0.05$, * $p < 0.01$

Survey-weighted standard errors in parentheses

SRMR Standardized root mean squared residual, *CD* Coefficient of determination

Table 2 Indirect and total effects of individualism and power distance through mediating variables on school belonging as estimated by models (1) and (2)

	(1)		(2)	
	Total Effect	Indirect Effect	Total Effect	Indirect Effect
Individualism	-0.0130**	-0.0496***	-0.1297***	-0.0669***
via	(0.0049)	(0.0020)	(0.0075)	(0.0030)
Bullied		-0.0292***		-0.0659***
		(0.0015)		(0.0022)
Teacher support		-0.0029***		0.0004
		(0.0004)		(0.0003)
Teacher interest		-0.0043***		0.0048***
		(0.0005)		(0.0007)
Disciplinary climate		-0.0006		-0.0004**
		(0.0006)		(0.0002)
Cooperation		-0.0127***		-0.0057***
		(0.001)		(0.0013)
Parental involvement		0.0002**		-0.0001
		(0.0001)		(0.0001)
Power distance	-0.0259***	-0.0505***	0.0108**	-0.0462***
via	(0.0042)	(0.0020)	(0.0048)	(0.0021)
Bullied		-0.0623***		-0.0489***
		(0.0017)		(0.0016)
Teacher support		0.0018***		0.000
		(0.0003)		(0.0002)
Teacher interest		0.0001		-0.0042***
		(0.0004)		(0.0005)
Disciplinary climate		-0.0005		-0.002**
		(0.0005)		(0.0008)
Cooperation		0.0114***		0.0092***
		(0.0009)		(0.0009)
Parental involvement		-0.001**		-0.0003**
		(0.0003)		(0.0002)

*** $p < 0.001$, ** $p < 0.05$, * $p < 0.01$

Standard errors in parenthesis

Standard errors for individual indirect effects estimated via bootstrapping with 1,000 iterations

no evidence of the existence of indirect effects of individualism on school belonging via teacher support or parental involvement, after accounting for differences in other student, school, or country characteristics.

Exploring the relationship between belonging, power distance, and the mediating variables presents a somewhat nuanced scenario. As shown in Table 2, without accounting for additional student, school, and country characteristics, the total effect of power distance on belonging is negative, but it is positive conditional on these additional characteristics. The total indirect effect of power distance on belonging is negative in both cases, as a result of combining the negative indirect effects of being bullied, parental involvement (and teacher interest and disciplinary climate when accounting for other student, school, and country characteristics), and the positive indirect effect of perceived cooperation. Without accounting for other student, school,

and country characteristics, the model predicts that the direct positive effect of power distance on school belonging (Table 1) is not large enough to compensate for these negative indirect effects, resulting in a negative total effect of power distance on belonging. However, when other student, school, and country characteristics are accounted for, the model predicts that the direct effect of power distance on belonging offsets the negative indirect effects of the mediating variables.

Since individualism and power distance represent cultural differences between countries rather than within countries (i.e., all students and schools within the same country are assumed to experience the same levels of individualism and power distance), it is worth exploring whether the mediating variables play a role in belonging within schools or if differences in these variables between countries drive these relationships. This is explored in the next section.

Disentangling student-level and country-level relationships

Table 3 presents the estimation results for Models 3 and 4. These models separate the within-school effect of the mediating variables on belonging from the school and country contextual effects of these variables. The school contextual effect of, for example, teacher support is the average change associated with an increase in the school average teacher support on belonging, over and above the student's perceived levels of teacher support. The country contextual effect of teacher support is the average change on belonging associated with an increase of the country average level of teacher support, over and above the student and school average level of teacher support.

As shown in Table 3, the relationships between individualism and power distance persist at the country level. The relationships between belonging and both culture measures have the same direction but are weaker. However, further nuances in the relationship between cultural values, the mediating variables, and belonging are revealed. For example, while within schools a higher level of teacher support is associated with a higher level of belonging, students in schools with a higher average level of teacher support report lower levels of belonging, over and above their perceived levels of teacher support and country average level of teacher support. After considering other student and country characteristics, the contextual effects of attending a school with a higher average perceived teacher support on belonging are close to zero, suggesting that the relationship between belonging and these contextual effects is partially explained by other school characteristics and are associated with the average perceived teacher support, such as disruptive teacher behaviour or the availability of educational material (Table 8).

To better understand these nuances, Table 4 presents the indirect (through the country averages of the mediating variables) and total effects of individualism and power distance on school belonging. As shown in Table 4, after controlling for other student, school, and country characteristics, the total effect of individualism on belonging is negative, while the total effect of power distance on belonging is positive. This means that, as before, students in countries with higher levels of individualism tend to have lower average levels of school belonging, while countries with a larger power distance tend to have higher levels of belonging. Also as noted previously, the total indirect effect of individualism on belonging through the mediating variables is negative, and accounts for 65% of the total effect of individualism on belonging (75% without considering control variables).

The total indirect effect of power distance on belonging is positive both before and after accounting for other student, school, and country characteristics. This effect amounts to 37% of the total impact of power distance on belonging (or 90% when control variables are not considered).This improved stability in the estimated parameters may indicate

that a contextual effects model, separating the within-school effects of the mediating variables from their school and country contextual effects of these variables on belonging, is a preferable way of modelling this relationship. This inference aligns with the findings presented in Table 3, supporting the adequacy of the contextual effects models for this analysis.

In the case of individualism, the positive indirect effects of the country average levels of perceived teacher interest, disciplinary climate, and parental involvement are surpassed by the negative indirect effects of the country average levels of exposure to bullying and perceived cooperation, resulting in a negative total indirect effect of individualism on school belonging. In turn, the negative indirect effects of power distance on belonging via the country average level of exposure to bullying and perceived teacher interest are surpassed by the negative indirect effects of disciplinary climate, cooperation, and parental involvement, resulting in a positive total indirect effect of power distance on school belonging.

These findings show the importance of separating the within-school effect of teacher support from the country contextual effect of teacher support on belonging. Studies by Chiu et al. (2016) and Cortina et al. (2017) found a positive relationship between teacher support and belonging, suggesting that this relationship holds both within and between countries, with higher levels of teacher support corresponding to higher levels of belonging.

Our findings reveal that this may not be the case. While more teacher support is linked to a higher sense of belonging within schools, this is not the case at the country level. This highlights the complex interplay between teacher support and school belonging, and the importance of considering both within-school and country-level effects. Our findings therefore challenge these previous assumptions about the link between belonging, teacher support, and culture.

Discussion

The results indicate that individualism and power distance have a negative total effect on belonging (RQ1), consistent with previous research on PISA datasets (Allen et al., 2018; Chiu et al., 2016; Cortina et al., 2017; Kiefer et al., 2015). Countries with on average lower individualism and smaller power distance, tend to have students who experience higher levels of school belonging. However, this provides a snapshot of cultural interactions with school belonging without considering the interplay of social and cultural factors with school belonging across student, school and country levels. When exploring the relationship between country-level individualism and power distance with belonging, the relationships are mediated by a range of variables, including exposure to bullying, perceived teacher support, teacher interest, disciplinary climate, cooperation, and parental involvement.

Table 3 Estimated direct effects on mediating variables and belonging according to models (3) and (4)

	(3)							(4)						
	Belonging	Country Bullied	Country teacher support	Country teacher interest	Country disciplinary climate	Country cooperation	Country parental involvement	Belonging	Country Bullied	Country teacher support	Country teacher interest	Country disciplinary climate	Country cooperation	Country parental involvement
Individualism	0.012* (0.006)	0.144*** (0.000)	-0.072*** (0.000)	-0.049*** (0.000)	-0.114*** (0.000)	-0.082*** (0.000)	-0.030*** (0.000)	-0.031*** (0.007)	0.282*** (0.000)	-0.003*** (0.000)	0.059*** (0.000)	-0.018*** (0.000)	-0.010*** (0.000)	0.063*** (0.000)
Power distance	0.003 (0.005)	0.294*** (0.000)	0.053*** (0.000)	0.012*** (0.000)	-0.094*** (0.000)	0.057*** (0.000)	0.084*** (0.000)	0.024*** (0.005)	0.228*** (0.000)	0.011*** (0.000)	-0.032*** (0.000)	-0.124*** (0.000)	0.060*** (0.000)	0.037*** (0.000)
Bullied	-0.207*** (0.005)							-0.210*** (0.005)						
School bullied	-0.052** (0.017)							-0.053** (0.017)						
Country bullied	-0.150*** (0.021)							-0.184*** (0.023)						
Teacher support	0.049*** (0.005)							0.048*** (0.005)						
School teacher support	-0.045* (0.020)							-0.026 (0.020)						
Country teacher support	-0.040 (0.030)							0.043 (0.032)						
Teacher interest	0.092*** (0.006)							0.079*** (0.006)						
School teacher interest	0.025 (0.020)							0.01 (0.020)						
Country teacher interest	0.063 (0.034)							0.286*** (0.037)						
Disciplinary climate	0.033*** (0.006)							0.029*** (0.006)						
School disciplinary climate	-0.022 (0.015)							-0.016 (0.015)						
Country disciplinary climate	-0.614*** (0.021)							-0.614*** (0.024)						

Table 3 (continued)

(3)

	Belonging	Country Bullied	Country teacher support	Country teacher interest	Country disciplinary climate	Country cooperation	Country parental involvement
Cooperation	0.174***						
	(0.005)						
School cooperation	0.101***						
	(0.018)						
Country cooperation	0.100***						
	(0.024)						
Parental involvement	0.003						
	(0.004)						
Country parental involvement	0.128***						
	(0.011)						
Constant	-0.045***	0.069***	0.079***	0.084***	0.036***	0.015***	-0.001***
	(0.003)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Includes control variables	No						
Var(e.Belonging)	0.757***						
	(0.008)						
Var(e.Country bullied)	0.082***						
	(0.000)						
Var(e.Country teacher support)	0.028***						
	(0.000)						
Var(e.Country teacher interest)	0.023***						
	(0.000)						

(4)

	Belonging	Country Bullied	Country teacher support	Country teacher interest	Country disciplinary climate	Country cooperation	Country parental involvement
Cooperation	0.164***						
	(0.005)						
School cooperation	0.078***						
	(0.018)						
Country cooperation	0.150***						
	(0.024)						
Parental involvement	-0.002						
	(0.005)						
Country parental involvement	0.149***						
	(0.011)						
Constant	-0.019***	-0.078***	-0.022***	-0.007***	0.042***	0.035***	0.003***
	(0.004)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Includes control variables	Yes						
Var(e.Belonging)	0.743***						
	(0.008)						
Var(e.Country bullied)	0.048***						
	(0.000)						
Var(e.Country teacher support)	0.014***						
	(0.000)						
Var(e.Country teacher interest)	0.012***						
	(0.000)						

Table 3 (continued)

	(3)							(4)						
	Belonging	Country Bullied	Country teacher support	Country teacher interest	Country disciplinary climate	Country cooperation	Country parental involvement	Belonging	Country Bullied	Country teacher support	Country teacher interest	Country disciplinary climate	Country cooperation	Country parental involvement
Var(e. Country disciplinary climate)	0.069*** (0.000)							0.040*** (0.000)						
Var(e. Country cooperation)	0.034*** (0.000)							0.015*** (0.000)						
Var(e. Country parental involvement)	0.163*** (0.000)							0.090*** (0.000)						
N	243,375							243,375						
Discrepancy	-1,544,388.05							-3,953,330.39						
SRMR	0.125							0.034						
CD	0.782							0.991						
Contextual model test	187.82***							123.11***						

*** $p < 0.001$, ** $p < 0.05$, * $p < 0.01$

Survey-weighted standard errors in parentheses

SRMR Standardized root mean squared residual, *CD* Coefficient of determination

School denotes the school average of a student-level variable

Country denotes the country average of a variable

Contextual test refers to the adjusted Wald test of equality of within-school and contextual effects of variables. The table reports the corresponding F statistic

Table 4 Indirect and total effects of individualism and power distance through average country level of mediating variables on school belonging as estimated by models (3) and (4)

	(3)		(4)	
	Total Effect	Indirect Effect	Total Effect	Indirect Effect
Individualism	0.0480***	0.0361***	-0.0470***	-0.0163**
via	(0.0054)	(0.0036)	(0.0085)	(0.0068)
Country bullied		-0.0216***		-0.0519***
		(0.0029)		(0.0066)
Country teacher support		0.0029		-0.0001
		(0.0021)		(0.0001)
Country teacher interest		-0.0031*		0.0168***
		(0.0017)		(0.0022)
Country disciplinary climate		0.0699***		0.0112***
		(0.0025)		(0.0008)
Country cooperation		-0.0082***		-0.0015***
		(0.002)		(0.0003)
Country parental involvement		-0.0038***		0.0093***
		(0.0004)		(0.0008)
Power distance	0.0319***	0.0286***	0.0638***	0.0400***
via	(0.0064)	(0.0060)	(0.0063)	(0.0056)
Country bullied		-0.0441***		-0.0419***
		(0.006)		(0.0053)
Country teacher support		-0.0021		0.0005
		(0.0016)		(0.0003)
Country teacher interest		0.0008*		-0.0092***
		(0.0004)		(0.0012)
Country disciplinary climate		0.0576***		0.0759***
		(0.0021)		(0.003)
Country cooperation		0.0057***		0.0091***
		(0.0014)		(0.0015)
Country parental involvement		0.0108***		0.0056***
		(0.001)		(0.0005)

*** $p < 0.001$, ** $p < 0.05$, * $p < 0.01$

Standard errors in parenthesis

Standard errors for individual indirect effects estimated via bootstrapping with 1,000 iterations

This indicates that the paths of these relationships, namely individualism and power distance with school belonging can vary at different system levels (RQ2).

At the level of individual students who participated in the PISA study, perceived teacher support, teacher interest, and cooperation, are positively correlated with school belonging, while exposure to bullying and parental involvement are negatively correlated with school belonging. When exploring how these variables mediated the relationship between belonging and culture overall (that is, without disentangling student, school and country-level), the indirect relationships between individualism and power distance with belonging were negative, via teacher interest, bullying, disciplinary climate, and cooperation (RQ2). The interplay between country, school and individual factors was nuanced, due to the complex relationship between countries' individualism and power distance with their composition in terms of student and school factors. Conditional on other student, school, and country characteristics, countries with higher levels of individualism have lower average levels of perceived teacher support, disciplinary climate, and cooperation, and higher average levels of exposure to bullying, perceived teacher interest, and parental involvement. Countries with a larger power distance have higher average levels of exposure to bullying, perceived teacher support, cooperation, and parental involvement, and lower average levels of perceived teacher interest and disciplinary climate. Furthermore, evidence of indirect and direct effects of individualism and power distance on school belonging were found at the country level (using country averages, see Table 4). Hence, our study provides some indications that school belonging varies cross-culturally for individualism and power distance, influenced through numerous student and school factors. Teacher support continues to be a consistent predictor of belonging (Allen et al., 2018; Kiefer et al., 2015), and was significantly correlated at

the school level. However, teacher support was not a significant mediator for individualism, indicating that teacher support is not likely to be influenced by a country's promotion of individualistic values. Further to this, countries with a higher average level of teacher support did not necessarily have higher average levels of school belonging. This may suggest that teacher support appears to be bound within the school context, insofar as students' experience of school belonging is associated with the level of teacher support they receive at a school level. Further analysis of the school contextual effect against the country contextual effect indicated that teacher support only correlated with belonging within schools rather than at the country level. This suggests a key difference between past cross-cultural investigations (Chiu et al., 2016; Cortina et al., 2017) which previously assumed that teacher support is relevant to belonging within schools as much as between countries (cross-culturally) which may not be the case.

After controlling for the effects of differences in other country characteristics, countries with higher levels of individualism tend to have lower average levels of belonging. However, in contrast to expectations countries with a larger power distance tend to have higher average levels of belonging. This implies that the initial negative relationships between cultural values on belonging conflate processes at the individual and country levels. This is particularly important for the relationship between belonging and power distance, as the processes influencing school belonging for students within countries (i.e., at the student level) seemed to differ from the processes influencing the relationship between power distance and the country average level of belonging. This is consistent with Mikk et al. (2016), who observed that variables that moved from student-level to country-level could change from being positively correlated with the dependent variable to negatively correlated. Such counter-intuitive changes in the direction of correlation from individual to country level are not unknown (Mikk et al., 2016), and suggest that previous research findings may have conflated the processes at the individual and country levels. It is likely that the processes involved at the individual level are qualitatively different from those at the country level, but clearly more specific research on this relationship is needed.

The complexity of these findings further reinforces that school belonging is a multi-faceted construct with influences at the student, school, and country-level. Our study found evidence to suggest that student and school-levels factors, namely bullying, teacher interest, cooperation, parental involvement, and disciplinary climate are associated with school belonging at the country level (RQ3). These factors shape the link between culture and schools in terms of belonging. There is a complex interplay between school-level and country-level factors in term of belonging, particularly through teacher support, highlighting the importance of evaluating within-school and country-level effects in future research.

Cultural diversity and school belonging

Consistent with our findings, previous research found that immigrant students experienced school belonging differently due to family, school, and cultural factors (Chiu et al., 2012; Mason, 2020). It may be important to distinguish between the 'need to belong' and actual school belonging. While the former is a universal human motivation, the latter is context-dependent and can be influenced by various factors. For instance, in some cultures, the need to belong may be satisfied more through close-knit family ties or religious communities, reducing the emphasis on school belonging.

Previous studies have reported an increasing cultural diversity in countries, and this is often not accounted for when measuring country-level scores for individualism and power distance (Chiu et al., 2012; Mikk et al., 2016). This diversity can further complicate the relationship between the need to belong and school belonging, as different cultural groups may value school belonging to varying extents. Continual research into school belonging could address how students' cultural identity may influence their sense of belonging at school (Mason, 2020); for example, how language barriers may impact belonging (Van der Wildt et al., 2015). Such research would provide a more nuanced understanding of school belonging and could inform strategies to promote it in culturally diverse contexts.

Teacher support and school belonging

Previous studies have investigated teacher rapport (Chiu et al., 2016; Cortina et al., 2017), which is a construct related to teacher support and considers the emotional connection that students develop with teachers. However, the current study used the teacher support construct from the PISA survey, which measured academic but not emotional support. Our findings suggest that students' belonging is less impacted by academic support than by emotional support, a finding that is consistent with previous research (Chhuon & Wallace, 2012; Ibrahim & El Zaatari, 2019). A subsequent study should address the relationship between students' ratings of emotional support from their teachers and their sense of belonging at school to increase construct validity in the teacher support measure. A future study could look specifically at how students belong in the classroom environment of the teacher whom they rate highly in terms of emotional support.

Contributions to the literature

This paper contributes to the belonging literature and builds on Chiu et al. (2016) and Cortina et al. (2017) in three ways. First, it has confirmed the link between culture and school belonging using more recent data, including a larger number of countries. Second, it contemplates multiple

mediators besides teacher support. Finally, it shows that the link between culture, teacher support, and belonging is more nuanced than initially reported, as the relationship between teacher support and belonging within schools is positive, but negative between countries. Hence, the study finds that 65% of the inverse connection between individualism and school belonging can be ascribed to several country-level mediating variables, while 37% of the relationship between power distance and belonging can be explained through the link between the former and multiple country-level mediating variables. As opposed to previous studies that have extensively explored student and school-related factors (Allen et al., 2018; Slaten et al., 2016), this study is one of the few to look at school belonging across multiple countries to infer whether school belonging is culturally specific (Chiu et al., 2016).

Practical contributions

The findings of this study have implications for educational stakeholders, including policy-makers, educators, and school administrators. As the findings suggest, individualism and power distance show a complex relationship with a sense of belonging, depending on whether one is considering country-level or individual-level data. However, what rings true is consistently finding a correlation between teacher support and school belonging. This can be taken as an opportunity for teachers to consider how they might balance priorities around personal agency and autonomy with cultivating a collaborative and cooperative school environment, as well as the level of authoritative versus relational approaches they wish to facilitate with students in their classrooms, dependent on the sociocultural context within with a school is situated. Educators can harness the insights from this study to develop curricula that enrich individualistic competencies while simultaneously building a culture of collaboration and mutual respect. For instance, introducing pedagogical strategies that focus on group projects and teamwork can complement traditional forms of individualised work tasks thus enabling students to become self-reliant yet cognisant of the benefits of working collaboratively.

In terms of advocating for school belonging, the research suggests that the average level of teacher support within schools plays a pivotal role, among other mediating variables. Yet, a higher average level of teacher support did not unequivocally translate into a greater sense of belonging in the findings. This relationship might imply that schools may need to reconsider not just the amount but the way teacher support is provided. Are teacher-student interactions meaningful? This question may require schools to reflect upon and evaluate their processes and teacher professional development opportunities to more effectively foster belonging while respecting individualistic tendencies among students.

Moreover, the impact of cultural factors and the divergence observed in the effects of individualism and power distance across countries strongly advocate for a more nuanced, culturally sensitive approach to education. As societies become increasingly diverse, educational frameworks must be adaptable and considerate of cultural heterogeneity. The tailoring of school belonging initiatives to reflect these multifaceted landscapes could significantly enhance the efficacy of efforts aimed at improving student belongingness.

Limitations and future research

There are some key constraints for generalisability of the present study. First, this study can only make inferences based on associations, and cannot infer any causal relationship. Another constraint was missing data. It is not clear from the OECD (2020) why missing values occurred in students' school belonging ratings; however, one potential explanation is that the PISA survey consists of various forms, so perhaps not all questions were provided to all students, to ensure the questionnaires were short (Akgul et al., 2016; OECD, 2020). The inclusion of additional control variables, such as school-level factors, necessitates the exclusion of countries that did not incorporate school-level questionnaires in their data collection efforts. These countries, predominantly located in the East, exhibit distinct cultural values that may differ significantly from those typically observed in Western societies.

This paper did not study how students experience their own culture and the possible within-country variation in the cultural values. Further research into the trickle-down effect of cultural expectations to the individual-level experience of school belonging would enhance the understanding of the links between culture and school belonging.

Conclusions

Although the effect size of cultural values on school belonging is relatively small, cultural identity on the personal level may still impact a student's experience of school (Butler-Barnes et al., 2015; Faircloth & Hamm, 2005; Murphy & Zirkel, 2015). Future studies could continue to delineate the relationship between personal cultural identity and the experience of belonging at school among adolescents. Overall, this study has demonstrated a novel approach to studying school belonging, one that addresses the potential role of culture (macrosystem) across countries. Since cultures are fluid, educational policymakers might contemplate the cultural expectations imposed on students. They could explore ways to foster a sense of school belonging through adjustments in school climate, teaching methodologies, and educational policies.

Appendix 1

Table 5 Number of students in each country or economy in the sample

Country/economy	Abbreviation	Number of students	Percent	OECD Country
United Arab Emirates	ARE	12,859	5.28	No
Argentina	ARG	4,709	1.93	No
Australia	AUS	7,088	2.91	Yes
Bulgaria	BGR	2,541	1.04	No
Brazil	BRA	3,995	1.64	No
Switzerland	CHE	2,583	1.06	Yes
Chile	CHL	3,261	1.34	Yes
Colombia	COL	4,567	1.88	Yes
Costa Rica	CRI	5,667	2.33	No
Czech Republic	CZE	5,062	2.08	Yes
Germany	DEU	1,455	0.60	Yes
Denmark	DNK	22	0.01	Yes
Spain	ESP	19,251	7.91	Yes
Estonia	EST	4,431	1.82	Yes
Finland	FIN	4,041	1.66	Yes
France	FRA	3,123	1.28	Yes
United Kingdom	GBR	6,613	2.72	Yes
Greece	GRC	4,071	1.67	Yes
Hong Kong	HKG	3,622	1.49	No
Croatia	HRV	4,441	1.82	No
Indonesia	IDN	7,105	2.92	No
Italy	ITA	6,452	2.65	Yes
Kosovo	KSV	2,881	1.18	No
Lithuania	LTU	4,786	1.97	Yes
Luxembourg	LUX	2,531	1.04	Yes
Morocco	MAR	1,323	0.54	No
Mexico	MEX	2,989	1.23	Yes
Malta	MLT	2,522	1.04	No
Malaysia	MYS	5,434	2.23	No
Netherlands	NLD	3,008	1.24	Yes
New Zealand	NZL	4,110	1.69	Yes
Panama	PAN	701	0.29	No
Peru	PER	1,620	0.67	No
Philippines	PHL	5,438	2.23	No
Poland	POL	4,697	1.93	Yes
Portugal	PRT	3,234	1.33	Yes
Qatar	QAT	10,124	4.16	No
B-S-J-Z (China)	QCI	11,727	4.82	No
Moscow Region (RUS)	QMR	1,557	0.64	No
Tatarstan (RUS)	QRT	4,467	1.84	No
Romania	ROU	2,545	1.05	No
Saudi Arabia	SAU	3,153	1.30	No
Singapore	SGP	5,987	2.46	No
Serbia	SRB	4,200	1.73	No
Slovak Republic	SVK	3,579	1.47	Yes
Slovenia	SVN	4,057	1.67	Yes
Chinese Taipei	TAP	5,655	2.32	No
Thailand	THA	7,849	3.23	No
Turkey	TUR	6,083	2.50	Yes
Uruguay	URY	2,194	0.90	No
United States	USA	3,388	1.39	Yes
Vietnam	VNM	4,577	1.88	No

Appendix 2

Table 6 Additional mediating and control variables included in the analysis

Variable	Variable of origin	Notes	Internal Consistency (Cronbach's α)
Student-level variables			
Female	ST004D01T – Student (Standardized) Gender		
Migration status	IMMIG—Index Immigration status – Native, first generation or second generation immigrant		
ESCS	ESCS- Index of economic, social and cultural status	This index is based on each participant's highest parental occupation, parental education and possessions in the home (approximate number of books). A higher score on the ESCS index reflects a higher socioeconomic status	.58
Age	AGE		
Grade	GRADE—Grade compared to modal grade in country		
Self-concept	SCREADCOMP—Self-concept of reading: Perception of competence (WLE)	Student's perceptions about their reading abilities based on three items: "I am a good reader", "I am able to understand difficult texts" and "I read fluently"	.76
Teacher interest	TEACHINT-Perceived teacher's interest (WLE)	Student's perceived teacher's interest in teaching based on four items: "It was clear to me that the teacher liked teaching us", "the enthusiasm of the teacher inspired me", "it was clear that the teacher likes to deal with the topic of the lesson", and "the teacher showed enjoyment in teaching". This variable was not collected in Canada	.87
Cooperation	PERCOOP – Perception of cooperation at school (WLE)	Student's perceived cooperation at school based on the following three items: "Students seem to value cooperation", "it seems that students are cooperating with each other", and "students seem to share the feeling that cooperating with each other is important". This variable was not collected in Canada	.89
Bullied	BEINGBULLIED – Exposure to bullying	Student's self-reported experiences of bullying at school in the last 12 months using the following items: "Other students left me out of things on purpose", "other students made fun of me" and "I was threatened by other students"	.76
Disciplinary climate	DISCLIMA – Disciplinary climate in test language lessons (WLE)	Student's perception of a disruptive disciplinary climate in their language lesson based on five items: "Students don't listen to what the teacher says","there is noise and disorder", "the teacher has to wait a long time for students to quiet down", "students cannot work well", and "students don't start working for a long time after the lesson begins"	.85
School-level variables			
Private	SCHLTYPE – School Ownership: Private independent, private government-dependent or public	Since not all countries have the two types of private school (private independent and private government-dependent), all private schools were grouped in a single category	

Table 6 (continued)

Variable	Variable of origin	Notes	Internal Consistency (Cronbach's α)
Staff shortages	STAFFSHORT—Shortage of educational staff (WLE)	Principal's perception of the following four issues as barriers for instruction: "A lack of teaching staff", "inadequate or poorly qualified teaching staff", "a lack of assisting staff", and "inadequate or poorly qualified assisting staff"	.75
Teacher behaviour	TEACHBEHA-Teacher behaviour hindering learning (WLE)	School principal's perception of teacher's behaviour hindering student learning based on five items: "Teachers not meeting individual students' needs", "teacher absenteeism", "staff resisting change", "teachers being too strict with students", and "teachers not being well prepared for classes"	.81
Parental involvement	SC064Q01TA – Proportion of parents: Discussed their child's progress with a teacher on their own initiative	This variable is reported by the school principal. It was not collected in Austria	
Equity policies	SC150Q01IA – These students attend regular classes and receive additional periods of instruction aimed at developing < test language > skills (e.g. reading literacy, grammar, vocabulary, communication) SC150Q02IA – Before transferring to regular classes, these students attend a preparatory programme aimed at developing < test language > skills (e.g. reading literacy, grammar, vocabulary, communication), SC150Q03IA – Before transferring to regular classes, these students receive some instruction in school subjects through their < heritage language > , SC150Q04IA – These students receive significant amounts of instruction in their < heritage language > aimed at developing proficiency in both languages. And SC150Q05IA- Class size is reduced to cater to the special needs of these students	Number of options offered to students whose heritage language is not the test language, from the options in the five questions, as reported by the principal	
Extracurricular activities	CREACTIV – Creative extra-curricular activities (Sum)	Total number of the activities available at School from the following options: "band, orchestra or choir"; "school play or school musical"; and "art club or art activities"	
Certified teachers	PROATCE – Index proportion of all teachers fully certified	Number of fully certified teachers divided by the total number of teachers	
Material shortage	EDUSHORT – Shortage of educational material (WLE)	Scale based on the principal's perception of the following four issues hindering the school's capacity to provide instruction: "A lack of educational material (e.g. textbooks, IT equipment, library or laboratory material)", "inadequate or poor quality educational material (e.g. textbooks, IT equipment, library or laboratory material)", "a lack of physical infrastructure (e.g. building, grounds, heating/cooling, lighting and acoustic systems)", and "inadequate or poor quality physical infrastructure (e.g. building, grounds, heating/cooling, lighting and acoustic systems)"	.84

Table 6 (continued)

Variable	Variable of origin	Notes	Internal Consistency (Cronbach's α)
Country-level variables			
HDI	Human Development Index 2018	The Human Development Index is calculated using each country's life expectancy at birth, expected years of schooling, mean years of schooling and the gross national income (GNI) per capita. This is used as an indicator of the state of development of a country. Source: United Nations Development Program (2023)	
Duration of comp. education	SE.COM.DURS – Years of compulsory education in 2018	Source: The World Bank (2023)	
Education expenditure	SE.XPD.TOTL.GD.ZS – Government expenditure on education, total (% of GDP) in 2018	Source: The World Bank (2023) Qatar is the only country with missing data for this variable that is not missing from the culture variables, but it has data in 2017 and 2019. The observation used here corresponds to the average to fill the gap	
Primary start	SE.PRM.AGES – Primary school starting age	Source: The World Bank (2023)	
Gini	YRSI_POV_GINI -Gini Index	The Gini index is an indicator of inequality. A higher level indicates a more unequal economy. The main source for this variable is The World Bank (2023), measured in 2018. However, this is not consistently reported across countries had to be complemented with the most recent available data from different sources for the following countries: • Chile: The World Bank (2023), Gini coefficient for 2017 • Japan, Korea and New Zealand: 2018 Gini coefficient reported by OECD (2023) • Hong Kong: 2016 Gini Index from as reported by International Monetary Fund. (2019) • Lebanon: 2014 Gini coefficient calculated by Saliba, Sayegh, and Salman (2017) • Morroco: The World Bank (2023) Gini coefficient for 2013 • Qatar: Gini index calculated by the Qatari Ministry of Development Planning and Statistics using 2012/13 data • Saudi Arabia: 2013 Gini coefficient reported by the CIA • Singapore: 2018 Gini coefficient based on equivalised household income from work (including employer CPF Contributions) before accounting for government transfers and taxes (based on modified OECD scale) by Department of Statistics Singapore (2023)	

Internal consistency for scales for each country/economy was calculated by the OECD (2017b). This table reports the average internal consistency across countries in the technical report

Appendix 3

Table 7 Full estimation results for models (1) and (2)

	(1) Belonging	(1) Bullied	(1) Teacher support	(1) Teacher interest	(1) Disciplinary climate	(1) Cooperation	(1) Parental involvement	(2) Belonging	(2) Bullied	(2) Teacher support	(2) Teacher interest	(2) Disciplinary climate	(2) Cooperation	(2) Parental involvement
Individualism	0.037*** (0.005)	0.135*** (0.006)	-0.069*** (0.005)	-0.047*** (0.005)	-0.111*** (0.005)	-0.069*** (0.005)	-0.017*** (0.000)	-0.063*** (0.007)	0.309*** (0.008)	0.01 (0.007)	0.059*** (0.007)	-0.029*** (0.007)	-0.033*** (0.007)	0.007*** (0.001)
Power distance	0.025*** (0.004)	0.287*** (0.005)	0.043*** (0.004)	0.001 (0.004)	-0.097*** (0.004)	0.062*** (0.004)	0.086*** (0.000)	0.057*** (0.005)	0.230*** (0.006)	-0.001 (0.005)	-0.051*** (0.005)	-0.139*** (0.005)	0.053*** (0.005)	0.035*** (0.001)
Bullied	-0.217*** (0.004)							-0.213*** (0.004)						
Teacher support	0.043*** (0.005)							0.044*** (0.005)						
Teacher interest	0.093*** (0.006)							0.082*** (0.006)						
Disciplinary climate	0.005 (0.005)							0.014** (0.005)						
Cooperation	0.184*** (0.005)							0.174*** (0.005)						
Parental involvement	-0.012** (0.004)							-0.010* (0.004)						
Female								-0.036*** (0.004)	-0.106*** (0.005)	0.001 (0.005)	0.017*** (0.004)	0.038*** (0.005)	-0.025*** (0.005)	-0.012** (0.004)
Immigrant								-0.006 (0.009)	-0.015 (0.009)	0.007 (0.009)	0.023** (0.008)	0.045*** (0.009)	0.026** (0.009)	0.002 (0.006)
ESCS								0.039*** (0.005)	-0.033*** (0.005)	-0.026*** (0.005)	0.001 (0.005)	0.028*** (0.005)	0.031*** (0.005)	0.091*** (0.004)
Age								0.000 (0.004)	-0.023*** (0.006)	-0.019*** (0.005)	-0.006 (0.005)	-0.006 (0.005)	-0.017*** (0.005)	-0.029*** (0.004)
Grade								0.005 (0.004)	-0.023*** (0.006)	0.001 (0.005)	0.017*** (0.005)	0.046*** (0.006)	0.032*** (0.005)	0.024*** (0.003)
Self-concept								0.092*** (0.005)	-0.031*** (0.006)	0.107*** (0.005)	0.198*** (0.005)	0.108*** (0.006)	0.156*** (0.005)	-0.001 (0.005)
Private								0.025*** (0.005)	0.022*** (0.006)	0.040*** (0.005)	0.047*** (0.005)	-0.020*** (0.005)	0.032*** (0.005)	-0.012*** (0.001)
Staff shortages								0.007 (0.005)	-0.039*** (0.006)	0 (0.005)	-0.006 (0.005)	0.015* (0.006)	-0.008 (0.006)	-0.056*** (0.001)
Teacher behaviour								-0.010* (0.004)	-0.024*** (0.005)	-0.035*** (0.004)	-0.018*** (0.004)	-0.013** (0.005)	-0.012** (0.005)	-0.078*** (0.001)
Equity policies								-0.003 (0.004)	0.047*** (0.005)	0.005 (0.004)	0.004 (0.004)	-0.012** (0.004)	0.004 (0.004)	0.056*** (0.000)
Extracurricular activities								-0.009* (0.004)	-0.022*** (0.005)	-0.006 (0.005)	0.010* (0.004)	0.042*** (0.005)	0.027*** (0.005)	0.089*** (0.001)

Table 7 (continued)

	(1)							(2)						
	Belonging	Bullied	Teacher support	Teacher interest	Disciplinary climate	Cooperation	Parental involvement	Belonging	Bullied	Teacher support	Teacher interest	Disciplinary climate	Cooperation	Parental involvement
Certified teachers								-0.004	0.009	-0.002	-0.009	0.008	0.020***	0.018***
								(0.004)	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)	(0.001)
Material shortage								0.006	0.077***	0.020***	0.030***	-0.032***	-0.006	-0.070***
								(0.005)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.001)
HDI								0.065***	-0.174***	-0.102***	-0.142***	-0.127***	-0.025***	-0.226***
								(0.005)	(0.006)	(0.005)	(0.005)	(0.005)	(0.006)	(0.002)
Duration of comp. education								0.105***	0.056***	-0.039***	-0.069***	-0.141***	-0.061***	0.051***
								(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.001)
Primary start								0.046***	-0.01	-0.075***	-0.047***	-0.063***	0.026***	-0.219***
								(0.005)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.001)
Education expenditure								0.059***	-0.113***	-0.022***	-0.045***	-0.071***	-0.099***	-0.101***
								(0.005)	(0.006)	(0.006)	(0.005)	(0.005)	(0.006)	(0.001)
Gini								-0.080***	0.031***	0.125***	0.094***	-0.012*	0	-0.199***
								(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.001)
Constant	-0.078***	0.078***	0.087***	0.092***	0.044***	0.004	-0.005***	-0.022***	-0.076***	-0.025***	-0.009*	0.049***	0.031***	0.005***
	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)	(0.005)	(0.000)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.001)
Var(e. Belonging)	0.770***							0.750***						
	(0.008)							(0.008)						
Var(e. Bullied)	1.067***							1.013***						
	(0.008)							(0.007)						
Var(e. Teacher interest)	0.881***							0.854***						
	(0.005)							(0.006)						
Var(e. Teacher support)	0.894***							0.841***						
	(0.006)							(0.005)						
Var(e. Disciplinary climate)	0.927***							0.878***						
	(0.007)							(0.006)						
Var(e. Cooperation)	0.942***							0.896***						
	(0.005)							(0.005)						
Var(e. Parental involvement)	1.012***							0.900***						
	(0.000)							(0.001)						
N	243,375							243,375						
Discrepancy	-1,479,237.89							-4,165,050.49						
SRMR	0.105							0.032						
CD	0.087							0.375						

*** $p<0.001$, ** $p<0.05$, * $p<0.01$

Survey-weighted standard errors in parentheses

SRMR Standardized root mean squared residual, *CD* Coefficient of determination

Table 8 Full estimation results for models (3) and (4)

	(3)							(4)						
	Belonging	Bullied	Teacher support	Teacher interest	Disciplinary climate	Cooperation	Parental involvement	Belonging	Bullied	Teacher support	Teacher interest	Disciplinary climate	Cooperation	Parental involvement
Individualism	0.012*	0.144***	-0.072***	-0.049***	-0.114***	-0.082***	-0.030***	-0.031***	0.282***	-0.003***	0.059***	-0.018***	-0.010***	0.063***
	(0.006)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.007)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Powerdistance	0.003	0.294***	0.053***	0.012***	-0.094***	0.057***	0.084***	0.024***	0.228***	0.011***	-0.032***	-0.124***	0.060***	0.037***
	(0.005)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.005)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Bullied	-0.207***							-0.210***						
	(0.005)							(0.005)						
School bullied	-0.052**							-0.053**						
	(0.017)							(0.017)						
Country bullied	-0.150***							-0.184***						
	(0.021)							(0.023)						
Teacher support	0.049***							0.048***						
	(0.005)							(0.005)						
School teacher support	-0.045*							-0.026						
	(0.020)							(0.020)						
Country teacher support	-0.04							0.043						
	(0.030)							(0.032)						
Teacher interest	0.092***							0.079***						
	(0.006)							(0.006)						
School teacher interest	0.025							0.01						
	(0.020)							(0.020)						
Country teacher interest	0.063							0.286***						
	(0.034)							(0.037)						
Disciplinary climate	0.033***							0.029***						
	(0.006)							(0.006)						
School disciplinary climate	-0.022							-0.016						
	(0.015)							(0.015)						
Country disciplinary climate	-0.614***							-0.614***						
	(0.021)							(0.024)						

Table 8 (continued)

	(3)							(4)						
	Belonging	Bullied	Teacher support	Teacher interest	Disciplinary climate	Cooperation	Parental involvement	Belonging	Bullied	Teacher support	Teacher interest	Disciplinary climate	Cooperation	Parental involvement
Cooperation	0.174*** (0.005)							0.164*** (0.005)						
School cooperation	0.101*** (0.018)							0.078*** (0.018)						
Country cooperation	0.100*** (0.024)							0.150*** (0.024)						
Parental involvement	0.003 (0.004)							-0.002 (0.005)						
Country parental involvement	0.128*** (0.011)							0.149*** (0.011)						
Female								-0.039*** (0.004)	0.000 (0.001)	0.000 (0.000)	0.000 (0.000)	-0.003*** (0.001)	-0.001*** (0.000)	-0.004*** (0.001)
Immigrant								-0.004 (0.009)	0.014*** (0.001)	0.011*** (0.000)	0.014*** (0.000)	0.008*** (0.001)	-0.001** (0.001)	0.006*** (0.001)
ESCS								0.037*** (0.005)	-0.024*** (0.001)	-0.008*** (0.000)	0.002*** (0.000)	0.013*** (0.001)	-0.006*** (0.000)	0.011*** (0.001)
Age								-0.003 (0.004)	-0.024*** (0.001)	-0.005*** (0.000)	-0.003*** (0.000)	-0.005*** (0.001)	-0.004*** (0.000)	-0.022*** (0.001)
Grade								0.009* (0.004)	0.033*** (0.001)	0.003*** (0.000)	0.002*** (0.000)	0.007*** (0.000)	0.004*** (0.000)	0.021*** (0.001)
Self-concept								0.092*** (0.005)	0.009*** (0.001)	0.009*** (0.000)	0.005*** (0.000)	0.004*** (0.001)	0.013*** (0.000)	-0.001 (0.001)
Private								0.009 (0.005)	0.032*** (0.000)	0.013*** (0.000)	0.012*** (0.000)	-0.035*** (0.000)	0.015*** (0.000)	-0.049*** (0.000)
Staff shortages								0.008 (0.005)	-0.035*** (0.000)	0.001*** (0.000)	-0.005*** (0.000)	0.018*** (0.000)	0.002*** (0.000)	0.023*** (0.000)
Teacher behaviour								-0.007 (0.004)	-0.018*** (0.000)	-0.008*** (0.000)	0.005*** (0.000)	0.015*** (0.000)	0.000*** (0.000)	0.013*** (0.000)

Table 8 (continued)

(3)

	Belonging	Bullied	Teacher support	Teacher interest	Disciplinary climate	Cooperation	Parental involvement
Equity policies							
Extracurricular activities							
Certified teachers							
Material shortage							
HDI							
Duration of comp. education							
Primary start							
Education expenditure							
Gini							
Constant	-0.045*** (0.003)	0.069*** (0.000)	0.079*** (0.000)	0.084*** (0.000)	0.036*** (0.000)	0.015*** (0.000)	-0.001*** (0.000)
Var(e. Belonging)	0.757*** (0.008)						
Var(e. Country bullied)	0.082*** (0.000)						
Var(e. Country teacher support)	0.028*** (0.000)						

(4)

	Belonging	Bullied	Teacher support	Teacher interest	Disciplinary climate	Cooperation	Parental involvement
Equity policies	-0.005 (0.004)	0.041*** (0.000)	0.011*** (0.000)	0.013*** (0.000)	-0.005*** (0.000)	0.014*** (0.000)	0.008*** (0.000)
Extracurricular activities	-0.005 (0.004)	0.006*** (0.000)	0.004*** (0.000)	0.010*** (0.000)	0.025*** (0.000)	0.014*** (0.000)	0.015*** (0.000)
Certified teachers	0.000 (0.004)	0.017*** (0.000)	0.007*** (0.000)	-0.001*** (0.000)	0.014*** (0.000)	0.005*** (0.000)	0.037*** (0.000)
Material shortage	0.005 (0.005)	0.053*** (0.000)	0.010*** (0.000)	0.014*** (0.000)	-0.028*** (0.000)	0.006*** (0.000)	-0.040*** (0.000)
HDI	0.031*** (0.005)	-0.185*** (0.000)	-0.097*** (0.000)	-0.117*** (0.000)	-0.098*** (0.000)	0.007*** (0.000)	-0.212*** (0.000)
Duration of comp. education	0.067*** (0.005)	0.061*** (0.000)	-0.037*** (0.000)	-0.067*** (0.000)	-0.134*** (0.000)	-0.068*** (0.000)	0.026*** (0.000)
Primary start	0.050*** (0.005)	0.005*** (0.000)	-0.071*** (0.000)	-0.052*** (0.000)	-0.075*** (0.000)	0.016*** (0.000)	-0.241*** (0.000)
Education expenditure	0.055*** (0.005)	-0.087*** (0.000)	-0.032*** (0.000)	-0.071*** (0.000)	-0.094*** (0.000)	-0.134*** (0.000)	-0.170*** (0.000)
Gini	-0.084*** (0.006)	0.023*** (0.000)	0.122*** (0.000)	0.099*** (0.000)	-0.008*** (0.000)	0.008*** (0.000)	-0.180*** (0.000)
Constant	-0.019*** (0.004)	-0.078*** (0.000)	-0.022*** (0.000)	-0.007*** (0.000)	0.042*** (0.000)	0.035*** (0.000)	0.003*** (0.000)
Var(e. Belonging)	0.743*** (0.008)						
Var(e. Country bullied)	0.048*** (0.000)						
Var(e. Country teacher support)	0.014*** (0.000)						

Table 8 (continued)

	(3)							(4)						
	Belonging	Bullied	Teacher support	Teacher interest	Disciplinary climate	Cooperation	Parental involvement	Belonging	Bullied	Teacher support	Teacher interest	Disciplinary climate	Cooperation	Parental involvement
Var(e. Country teacher interest)	0.023*** (0.000)							0.012*** (0.000)						
Var(e. Country disciplinary climate)	0.069*** (0.000)							0.040*** (0.000)						
Var(e. Country cooperation)	0.034*** (0.000)							0.015*** (0.000)						
Var(e. Country parental involvement)	0.163*** (0.000)							0.090*** (0.000)						
N	243,375							243,375						
Discrepancy	-1,544,388.05							-3,953,330.39						
SRMR	0.125							0.034						
CD	0.782							0.991						
Contextual model test	187.82***							123.11***						

*** $p < 0.001$, ** $p < 0.05$, * $p < 0.01$

Survey-weighted standard errors in parentheses

SRMR Standardized root mean squared residual, *CD* Coefficient of determination

School denotes the school average of a student-level variable

Country denotes the country average of a variable

Contextual test refers to the adjusted Wald test of equality of within-school and contextual effects of variables. The table reports the corresponding F statistic

Appendix 4: Variable technical parameters
Sense of belonging

The following tables reproduce OECD's (2020) results from scale building and reliability analysis for relevant variables included in this paper. The table numbers correspond to the tables in such report.

Table 9 Item parameters for Subjective well-being—Sense of belonging to school (BELONG)

Item	Thinking about your school: to what extent do you agree with the following statements?	beta	d_1	d_2	d_3	alpha
ST034Q01TA	I feel like an outsider (or left out of things) at school	0.02487	0.67853	0.30607	-0.98459	1.32403
ST034Q02TA	I make friends easily at school	-0.02813	1.19635	0.60206	-1.79841	0.61848
ST034Q03TA	I feel like I belong at school	0.12458	1.23104	0.64173	-1.87276	0.57363
ST034Q04TA	I feel awkward and out of place in my school	0.00983	0.79867	0.29469	-1.09336	1.22995
ST034Q05TA	Other students seem to like me	0.05579	1.29237	0.91268	-2.20506	0.59009
ST034Q06TA	I feel lonely at school	-0.07933	0.61445	0.24943	-0.86389	1.66382

Teacher support

Table 10 Item parameters for Teacher support in test language lessons (TEACHSUP)

Item	How often do these things happen in your < test language lessons > ?	beta	d_1	d_2	d_3	alpha
ST100Q01TA	The teacher shows an interest in every student's learning	0.00057	1.14721	-0.05161	-1.0956	0.69624
ST100Q02TA	The teacher gives extra help when students need it	-0.00628	1.1914	-0.06185	-1.12956	0.99848
ST100Q03TA	The teacher helps students with their learning	-0.03142	1.05191	-0.01683	-1.03508	1.4817
ST100Q04TA	The teacher continues teaching until the students understand	0.06365	1.14751	-0.09008	-1.05743	0.82358

Because of poor scale quality compared with other groups, data from Ukraine were not included in scaling

Teacher interest (AKA Teacher Enthusiasm)

Table 11 Item parameters for Perceived teacher's interest (TEACHINT)

Item	Thinking of your past two <test language lessons > : how much do you disagree or agree with the following statements?	beta	d_1	d_2	d_3	alpha
ST213Q01HA	It was clear to me that the teacher liked teaching us	-0.01579	1.49452	0.55649	-2.05102	1.03423
ST213Q02HA	The enthusiasm of the teacher inspired me	0.4046	1.81162	0.27765	-2.08927	0.82917
ST213Q03HA	It was clear that the teacher likes to deal with the topic of the lesson	-0.23267	1.60729	0.64304	-2.25033	0.96608
ST213Q04HA	The teacher showed enjoyment in teaching	-0.08062	1.50229	0.42711	-1.92939	1.17052
Item	Groups with unique parameters	beta	d_1	d_2	d_3	alpha
ST213Q02HA	Malaysia (Malay)	-0.47893	1.43383	0.53258	-1.96641	1.01257

Bullying

Table 12 Item parameters for Student's experience of being bullied (BEINGBULLIED)

Item	During the past 12 months, how often have you had the following experiences in school?	beta	d_1	d_2	d_3	alpha
ST038Q03NA	Other students left me out of things on purpose	0.05406	0.64837	-0.09935	-0.54902	0.88999
ST038Q04NA	Other students made fun of me	-0.30441	0.76604	-0.1472	-0.61884	1.09984
ST038Q05NA	I was threatened by other students	0.2838	0.38788	0.1969	-0.58478	1.01017

Because of poor scale quality compared with other groups, data from Korea were not included in scaling

12 Disciplinary climate

Table 13 Item parameters for Disciplinary climate in test language classes (TCDISCLIMA)

Item	How often do these things happen in your <test language lessons>?	beta	d_1	d_2	d_3	alpha
TC170Q01HA	Many students don't listen to what I say	0.0193	1.5202	0.88813	-2.40833	0.91301
TC170Q02HA	There is noise and disorder	-0.10124	1.40078	0.65905	-2.05983	1.14684
TC170Q03HA	I have to wait a long time for students to quiet down	-0.14797	1.30145	0.52559	-1.82703	1.13305
TC170Q04HA	Students cannot work well	-0.2493	1.7065	0.76074	-2.46724	0.903
TC170Q05HA	Students don't start working for a long time after the lesson begins	-0.32817	1.38044	0.52319	-1.90363	1.09405
Item	Groups with unique parameters	beta	d_1	d_2	d_3	alpha
TC170Q04HA	Albania (Albanian)	0.87676	2.20409	1.33504	-3.53913	0.71305
TC170Q04HA	Spain (Spanish, Basque, Galician, Valencian)	-0.54508	1.35739	0.49618	-1.85358	1.31372
TC170Q04HA	Hong Kong (China) (Chinese)	0.87676	2.20409	1.33504	-3.53913	0.71305
TC170Q04HA	Korea (Korean)	-0.32222	1.2385	0.3991	-1.63761	1.54983
TC170Q04HA	Azerbaijan (Baku city only) (Azeri, Russian)	0.87676	2.20409	1.33504	-3.53913	0.71305
TC170Q05HA	Hong Kong (China) (Chinese)	0.26379	1.8171	1.00155	-2.81865	0.85033

Cooperation individualism

Table 14 Item parameters for Perception of cooperation at school (PERCOOP)

Item	Think about your school: how true are the following statements?	beta	d_1	d_2	d_3	alpha
ST206Q01HA	Students seem to value cooperation	0.1638	3.04096	0.14748	-3.18844	0.82221
ST206Q02HA	It seems that students are cooperating with each other	-0.08958	3.05083	0.15547	-3.2063	1.26398
ST206Q03HA	Students seem to share the feeling that cooperating with each other is important	-0.02347	3.06693	0.18801	-3.25494	0.91381

Item parameters for Perception of cooperation at school (PERCOOP)

Item	Think about your school: how true are the following statements?	beta	d_1	d_2	d_3	alpha
ST206Q01HA	Students seem to value cooperation	0.1638	3.04096	0.14748	-3.18844	0.82221
ST206Q02HA	It seems that students are cooperating with each other	-0.08958	3.05083	0.15547	-3.2063	1.26398
ST206Q03HA	Students seem to share the feeling that cooperating with each other is important	-0.02347	3.06693	0.18801	-3.25494	0.91381

Table 15 Item parameters for Current parental support for learning at home (CURSUPP)

Item	How often do you or someone else in your home do the following things with your child?	beta	d_1	d_2	d_3	d_4	alpha
PA003Q01TA	Discuss how well my child is doing at school	-0.51196	0.10453	0.36461	-0.03193	-0.43721	1.1295
PA003Q02TA	Eat < the main meal > with my child around a table	-0.81531	-1.25081	0.35189	0.68509	0.21382	0.6706
PA003Q03TA	Spend time just talking to my child	-0.55495	-0.08315	0.44153	0.07422	-0.43259	1.42461
PA003Q04HA	Help my child with his/her reading and writing homework	0.45705	-0.2925	0.70442	0.13403	-0.54595	0.84693
PA003Q05IA	Discuss political or social issues	0.35233	-0.14988	0.86658	0.05802	-0.77473	0.72586
PA003Q06IA	Go to a bookstore or library with my child	0.94737	0.61031	0.40577	-0.5756	-0.44048	0.9379
PA003Q07IA	Talk with my child about what he/she is reading on his/her own	0.30385	0.2638	0.39791	-0.21413	-0.44757	1.26459
Item	Groups with unique parameters	beta	d_1	d_2	d_3	d_4	alpha
PA003Q01TA	Germany (German)	-0.26093	0.23223	0.65658	-0.13479	-0.75402	1.29885
PA003Q01TA	Luxembourg (German)	-0.26093	0.23223	0.65658	-0.13479	-0.75402	1.29885
PA003Q03TA	Germany (German)	-0.47366	-0.1986	0.28445	0.04179	-0.12763	3.40154

Declarations

Ethical approval This article does not contain any studies involving human and animals performed by any of the authors.

Conflict of interest All authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

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