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The interplay between teacher empathy, students' sense of school belonging, and learning achievement

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Abstract
Teacher empathy has become an essential topic in educational research for enhancing students' learning achievement. However, most existing studies focused on the direct relationship between teacher empathy and students' learning achievement. They ignored the mediation of student factors (e.g., students' sense of school belonging) between teacher empathy and learning achievement. Among the few studies that included sense of school belonging, most were based on classroom-based observations, which render the generalizability of their findings uncertain. The present study was designed to investigate the relationship between teacher empathy, students' sense of school belonging, and learning achievement with data from the Programme for International Student Assessment (PISA) 2018 generated by 506,317 15-year-olds from 75 countries/territories (mean age = 15.79, SD = 0.29; 51% girls). Results of multilevel structural equation modeling showed that teacher empathy was positively related to reading achievement directly and indirectly through students' sense of school belonging. Specifically, students' sense of school belonging mediated 29% of the total effect of teacher empathy on reading achievement. These results have theoretical implications for future research in teacher empathy on the importance of simultaneously including other student features, such as students' cognitive and emotional differences. The results also have practical implications for teacher training on raising teachers' attention to student emotions during reading instruction.

Keywords Mediation · Multilevel modeling · School belonging · Teacher empathy

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Introduction

Teacher empathy plays a vital role in supporting students' emotional, cognitive, and behavioral development (Berkovich, 2020; Ibrahim & El Zaatari, 2020; Rogers, 2002). However, teacher empathy does not automatically ensure student learning. Instead, it may depend on student characteristics, such as their learning motivation and sense of school belonging (hereafter shortened as school belonging) (Vargas-Madriz & Konishi, 2021). Among these characteristics, school belonging has caught much attention from educational researchers (Allen, Slaten, et al., 2021; Goodenow & Grady, 1993). However, studies examining the interconnection between teacher empathy and school belonging are scant (Bullough, 2019).

The present study aimed to investigate the interplay between teacher empathy, school belonging, and learning achievement, with an emphasis on the mediating role of school belonging between teacher empathy and learning achievement. We used the data of the Programme for International Student Assessment (PISA) 2018 (OECD, 2019a) produced by adolescents from 75 countries/territories to achieve our goal.

Teacher empathy and learning achievement

Teacher empathy refers to the degree to which teachers attend and respond to students' emotions, thoughts, situations, and needs (Meyers et al., 2019). According to Rogers (2002), an emphasis on teacher empathy can drive an education revolution by shifting the centrality of education from teachers to students (Feshbach & Feshbach, 2009). The importance of teacher empathy receives consensus among teachers and researchers for its capacity to enhance teacher-student interaction and teaching effectiveness (Berkovich, 2020). For example, in a recent social-emotional learning (SEL) program, teacher empathy has been included as one of the social-emotional skills (Berkovich, 2020). In a meta-analysis synthesizing 119 studies (Cornelius-White, 2007), teacher empathy was found to be positively associated with students learning outcomes ($r = 0.31$).

The literature has identified three aspects of teacher empathy: affect, cognition, and behavior (Meyers et al., 2019). The affective element requires teachers to connect and respond emotionally to students' feelings or situations. The cognitive part denotes the ability to think from students' perspectives (also known as perspective-taking). The behavioral element refers to teachers' concerns and caring for students, for example, providing comfort and support (Jaber et al., 2018; Meyers et al., 2019).

Self-determination theory contends that children's motivation can be elevated when three basic needs are satisfied: relatedness, competence, and autonomy (Deci et al., 1991). As shown in a meta-analysis (Roorda et al., 2011), the satisfaction of these needs is positively associated with teacher empathy. Studies have shown that when students perceive their teachers are willing to care about their feelings, understand their opinions, and respond to their needs, they will experience higher learning motivation and engagement (Arghode et al., 2013). On the contrary, if students find their teachers merely complete instructional tasks without trying to connect with them empathically, they are likely to be demotivated and disengaged (Wallace et al., 2012).

Teacher empathy is also prioritized in many other teaching paradigms, such as formative assessment (Cowie & Bell, 1999), responsive teaching (Henriksen et al., 2018; Robertson et al., 2015), and design thinking (Henriksen et al., 2018). Studies in formative

assessment suggested that students achieve more if instructors' feedback necessitates a certain degree of empathy (Cowie & Bell, 1999). Responsive teaching encourages teachers to go beyond judging students' opinions to discern potential values and seek the connection between students' thinking and disciplinary concepts (Robertson et al., 2015). All these empathetic approaches help teachers adjust their teaching goals, plans, or activities, which in turn helps maximize students' learning outcomes (Robertson et al., 2015).

Design thinking is a newly welcomed pedagogical paradigm owing to the analogy between teachers and designers. Both professions often face multifaceted problems without a correct solution (Henriksen et al., 2018). Models of design thinking designate empathy as a prerequisite. Teachers should seek to understand specific situations students face, enabling teachers to articulate the exact problem as the basis for generating and implementing innovative teaching solutions (Henriksen et al., 2018). According to design thinking researchers, teachers with low empathy tend to blame students for their undesirable behaviors. In contrast, empathic teachers are inclined to ascribe problematic behaviors to non-deprecating reasons (e.g., excessive family responsibilities and fear of failure) and more likely to pinpoint and resolve learning barriers than demotivating (Meyers et al., 2019).

Incongruity also emerges in the literature despite the positive relevance of teacher empathy to learning achievement. Bostic (2014) examined the correlation between teacher empathy and students' English reading scores. Participants involved 27 teachers and 1861 students from eighth and eleventh grades in an urban school district in the USA. Results of multiple regression showed an insignificant correlation between teacher empathy and student scores (Bostic, 2014). Bostic reflected that the non-significance might be due to the small sample size of teachers and the measurement quality related to teacher empathy and learning achievement.

This brief review above suggests that teacher empathy has received wide popularity in different paradigms for its importance in predicting learning outcomes. However, most existent studies examined teacher empathy from the intrapersonal perspective (Berkovich, 2020). Such an approach assumes that once executed, teacher empathy can automatically transmit its facilitating effect to students. Studies that emphasize the interpersonal perspective are yet to come by considering the characteristics of the recipients, that is, students' sense of school belonging (Goodenow & Grady, 1993).

School belonging and learning achievement

Varied terms have emerged akin to school belonging, for example, school connectedness, school attachment, and school bonding (Allen et al., 2021). A well-accepted definition was provided by Goodenow and Grady (1993). They conceptualized school belonging as "the extent to which students feel personally accepted, respected, included, and supported by others—especially teachers and other adults in the school social environment" (pp. 60–61). School belonging is a socially grounded experience that integrates different components, including school-related involvement, relationship with teachers and fellow students, and general perception of the school (Goodenow & Grady, 1993; Ibrahim & El Zaatari, 2020). Since schools make up a large proportion of adolescents' time and serve as a central context for their social and academic activities, school belonging is inextricably bound up with the youth's overall development (Allen et al., 2021; Vargas-Madriz & Konishi, 2021).

Motivational theories such as Maslow's hierarchy of needs (Maslow, 1943) and the belongingness hypothesis (Baumeister et al., 2002) identify the sense of belonging as a fundamental motivator of the human impulse to build and maintain interpersonal

relationships. Pursuing a sense of school belonging is thus not only a natural tendency but also a necessity for fulfilling students' psychological needs (Baumeister et al., 2002). It has been documented that school belonging is related to favorable social and emotional outcomes, including mental health (Rose et al., 2017), transition adjustment, adaption (Kuo & Yang, 2019), and self-efficacy (Tannert & Gröschner, 2021). Previous research has revealed that an increase in students' sense of school belonging leads to a decline in undesirable outcomes, such as mental disorders (Wagle et al., 2021; Zhang et al., 2018), learning anxiety (Allen et al., 2021a, 2021b), absences (Borman et al., 2019), and bullying victimization (Li et al., 2020).

For social constructivists, the premise for learning to occur relies on the learner's interpretation and communication within a social-cultural environment (Vygotsky, 2001). Being able to situate oneself in a social environment allows the individual to fulfill the need for relatedness, one of the three basic needs that help raise motivation, according to self-determination theorists (Deci et al., 1991). Suppose a student feels indifference and exclusion by peers or teachers, such a negative psychological experience will hinder the student from engaging in school-based activities, cooperating with peers, or seeking others' help when confronted with difficulties or frustration in learning (Li et al., 2020).

According to these multiple perspectives, there are several ways that school belonging determines learning achievement. For instance, school belonging endows adolescents with emotional security. It helps them to build positive self-esteem and self-identity, which lays the foundation for the youth to venture into new surroundings and experiences, thus providing more opportunities to fulfill their development needs and enhance their competence (Bronfenbrenner & Morris, 2006; Ibrahim & El Zaatari, 2020). Besides, students with a higher sense of school belonging are more willing to build and maintain interpersonal relationships with their friends, peers, and teachers (Baumeister et al., 2002; Maslow, 1943; Vygotsky, 2001). The stronger the connection students can build with their environments, the more their basic needs of relatedness are satisfied (Deci et al., 1991). This satisfaction again reduces negative factors that hinder learning, such as absences (Borman et al., 2019), learning anxiety (Allen et al., 2021a, 2021b), bullying victimization (Li et al., 2020), or mental disorders (Wagle et al., 2021). The fulfillment also enhances favorable factors for learning, such as mental health (Rose et al., 2017), self-efficacy (Tannert & Gröschner, 2021), meta-cognition (Kuo & Yang, 2019; Loukas et al., 2016), engaging in school activities, collaborating with peers, and seeking help from peers or teachers when confronted with difficulties (Li et al., 2020; OECD, 2019b).

Numerous studies have confirmed the positive association between school belonging and learning motivation, engagement, and academic achievement (Akar Vural et al., 2020; Borman et al., 2019). For example, in an intervention program addressing students' belonging crisis in a middle school, Borman et al. (2019) found that students in the intervention group experienced a higher sense of school belonging and obtained a more considerable increase in GPAs. In another study, Akar Vural et al. (2020) divided 770 eighth graders into three groups according to their academic achievement. The Mann–Whitney U test results indicated a significant difference in school belonging among groups favoring higher grades. Given this salient evidence supporting the positive association between school belonging and learning achievement, the probability is high that school belonging as a recipient variable can mediate the relationship between teacher empathy and learning outcome. The next part will discuss this possible connection.

Teacher empathy, school belonging, and learning achievement

Researchers have agreed that the value of empathy has been foregrounded in the evolutionary path of human beings because it functions as a way to form connections and unity among individuals (Bullough, 2019). According to a review by the Centers for Disease Control and Prevention (2009), an essential resource for students' sense of school belonging comes from their teachers. If the teachers devote their time and effort to think what students are thinking, feel what students are feeling, and communicate their care and love, a positive teacher-student relationship falls into place. In turn, a good rapport between teachers and students constitutes a substantial part of students' sense of belonging at school (Allen et al., 2021b). Through teachers' explicit and implicit instructions, students attain prosocial dispositions and interpersonal skills, such as taking others' perspectives and being willing to help others (Berkovich, 2020). With teachers' care and support, students tend to adopt a mastery-goal approach in learning rather than compete with one another for higher scores (Berkovich, 2020; Durlak et al., 2011). Accordingly, empathic teachers can create a friendly learning community where students feel at ease participating in learning activities or looking for help when facing difficulties, thereby helping students better fit in the class and the school environment (Meyers et al., 2019; Rogers, 2002).

Mounting evidence has testified to the mediating role of school belonging in predicting learning outcomes (Vargas-Madriz & Konishi, 2021). Vargas-Madriz and Konishi (2021) exemplified this by administering a survey about school climate among 238 high school students. Results of hierarchical multiple regression analyses showed that school belonging mediated the effect of teacher support on students' academic involvement.

Empirical studies have testified to the mediating role of students' sense of school belonging in the relationship between teacher activities and student learning. For instance, Vargas-Madriz and Konishi (2021) examined the relationship between school belonging, social support (including support from peers, parents, and teachers), and academic involvement among 238 high school students. Results of hierarchical multiple regression demonstrated that school belonging mediated the relationship between teacher support and academic engagement. In other words, increased teacher support improves students' sense of school belonging and enhances learning engagement.

This brief literature review suggests that teacher empathy and students' sense of school belonging are significant predictors of students' learning. Teacher empathy is likely to relate to student learning through school belonging. However, few studies have directly addressed the subtle interplay between teacher empathy and school belonging in predicting student learning outcomes. The current study aimed to investigate the predictive effects of teacher empathy and students' school belonging on learning achievement, with a focus on the mediation of school belonging in the relationship between teacher empathy and learning outcome. The current study used PISA 2018 data produced by adolescent students from 75 countries/territories.

Many studies have shown that students' socio-economic status (SES) positively predicted learning outcomes (Chiu & McBride-Chang, 2006; Hoff, 2013). It has also been consistently shown that gender positively affects achievement by favoring girls in reading (Chiu & McBride-Chang, 2006). The current study included these two variables as covariates to control for possible confounding effects from SES and gender.

The current study answered the following research question:

Question. To what extent does teacher empathy predict learning achievement through students' school belonging after controlling for student gender and SES effects?

Method

Data

The current study used OECD PISA 2018 data from 75 countries/territories (https://www.oecd.org/pisa/data/2018database/). In particular, we used student data on empathy, school belonging, and learning achievement in reading. Besides, student gender and their social-economic status were included as covariates. After dropping students with complete missing values on each key variable, the working data contained 506,317 students (mean age = 15.79, SD = 0.29; 51% girls).

Measures

Teacher empathy The Teacher Empathy Questionnaire (TEQ) asked students to think of their past two reading lessons about their reading teachers and endorse their agreement on three statements on a four-point scale (1 = Strongly Disagree, 4 = Strongly Agree). The means of the three items ranged from 2.79 (SD = 0.86) to 2.86 (SD = 0.86). The internal consistency of the three items was $\alpha = 0.86$. Detailed information regarding the scale is presented in Table 1.

School belonging School Belonging Questionnaire (SBQ) was a six-item scale on four points (1 = Strongly Disagree, 4 = Strongly Agree). The means of the six items ranged from 2.90 (SD = 0.73) to 3.19 (SD = 0.85). The internal consistency of the three items was $\alpha = 0.79$. Please refer to Table 1 for details.

Learning achievement PISA 2018 provided three achievement scores, reading, mathematics, and science. As empathy data in PISA 2018 were collected for reading teachers, the current study utilized reading scores to represent learning achievement. PISA 2018 termed reading achievement "reading literacy" and defined it as the capability to understand, use, reflect on, and engage with written texts (OECD, 2019a). PISA provided ten plausible values for reading achievement. We only used the first, given that previous studies have shown that the results of using different plausible values are the same (Spiezia, 2011). The mean of the plausible value was 463.50 (SD = 104.63).

Covariates The study included two covariates at the student level: gender (girls = 1, boys = 2) and students' socio-economic status (SES). PISA used ESCS (an index of economic, social, and cultural status) that captured students' background information (e.g., parents' education level, home possessions, and cultural resources) to represent SES (OECD, 2019a). The mean of ESCS for our data was − 0.26 (SD = 1.08).

Data analysis

Primary data analyses involved two steps: First, confirmatory factor analysis (CFA) was conducted to ensure the measurement quality of multiple-indicator variables (i.e., school belonging and teacher empathy). Second, multilevel structural equation modeling (ML-SEM) was undertaken to explore the relationship between belonging, teacher empathy,

Table 1 Descriptive statistics and reliability estimates

	Code	Content	*M*	SD	Alpha
Teacher empathy	ST211Q01	The teacher made me feel confident in my ability to do well in the course	2.86	0.86	0.86
	ST211Q02	The teacher listened to my view on how to do things	2.79	0.86	
	ST211Q03	I felt that my teacher understood me	2.82	0.87	
School belonging	ST034Q01	I feel like an outsider (or left out of things) at school. (Response reversed)	3.07	0.87	0.79
	ST034Q02	I make friends easily at school	2.94	0.79	
	ST034Q03	I feel like I belong at school	2.86	0.82	
	ST034Q04	I feel awkward and out of place in my school. (Response reversed)	3.05	0.84	
	ST034Q05	Other students seem to like me	2.90	0.73	
	ST034Q06	I feel lonely at school. (Response reversed)	3.19	0.85	

and reading achievement after controlling for covariate effects. During this step, our focus was placed on the relationship at the student level (i.e., the mediation of school belonging between teacher empathy and learning achievement).

This ML-SEM was run on M*plus* 8.5 (Muthén & Muthén, 1998–2020) with the estimator of full information maximum likelihood. The model-data fit was evaluated based on multiple criteria: Root Mean Square Error of Approximation (RMSEA) and Standardized Root Mean Square Residual (SRMR) no more than 0.05, and Tucker–Lewis index (TLI) and Comparative Fit Index (CFI) no smaller than 0.95 (Mueller & Hancock, 2010).

Results

Preliminary analysis

Before multivariate analysis, preliminary correlation analysis was conducted. According to Table 2, reading achievement was positively associated with belonging ($r=0.12$, $p<0.01$) and empathy ($r=0.07$, $p<0.01$). Belonging and empathy were positively associated with each other ($r=0.16$). SES was positively associated with all key variables except for teacher empathy ($r=-0.002$, $p>0.05$). Gender was negatively associated with all key variables: $r=-0.13$, $p<0.05$ with reading achievement, $r=-0.01$, $p<0.05$ with school belonging, and $r=-0.04$, $p<0.05$ with teacher empathy.

Results of model fit

Results of model fit are shown in Table 3. The three-item TEQ (Model 1) was a saturated model, presenting a perfect fit.

The CFA model for the SBQ (Model 2) showed an excellent fit after controlling for method effect by freeing the covariances among three non-reversed items (ST034Q02, −03, −05): RMSEA (95% CI) = 0.038 (0.037, 0.039), SRMR = 0.010, CFI = 0.995, and TLI = 0.988.

The full measurement model (Model 3) that combined both latent factors, reading achievement and covariates (SES and sex), also showed an excellent fit: RMSEA (95% CI) = 0.030 (0.030, 0.031), SRMR = 0.020, CFI = 0.988, and TLI = 0.983.

The final model (Model 4), or the ML-SEM at the student level, also fits the data excellently: RMSEA = 0.026, SRMR = 0.020, CFI = 0.985, and TLI = 0.976.

Table 2 Correlations

Variable	Belonging	Empathy	SES	Gender
Reading	0.12*	0.07*	0.39*	−0.13*
School belonging		0.16*	0.09*	−0.01*
Teacher empathy			−0.002	−0.04*

*$p < 0.01$.

Table 3 Model fit statistics

Models	x^2	*df*	x^2/df	*p-Value*	RMSEA (95% C.I.)	SRMR	CFI	TLI
Model 1. CFA for empathy	0.008	0	–	0.000	0.000 (0.000, 0.000)	0.000	1.000	1.000
Model 2. CFA for school belonging	4300.219	6	716.70	0.000	0.038 (0.037, 0.039)	0.010	0.995	0.988
Model 3. Full measurement model	20,341.081	44	462.30	0.000	0.030 (0.030, 0.031)	0.020	0.988	0.983
Model 4. Multilevel model	14,910.724	44	338.88	0.000	0.026	0.020 (within)	0.985	0.976

Note. In Model 2, the covariances among ST034Q02, ST034Q03, and ST034Q05 were freed to account for method effect (non-reversed items). In Model 3, all variables, including covariates, were included. Model 4 was based on the structure of Model 3, but with variances at the school level controlled.

Estimates of ML-SEM

Figure 1 only shows the estimates at the student level. The total effect of teacher empathy on reading achievement was $\beta = 0.07$ ($p < 0.001$). Out of this total effect, the direct effect was $\beta = 0.05$, $p < 0.001$ (71% of the total effect).

The effect of teacher empathy on belonging was $\beta = 0.17$ ($p < 0.001$) and the effect of belonging on reading achievement was $\beta = 0.13$ ($p < 0.001$). Accordingly, the mediated effect of teacher empathy on reading achievement by way of belonging was $\beta = 0.02$, $p < 0.001$ (29% of the total effect).

Regarding covariate effects, reading achievement was positively predicted by SES ($\beta = 0.26$, $p < 0.001$) and negatively predicted by student gender in favor of girls ($\beta = -0.25$, $p < 0.001$).

Discussion

The present study investigated the interplay between teacher empathy and students' sense of school belonging in determining reading achievement. We hypothesized that teacher empathy would predict reading achievement through students' sense of school belonging. The model was tested in an international sample of 506,317 15-year-old adolescents from 75 countries/territories. Results of ML-SEM controlling for school-level effects showed that, after accounting for the SES and student gender effects, teacher empathy positively predicted reading achievement through students' sense of school belonging. In other words, students taught by more empathic teachers had a higher sense of school belonging, which was again associated with higher reading achievement.

First, our results showed a significant positive relationship between teacher empathy and students' sense of school belonging. This finding supports the fundamental assumption that empathy is essential to form connections among human beings (Bullough, 2019) and that teacher empathy affects school belonging (Centers for Disease Control & Prevention, 2009). This positive relationship is consistent with a meta-analysis of intervention studies (Durlak et al., 2011).

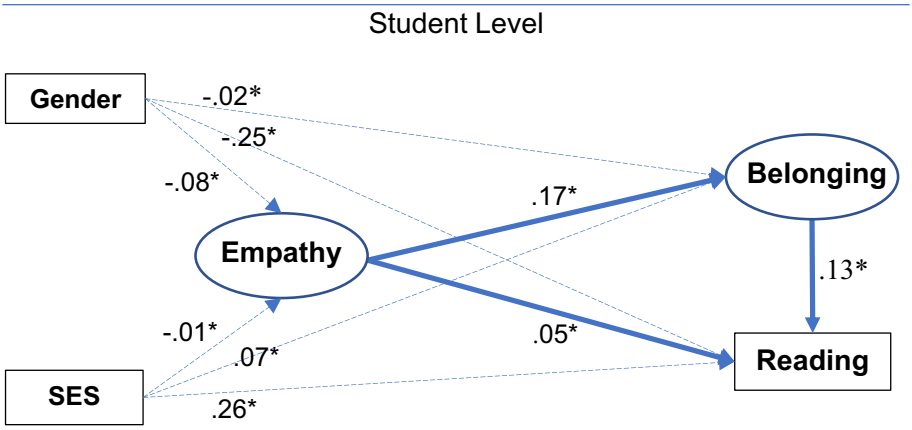

Fig. 1 Multilevel modeling results with standardized estimates. *$p < 0.001$

As suggested by the PISA measures of teacher empathy and students' sense of school belonging, empathetic teachers helped students build their self-confidence, cared about their feelings, and watched their learning progress closely. Students instructed by these teachers were less likely to have negative experiences such as feeling awkward or lonely; instead, they were more likely to gain self-confidence and build relationships with their peers.

Our results showed that school belonging was positively associated with reading achievement. This is in line with findings in previous research regarding learning in the general domains (Akar Vural et al., 2020; Borman et al., 2019) and reading achievement (Mullis et al., 2017). As suggested by our study, students with a strong sense of school belonging are confident in their ability, more ready to build relationships with their peers, and less likely to feel lonely. The positive relationship between students' sense of school belonging and reading achievement suggested that students' strong self-confidence and good interpersonal relationship significantly benefit their learning outcome in reading.

Our results provide supporting evidence for the contentions about the positive association between school belonging and learning achievement in various theoretical paradigms, such as the belongingness hypothesis (Baumeister et al., 2002), Maslow's hierarchy of needs (Maslow, 1943), social constructivism (Vygotsky, 2001), and self-determination theory (Deci et al., 1991). For instance, the positive relationship between school belonging (related to self-confidence and peer relationships in our case) and reading achievement reinforced the contention for considering self-confidence as an essential component of students' developmental needs and the importance of fulfilling these basic needs for enhancing learning achievement (Deci et al., 1991). Further, the positive belonging-achievement relationship corroborates the argument for the importance of interpersonal relationships for improving learning achievement rooted in the theories mentioned above. According to the views, students with a higher sense of school belonging are more ready to foster academic engagement emotionally, cognitively, and behaviorally (Baumeister et al., 2002; Maslow, 1943; Vygotsky, 2001), which in turn benefits learning achievement (Fredricks et al., 2004).

Our findings show that teacher empathy positively correlates with learning achievement through students' sense of school belonging. Taking advantage of a large international data set, our study disconfirmed the insignificant correlation found in Bostic (2014). The positive association between teacher empathy and learning achievement provided generalizable evidence supporting the prominence given to empathetic teaching in several teaching paradigms, such as responsive teaching (Robertson et al., 2015), formative assessment (Cowie & Bell, 1999), and design thinking (Henriksen et al., 2018). The mediated role of school belonging reflects the tenet of the ecological model in that learning achievement depends on the interaction among variables in different layers from the individual level to outer layers such as micro-level, meso-level, and beyond (Bronfenbrenner & Morris, 2006). As one of the principal persons in the micro-system, the teacher exerts a particular influence on the individual not only in a direct way through proximal processes but also in an indirect way by enhancing students' sense of school belonging.

Conclusion, implications, and limitations

The findings indicate that teacher empathy is a crucial factor determining the disparities in reading achievement and students' sense of school belonging mediates this effect.

The current study could have theoretical contributions to studies in teacher empathy. First, this study provided integrated evidence revealing the interplay between teacher empathy and school belonging in determining learning achievement. Previous studies have mainly focused on teacher empathy or students' school belonging as separate predictors of learning achievement. This study demonstrated the collaboration between teacher empathy and students' sense of school belonging in determining learning achievement. A strong message from our study is that an ecological perspective that considers both teacher and student variables simultaneously is able to provide a more comprehensive picture of instruction and learning. Second, this study addressed the gap of insufficient evidence indicating the direct connection between teacher empathy and students' learning outcome. Considerable evidence has supported the benefits of teacher empathy to students' overall well-being. However, a strong impetus for educational systems to recognize the significance of teacher empathy requires more research efforts to confirm the benefit of teacher empathy to tangible indicators of students' success, for example, learning achievement.

Our study also has pedagogical and policy implications. When teachers are saddled with inordinate emphasis on scores, they would judge students' performance critically and are less likely to feel and think from students' perspectives (Ibrahim & El Zaatari, 2020). Such unempathetic teaching is detrimental to students' sense of school belonging and the developmental needs that students' academic success hinges on. We suggest that teacher training should prioritize teachers' awareness and skills related to teacher empathy in various ways. For instance, teacher training programs can provide workshops to introduce skills and social-emotional knowledge, organize focus groups for teachers to share their feelings and stories about their empathetic connection with students (Wink et al., 2021), or provide training on effective strategies that teachers can apply to build up an empathetic relationship with their students.

Given the importance of school belonging, schools need to implement programs and interventions to create a warm and supportive atmosphere to boost students' sense of belonging. For instance, schools can develop various extracurricular activities to promote students' team spirit or provide specialized services for students confronted with psychological problems (Allen et al., 2021b). Besides, when implementing a school-based program such as streaming students based on their academic performance, schools should carefully evaluate the possible negative consequences of such a program on students' sense of school belonging and take measures to minimize this potential unwanted effect.

Furthermore, as one of the anonymous reviewers rightly pointed out, schools and teachers could collaborate with parents to foster students' sense of school belonging. Although our study did not include parental involvement, the literature has documented that parental involvement is an essential source of teacher empathy and students' sense of school belonging (Jeynes, 2010, 2011). Effective school-parent communication could be built to encourage parents to invest more efforts in their children's education explicitly (e.g., helping with homework) and implicitly (e.g., creating an academically oriented home atmosphere) (Jeynes, 2010).

Finally, it is incumbent upon schools, educational administrators, and governmental bodies at the administration level to enact workable policies and concrete measures that channel teachers' time and energy to empathetic connection with their students from sole attention to intensive academic competition. With the reduction of emphasis on scores, teachers will be able to allocate more resources to listen to and communicate with their students closely, and students will be able to spend more time interacting with other school members and acquiring prosocial skills. All these treatments will eventually help students to thrive in school.

The present study had limitations. First, our study used the cross-sectional data available in PISA 2018. Hence, exploration with a causal-effect relationship was not possible. Future developmental studies may explore the mutual relationships between teacher empathy, school belonging, and learning achievement. The second limitation deals with the measurement of teacher empathy. In PISA 2018, teacher empathy was tapped in the general aspect instead of a more specific approach which Jaber et al. (2018) termed as epistemic empathy, that is, teacher empathy towards the process of students' knowledge construction. It is possible that teacher empathy bears a stronger relationship with students' learning outcomes if measured more specifically. Third, as teacher empathy was collected from reading teachers, learning achievement was only represented by reading scores. Given the considerable commonality among reading, mathematics, and science (OECD, 2019a), future studies may explore how teacher empathy influences learning achievement in these domains.

Despite the limitations, our results are still convincible, taking advantage of the internationally representative data, high measurement quality, and fine-grained data analysis that had enabled us to filter out noises from the school and student levels (e.g., gender and SES).

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Data availability The data that support the findings of this study are openly available in OECD PISA 2018 dataset at https://www.oecd.org/pisa/data/2018database/.

Declarations

Ethics approval Not applicable.

Consent to participate Not applicable.

Competing interests The authors declare no competing interests.

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Current themes of research.

Language assessment. Educational psychology. Large-scale international educational assessment. Psychometrics. Educational statistics. Educational data mining.

Most relevant publications in the field of Psychology of Education:

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Language education and assessment.

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Most relevant publications in the field of Psychology of Education:.

No previous publications.

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Current themes of research.

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