

Rising beliefs but descending self-efficacy when preparing in-service teachers for linguistically responsive teaching – insights from a longitudinal intervention study

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ABSTRACT

Fostering teacher beliefs (TB) and self-efficacy (TSE) towards multilingualism in class is key for the successful implementation of linguistically responsive teaching (LRT) aiming to support multilingual students, who are often disadvantaged in class. However, TB and TSE towards multilingualism have not been examined together within a longitudinal LRT intervention. Therefore, 44 teachers were trained in a professional development (PD) workshop about LRT, which they then implemented in their regular German classes. TB and TSE were measured longitudinally (TB pre-PD, post-PD and post-implementation, TSE post-PD and post-implementation). TB significantly improved through PD and remained stable during implementation, while TSE significantly decreased, probably due to unexpected challenges to motivate multilingual students to use their family languages. TB and TSE were moderately correlated when measured at the same time. Longitudinally, post-PD TSE had a positive effect on post-implementation TB when controlling for post-PD TM, but post-PD TB had no effect on post-implementation TSE when controlling for post-PD TSE. Overall, TB remained positive during the implementation of LRT without decreasing along with TSE. Hence, this study makes optimistic for improving TB through PD, but also emphasises that TSE needs further support during implementation.

ARTICLE HISTORY



Received 11 November 2024
Accepted 22 December 2024

KEYWORDS

Teacher beliefs; self-efficacy; multilingual students; linguistic diversity

Introduction

In order to meet the needs of a growing, migration-related, linguistically superdiverse student population in many countries (Paine, Aydarova, and Syahril 2017; Vertovec 2023), research on multilingual education has increased but educational practitioners in many countries still persist in monolingual teaching habits (Duarte and Günther-van der Meij 2022) due to the monolingual habitus (Gogolin 2008). Several promising multilingual classroom approaches like linguistically responsive teaching (LRT; Lucas and Villegas 2013) are evolving (Lorenz, Krulatz, and Torgersen 2021). However, they are rarely used due to teachers' negative beliefs and lack of knowledge about

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how to meet other family languages, i.e. the language(s) spoken within the family or home environment, in the classroom (Bredthauer and Engfer 2018; Daelman et al. 2023). Therefore, multilingual students are disadvantaged as they cannot use their full linguistic repertoire which could benefit their learning (Bosma et al. 2023; García 2009). This is discussed as one factor contributing to persisting educational disparities in Germany between students with and without migration background (Mang et al. 2023). Furthermore, when teachers are not prepared and well educated for these challenges, they lack confidence in their teaching capabilities and experience low self-efficacy (Schwarzer and Hallum 2008; Siwatu and Chesnut 2015), leaving them feeling overwhelmed by students' family languages in class (Bredthauer and Engfer 2018; Romijn et al. 2020).

Thus, professional development (PD) is important to provide strategies for teachers to deal with multilingual students and to foster teachers' beliefs (TB) and self-efficacy (TSE) towards multilingualism in class. Both constructs shape teachers' teaching practice (Borg 2017; Schwarzer and Jerusalem 2002) and dealing with students' linguistic diversity.

In the context of PD for multilingual teaching approaches, some studies analysed TB (e.g. Aleksić and Bebić-Crestany 2022; Mast and Sachse 2021), but only a few studies examined TSE (Kaplan Toren and Schwartz 2024; Mahalingappa 2023). No studies examined the longitudinal development of both constructs in relationship to each other during PD and implementation of LRT approaches. We examined the development of TB and TSE towards multilingualism over time in 44 teachers as they were trained in PD workshops and later implemented an LRT unit on reading strategies in their regular German classes.

Literature review

Preparing teachers for multilingual students through Linguistically Responsive Teaching

Many pedagogical approaches for supporting multilingual students evolved, that all share the same goals: affirming multilingual students in their linguistic competencies and identities, valuing their family language as a learning resource, integrating their prior knowledge, oral and literacy skills in their family languages into the learning process, and fostering their sense of belonging in the classroom via human relationships (Cummins et al. 2005; Lorenz, Krulatz, and Torgersen 2021). Among those, one of the most promising approaches is LRT, a 'content-language-integrated pedagogical approach ... with the aims of providing well-supported teaching and learning and equitable outcomes for multilingual learners. ... It is primarily a framework to guide teaching in multilingual and multicultural classes' (Haan and Gallagher 2022, 7). In practice, LRT is a set of instructional strategies of scaffolding and supporting student learning, of interacting in class with multiple language use, and this way intertwining learning and language development while keeping the needs of MS in focus. Since teachers are not used to this approach, they need PD to acquire knowledge and practice in order to be able to apply it (Heineke et al. 2018). The foundation of successful PD in this sense is teachers' 'willingness ... to explore their beliefs and develop their capacity to work effectively with multilingual learners' (Haan and Gallagher 2022, 7). Hence, teachers need to consciously reflect both their current TBM and TSEM in PD, to then develop positive TBM and TSEM, which are both key for realising LRT (Lucas and Villegas 2013). This allows them to value linguistic diversity, to advocate for MS and to understand their linguistic background as well as their needs within the classroom.

TB and TSE are essential elements of professional teacher competence, which is comprised by knowledge, self-regulation, beliefs or values, and motivational orientations (Baumert and Kunter 2006). TB towards multilingualism in particular are one facet of the beliefs component, while TSE towards multilingualism is one facet of self-efficacy, which itself belongs to the motivational orientations component (Baumert and Kunter 2006; Hachfeld et al. 2015). Both TB and TSE shape teachers' decisions and actions in the classroom. Both therefore determine how teachers deal with linguistic diversity, and if the implementation of LRT approaches will succeed (Aleksić and Bebić-Crestany 2022; Mahalingappa 2023; Schnitzer 2020).

Though there is more research evolving about LRT approaches (Lucas and Villegas 2013), no studies have examined TB and TSE longitudinal development within that context.

Teacher beliefs towards multilingualism in class

TB have been defined in various ways. In educational research, beliefs are defined as ‘psychologically held understandings and assumptions about phenomena or objects of the world that are felt to be true, have both implicit and explicit aspects, and influence people’s interactions with the world’ (Voss et al. 2013, 249f). From that follows, TB shape teachers’ decisions and actions in the classroom (Borg 2017; Fischer and Ehmke 2019). For implementing multilingual approaches, positive TB about the multilingual potential of students are therefore key (Mehlhorn 2020; Prilutskaya 2021).

Most research on TB in the field of multilingualism either refers to EFL teachers (Borg 2011 in the UK; Cenoz and Gorter 2020 in Spain; Tishakov and Tsagari 2022 in Norway), and to the country-specific equivalents like DaZ/DaF teachers in Germany (e.g. Fischer and Ehmke 2019), or to foreign language teachers in general (e.g. Heyder and Schädlich 2014). Few studies (e.g. Alisaari et al. 2019; Brandt 2020; Gorter and Arocena 2020) refer to TB towards multilingualism in non-foreign-language classrooms such as German classes in Germany as in the current study.

Existing studies about pre- and in-service TB towards multilingualism show conflicting results: On the one hand, teachers generally see advantages in multilingualism for multilingual students (Haukås 2016) such as fostering language awareness and content understanding (Da Silva et al. 2022), as strengthening multilingual students’ self-esteem, self-confidence and identity (Ekinci and Gueneşli 2016), and as a valuable asset for the development of the majority language (Alisaari et al. 2019). On the other hand, when it comes to teaching and learning, teachers are harbouring rather negative beliefs about multilingual students being cognitively overstrained, monolingual students feeling excluded, or about hindering multilingual students’ acquisition of the majority language (Alisaari et al. 2019; Ekinci and Gueneşli 2016). Teachers also view negative consequences overall on classroom management and climate (Bredthauer and Engfer 2018; Oomen-Welke 1997), as the additional languages are perceived as a disruption in class (Schnitzer 2020).

Through these negative TB, teachers legitimize excluding languages other than the majority language in the classroom (Aleksić and Bebić-Crestany 2022; Alisaari et al. 2019; Bailey 2017), and fail to put their general appreciation of multilingualism into practice. This has been noted by several researchers across many countries (Bredthauer and Engfer 2018; Camenzuli, Lundberg, and Gauci 2022; Haukås 2016).

Since beliefs are generally considered to be fairly resistant to change (Borg 2011), the changeability of TB through PD is still in question. It seems that the more beliefs are based on explicit components, the easier they can be changed through confrontation with new information and knowledge acquisition (Furinghetti and Pehkonen 2002; Trautwein 2013). PD workshops that guide teachers to reflect on and become aware of their own beliefs can thus lead to positive changes in their beliefs (Putjata et al. 2022; Trautwein 2013).

Regarding TB towards multilingualism, several studies found positive effects of PD workshops with in-service teachers (Aleksić and Bebić-Crestany 2022; Kirsch and Aleksić 2018; Mast and Sachse 2021) as well as with pre-service teachers (Dursun, Agirdag, and Claes 2023; Portolés and Martí 2020; Schroedler and Fischer 2020). Studies also found that number of semesters and learning opportunities were the most important predictors of TB, so TB can indeed be positively influenced through knowledge acquisition and reflection (Fischer and Ehmke 2019; Gebauer and McElvany 2017). Some studies, however, found no effect of university courses on pre-service TB towards multilingualism (Döll and Guldenschuh 2022; Pötzl et al. 2021), so while there is some evidence of improvement of TB through PD, replications especially for in-service teachers are needed.

Far fewer studies examined regular teachers’ beliefs development during the implementation of LRT approaches. When teachers are well-guided into applying a new classroom approach, they can

make positive experiences during implementation causing their TB towards multilingualism to improve (Duarte and Günther-van der Meij 2022; Kutzelmann et al. 2017; Svensson 2021). These encouraging results from qualitative studies have not been replicated in quantitative designs that include the implementation of LRT in classrooms. Gorter and Arocena (2020) showed with data from 124 in-service teachers an improvement of TB towards multilingualism throughout PD, and a preservation of that level of TB when teachers implemented LRT into at least one lesson. So, the development of TB towards multilingualism during implementation is still a research gap.

Teachers' self-efficacy in dealing with multilingualism in class

Self-efficacy is defined as 'beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments' (Bandura 2010). TSE is highly relevant as it is associated with student achievement (Tschannen-Moran and Hoy 2001). Applying Social Cognitive Theory (Bandura 2010) to teachers, their agency and motivation to act is shaped by four types of experiences that constitute self-efficacy: feelings and thoughts about own ability to teach, feedback and mentoring by other teachers, teaching being modelled and discussed, and finally mastery experiences i.e. making own teaching experiences. The latter is overall the strongest predictor for self-efficacy because it links personal experience to concrete outcomes in the future (Bandura 2010). We hence focus on the development of TSE towards multilingualism throughout implementation rather than PD.

As self-efficacy is always domain-specific (Bandura 2010; Baumert and Kunter 2006; Tschannen-Moran and Hoy 2001), teachers can feel confident about teaching in general, but can at the same time be insecure when they are teaching multilingual students (Clark and Andreasen 2021; Kurucz et al. 2020). When implementing a novel LRT unit in class, the development of TSE towards multilingualism is therefore of special interest.

To our knowledge, considerably more research can be found regarding the development of self-efficacy in culturally responsive teaching (CRT) than for LRT or for teachers dealing with multilingual students. In general, teachers do not feel prepared for teaching multilingual classrooms (Bredthauer and Engfer 2016). They worry about their inability to speak students' family languages (Bailey 2017; Götz, Kutzelmann, and Massler 2017; Haukås 2016) as well as about losing authority in the classroom (Bredthauer and Engfer 2018; Oomen-Welke 1997). Hence, TSE for implementing LRT approaches was found to be rather low when teachers had no experience, even when teachers were generally willing to implement LRT (Bailey 2017). This TSE for implementation improved considerably when they became more knowledgeable and experienced (Lee and Zhang 2023). Experience was one of the key factors for TSE in dealing with multilingual students: Stangen and colleagues (2022) found that pre-service teachers felt significantly less self-efficacious than in-service teachers for 'teaching' and 'diagnosing' multilingual students, while using learning opportunities was the strongest predictor of TSE (Stangen et al. 2022). TSE can also be overestimated after PD and then decrease in confrontation with the reality of teaching multilingual students (Clark 2020; Clark and Andreasen 2021), so not only the quantity of experience but also the quality matters.

In conclusion, these results confirm how TSE highly depends on personal experiences and, real improvement or change of TSE towards multilingualism depends on the practical experiences that teachers are able to make during the implementation of LRT approaches. So far no studies have investigated in-service TSE development for LRT when implementing it in class (Clark 2020; Comstock et al. 2023). Some studies with pre-service teachers in related fields of research such as CRT give some insight into TSE development during the phase of practical implementation, though their transferability to the LRT setting should be interpreted with caution. Some of those studies found that TSE to support multilingual students increased through implementing LRT or CRT interventions (Comstock et al. 2023; Mahalingappa 2023; Mahalingappa, Hughes, and Polat 2018). In contrast, McCusker (2023) found that pre-service teachers with practicum experiences in teaching multilingual students did not have higher self-efficacy for LRT or CRT than those without. Other studies even found a decrease of TSE through teaching experience (e.g. Clark 2020; Hoy

and Spero 2005). This indicates, that TSE does not necessarily increase through the experience of teaching multilingual students or implementing LRT. Therefore, the current study investigates this open question.

Relationship between beliefs and self-efficacy and their development over time

From a theoretical perspective, TB and TSE are related as they are part of the same construct of professional teacher competence (Baumert and Kunter 2006; Keppens et al. 2021), which also can be acquired and changed through learning and practice in PD (Blömeke, Gustafsson, and Shavelson 2015; Klieme and Leutner 2006). As beliefs and practical experiences interact with each other (Phipps & Borg, 2009; Borg 2017), it is difficult to foresee if and how beliefs and self-efficacy change during practical implementation of a new educational approach. TB and TSE influence their practice, but their practical experience might also influence their beliefs and self-efficacy and might cause them to increase or decrease, depending on the kind of experiences being made.

So far, no studies have explicitly investigated the relationship between in-service TB and TSE in the specific area of LRT in the regular classroom and with longitudinal data. Studies show that pre-service TB about LRT are connected to their experience of TSE in educating MS, which in turn can influence their interactions with students and which instructional decisions they make (Cho, Chou, and Wiens 2023; Lee and Zhang 2023). Several studies from related fields like CRT show positive correlative associations between pre-service TB and their TSE for teaching multilingual students (Cho, Chou, and Wiens 2023; Szwed and González-Carriedo 2019). Some authors found TB predicted TSE for teaching multilingual students (Lee and Zhang 2023) and others found TSE predicted TB (Carbonneau et al. 2023).

In summary, previous evidence suggests that TBs and TSE towards multilingualism are somehow positively related, but research is ambivalent about which construct predicts the other as no hypothesis can be derived from theory and no causal paths were proven empirically. Though both predictive directions are plausible, existing studies analysed only one direction each time. Therefore, to build on existing results, both predictive directions are considered in the present study.

The present study: research questions

Prior research has shown (Aleksić and Bebić-Crestany 2022; Mast and Sachse 2021), TB can be improved through PD workshops. The reality of implementing LRT in linguistically superdiverse classes can be challenging, however, as both teachers and students are not used to this new approach. TB (Duarte and Günther-van der Meij 2022) and TSE (Mahalingappa, Hughes, and Polat 2018) towards multilingualism could improve, but teachers might also experience difficulties and stagnate in beliefs improvement (Gorter and Arocena 2020) and even decrease in self-efficacy (Clark 2020). Given these highly contradicting previous findings, our research questions (RQ) thus are:

RQ1: How do TB towards multilingualism develop during a PD workshop on LRT and during the implementation of an LRT unit?

RQ2: How does TSE towards multilingualism develop during the implementation of the LRT unit?

As research is ambivalent about the predictive relationship between beliefs and self-efficacy, we further ask:

RQ3: How does TSE before implementation impact TB towards multilingualism after the implementation of an LRT unit?

And vice versa:

RQ4: How do TB before implementation impact TSE towards multilingualism after the implementation of an LRT unit?

Methodology

Study design

To address the research questions, data from the meRLe intervention study that investigated the effectiveness of an LRT unit on reading strategy use for promoting the understanding of German texts in fourth-grade primary school classes in three federal states in Germany (see Decristan et al. 2022) was used. The study was approved by a university ethics committee and all teachers and students participated voluntarily.

Teachers were first trained in a PD workshop to then implement a LRT unit, which was comprised of a reading training with multilingual material to improve reading of German texts. The intervention combined reciprocal teaching (Palinscar and Brown 1984), a cooperative learning method where students switch roles in teaching and being taught by each other, with the elements of LRT (Haan and Gallagher 2022) to facilitate multilingual interaction.

Teachers completed questionnaires at three times of measurement: before (t_1) and after the PD workshop (t_2), and again after implementation of the LRT unit (t_3) to evaluate PD and implementation.

Professional development workshop and teaching equipment

The PD workshop took place on three afternoons, one per week, each 4 hours long. It was first developed by a multi-professional team with three expert teachers (expertise in primary school education, special needs education, and foreign language education) and the research staff. Key elements of LRT were field-tested in a workshop in 2018 with about 20 teachers and were revised afterwards. In North Rhine-Westphalia and Hesse, PD was conducted in-person at universities in 2019. In Baden-Wuerttemberg, PD was conducted two years later online (due to the COVID pandemic).

A training manual provided free of charge served each teacher as a guide through the PD workshop and through the entire teaching unit. The manual closely explained each lesson with guidelines for implementation and included copy templates for work sheets and reading texts. Also, the scientific background was included for rereading after the training sections, and to substantiate the scientific foundation of the project.

We aimed at realising the general features for effective PD identified by Kalinowski and colleagues (2019, 11) of intensive long-term trainings (1) with learning opportunities to practice training content (2) and practical assistance (3), of encouraging teacher cooperation (4), considering teachers' needs (5) and students' individual home languages (6). On the first day, teachers were introduced to the key elements of reciprocal teaching and LRT. They were informed about current research on multilingualism in the classroom and reading strategies. The aim was to sensitise teachers for the benefits of using the entire linguistic repertoire by including family languages in the classroom, for the importance of valuing students in their multilingual identity, and to explain how this way classroom climate can improve also for monolingual German students. For example, teachers filled out language portraits (Gogolin and Neumann 1991) to understand the sensitivity of this topic. They were encouraged to share about their experiences with multilingualism in the classroom and about their expectations and motivation to participate in the project. Challenges and possible solutions were discussed together. In this way, we focused on keeping the PD workshop as practice-oriented as possible (see 2.). As our PD workshop was integrated into a research project we were only able to offer a 3-day training and no longer term training (see 1.). Through the training manual teachers could closely follow along each step of implementation and practice it themselves in cooperative sequences in a personal walk through the entire LRT unit (see 2.). On the second day, teachers practiced reading and learning strategies in small groups (see 4.) to get familiar with the teaching material before teaching it in class (see 2. & 3.), and were encouraged to cooperate with each other (see 4.). As our novel approach combined LRT (Haan and Gallagher 2022) with the acquisition of reading and learning strategies through reciprocal teaching (Palinscar and Brown 1984), they were also informed about how reading competence would be enhanced by following

the worked-out LRT unit as well as about the principles of reciprocal teaching as a cooperative learning method enabling multilingual interaction. This continued throughout the third day, where teachers were jointly counselled and practically advised in their arrangement of small groups along shared family languages in their individual classes (see 3.). Carefully considering teachers' and their students' specific needs, small groups were built according to students' individual linguistic profile in close communication with us (see 5. and 6.). Teachers also continued practicing reciprocal teaching with the material themselves to enhance self-efficacy in implementing it later on (see 2.).

As the LRT unit focused on the multilingual acquisition of reading strategies for promoting reading comprehension, we provided material for language support (6.): Bilingual prompt cards for each tandem explained four steps of how to apply the reading strategy both in German and in their shared family language which encouraged using it. Each class received two so-called learning audio-pens with read-aloud strategy instruction in almost all family languages in the class when being pointed to the prompt cards. This especially helped students who had no proficiency in reading their (written) family language. The material covered 36 different family languages¹ translated by native speakers. This way all teachers were able to carry out the LRT unit without having to speak students' diverse family languages themselves.

Intervention: Linguistically Responsive Teaching unit

The LRT unit comprised 12 lessons each 45 min long and aimed at (1) facilitating a multilingual-friendly classroom environment to encourage students to use their family languages, (2) fostering reading competence within the LRT approach, and (3) strengthening social competencies through reciprocal teaching in small-groups. Reciprocal teaching served as a cooperative method for the acquisition of reading and learning strategies fostering reading competence as key qualification, and as a framework that enabled multilingual interaction. Through the LRT approach, other languages were valued as resources and it was encouraged but not enforced to use the entire language repertoire.

Elements of LRT were systematically applied throughout the entire teaching unit, which was framed into the cover story of a girl travelling around the world getting to know different cultures and languages (see Decristan et al. 2022): The first lesson began with students colouring language portraits (Gogolin and Neumann 1991) to visualise multilingualism in the classroom and established an appreciative climate for family languages welcoming their use in class. Next, student small groups were formed ideally with two multilingual students speaking the same family language (i.e. the language used most in case of multiple family languages) and two monolingual German-speaking students, so that each student had at least one family language partner. Then teachers introduced, scaffolded and practiced two reading strategies (questioning and summarising) first altogether in class, then had students continue these strategies themselves in small groups. Here, using and appreciating family languages was continually encouraged by teachers and multilingual material as students were provided with bilingual prompt cards and language learning audio-pens.

Participants

Forty-four primary school teachers from three federal states in Germany (North Rhine-Westphalia, Hesse, Baden-Wuerttemberg) completed the professional development workshops and implemented the teaching unit in their fourth-grade classrooms. 91% were female, their mean age was 45 years ($SD = 12$), they had 18 years ($SD = 12$) of teaching experience on average, and 11% were multilingual themselves. Teachers were contacted via mail and phone via school headmasters. Participation in the intervention study as well as in the PD workshops was voluntarily. 42% had already attended PD workshops about children with a non-German family language.

Treatment adherence

Treatment adherence was checked by two independent raters during classroom observations of one of the lessons through ten dichotomous items indicating whether teachers implemented certain

essential elements of the teaching unit (e.g. ‘students use prompt cards’). Teachers showed a high adherence with 92% on average. Interrater agreement was high with 98.2% (Decristan et al. 2022). Teachers implemented the teaching unit on average within five weeks ($M = 5.17$, $SD = 1.57$) with 2–3 lessons per week ($M = 2.61$, $SD = 0.83$).

As a measure of social validity, teachers were asked at the end of the implementation to indicate on a four-point-Likert scale (from 1 = disagree to 4 = totally agree) whether they appraised the teaching unit as supportive for students’ reading competence ($M = 3.4$, $SD = 0.8$) and as supportive in sensitising for linguistic diversity ($M = 2.8$, $SD = 0.9$). Means show that most teachers agreed or totally agreed. Teachers were further asked to assign a school grade to the teaching unit (in Germany 1 = A/very good to 6 = F/inadequate) revealing good overall feedback ($M = 2.2$, $SD = 1.1$).

Instruments

Teacher beliefs survey

A nine-item paper-pencil questionnaire (four-point-Likert scale from ‘1-fully disagree’ to ‘4-fully agree’; $TB_{(t1)} \alpha = .87$, $TB_{(t2)} \alpha = .84$, $TB_{(t3)} \alpha = .85$) was used to measure TB towards multilingualism (e.g. ‘Children who only speak German are disadvantaged when other languages are spoken in class’). In developing the questionnaire, we focused on prevalent TB in literature, as described in detail earlier. Six items were adapted from existing questionnaires (i.e. Bos et al. 2011; Lange 2019; Maak and Ricart Brede 2019) and three further items were developed by the researchers. As the majority of aspects tackled negative TB, eight items were inverted and then recoded so that higher numbers in the overall scale represented more positive attitudes.

Self-efficacy survey

A newly constructed four-item paper-pencil questionnaire (four-point-Likert scale from ‘1-fully disagree’ to ‘4-fully agree’; $TSE_{(t2)} \alpha = .79$, $TSE_{(t3)} \alpha = .69$) was used to measure TSE towards multilingualism (e.g. ‘Even though I do not understand all the languages of the children in my class, I feel confident to include these languages in my lessons.’). The items focused on the content the LRT unit aimed at facilitating: creating a climate of acceptance and appreciation for multilingualism, including languages even when teachers do not understand them, encouraging multilingual practices though students are not used to it, and doing so though time in class is short. Self-efficacy was only assessed two times, before and after the implementation, as it did not seem legitimate to assume teachers would feel confident in implementing a teaching unit which they did not yet know.

Analyses

T-tests were employed to test whether mean differences in TB and TSE towards multilingualism over time were statistically significant. This entailed determining the impact of the PD workshops (t_2 vs. t_1 ; RQ1) and the implementation (t_3 vs. t_2 ; RQ2). Two multiple linear regression analyses (all tests one-sided) were run to test the effects of $TB_{(t2)}$ and $TSE_{(t2)}$ after PD workshops on $TB_{(t3)}$ after implementation (RQ3) and to test the effects of $TB_{(t2)}$ and $TSE_{(t2)}$ after PD workshops on $TSE_{(t3)}$ after implementation (RQ4). As TB and TSE were highly correlated when measured at the same time, multicollinearity analyses were also conducted. The *Variance Inflation Factor* had values up to 1.6 which was below the usual cut-off value (Field 2018) and thus did not indicate multicollinearity.

Results

Descriptive and correlation results

To give an overview of the data, Table 1 shows means and standard deviations for TB and TSE towards multilingualism at the different times of measurement, and their bivariate correlations. TB show rather high stability over time (lowest intercorrelation $r = .62^{**}$), whereas the stability of TSE

Table 1. Means, standard deviations and correlations for TB and TSE towards multilingualism.

	<i>M</i>	<i>SD</i>	(1)	(2)	(3)	(4)
(1) TB _(t1)	3.26	0.52				
(2) TB _(t2)	3.48	0.44	.74**			
(3) TB _(t3)	3.52	0.44	.62**	.68**		
(4) TSE _(t2)	3.46	0.45	.40**	.61**	.61**	
(5) TSE _(t3)	2.92	0.68	.23	.27	.59**	.39*

Notes: * $p < .01$, ** $p < .001$.

values were descriptively low ($r = .39^*$). To evaluate the impact of the PD workshop and the implementation of the LRT unit itself, before and after scores of TB and TSE were compared.

Research questions 1 and 2: impact of PD and implementation of LRT on TB and TSE towards multilingualism

The analysis of the development of TB (RQ1) showed that TB towards multilingualism were more positive at t_2 than at t_1 ($t(43) = -4.23, p < .001$, Cohen’s $d = 0.35$), hinting at an improvement through the PD workshop. Moreover, this gain seems to endure throughout the implementation of the LRT unit (RQ2) as TB remained stable at a high level (from t_2 to t_3 ; $t(43) = -0.768, p = .223$). In contrast, the development of TSE (RQ2) from before (t_2) to after (t_3) implementing the teaching unit showed a meaningful decrease of TSE ($t(43) = -5.496, p < .001$, Cohen’s $d = 0.66$), thus teachers felt less self-efficacious or confident after implementing the LRT unit than before. The following section examines what these different effects of PD and intervention mean for the relationship between the two constructs over time.

Research questions 3 and 4: interrelations between TB and TSE towards multilingualism over time

Interrelations between TB and TSE towards multilingualism over time (RQ3 and RQ4) were examined with linear regressions (see Table 2). TB_(t3) after the implementation were predicted by both TB_(t2) and TSE_(t2).

Table 2. Prediction of TB and TSE after implementation (t_3) and correlations.

Coefficients	Regression of TB _(t3)			Regression of TSE _(t3)		
	β	<i>SE</i>	<i>p</i>	β	<i>SE</i>	<i>p</i>
(Constant)		0.407	.060		0.853	.178
TB _(t2)	0.496	0.133	.001	0.047	0.279	.398
TSE _(t2)	0.309	0.130	.027	0.359	0.273	.027
ΔR^2	.528			0.152		
adj. ΔR^2	.505			0.110		

In contrast to this, TSE_(t3) after the implementation (RQ4) was only predicted by previous TSE_(t2), while previous TB_(t2) had no predictive power for TSE_(t3). Though TSE decreased (see Table 1), teachers with higher t_2 -self-efficacy before implementation still felt more self-efficacious after implementation (t_3) than teachers with initially lower self-efficacy at t_2 . When comparing both regression models, it is noticeable that the explained variance for TSE_(t3) (11%) is considerably lower than for TB_(t3) (50%).

Discussion

This study aimed to investigate TB and TSE development throughout an LRT intervention including PD workshops. A key finding of the study is that TB and TSE towards multilingualism are

related constructs that can change throughout PD workshops and the implementation of LRT. The study therefore shows that TSE is an important predictor for TB after implementing LRT. Surprisingly, positive TB do not seem to play a role anymore when TSE is shaken during implementation. This result is unexpected given the theoretical interrelations of the two constructs and previous empirical findings. Implications of these and the other findings will be discussed in the following section.

Interpretation

Critical integration of findings for research question 1

Analyses of TB development over time (RQ1) show that TB towards multilingualism significantly improved through PD and sustainably remained positive during implementation. Cenoz and Gorter (2020) found a very similar pattern when analysing the development of TB. They found that TB towards multilingualism significantly improved through training. When teachers were implementing a multilingual approach in their own classrooms TB did not improve further, but neither did the improvement diminish again. As our results confirm this pattern, it is encouraging to see that (1) PD on multilingual approaches can indeed improve TB towards multilingualism, and (2) this positive effect sustainably stays and does not diminish even when TSE decreases during the critical moment of implementation.

Teachers in our sample already showed a high level of positive TB towards multilingualism ($M = 3.26$, $\max = 4.00$) before the PD workshops, indicating that they were highly interested in implementing LRT in the classroom. Possibly, related ceiling effects might have prevented TB from improving even further throughout the implementation phase. A larger Likert-scale format or a random sample could reveal more differentiated results. However, for in-class intervention studies random sampling is indeed a challenge and voluntary participation often results in the same high motivation of participating teachers in other studies (Kalinowski, Gronostaj, and Vock 2019).

Critical integration of findings for research question 2

In analysing TSE development over time (RQ2), TSE towards multilingualism decreased through the LRT-implementation phase contrary to TB towards multilingualism. A possible explanation for this result could be found in research on the so-called ‘praxis shock’ of novice teachers: Teachers are starting with high, idealistic subjective theories on teaching when they come from university and just entered their professional life. Then they are overstrained by the reality of simultaneous teaching demands and difficulties in class (Keller-Schneider and Hericks 2011). For instance, a longitudinal study shows that TSE for teaching reading while attending to issues of diversity decreased within their first year of in-service teaching (Clark 2020), which confirms this pattern. In our sample, while all teachers were experienced in teaching in general, the multilingual aspect of the LRT approach was new to them. Teachers might have been very motivated for implementing LRT after the PD workshops but then were confronted with difficulties. Studies show that it is very difficult to motivate students to use their family languages for learning, because due to the monolingual habitus both teachers and students are not used to it (Gogolin 2008). For example, Turkish students refused using Turkish texts or Turkish conversation for learning in a formal setting, even when they were explicitly encouraged to do so, and chose to work in German instead (Decristan et al. 2021; Meyer and Prediger 2011). Also, some students could have felt insecure or felt fake when using their family languages (Dewaele and Nakano 2013; Reitenbach et al. 2023), and thus could have refused doing so. These individual factors on students’ side were out of teachers’ control and might be important reasons that teachers experienced low TSE when implementing LRT.

Critical integration of findings for research questions 3 and 4

Regarding the interrelations between both constructs over time as addressed in RQ3 and RQ4, we found different patterns in the linear regressions. The regression analysis of $TB_{(t3)}$ on $TB_{(t2)}$ and

TSE_(t2) shows the expected positive and substantial interrelation: Teachers still valued multilingualism after the implementation (t₃) higher when they had more positive TB and higher TSE before (t₂).

However, regressing TSE_(t3) on the same predictors shows that only prior TSE_(t2) self-estimation predicted TSE_(t3) after implementation. Teachers' positive beliefs (t₂) cannot protect against the decrease of self-efficacy during implementation. Furthermore, the explained variance in the TB_(t3) regression is substantially higher than for the TSE_(t3) regression, suggesting that other variables, such as practical experiences would have been more important for predicting TSE_(t3).

Nevertheless, teachers with higher TSE_(t2) seem to stay more self-efficacious (TSE_(t3)), even though they might have struggled with the unexpected challenges of activating students' family languages (Clark and Andreasen 2021). Thus, positive TB matter for teachers being open to implement LRT at first (Mehlhorn 2020), but for sustaining TSE during implementation, positive experiences might be more crucial than positive TB (see also Bandura 2010).

Limitations and implications for future research

Although the study presents relevant findings considering the integration of multilingualism in the regular classroom, methodological limitations have to be considered.

One critical aspect is the limited four-point-Likert-scale format probably causing ceiling effects. Thus, applying a larger Likert-scale format could reveal a more differentiated pattern in TB and TSE development over time, as participating teachers already score high in the beginning. In our sample, this might also be due to their voluntary participation.

Another limitation of the study lies in the small sample size. Other relevant teacher variables, e.g. time of in-service teaching, experience in working with multilingual students, or life experiences (Gallagher and Scrivner 2024) could have been controlled for, given a larger sample size. The entire intervention study with its longitudinal design, a PD programme and multilingual teaching material for each language tandem, was very labour-intensive, which hindered the acquisition of a larger sample. However, all research questions were investigated within this complex longitudinal intervention and thus give more valuable insights than cross-sectional data.

When teachers went through the implementation phase their TSE for implementing LRT was put to test. This highlights how essential it is to have practical experience involved when measuring TSE. As TSE is comprised by concrete experiences, actual teacher behaviour in class and how students react is a concrete mastery experience for LRT (Hoy and Spero 2005), and thus a relevant predictor that was not measured. Other proxy-predictors like in-service teaching time could not be incorporated due to restrictions of sample size. In further analyses, both teacher behaviour and student reactions should be examined more closely during implementation to derive more information on what positively affects TSE_(t3).

Research shows the significant role of follow-up support for increasing TSE in implementing new teaching approaches. Without it, TSE might decrease due to a 'praxis-schock', as other studies have also shown (Clark and Andreasen 2021; Darling-Hammond, Hyler, and Gardner 2017; Hoy and Spero 2005; Tschannen-Moran and McMaster 2009). Thus, teachers might have needed more individual support and feedback during that phase, or more opportunities to collaborate and exchange experiences with other teachers, which increases the success of PD in general (Darling-Hammond, Hyler, and Gardner 2017). As teachers were flexible in how fast they implemented the teaching unit in their regular classes, staying in touch with each individual teacher was difficult to realise, but future LRT intervention studies should take this into consideration.

Conclusion

In conclusion, it is encouraging that TB towards multilingualism can be sustainably improved through PD and show a high construct stability over time as they do not decrease along with TSE during implementation. This is a promising result for further LRT interventions and research.

That said, the novelty of the LRT approach in regular class in Germany comes along with presumably challenging situations for teachers. Those situations seem to decrease TSE (Bandura 2010; Clark and Andreasen 2021) as TSE towards multilingualism relies heavily on concrete experiences during implementation. Those experiences and how teachers deal with LRT should be examined more closely as they are linked to both TB and TSE towards multilingualism (Gallagher and Scrivner 2024; Hoy and Spero 2005). Thus, in practice, teachers need close support during the implementation phase, and in research, further studies are needed on how best to provide this support, and which other factors besides TB relate to TSE towards multilingualism.

Note

1. Two additional languages (Tigrigna and Macedonian) could be provided only in audio format through the learning audio-pen. The difference to the 24 languages reported by Decristan et al. (2022) is due to incorporating additional data from Baden-Wuerttemberg in the present paper.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by the Federal Ministry of Education and Research, Germany [grant number 01 JM 1704A].

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Appendix

Table A1. TB towards multilingualism scale.

Prompt	How do you see multilingualism?	Discriminatory power _(t1)	Item difficulty _(t1)
mei1	When multilingual children explain something to each other in their non-German language of origin, this is beneficial for children	0.61	0.85
mei2*	It leads to poorer learning outcomes when children use their non-German languages of origin for learning	0.65	0.84
mei3*	Language switches represent a cognitive overload	0.39	0.72
mei4*	Children who only speak German are disadvantaged when other languages are spoken in class	0.76	0.79
mei5*	I feel insecure when children use languages that I cannot understand	0.53	0.63
mei6*	If I give space to languages other than German in the classroom, there is not enough time for the teaching content	0.76	0.74
mei7*	If children also speak languages other than German in class, the classroom climate suffers	0.72	0.70
mei8*	It is only possible to productively include languages other than German in lessons if the teacher is also proficient in them	0.56	0.71
mei9*	Only German should be allowed in school so that children learn German more easily	0.63	0.80

Note. *Item was inverted. $TM_{(t1)} \alpha = .87$, $TM_{(t2)} \alpha = .84$, $TM_{(t3)} \alpha = .85$.

Table A2. TSE towards multilingualism scale.

		Discriminatory power _(t2)	Item difficulty _(t2)
msw1	Even when time is short in class, I manage to instruct multilingual children to use languages other than German	0.50	0.74
msw2	Even if the children are not used to languages other than German being spoken in German class, I manage to create a climate of acceptance and appreciation for multilingualism	0.60	0.87
msw3	Even though I do not understand all the languages of the children in my class, I feel confident to include these languages in my lessons	0.65	0.85
msw4	Even if children are not used to languages other than German being spoken in German class, I manage to encourage multilingual children to use other languages	0.66	0.82

Note. TSE_(t2) $\alpha = .79$, TSE_(t3) $\alpha = .69$.