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Teacher-related factors associated with teacher–child interaction quality in preschool education

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Abstract

Quality teacher–child interaction is considered one of the primary mechanisms through which educational experience fosters the development of children’s competencies. Teachers’ self-efficacy and beliefs about developmentally appropriate practices influence the quality of classroom interaction. However, the findings are mixed, and more research must be done within the preschool teacher population. The present study investigated teacher-related factors influencing teacher–child interaction quality with preschool children. Two rating scales and one observation measure were used to survey and observe 55 preschool teachers in preschool centres of Arba Minch town, Ethiopia. Statistically significant positive correlations were found between teacher factors (i.e., teacher belief, self-efficacy, teaching experience) and teacher–child interaction quality (emotional support, classroom organization, and instructional support). Teacher belief significantly predicted teachers’ emotional support and classroom organization, while teaching experience significantly predicted instructional support. The findings of this study have implications for concerned bodies striving to achieve the 2030 sustainable development goals aimed at increasing the supply of qualified teachers to ensure all girls and boys have access to quality early childhood development and care so that they are ready for primary education, especially in the least developed countries.

Keywords: Teacher-related factors, Teacher–child interaction, Preschool education, Classroom quality, Teacher belief, Self-efficacy

Introduction

Children who receive high-quality early education experiences are more likely to succeed in various areas later in their lives. The early years (birth–5 years) are a time of opportunity where children’s health and well-being and quality experiences are an investment in learning and development (Shonkoff, 2014). Given the importance of early education experiences in children’s lives, researchers have been searching for factors that explain differences in the quality of care and education provided to young children. A robust amount of research literature considers teachers to be one of the most critical determinants of whether a classroom demonstrates higher versus lower quality of

instruction. Thus, teachers are expected to design learning activities to facilitate young children's self-awareness, self-management, social awareness, relationship skills, and responsible decision-making (CASEL, 2020). One of the well-established predictors of child development is teacher–child interaction quality. High teacher–child interaction quality is associated with better child outcomes, such as children's social skills and self-regulation (Salminen et al., 2021; Ulferts et al., 2019). Interaction quality is also considered one of the primary mechanisms through which educational experience fosters the development of children's competencies (Downer et al., 2010). These facts underscore the significance of improving teacher–child interaction quality and its determinants in preschool settings.

However, empirical evidence suggests that teachers' professional demographics (such as their level of education and experience, beliefs about developmentally appropriate practices, and teaching self-efficacy) have been linked to the quality of interactions in the classroom, but these findings are neither consistent nor strong. For instance, the child care literature indicated that teachers who hold at least a bachelor's degree are likely to have higher quality interactions than teachers without a bachelor's degree (Early et al., 2006); nonetheless, this association has not been found in other studies of pre-kindergarten programs (Early et al., 2007). In other words, structural quality features are assumed to predict interaction quality, but the evidence is still inconclusive (Mashburn et al., 2008; Slot et al., 2015).

Teachers' self-efficacy and beliefs about developmentally appropriate practices (DAP) were the most critical teacher characteristics associated with higher-quality classroom interaction. Teachers with higher self-efficacy seem to provide higher interaction quality (Hu et al., 2021), however, the results are inconclusive, and there is little research on the preschool teacher population (Bullock et al., 2015; Eckhardt & Egert, 2018). For instance, a recent study showed contradictory results regarding the association between teacher self-efficacy and teacher–child interaction quality in toddler classrooms (Reyhing & Perren, 2023). Furthermore, findings on the association between self-efficacy and interaction quality revealed mixed results with a slight positive tendency (Zee & Koomen, 2016). These inconsistent findings require further research on the link between teacher self-efficacy and interaction quality.

Although preschool teachers' self-efficacy was a significant predictor of classroom quality (Justice et al., 2008), as well as effective classroom management (Klassen & Chiu, 2010), not many studies have explored what relationship, if any, classroom quality has with teacher self-efficacy (Poulou et al., 2019; Bullock et al., 2015). Similarly, researchers have also asserted that there is limited research on teacher beliefs in preschool settings (Eckhardt & Egert, 2020). The present study was undertaken to fill this research gap in a preschool setting. In general, factors influencing the quality of teacher–child interactions have yet to be fully spelled out in the research literature despite their importance, specifically with early childhood populations, and contradictory findings exist between teacher-related factors and classroom interaction quality.

Besides, no published empirical research has explored the relationship between teacher-related factors and teacher–child interaction using the Classroom Assessment Scoring System (CLASS) in Ethiopian preschools. Thus, this study examined the association between teacher-related factors (i.e., teacher beliefs about

developmentally appropriate practice, teaching self-efficacy, educational level, and years of teaching experience) and teacher–child interaction quality.

Early childhood education settings for children ages 4–6 in Ethiopia

The government of Ethiopia recognizes the importance of early childhood care and education (ECCE) as a critical stage that requires due attention and a lot of investments. Even though it acknowledges the pre-primary phase of education for children aged 4–6 years, active engagement in provision has been low, and in practice, ECCE is almost entirely provided by the private sector (Woodhead et al., 2009).

The most important feature that characterizes early childhood education settings for children ages 4–6 in Ethiopia is the modality of ECCE provision and how instruction is organized. The kindergarten program (for children ages 4–6), mainly operated by non-governmental organizations such as private institutions, communities, and religious organizations (Ministry of Education, MoE, 2016), has its own curriculum and trained teachers. Children’s skill development is promoted through whole-group activities such as oral routines (singing and storytelling) and free play. A more recent study in Ethiopian preschools revealed that even though teachers mentioned different teaching methods implemented in the classroom (e.g., question and answer, student-centred activities, demonstration, presentation, visual aids, lecture, storytime, and singing), their actual teaching in the classrooms mainly covered lecturing and demonstrations (Adam Fadila, 2020).

Teacher–child interaction

Teacher–child interactions are the daily back-and-forth exchanges between teachers and children, including social and instructional (Hamre et al., 2012a, 2012b). As teachers and children engage in responsive interactions, whether in small groups or one-on-one, children can learn essential skills of self-regulation, empathy, and problem-solving (Goulet & Schroeder, 1998), and these responsive interactions, in turn, form the foundation from which children can learn challenging academic skills. Pianta et al. (2008) described three broad domains of teacher–child interaction that are assumed to influence children’s development as a result of their experiences in classrooms (Emotional Support, Classroom Organization, and Instructional Support), including ten dimensions (Positive Climate, Negative Climate, Teacher Sensitivity, Regard for Student Perspective, Behavior Management, Productivity, Concept Development, Instructional Learning Formats, Quality of Feedback, and Language Modeling). Each interaction domain directly or indirectly affects children’s language and literacy development (Downer et al., 2010). The emotional support domain incorporates positive climate, negative climate, teacher sensitivity, and regard for student perspectives (Pianta et al., 2008). The domain of classroom organization assesses behaviour management, productivity, and instructional learning formats. Finally, the instructional support domain focuses on concept development, quality of feedback, and language modelling.

Teacher self-efficacy influence on interaction quality

Self-efficacy refers to individuals’ beliefs about their capabilities to successfully carry out a particular course of action (Bandura, 1997). When the concept of self-efficacy is

applied to the teaching profession and the role of teachers in the classroom, it is defined as the belief that one's capabilities can bring about desirable changes in students' behaviour and achievement (Guo et al., 2010).

Scholars propose that the instructional behaviours, practices, and strategies teachers employ to encourage students' cognitive development may, in part, be influenced by their self-efficacy (Tschannen-Moran & Woolfolk Hoy, 2001). Empirical studies have established the significance of preschool teachers' self-efficacy to classroom quality and teaching practices (Fackler & Malmberg, 2016; Guo et al., 2010; Wolstein et al., 2021). In a study exploring self-efficacy beliefs' role in providing high-quality childcare, Perren et al. (2017) found that teacher self-efficacy significantly predicted self-reported child-centred practices of preschool teachers. Highly efficacious teachers have high levels of well-being, professional development, and quality teaching practices and instructional strategies (Author et al., 2021). Efficacy in in-service teachers has also been shown to contribute to the quality of their instructional support and the instructional literacy environment in preschool (Guo et al., 2013). Preschool teachers with a higher sense of efficacy for classroom management provide children with higher-quality interactions (Hu et al., 2021). Similarly, teachers who felt efficacious in both their instructional and engaging strategies were found to apply instructional strategies to advance students' mastery goal orientations (Rubie-Davies et al., 2011). Furthermore, teachers with high self-efficacy are more likely to influence students' motivation and academic achievement than teachers with low self-efficacy (Kim & Seo, 2018). Thus, teacher self-efficacy beliefs can be assumed to influence child outcomes through teacher–child interactions.

In the preschool context, however, a consensus has not been reached on whether highly self-efficacious teachers provide their students with higher levels of emotional support (Guo et al., 2010; Pakarinen et al., 2010), and a research gap prevails in early childhood education teacher self-efficacy, specifically within the preschool teacher population (Bullock et al., 2015; Poulou et al., 2018). Researchers in China also found that preschool teachers with higher self-efficacy beliefs in classroom management show higher interaction quality, but efficacy in student engagement was negatively related to quality of classroom organization (Hu et al., 2021). In addition, positive trends of predicting significant change in children's vocabulary knowledge were found by investigating the two subscale domain scores of the CLASS in correlation with print awareness (Guo et al., 2010). In this study, teacher self-efficacy, however, did not significantly correlate to the CLASS's emotional and instructional support domains. Teacher self-efficacy was not a predictor of language and literacy gains of preschool children. Although research asserts the significance of teacher–child interaction quality for child development, there needs to be more knowledge concerning the link between teacher self-efficacy and classroom interaction quality.

Teacher belief influence on interaction quality

All teachers hold beliefs about their work, students, subject matter, roles, and responsibilities (Pajares, 1992). These beliefs, to some extent, affect their strategies and pedagogy in the classroom (Caudle & Moran, 2012; Hamre et al., 2012a, 2012b). Pajares (1992) further stated that educational research should prioritize studying teacher beliefs, considering their influence on teacher planning, decision-making, and classroom practices.

Beliefs also shape teachers' decisions in the classroom (Caudle & Moran, 2012). Teachers' emotional, organizational, and instructional support decisions are influenced by their beliefs about children, discipline, and behaviour management (Brown & Smith-Feger, 2010; Coplan et al., 2015). Also, teacher beliefs and psychological functioning are more salient predictors of the quality of interactions (Gerber et al., 2007). Teachers who engage in positive interactions with young children are more likely to be knowledgeable about developmentally appropriate practice (DAP) and hold child-centred beliefs (Hu et al., 2017; Downer et al., 2012). Teachers with child-centred beliefs are more accepting and respectful toward children and are more sensitive and responsive in their interactions (Clarke-Stewart et al., 2002; Pianta et al., 2005). Empirical studies confirmed that teachers rated highest on child-centred beliefs scored highest on all dimensions of teacher–child interaction quality. In contrast, teachers rated highest on teacher-centred practices received the lowest scores on the instructional support subscale of the CLASS (Salminen et al., 2012). Findings also suggest that teacher beliefs can directly influence the interactions and activities teachers choose (Gamelas & Aguiar, 2014). Similarly, teachers' beliefs and self-perceptions may also determine the nature of the interactions that occur between them and the children they teach (Lim & Torr, 2007), their practices inside the classroom (Hu et al., 2017), and teacher–child interactions (Zee & Koomen, 2016). Teacher beliefs also influence their behavioural expectations about children and how they interact with young children (Ho et al., 2012). In sum, a teacher's beliefs shape his/her approach to teaching and influence instructional strategies and performance in the classroom as these beliefs help to describe their professional identity (Cheng et al., 2009).

However, previous studies found that teachers' beliefs were inconsistent with classroom practices (Bakshi, 2021; Wen et al., 2011). Teachers often report believing in child-centred practices, but apply more traditional teacher-centred practices. Their beliefs may be more developmentally appropriate than actual practices (Mengstie, 2022). They explained this inconsistency between their beliefs and practices to external factors such as large class sizes, lack of resources, insufficient parental support, and administrative issues. Thus, the extent to which classroom practice can be associated with teachers' beliefs is inconsistent and may vary depending on the context of the teaching–learning experience. Given the influence of teacher beliefs on classroom practices, it is imperative to examine the impact of teacher beliefs on interaction quality.

Teachers' educational level and teaching experience influence on interaction quality

Teachers' educational level and teaching experience are among the structural factors influencing process quality (i.e., teacher–child interaction) in preschool settings. There are many instances in early childhood studies that have found associations between teachers' education level and classroom interaction quality. Studies have noted that the higher the level of teacher education and early childhood training, the better the quality of care and developmentally appropriate practices delivered to young children (Brandenburg et al., 2016; Epstein, 1999). Higher educational levels specific to early childhood have higher-quality classrooms (Tout et al., 2005). Research also suggests a link between teacher educational level and care quality. A previous study confirmed that children received higher-quality education when their teachers had higher educational levels and

consistently worked with the same group (Mims et al., 2008). In the Denny et al. (2012) study, teachers' education and experience were significantly associated with classroom quality but with different domains. The teachers' level of education and years of experience positively influenced the quality of instructional support, while a degree in early childhood education was positively related to the quality of student engagement.

However, researchers who investigated the association between teachers' level of education and classroom quality have revealed inconsistent results (Falenchuk et al., 2017; Perlman et al., 2016). For instance, the secondary analysis of seven large-scale early care and education studies did not yield consistent results considering the effect of teachers' degree of education and major on classroom quality or children's outcomes (Early et al., 2007). Teacher education was positively and significantly related to classroom quality in two studies, while there were no associations in four studies, and a significant but negative correlation was found in one study. The childcare literature revealed that teachers who hold at least a bachelor's degree tend to have higher-quality interactions than teachers without a bachelor's degree (Early et al., 2006); nonetheless, this association has not been found in recent studies of pre-kindergarten programs (Early et al., 2007). Having specialized training in child development may be a more significant contributor to the quality of classroom interactions than simply holding a bachelor's degree (Pianta et al., 2005). The lack of evidence for the associations and inconsistent findings between a teacher's level of education and the quality of care or child outcomes in some studies suggests that perhaps other factors may account for the differences in the quality of care teachers provide. Previous research on teaching experience and classroom quality is inconsistent as effects for the length of teaching experience have not been found in some studies (e.g., Abu Taleb, 2012; Early et al., 2007; Eckhardt & Egert, 2018; Gerber et al., 2007; Manning et al., 2019), while other studies have indicated that emotional support is higher in classrooms where the teacher has fewer years of professional experience (Connor et al., 2005; Mashburn et al., 2006). A study by Phillipson et al. (1997) also indicated that process quality (i.e., teacher-child interaction) was higher in preschool classrooms when teachers were moderately experienced and had higher wages, and years of teaching experience positively influenced the quality of instructional support (Denny et al., 2012). Shorter teaching experience has been found to protect first graders against the detrimental impact of social and learning risk factors on peer rejection (Kiuru et al., 2012) for less experienced teachers who have received their training more recently and, therefore, may have learned more child-centred practices. Generally, a preschool classroom is better positioned to promote high process quality by having high structural quality (Yoshikawa et al., 2013). Although there tends to be a significant relationship between teachers' professional qualifications and the quality of interactions, the association often reflects a small effect size, indicating that professional qualifications may be a minor contributor to the quality of classroom interactions.

Methods

The correlational research design investigated the relationship between teacher-related factors (i.e., teacher beliefs, self-efficacy, educational level, and years of teaching experience) and teacher-child interaction quality. Specifically, it was undertaken to determine if a relationship exists between teacher-child interaction quality as measured in

the domains of (Emotional Support, Classroom Organization, and Instructional Support), and preschool teacher beliefs, self-efficacy, educational level, and years of teaching experience.

Sampling and participants

The target population of this study comprised preschool teachers in Arba Minch town, Ethiopia. The researchers randomly selected 26 schools from a total of 39 preschools located in the city. Out of the 95 preschool teachers randomly invited to participate in this study, 55 (52 females and 3 males) agreed to be observed in their classrooms and completed a survey questionnaire for the quantitative part of this study. They were informed about the study's purpose and details, and their information would be kept confidential. The participating teacher's average age in the observed classrooms was 27 years, with the highest age being 33 and the lowest 23. A majority of teachers (78%) hold a diploma (certification typically requires a three-year training related to early childhood and teacher education professional courses), while 22% have a certificate (certification typically requires one-year training related to early childhood and teacher education professional courses). However, 26 teachers (47%) did not receive their diplomas and certificates in an area related to child development and education in this study, and the years of teaching experience in preschools ranged from 1 to 6 years with an average of 3 years. Within these classrooms, class sizes vary from 26 to 34 children, with an average class size of 29. Even though the class size in the observed classrooms seems small, practically speaking, it is considerably larger in Ethiopian preschools, and it is expected to see a class size above 45 children. The research site was selected due to logistics issues related to observers' training and the time needed to complete four observation cycles for each teacher.

Measures

Classroom assessment scoring system Pre-K (CLASS Pre-K)

The observational measure of preschool classroom quality used in the present study is the Classroom Assessment Scoring System (CLASS; Pianta et al., 2008). It was used to assess the quality of teacher–child interactions in preschool classrooms. The scale measures interaction quality along with three primary domains (Emotional Support, Instructional Support, and Classroom Management) and ten dimensions (Positive Climate, Negative Climate, Teacher Sensitivity, Regard for Student Perspective, Behavior Management, Productivity, Concept Development, Instructional Learning Formats, Quality of Feedback, and Language Modeling) (Pianta et al., 2008). Sample items under Positive Climate (PC) include Relationships, Positive Affect, Positive Communication, and Respect. Similarly, Negative Affect, Punitive Control, Sarcasm/Disrespect, and Severe Negativity are items included under the Negative Climate (NC) dimension. Items on the CLASS are rated on a 7-point scale ranging from *low quality* (1 or 2) to *mid-range quality* (3–5) to *high quality* (6–7). Concerning the psychometric information of the CLASS, Inter-rater reliability has been found to be high (0.87) when reliability is defined as scores within one scale point of each other (Pianta et al., 2008). The CLASS has also demonstrated high predictive and construct validity.

Teacher Belief Scale (TBS)

The instrument selected for this study is the Teacher Beliefs Scale (TBS, Charlesworth et al., 1991), a 37-item graded response scale addressing developmentally appropriate and inappropriate teacher strategies. The TBS, developed by Charlesworth et al. (1991) and revised by Charlesworth et al. (1993), was selected because this study aims to investigate early childhood teachers' DAP beliefs. The items of TBS are based on several areas of the National Association for the Education of Young Children (NAEYC's) appropriate practice guidelines: curriculum goals, teaching strategies, the guidance of socio-emotional development, language development and literacy, cognitive development, physical development, aesthetic development, motivation and assessment of children (Charlesworth et al., 1991).

The DIP and DAP constructs upon which the TBS is based apply to both kindergarten and preschool age groups. TBS consists of 37 items, and all but one are measured on a 5-point Likert scale. It comprises 22 statements that measure DAP and 14 statements that measure DIP, requiring participants to respond on a 5-point scale from 1 (*not important at all*) to 5 (*extremely important*). Sample questions of TBS include "It is ___ for children in early childhood classrooms to learn through active exploration, and Flashcards (words, basic facts) are ___ to an early childhood classroom for instructional purposes". According to Charlesworth et al. (1993), the questionnaire provides a picture of the beliefs of teachers using a degree-of-importance rating scale, revealing the relative value of beliefs since its items are measured on the Likert scale.

Although previous researchers have found more than one factor in the Teacher Beliefs Scale, this study utilized it as a singular scale. Because the DAP and DIP constructs have been conceptualized as being in a continuum instead of as two separate constructs, it is possible to use the scale as one continuum from DAP to DIP as well. Furthermore, the present study utilized the Teacher Beliefs Scale as a whole without dividing it into two subscales because the sample size is very small. Moreover, negative (developmentally inappropriate items) were reversed when totalling the belief scale scores.

Teachers' self-efficacy (TSE)

Teachers' perception of the overall self-efficacy level was measured using a short, 12-item version of the Teachers' Sense of Efficacy Scale (TSES; Tschannen-Moran & Woolfolk Hoy, 2001). Analogous to the original 24-item instrument, the short form of TSES comprises three interrelated dimensions of teacher self-efficacy, which are designated as Instructional Strategies (IS), Classroom Management (CM), and Student Engagement (SE). Each item was rated on a 9-point Likert scale (from 1 = *Nothing* to 9 = *A Great Deal*). Sample items of TSE include "How much can you do to get children to believe they can do well in school work? And to what extent can you provide an alternative explanation or example when children are confused?" The psychometric characteristics of the short form of the TSES have been shown to be adequate and largely comparable to those of the long -form (e.g., Tschannen-Moran & Woolfolk Hoy, 2001). In other words, the 12-item, short version form of the efficacy scale was found to have a stronger factor structure than the 24-item, long version. Therefore, these reliability and validity assessments support the appropriateness of the short form of TSES for use in the present study.

Demographic questionnaire

The researcher developed the Teachers' Background Survey to gain additional information on the participants' educational attainment and teaching experiences that may not have been included in their other responses. Therefore, the background survey provided data needed to examine the relationship between teachers' educational attainment, years of teaching experience, and observed teacher-child interaction quality related to their classroom teaching.

Translations

The instruments, Teacher Sense of Self-Efficacy (TSES) and Teacher Belief Scale (TBS), were translated into Amharic (Ethiopia's official language) to make it easily understandable by preschool teachers. The translation was performed using a standard forward-backward procedure involving two forward translators and one backward translator. All translators have a minimum of a Master's degree and more than eight years of teaching experience in related fields. In the first step of the translation process, two native Amharic speakers independently translated the original English version of the TSES, TBS, and demographic questionnaires into the Amharic language. After the translations were completed, the translators critically evaluated all items for difficulties in translation and the familiarity and relevance of the items for the Ethiopian preschool context. Any discrepancies between the two translations were solved by consensus among the translators, resulting in a single forward translation of the Amharic version of TSES, TBS, and demographic questionnaires.

The draft version of these instruments was then back-translated by a proficient English speaker from Amharic into English. Finally, the Amharic version of the instruments was pilot-tested with ten preschool teachers, who reviewed each item for content validity and wording clarity. Also, three faculty members with specializations in different areas, including early childhood education and assessment and evaluation, reviewed the items to ensure content validity. Depending on their analysis, the investigator, in collaboration with the translators, slightly reworded three adopted TBS items (items 14, 16, and 27) deemed too complex without altering their meaning.

Observer training and coding reliability

The investigator consulted a researcher who used CLASS Pre-K in preschool studies. With the scholar's help, the investigator interpreted each CLASS item in light of the Ethiopian preschool context in which several activities are integrated as thematic learning throughout the day. For this intensive training session, the investigator recruited and trained Master's degree students of Psychology who had completed coursework and was on a long inter-semester break. With the CLASS instrument, observer training consisted of three full days of introductions and background readings on the measure, studying the dimensions, and how to rate the three domains and the ten dimensions utilizing the CLASS Pre-K datasheet manual.

After the training, two observers coded the same classroom live observations on two different days for at least 2 h, followed by an item-by-item group discussion. The observers followed all procedures clearly stated in the CLASS-Pre-K manual during the data collection process to be objective observers, such as taking notes, making judgments

based on the written descriptions, and referring to the manual before assigning any scores. As it was suggested by Pianta et al. (2008), the investigator of this study established IOA (Inter Observer Agreement) by conducting double coding sessions whereby two observers coded the same classroom live observation and checked their codes for consistency. In other words, the trainees had discussions after each live observation session whereby they shared ratings across all domains and dimensions and discussed rationales for each other's ratings. The consensus ratings establish a standard to judge the accuracy of ratings made by trainees; ratings that do not agree with the consensus ratings reflect a high degree of random error, which is used to pinpoint additional training needs (Pianta et al., 2008). They were trained until they reached good inter-rater reliability before starting data collection.

The first attempt at IOA was unsuccessful, with interobserver agreement (IOA) scores of 48%. After intensive group consensus discussions and re-training, the second and the third attempts at IOA were still unsuccessful, with IOA scores of 65% and 78%, respectively. However, the final attempt at IOA was successful, with an IOA score of 83%, which is higher than the standard set by the investigator. According to McMillian & Schumacher (2001), an IOA above 70% has been considered acceptable reliability. Therefore, the 83% score achieved by the trainees would indicate acceptable reliability. The inter-rater reliability, the degree of concordance among raters, was analysed using Intra-Class-Correlations (ICC) across the two pairs of raters, and the average inter-rater reliability estimates for the 10 dimensions ranged from 0.77 to 0.92 with an overall score of $ICC = 0.86$, suggesting a high degree of consistency among CLASS ratings.

Procedures

The researcher contacted all teachers who had previously agreed to participate in the study, and the objectives of the study were described and permissions obtained. The quality of classroom interactions was assessed by trained independent observers using the Classroom Assessment Scoring System (CLASS Pre-K). Based on the teacher's typical daily classroom schedule, teachers and observers chose convenient days to observe four morning sessions in each classroom. During the observations, observers coded interactions in the classroom according to the CLASS recommended procedure of four 20-min observation and 10-min scoring cycles. The CLASS observations were scheduled based on the recommendations of the instrument developers so that four complete cycles of 20 -minutes of observation and 10 min of scoring were completed in each classroom for each teacher participating in the present study (Pianta et al., 2008). The four-cycle schedule of observations at each classroom for each teacher is reported in previous studies as providing the most significant reliability estimates using Cronbach's alpha for each CLASS dimension. Each classroom was observed by two observers at a time during the morning hours for consistency, excluding outside play and mealtime. Finally, teachers completed the TBS and TSE, providing their demographic information in the current study.

Data analysis

Before analysis, data screening was conducted to check for missing values, errors, and extreme values. The reliability test was performed to measure the reliability of the scales

by assessing how each item correlated with other items within each scale. The following alpha values were computed independently for the TBS was $\alpha=0.84$, TSES (classroom management $\alpha=0.85$, instructional strategies $\alpha=0.88$, student engagement $\alpha=0.80$), and total TSES $\alpha=0.89$. Furthermore, a bivariate correlation was computed among independent variables (i.e., teacher beliefs, self-efficacy, educational level, and years of teaching experience), and dependent variables of teacher–child interaction quality as measured on the domains of emotional support, classroom organization, and instructional support. Finally, regression analysis was carried out to investigate whether specific teacher-related factors (i.e., teaching experience, teacher belief, and self-efficacy) could significantly predict classroom quality (emotional support, classroom organization, and instructional support). Variables with significant correlations on each independent variable–dependent variable pair were entered into separate multiple regressions.

Results

This study explored the relationship between preschool teacher beliefs, self-efficacy, educational level, years of teaching experience, and teacher–child interaction measured by the CLASS-Pre-K. The predictive validity of teacher beliefs, teaching self-efficacy, and years of teaching experience in classroom interaction were also considered. The first question addressed in this study concerned the relationship between preschool teacher beliefs and classroom quality. Results indicated a positive relationship between teacher belief and teacher outcomes (i.e., teacher–child interaction) measured by the CLASS. Overall, teacher belief was positively and significantly correlated with emotional support, classroom organization, and instructional support. Table 1 displays the result of this analysis.

The investigator’s second research question sought to determine the relationship between a teacher’s self-efficacy and classroom quality. A bivariate correlation showed that classroom management, instructional strategies, and student engagement of the TSES were significantly correlated with emotional support, classroom organization, and instructional support. Table 2 displays the result of this analysis.

The investigator’s third research question explored the relationship between teacher educational levels, years of experience, and classroom quality. As shown in Table 3, teacher educational level was not significantly associated with the three CLASS-Pre-K domains of emotional support, classroom organization, and instructional support; in contrast, years of teaching experience correlated considerably with emotional support and instructional support but not with classroom organization.

Table 1 Descriptive statistics and correlations among teacher belief and classroom quality

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5
1. Emotional Support	2.74	0.77	–				
2. Classroom Organization	2.42	0.67	0.71**	–			
3. Instructional Support	2.43	0.96	0.54**	0.68**	–		
4. Overall CLASS Score	2.53	0.69	0.85**	0.90**	0.89**	–	
5. Teacher Belief	3.91	0.37	0.58**	0.56**	0.40**	0.57**	–

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

Table 2 Descriptive statistics and correlations among self-efficacy and classroom quality

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8
1. Emotional Support	2.74	0.77	–							
2. Classroom Organization	2.42	0.67	0.71**	–						
3. Instructional Support	2.43	0.96	0.54**	0.68**	–					
4. Overall CLASS Score	2.53	0.69	0.85**	0.90**	0.89**	–				
5. Classroom Management	6.80	1.24	0.45**	0.38**	0.32*	0.43**	–			
6. Instructional Strategies	7.58	1.11	0.35**	0.31*	0.37**	0.39**	0.41**	–		
7. Student Engagement	7.05	1.13	0.42**	0.38**	0.36**	0.44**	0.70**	0.37**	–	
8. Total Self-efficacy	7.14	0.94	0.50**	0.44**	0.44**	0.52**	0.88**	0.71**	0.85**	–

* $p < 0.05$, ** $p < 0.01$ **Table 3** Relations among educational level, years of teaching experience, and classroom quality

Variables	1	2	3	4	5	6
1. Emotional Support	–					
2. Classroom Organization	0.71**	–				
3. Instructional Support	0.54**	0.68**	–			
4. Overall CLASS Score	0.85**	0.90**	0.90**	–		
5. Educational Level	0.15	0.10	0.08	0.12	–	
6. Teaching Experience	0.35**	0.24	0.37**	0.37**	0.25	–

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

Finally, multiple linear regression analysis was carried out to investigate whether specific teacher-related factors (i.e., teaching experience, teacher belief, and self-efficacy) could significantly predict classroom quality (emotional support, classroom organization, and instructional support). Tests to see if the data met the assumption of collinearity indicated that multicollinearity was not a concern (Teaching Experience, $Tolerance = 0.87$; $VIF = 1.14$; Teacher Beliefs, $Tolerance = 0.77$; $VIF = 1.28$; Classroom Management, $Tolerance = 0.41$; $VIF = 2.40$; Instructional Strategy, $Tolerance = 0.79$; $VIF = 1.26$; and Student Engagement, $Tolerance = 0.49$; $VIF = 2.01$). Three hypotheses were made, and results showed that teacher belief predicted emotional support and classroom organization while teaching experience predicted instructional support. Firstly, it was hypothesized that teaching experience, teacher belief, and self-efficacy could significantly predict teachers' emotional support. The model was significant, $R^2 = 0.45$, $F(5, 49) = 7.99$, $p < 0.001$, indicating teacher belief significantly predicted emotional support. The model explains 45% of the variance in emotional support is predicted by teacher belief. In other words, preschool teachers with strong developmentally appropriate practice (DAP) beliefs might fulfil students' academic and emotional needs.

Secondly, it was hypothesized that teaching experience, teacher belief, and self-efficacy could significantly predict teachers' classroom organization.

The model was significant, $R^2 = 0.38$, $F(5, 49) = 6.08$, $p < 0.001$, indicating teacher belief significantly predicted classroom organization. The model explains 38% of the variance in classroom organization is predicted by teacher belief. The result suggests that teachers with strong DAP (developmentally appropriate practice) beliefs use effective strategies to manage student behaviour and maximize classroom learning opportunities. Finally, it was also hypothesized that teaching experience, teacher belief, and self-efficacy

could significantly predict teachers' instructional support. Results have shown that teaching experience predicted instructional support, $R^2 = 0.33$, $F(5, 49) = 4.79$, $p < 0.001$. The model explains 33% of the variance in instructional support is predicted by teaching experience. Table 4 displays the result of this analysis.

Discussion

This study contributes to understanding factors influencing teacher–child interaction quality in preschool settings. The researchers investigated the relationship between teacher-related factors (i.e., teacher belief, teaching self-efficacy, educational level, and teaching experience) and teacher–child interaction quality. Results indicate that teacher belief, teaching self-efficacy, and teaching experience were significantly associated with emotional support, classroom organization, and instructional support. Further, results suggest that teacher belief predicted emotional support and classroom organization, while teaching experience predicted instructional support. The significant association between teacher belief and observed teacher–child interaction quality is in line with previous findings (Gamelas & Aguiar, 2014; Guo et al., 2010; Hu et al., 2017; Lee & Sung, 2022; Rubie-Davies et al., 2012; Salminen et al., 2012; Zee & Koomen, 2016). This significant association validates that DAP defines appropriate instructional practices for young children in early childhood education. Thus, consistent with the core argument that teacher beliefs influence classroom practices and the significant association between teacher beliefs and classroom quality in the present study, strong beliefs about DAP are essential for effective educational practice in early childhood education. In other words, preschool teachers with strong DAP beliefs fulfil students' academic and emotional needs and use effective strategies to manage student behaviour and maximize classroom

Table 4 Multiple linear regression analysis summary for teacher-related factors predicting classroom quality

Variable	B	SE	t	p
Emotional Support				
Teaching Experience	0.095	0.056	1.688	0.098
Teacher Beliefs	0.888	0.249	3.572	0.001
Classroom Management	0.002	0.026	0.060	0.952
Instructional Strategy	0.019	0.021	0.898	0.373
Student Engagement	0.037	0.026	1.448	0.154
Classroom Organization				
Teaching Experience	0.041	0.055	0.735	0.466
Teacher Beliefs	0.900	0.244	3.682	0.001
Classroom Management	−0.007	0.025	−0.275	0.785
Instructional Strategy	0.013	0.020	0.618	0.540
Student Engagement	0.038	0.025	1.507	0.138
Instructional Support				
Teaching Experience	0.184	0.082	2.260	0.028
Teacher Beliefs	0.678	0.361	1.879	0.066
Classroom Management	−0.032	0.037	−0.864	0.392
Instructional Strategy	0.050	0.030	1.651	0.105
Student Engagement	0.060	0.037	1.597	0.117

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

learning opportunities. One explanation for the significant association between teacher beliefs and observed teacher–child interaction quality may be that the teaching through interaction model of the CLASS framework favours a child-centred approach to teaching. Therefore, enhancing teachers' child-centred beliefs to promote quality through higher emotional support, classroom organization, and instructional support is essential in a preschool setting.

Given the associations between teachers' beliefs and classroom quality, professional development training tailored to improving teachers' beliefs needs more attention within in-service and pre-service training. Even though a significant positive association was found between teacher belief and interaction quality, the observed low-level classroom organization and instructional support may reflect the notion that teachers do not always practise what they believe. Teachers often report believing in child-centred practices but apply more traditional, teacher-centred practices (Mengstie, 2022; Hu, 2011; Wen et al., 2011). A more recent study in Ethiopian preschools revealed that teachers mentioned different teaching methods implemented in the classroom (e.g., question and answer, student-centred activities, demonstration, presentation, visual aids, lecture, storytime, and singing); however, their actual teaching in the classrooms mainly covered lecturing and demonstrations (Adam Fadila, 2020). Moreover, with the large class sizes prevalent in Ethiopian preschools, teachers have more children under their care, limiting the transformation of educational beliefs and thereby hindering the implementation of classroom practices regarding teacher–child interaction quality.

Teaching self-efficacy was also significantly associated with the quality of the emotional support, classroom organization, and instructional support in the present study. This finding echoes previous research in which self-efficacious teachers tend to practise higher quality teacher–child interactions and employ instructional strategies thought to foster students' academic achievement (Fackler & Malmberg, 2016; Guo et al., 2010, 2013; Hu et al., 2021; Perren et al., 2017; Wolstein et al., 2021). This finding indicates that teaching self-efficacy, as a personal characteristic, may influence student and teacher outcomes through teacher behaviour and practices, which determine the quality of the classroom environment. Given the associations between teachers' self-efficacy and classroom quality, professional development training customized to enhance teachers' teaching self-efficacy needs more attention within in-service and pre-service training since professional development programs in in-service training can positively influence teacher self-efficacy (Santiago et al., 2022; Toran, 2017).

As measured by the achieved educational level, teacher education was not significantly associated with the three CLASS-Pre-K domains of emotional support, classroom organization, and instructional support was consistent with previous findings (Early et al., 2007; Falenchuk et al., 2017). The secondary analysis of seven large-scale early care and education studies did not yield consistent results considering the effect of teachers' degree of education and major on classroom quality or children's outcomes. Teacher education was positively and significantly related to classroom quality in two studies, while four had no associations. This lack of associations suggests that other factors may account for differences in the quality of care provided by teachers. Twenty-six teachers (47%) in the observed classrooms did not receive their diplomas and certificates in an area related to child development and education in the present study, which might have

influenced classroom quality. Having specialized training in child development may be a more significant contributor to the quality of classroom interactions than simply holding a bachelor's degree (Pianta et al., 2005). More education may be beneficial, however, there is no conclusive evidence that a teacher with a bachelor's degree or any other specific level of education will ensure a high-quality classroom or improve children's learning (Early et al., 2007). Also, years of teaching experience was positively associated with CLASS domains of emotional support and instructional support but not with classroom organization in the present study. Previous research on teaching experience and classroom quality is inconsistent as effects for the length of teaching experience have not been found in some studies (e.g., Ahu Taleb, 2012; Eckhardt & Egert, 2018; Early et al., 2007; Gerber et al., 2007; Manning et al., 2019), while other studies have indicated that emotional support is higher in classrooms where the teacher has fewer years of professional experience (Connor et al., 2005; Mashburn et al., 2006). Teachers in the observed classrooms had fewer years of teaching experience (3 years on average), so children were provided middle-level emotional support. Less experienced teachers receive their training more recently and, therefore, may have learned more child-centred practices. One explanation for the lack of significant association between teaching experience and classroom organization may be teachers' shorter professional experience, which might have prevented them from effectively managing classroom activities.

Findings further reveal that teacher belief predicted emotional support and classroom organization, while teaching experience predicted instructional support. This indicates that teachers' DAP beliefs may be an essential indicator of teaching quality and promote teacher-child interactions, primarily by increasing teachers' responsivity to students' academic and emotional needs and managing children's behaviour. Besides, teaching experience predicted the CLASS domain of instructional support in the current sample. This may be due to the number of years of teaching experience (3 years on average), which might have prevented teachers from promoting students' higher-order thinking skills, so the low-level instructional support provided to children in the observed classrooms. Therefore, school systems would devise a strategy to retain more experienced teachers, thereby providing professional development and in-service training to improve classroom quality.

Limitations and future directions

There are many drawbacks to the present study and suggestions for future research. First, the sample size for the present study was small. A more significant number of participants would have made the study more robust. Larger samples would also increase the likelihood of obtaining strong correlations that are not observed in some variables in the present study. Though the sample is randomized, it does not fully represent Ethiopian preschools, and the generalization of the results might be limited. Therefore, larger sample sizes could be used in the future. Second, due to logistical issues such as the cost of training and lack of professional trainers in the vicinity, observers were not trained and certified by CLASS professionals from Teachstone Company. The CLASS method of data collection by certified CLASS observers would provide a new and improved way to measure preschool quality in the future. Third, this study utilized correlation analyses to yield results. Multilevel modelling needs to be used in the data analysis to more precisely

represent the presence of children nested in classrooms with teachers. Fourth, this study is solely based on quantitative data. Qualitative studies that allow for the prediction of classroom quality can help investigate the role of teacher-related factors in explaining teacher–child interaction quality. Finally, this study used self-reporting while measuring teachers' beliefs and self-efficacy. Previous researchers have found that the self-report nature of the Teacher Belief Survey and Self-efficacy does not tell the whole story. Teachers may have interpreted the items in different ways or marked items that were, for unknown reasons, inconsistent with their intent (Dobbs & Arnold, 2009; Northrup, 1996). Future researchers should use a teacher interview to supplement the results of these surveys.

Conclusions and implications for practice

Quality teacher–child interaction is considered one of the primary mechanisms through which educational experience fosters the development of children's competencies. Therefore, it is imperative to understand the factors that influence interaction quality. Results indicate that teacher belief, teaching self-efficacy, and teaching experience were significantly associated with CLASS emotional support, classroom organization, and instructional support domains. Further, results suggest that teacher belief predicted emotional support and classroom organization, while teaching experience predicted instructional support. Given the associations between teacher belief and classroom quality, professional development programs tailored to enhance teacher beliefs about developmentally appropriate practices need more attention within in-service and pre-service training. Pre-service and in-service professional development programs would emphasize promoting teachers' child-centred beliefs, for teachers' child-centred beliefs are a predictor of emotional support and classroom organization. Professional development programs would equip teachers with components of teacher–child interactions (i.e., emotional support, classroom organization, instructional support), helping them understand effective teacher–child interactions to improve classroom quality. Also, teacher mentors could be used with early childhood educators to help them develop skills related to developmentally appropriate practices for young children. The association between teaching self-efficacy and classroom quality also suggests that preschool teacher training programs would empower teachers with strategies that can make them feel effective and productive in working with all children, thereby assuring the children's future success in social and academic learning. Besides, school administrators in the early childhood care and education (ECCE) workforce could devise a strategy to recruit highly qualified teachers (i.e., teachers specialized in child development) and retain those who have taught for more than three years since teachers' professional experience predicted instructional support. The findings of this study have implications for concerned bodies striving to achieve the 2030 sustainable development goals aimed at increasing the supply of qualified teachers to ensure all girls and boys have access to quality early childhood development and care so that they are ready for primary education, especially in the least developed countries.

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