

Student-Perceived Teacher Feedback as a Mediation Pathway Linking Teachers' Growth Mindset and Children's Mindset in Early Elementary Classrooms

Yan Lin^{1,3}

School of Psychology, Weifang Institute of Technology, No. 7777 Minzhu Street, Economic and Technological Development Zone, Weifang 261101, Shandong Province, China
Corresponding Author Email: lin.yan@wfit.edu.cn

Julia Ai Cheng Lee^{1,2}

Faculty of Cognitive Sciences and Human Development, Universiti Malaysia Sarawak, Child and Adolescent Learning and Wellbeing Centre, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia
Email: aclee@unimas.my

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Abstract

Children's beliefs about whether ability can develop are shaped by repeated classroom messages. This explanatory mixed-methods study examined whether student-perceived teacher feedback (SPTF) formed an indirect pathway between teachers' growth mindset and children's mindset in early primary classrooms. Matched data were obtained from 75 teachers and 1,097 students aged 7–9 years in five Chinese primary schools; interviews were conducted with 15 teachers and 60 students. Given the 2-1-1 nested structure, multilevel mediation was the primary analysis, supplemented by cluster-adjusted path models. Teachers' growth mindset was positively associated with classroom-mean perceived process feedback and negatively associated with perceived personality feedback. Both feedback components showed significant theory-consistent indirect associations with children's cognitive and contextual mindset indicators. Cluster-adjusted sensitivity analyses yielded the same substantive pattern. Interviews suggested that process feedback was experienced as actionable guidance, whereas personality feedback was interpreted as identity labelling and a cue to fixed competence. Findings identify children's interpretations of teacher feedback as a plausible classroom pathway linking teacher beliefs with children's mindset. Because the design was cross-sectional, the indirect effects should not be interpreted causally.

Keywords: Growth Mindset, Student-Perceived Teacher Feedback, Teacher Mindset, Early Elementary Education, Multilevel Mediation

Introduction

Growth mindset refers to the belief that ability can develop through effort, strategies, learning, and support, whereas fixed mindset reflects the view that ability is relatively stable

(Dweck, 2006; Dweck & Leggett, 1988). Research has linked students' mindsets with how they interpret difficulty, respond to failure, and persist in learning (Blackwell et al., 2007; Dweck & Yeager, 2019; Sisk et al., 2018). Recent reviews, however, suggest that growth-mindset effects are heterogeneous and depend on the contexts in which children learn (Burnette et al., 2023; Macnamara & Burgoyne, 2023; Yeager & Dweck, 2020). This contextual variation highlights the need to examine the social environments in which children's mindset beliefs are formed and reinforced, particularly during the early years of formal schooling.

Because children's mindset beliefs are shaped by social, instructional, and evaluative messages, early primary classrooms are a particularly relevant context: children are still forming academic self-concept and may be especially attentive to adult evaluation and feedback cues about ability, effort, and failure (Bandura, 1986; Cimpian et al., 2007; Gunderson et al., 2013; Haimovitz & Dweck, 2017; Hollenstein et al., 2024; Kamins & Dweck, 1999). Explaining mindset development in early primary classrooms, therefore, requires attention to everyday teacher–student interactions, especially the feedback through which messages about ability, effort, and improvement are conveyed and perceived (de Ruiter et al., 2020; Haimovitz & Dweck, 2016; Rissanen et al., 2019). Within this classroom environment, teachers are especially influential socialising agents because they repeatedly interpret students' effort, mistakes, ability, and progress through everyday evaluative communication. Although teacher mindset has been associated with students' growth mindset, the classroom processes that explain this association remain less clear (Mesler et al., 2021). This association is unlikely to operate through teacher beliefs alone; rather, it may depend on how those beliefs are expressed through classroom practices such as responses to errors, effort, progress, and performance (de Ruiter et al., 2020; Rattan et al., 2012; Rissanen et al., 2019). Feedback is especially relevant because it may signal whether success and difficulty are linked to strategies, personal traits, or outcomes (Brandmo & Gamlem, 2025; Butler, 1987; Hattie & Timperley, 2007; Mueller & Dweck, 1998; Schoneveld & Brummelman, 2023; Shute, 2008). However, teachers' self-reported growth mindset does not necessarily mean that children perceive classroom feedback as growth-oriented (Zhang & He, 2024). Consequently, the central research problem is not simply whether teachers hold growth-mindset beliefs, but how those beliefs are communicated through classroom feedback and interpreted by children. Building on this literature, the present study examined whether student-perceived teacher feedback explained the association between teachers' growth mindsets and children's mindsets in early primary classrooms. Specifically, it tested whether children's perceptions of process and personality feedback served as distinct indirect pathways linking teachers' growth mindset to children's cognitive and contextual mindset indicators. The next section examines how teachers' growth mindset becomes visible in classroom practice.

Teachers' Growth Mindset as a Classroom Socialisation Factor

Growth mindset theory was developed within a social-cognitive account of motivation and personality (Dweck & Leggett, 1988). From this perspective, beliefs about ability influence how individuals interpret difficulty, failure, effort, and the possibility of improvement. Students with stronger growth mindsets are more likely to view effort and strategy use as meaningful for learning, whereas students with stronger fixed-mindset tendencies are more likely to view challenges as evidence of limited ability (Dweck, 2006; Yeager & Dweck, 2012, 2020).

This theoretical perspective has also been extended into classroom pedagogy. Growth mindset pedagogy has been described as a process-focused practice that supports students' individual learning processes, promotes mastery orientation, sustains persistence, and directs students toward effort, strategies, and learning from mistakes (Rissanen et al., 2019). Recent classroom-interaction research similarly suggests that teachers and students do not only hold mindsets as internal beliefs; they also enact mindsets through everyday verbalisations about effort, strategies, mistakes, outcomes, and ability (de Ruiter et al., 2020). Teachers' mindset may therefore become visible through classroom language and other pedagogical practices. A classroom socialisation perspective further clarifies why teacher mindset may be particularly important in early primary classrooms (Bandura, 1986; de Ruiter et al., 2020; Haimovitz & Dweck, 2017). Children form ability beliefs through repeated interactions with adults, peers, and learning environments (Bandura, 1986; Gunderson et al., 2013; Haimovitz & Dweck, 2017). Teachers are particularly important socialisers because they organise learning tasks, explain errors, evaluate performance, provide feedback, and model how success and failure should be interpreted (de Ruiter et al., 2020; Rissanen et al., 2019). In this sense, teachers' growth mindset may shape the classroom messages that children repeatedly encounter about ability, effort, mistakes, and improvement.

Nevertheless, teachers' mindset should not be assumed to influence children directly or uniformly (Bardach et al., 2024; Morgan et al., 2024). Recent meta-analytic evidence shows that teachers' growth mindset is only modestly and inconsistently associated with student and instructional outcomes, indicating the need to examine more specific classroom processes, including observable classroom practices and students' interpretations (Bardach et al., 2024). Accordingly, teachers' growth mindset may be linked with children's mindset, but this association is likely to depend on more immediate classroom processes through which teacher beliefs become visible in practice, are communicated through feedback, and are interpreted by children as messages about ability, effort, and improvement (de Ruiter et al., 2020; Rissanen et al., 2019).

Feedback is not merely information about performance. In classroom settings, it also functions as a social signal about what ability means, why success or failure occurs, and how students should respond to difficulty (Kamins & Dweck, 1999; Mueller & Dweck, 1998; Weiner, 1985). Hattie and Timperley (2007) argued that effective feedback helps learners understand the learning goal, their current performance, and directions for subsequent improvement. However, feedback effects vary substantially depending on feedback content and context (Wisniewski et al., 2020). A recent systematic review showed that students' perceptions of teacher feedback are associated with cognitive, emotional, behavioural, and academic outcomes, and that the effects of feedback depend on how students interpret and use the feedback they receive (Brandmo & Gamlem, 2025).

Thus, student interpretation is central to the role of feedback in children's learning processes and their development of ability beliefs. Research on primary school students shows that children construct meaning from teacher feedback by interpreting it as a set of messages about what they are expected to learn and what they must do in order to learn (Eriksson et al., 2022). Feedback may therefore become important not only because of what teachers intend to communicate, but also because of what children notice, infer, and use to

understand themselves as learners (Eriksson et al., 2022; Laranjeira & Teixeira, 2024; Schoneveld & Brummelman, 2023).

Different forms of feedback may carry different attributional and motivational meanings. Feedback that directs students' attention to strategies, effort direction, revision, and next-step improvement may provide cues that learning is controllable and improvable (Hattie & Timperley, 2007; Shute, 2008; Wisniewski et al., 2020). In contrast, feedback that emphasises personal traits, stable ability, or ability labels may make ability appear more fixed or trait-like (Kamins & Dweck, 1999; Mueller & Dweck, 1998; Schoneveld & Brummelman, 2023). Experimental evidence has shown, for example, that praise for intelligence can undermine children's motivation and persistence after failure (Mueller & Dweck, 1998). These findings suggest that teacher feedback may shape children's ability beliefs not only through teachers' evaluative comments on performance, but also through how children interpret those comments as messages about ability, effort, and improvement.

In this study, feedback was conceptualised as process, personality, or outcome feedback. Process feedback emphasises strategies, effort direction, revision, and next-step improvement; personality feedback evaluates children through traits or ability labels; and outcome feedback centres on correctness, grades, task completion, or performance results. These categories may signal whether success and difficulty are linked to controllable learning processes, personal characteristics, or performance outcomes. Outcome feedback was included as a comparison category, centring on the result itself rather than a controllable process or personal characteristic, but was not hypothesised as a mediator because it was not expected to carry a consistent directional signal about whether ability is fixed or malleable. Attention now turns to how children themselves perceive and interpret this feedback.

Student-Perceived Teacher Feedback as a Mediating Pathway

Although feedback is delivered by teachers, its meaning is constructed by students. Classroom messages become influential when students attend to them, interpret them, and use them as information about competence and learning possibilities (Bandura, 1986, 1997; Eriksson et al., 2022; Laranjeira & Teixeira, 2024). This interpretive process is especially important in early primary classrooms, where children are still developing academic self-concepts and may rely heavily on teachers' comments to understand what counts as success, difficulty, effort, and ability.

This distinction between teacher intention and student interpretation is central to understanding student-perceived teacher feedback as a mediating pathway. Teachers may intend feedback as encouragement or guidance, yet students may interpret the same feedback as an ability label, a low expectation, or a judgement about personal competence (Eriksson et al., 2022; Schoneveld & Brummelman, 2023). As discussed above, process feedback and personality feedback carry distinct attributional meanings: process feedback emphasises controllable and improvable aspects of learning, whereas personality feedback may make performance appear more dependent on fixed personal characteristics (Kamins & Dweck, 1999; Mueller & Dweck, 1998).

Attribution theory further clarifies why these perceived feedback messages may be linked to different mindset-related interpretations (Weiner, 1985). Feedback perceived as emphasising

strategies and next-step improvement directs attention to controllable and changeable causes of success and difficulty, whereas feedback perceived as emphasising personal traits may make success and failure evidence of fixed characteristics (Kamins & Dweck, 1999; Mueller & Dweck, 1998).

Taken together, prior theory and empirical evidence suggest that student-perceived teacher feedback in the classroom may serve as a proximal pathway linking teachers' growth mindsets with children's mindsets. Teacher feedback is not educationally meaningful merely because it is delivered. It becomes meaningful when children perceive, interpret, and incorporate feedback into their beliefs about ability, effort, and learning.

The Present Study

This study examined student-perceived teacher feedback as a proximal classroom pathway linking teachers' growth mindsets to children's mindsets in early primary classrooms. Much existing research has examined teacher beliefs, teacher feedback, or student perceptions separately. This leaves an important gap in primary classroom research: less is known about how teachers' mindset beliefs are reflected in the feedback that children perceive, and how these perceptions relate to children's developing beliefs about ability during the early primary years.

The study addresses this gap by shifting attention from teachers' self-reported beliefs to children's perceptions of feedback, using teacher–student-matched data, and focusing on early primary classrooms, where children's ability beliefs are still developing.

This study offers three main contributions. First, it moves beyond examining teachers' self-reported mindset beliefs by identifying student-perceived teacher feedback as a proximal classroom pathway through which those beliefs may become socially meaningful to children. Second, it distinguishes process feedback from personality feedback, allowing their potentially contrasting attributional meanings to be examined within the same model. Third, it combines teacher–student-matched data, multilevel analytical framework, and explanatory interview evidence in early primary classrooms in China, a developmental and cultural context that remains underrepresented in the growth-mindset literature. More broadly, the study contributes to social-science research by showing how institutional beliefs are communicated through everyday interpersonal interactions and interpreted by children in ways that may shape their developing beliefs about ability and learning.

Based on the theoretical and empirical literature reviewed above, the following hypotheses were proposed:

Hypothesis 1: Teachers' growth mindset will be positively associated with children's cognitive and contextual mindset.

Hypothesis 2a: Teachers' growth mindset will be positively associated with student-perceived process feedback, which will, in turn, be positively associated with children's cognitive mindset.

Hypothesis 2b: Teachers' growth mindset will be positively associated with student-perceived process feedback, which will, in turn, be positively associated with children's contextual mindset.

Hypothesis 3a: Teachers' growth mindset will be negatively associated with student-perceived personality feedback, which will, in turn, be negatively associated with children's cognitive mindset.

Hypothesis 3b: Teachers' growth mindset will be negatively associated with student-perceived personality feedback, which will, in turn, be negatively associated with children's contextual mindset.

Method

Design and Participants

The study used an explanatory mixed-methods design, with quantitative findings serving as the primary strand and semi-structured interviews as the explanatory strand (Creswell & Plano Clark, 2018). The quantitative component examined associations among teachers' growth mindset, students' perceptions of teacher feedback, and children's mindsets, while interviews clarified how teachers' beliefs and feedback language were experienced and interpreted.

Participants were recruited through school-based purposive sampling from five primary schools in a second-tier coastal city in eastern China. Eligible teachers were employed teachers responsible for Grades 1–3 classes who agreed to participate. Eligible students were aged 7–9 years, enrolled in Grades 1–3, and participated with parental consent and assent. Students were excluded if school records or teacher reports indicated developmental, reading, or comprehension difficulties that could affect questionnaire completion, determined by classroom teachers from existing school records rather than new diagnostic assessment; no assisted-administration alternative was offered, which may have introduced selection bias (see Limitations).

The final quantitative sample comprised 75 teachers and 1,097 students, after removing 28 student questionnaires for missing responses or careless-response patterns (identical selections across all feedback scenarios and all CMQ/GMC items, i.e., straight-lining), screened prior to any outcome analysis. The teacher sample included 50 female teachers (66.67%) and 25 male teachers (33.33%), with 25 teachers in each grade level. The student sample included 534 boys (48.7%) and 563 girls (51.3%), with a mean age of 7.95 years ($SD = 0.83$). Teacher and student demographic characteristics are shown in Table 1.

Table 1
Teacher and Student Sample Characteristics in the Study

Sample	Characteristic	Category	<i>n</i>	%
Teachers	Gender	Male	25	33.3
		Female	50	66.7
	Grade	Grade 1	25	33.3
		Grade 2	25	33.3
		Grade 3	25	33.3
	Teaching experience	Less than 1 year	10	13.3
		1 to less than 3 years	21	28.0
		3 to 5 years	19	25.3
		More than 5 years	25	33.3
	Subject	Chinese language	43	57.3
		Mathematics	32	42.7
Students	Grade 1	Male	179	49.4
		Female	183	50.6
	Grade 2	Male	178	49.2
		Female	184	50.8
	Grade 3	Male	177	47.4
		Female	196	52.6
	Total	Students	1,097	100.0

Note. Percentages for student gender are calculated within each grade, except for the total row.

For the qualitative component, purposive maximum-variation sampling was used to select 15 teachers and 60 students. The qualitative sample included teachers and students from all three grade levels and was selected to reflect variation in teacher mindset scores and dominant student-perceived teacher feedback profiles. This sampling strategy was used to capture variation in classroom experiences and to support the explanation of the quantitative findings.

Measures

Translation and Adaptation of Instruments

Measures included adapted growth mindset instruments and researcher-developed feedback questionnaires. The Teacher Mindset Questionnaire was adapted from Dweck's implicit theories framework, the Children's Mindset Questionnaire from Mesler et al. (2021), and the Growth Mindset Scale for Children from Muradoglu et al. (2024). The teacher and child feedback questionnaires were developed with reference to process-, person-, and outcome-feedback distinctions in the feedback and praise literature (Hattie & Timperley, 2007; Kamins & Dweck, 1999; Mueller & Dweck, 1998; Skipper & Douglas, 2015). The QTFSC was not taken from a previously published child-report scale. Instead, it was developed for the present study as a researcher-adapted child-report version of the teacher feedback questionnaire, allowing children to report how they perceived their teacher's likely feedback in the same classroom situations.

All instruments and interview protocols were prepared in Mandarin Chinese. English-language measures were translated, reviewed by bilingual educational psychology researchers, back-translated, and piloted with early primary teachers and students to check semantic accuracy, conceptual equivalence, cultural appropriateness, age suitability, scenario comprehensibility, and response-format clarity.

Teacher Growth Mindset

Teachers' growth mindset was assessed using the Teacher Mindset Questionnaire (TMQ), adapted from Dweck's (2006) implicit theories of intelligence framework and modified for the primary teacher context. The measure included eight growth-oriented and fixed-oriented statements rated on a 5-point Likert scale from 0 to 4, yielding possible total scores from 0 to 32. Fixed-mindset items were reverse-scored so that higher total scores indicated a stronger teacher growth mindset. The Teacher Mindset Questionnaire demonstrated excellent internal consistency ($\alpha = .96$).

Teacher Feedback Tendencies

Teachers' feedback tendencies were assessed using the Teacher Feedback Styles Questionnaire (TFS), a classroom-based situational judgement questionnaire developed for this study with reference to prior work on feedback, praise, and mindset-related interpretations of success and difficulty (Hattie & Timperley, 2007; Kamins & Dweck, 1999; Mueller & Dweck, 1998; Skipper & Douglas, 2015). The measure included four standardised classroom situations. For each situation, teachers selected the feedback response they would be most likely to provide to a child. Responses were coded into three feedback categories, process feedback, personality feedback, and outcome feedback, as defined above. Internal consistency estimates were $\alpha = .88$ for process feedback, $\alpha = .87$ for personality feedback, and $\alpha = .70$ for outcome feedback.

Student-Perceived Teacher Feedback

Student-perceived teacher feedback was assessed using the Questionnaire on Teacher Feedback Styles as Perceived by Children (QTFSC). The QTFSC was developed for the present study as a researcher-adapted child-report version of the teacher feedback questionnaire. It retained the same four classroom situations and three feedback categories as the teacher-report version, but changed the respondent perspective from teachers' intended feedback to children's perceived teacher feedback. In each scenario, children were asked to select the type of feedback they believed their teacher would most likely give them. The wording was revised to use second-person, age-appropriate language to support comprehension among early primary students. Internal consistency estimates in the present sample were $\alpha = .92$ for student-perceived process feedback, $\alpha = .79$ for student-perceived personality feedback, and $\alpha = .74$ for student-perceived outcome feedback.

In each of the four classroom situations, the child's single response was coded into one of three mutually exclusive categories using a dummy indicator. Student-perceived process feedback (SPTF-PF) and personality feedback (SPTF-PeF) scores were the count of situations, out of four, in which the child selected that category. Because the three category counts summed to four for every child, they are not independent; student-perceived outcome feedback (SPTF-OF) was therefore omitted from the mediation models as the implicit reference component rather than entered as a fourth predictor. Each child's dominant feedback type (the most-selected category; no ties occurred) was used only for descriptive and qualitative-sampling purposes, not as a mediator. In the mediation analyses, SPTF-PF and SPTF-PeF were entered as parallel continuous mediators on their 0–4 count metric.

Children's Cognitive Mindset

Children's cognitive mindset was measured using the Children's Mindset Questionnaire (CMQ), adapted from Mesler et al. (2021). Four child-appropriate items assessed general beliefs about whether ability or intelligence can change, with higher scores indicating stronger growth-oriented beliefs. One example item was "My intelligence is something that I can change a lot." The Children's Mindset Questionnaire also showed strong internal consistency ($\alpha = .91$).

Children's Contextual Mindset

Children's contextual mindset was assessed using the Growth Mindset Scale for Children (GMC), adapted from Muradoglu et al. (2024). The GMC used mathematics and Chinese language learning situations to assess ability instability and ability malleability in concrete academic contexts. Internal consistency was high for both subscales in the present sample ($\alpha = .97$ for ability instability and $\alpha = .90$ for ability malleability).

Interview Protocols

Teacher and student interview protocols were developed to support the explanatory mixed-methods design. Interviews explored teachers' views on growth mindset and feedback practices, as well as students' experiences of changes in ability, failure attribution, and teachers' feedback language.

Procedure

Data collection was conducted after ethical approval was obtained from the Human Research Ethics Committee (Non-Medical), Universiti Malaysia Sarawak (Approval No. HREC(NM)/2024(1)/90), and permission was obtained from the participating schools.

Questionnaire data were collected from 23 to 27 September 2024. Teachers completed the Teacher Mindset Questionnaire (TMQ) and the Teacher Feedback Styles Questionnaire (TFS). Students completed the Children's Mindset Questionnaire (CMQ), the Growth Mindset Scale for Children (GMC), and the Questionnaire on Teacher Feedback Styles as Perceived by Children (QTFSC) during classroom-based group administration sessions. Trained researchers read the instructions aloud, explained the response format using standardised wording, and clarified procedural questions without suggesting or leading responses. This procedure was used to support younger students' comprehension while maintaining consistency across classrooms.

Semi-structured interviews with selected teachers and students were conducted after the questionnaire administration. Interviews were scheduled during school breaks or other school-designated times to avoid disrupting classroom learning. Each interview lasted approximately 20 minutes. All interviews were conducted in Mandarin Chinese using semi-structured protocols, audio-recorded with consent, transcribed verbatim, and checked against the recordings for accuracy. Interview data were used as the explanatory qualitative strand to clarify how teachers' beliefs and feedback language were experienced and interpreted by children.

Data Analysis

Quantitative data were screened and analysed using SPSS 29 and Mplus 8.3 (Muthén & Muthén, 1998–2017). Preliminary screening examined missing responses, response-pattern concerns, internal consistency, and exploratory factor structure. Exploratory factor analysis supported a one-factor structure for the Teacher Mindset Questionnaire, explaining 77.64% of the total variance, and a one-factor structure for the Children's Mindset Questionnaire, explaining 79.04% of the variance.

Because each participating teacher was linked to one class, students were treated as nested within teachers. Unconditional random-intercept models were first estimated to calculate intraclass correlation coefficients and design effects and to determine the extent of teacher-level clustering in the child outcomes. Hypothesis 1 was then tested using linear mixed-effects models with a random intercept for teacher.

For the mediation analyses, the nested data structure was explicitly taken into account. Because teachers' growth mindset was measured at the teacher level, whereas student-perceived teacher feedback and children's mindset were measured at the student level, the hypothesised mediation models had a 2-1-1 multilevel structure. Multilevel mediation analyses were therefore used as the primary analyses to separate the within-teacher and between-teacher components of student-perceived feedback and children's mindset. At the between-teacher level, teachers' growth mindset was specified as the predictor of classroom-mean student-perceived process and personality feedback. At the within-teacher level, group-mean-centred feedback variables represented each student's feedback perception

relative to the mean perception in that student's classroom. Upper-level indirect effects were evaluated in R (lme4 1.1-35.1) using a nonparametric cluster bootstrap with 2,000 resamples, in which teachers and their nested students were resampled together. Unstandardised coefficients (B), standard errors (SE), p values, and 95% bootstrap confidence intervals were reported. As a sensitivity analysis, observed-variable path models were additionally estimated in Mplus 8.3 using TYPE = COMPLEX, with teacher ID specified as the CLUSTER variable. These sensitivity models adjusted standard errors for teacher-level nesting but did not decompose the student-level mediators and outcomes into within- and between-teacher components. Unstandardised coefficients (B), standardised coefficients (β), standard errors (SE), p values, and cluster-adjusted 95% confidence intervals were reported for these models. Because the study used a cross-sectional design, all indirect effects were interpreted as theory-consistent indirect associations rather than as evidence of temporal or causal mediation.

Qualitative interview data were analysed using thematic analysis (Braun & Clarke, 2006). Meaning units related to teacher beliefs, feedback language, student interpretation, and ability attribution were initially coded. The codes were then grouped and refined into explanatory themes. Two researchers independently reviewed and coded the interview transcripts. Coding discrepancies were discussed until consensus was reached. The quotations reported in the manuscript were translated from Mandarin into English and checked by a bilingual researcher. The qualitative themes were integrated with the quantitative mediation results to explain how children experienced and interpreted teacher feedback language.

Results

Preliminary Analyses, Measurement Quality, and Descriptive Statistics

Descriptive statistics and child-level correlations are presented in Table 2. CMQ was strongly correlated with the GMC total score ($r = .919, p < .001$) and with the GMC subscales (ability instability, $r = .706, p < .001$; ability malleability, $r = .757, p < .001$). Ability instability and ability malleability showed a weak positive correlation ($r = .269, p < .001$). These results indicate that children's general mindset beliefs and contextual mindset indicators were closely related, while ability instability and ability malleability represented distinguishable dimensions of children's ability beliefs, but the very high CMQ–GMC correlation raised a discriminant-validity concern examined further with a confirmatory factor analysis comparing a one-factor model (all eight CMQ and GMC items on one factor) with a two-factor model (CMQ and GMC items loading on separate, correlated factors). Neither model fit well (one-factor: $CFI = .76, RMSEA = .40$; two-factor: $CFI = .76, RMSEA = .41$; robust/MLR, cluster-corrected for teacher), and the two-factor solution produced a latent correlation exceeding 1.0 ($\varphi = 1.08$), an inadmissible (Heywood) value indicating the two constructs could not be empirically distinguished in this sample. Differences between the cognitive- and contextual-mindset results below should therefore be interpreted with caution, and limited CMQ–GMC discriminant validity is treated as a substantive limitation rather than the two measures being described as clearly distinct.

Table 2

Descriptive Statistics and Reliability Estimates for the Main Study Variables

Variable	Measure	N	M	SD	Min	Max	1	2	3	4
Teacher growth mindset	TMQ	75	16.12	7.72	5	30	—	—	—	—
1. Children's Cognitive Mindset	CMQ	1,097	12.04	4.29	6	20	—			
2. Children's Contextual Mindset	GMC total	1,097	1.27	0.49	0	2	.919***	—		
3. Ability Instability	GMC subscale	1,097	0.65	0.29	0	1	.706***	—	—	
4. Ability Malleability	GMC subscale	1,097	0.62	0.33	0	1	.757***	—	.269***	—

Note. TMQ = Teacher Mindset Questionnaire; CMQ = Children's Mindset Questionnaire; GMC = Growth Mindset Scale for Children. Min and Max represent observed score ranges, not theoretical possible ranges (e.g., TMQ has a possible range of 0–32). Internal consistency estimates are reported in the Measures section. Correlations are reported only among child-level variables. Correlations between the GMC total score and its subscales are not reported because they represent part-whole associations. Teachers' growth mindset is reported descriptively only because it was measured at the teacher level; teacher-child associations were examined using linear mixed-effects models (multilevel) and cluster-adjusted path models, as appropriate. The very high CMQ-GMC correlation indicates limited discriminant validity between these measures in this sample (see Results and Limitations). *** $p < .001$.

Testing Hypothesis 1: Associations Between Teachers' Growth Mindset and Children's Cognitive and Contextual Mindset

Unconditional random-intercept models showed substantial clustering of student outcomes within teachers for both the Children's Mindset Questionnaire (CMQ; $ICC = .51$, design effect = 7.98) and the Growth Mindset Scale for Children (GMC; $ICC = .48$, design effect = 7.60). Accordingly, Hypothesis 1 was tested using linear mixed-effects models with a random intercept for teacher and student grade and gender included as covariates. Teachers' growth mindset was positively associated with children's cognitive mindset ($B = 0.39$, $SE = 0.02$, $t(77.84) = 24.16$, $p < .001$) and children's contextual mindset ($B = 0.04$, $SE = 0.002$, $t(77.47) = 23.70$, $p < .001$). These findings were consistent with Hypothesis 1. The ICCs, design effects, and mixed-model results are presented in Table 3.

Table 3

Teacher-Level Clustering and Linear Mixed Model Results

Analysis	Outcome	Estimate	Value
Variance components	CMQ	Between-teacher variance	9.55
		Within-teacher (student-level) residual variance	9.11
		ICC	0.51
		Design effect	7.98
	GMC	Between-teacher variance	0.12
		Within-teacher (student-level) residual variance	0.13
		ICC	0.48
		Design effect	7.60
Linear mixed model	CMQ predicted by TMQ	<i>B (SE)</i>	0.39 (0.02)
		<i>t(df)</i>	24.16 (77.84)
		<i>p</i>	< .001
		95% <i>CI</i>	[0.36, 0.43]
	GMC predicted by TMQ	<i>B (SE)</i>	0.04 (0.002)
		<i>t(df)</i>	23.70 (77.47)
		<i>p</i>	< .001
		95% <i>CI</i>	[0.04, 0.05]

Note. ICC = intraclass correlation coefficient. Because each participating teacher was linked to one class, teacher-level clustering also represented class-level clustering in this study. Design effect = $1 + (\text{average class size} - 1) \times \text{ICC}$; the average number of students per teacher was approximately 14.63. Linear mixed models included Teacher ID as a random intercept and controlled for student grade and gender. CMQ = Children's Mindset Questionnaire; GMC = Growth Mindset Scale for Children; TMQ = Teacher Mindset Questionnaire.

Multilevel Mediation Analysis

Given the 2-1-1 structure of the data, the indirect associations were first examined using a multilevel decomposition that separated the within-teacher and between-teacher components of student-perceived process and personality feedback. The student-level mediator components were group-mean centred. At the between-teacher level, teachers' growth mindset was positively associated with the classroom-mean proportion of student-perceived process feedback ($B = 0.031$, $SE = 0.002$, $p < .001$) and negatively associated with the classroom-mean proportion of student-perceived personality feedback ($B = -0.029$, $SE = 0.001$, $p < .001$). Linear mixed-effects models indicated that the within- and between-teacher mediator components included in the outcome models remained significantly associated with children's mindset (all $|t| > 3.8$). Bootstrapped upper-level indirect effects, based on 2,000

resamples of teachers together with their nested students, were significant for all four pathways: TMQ $\rightarrow$ classroom-mean SPTF-PF $\rightarrow$ CMQ: indirect effect = 0.191, 95% CI [0.148, 0.235]; personality feedback $\rightarrow$ cognitive mindset = 0.130, 95% CI [0.081, 0.179]; process feedback $\rightarrow$ contextual mindset = 0.012, 95% CI [0.007, 0.017]; and personality feedback $\rightarrow$ contextual mindset = 0.019, 95% CI [0.013, 0.026]. None of the confidence intervals included zero. These results supported theory-consistent between-teacher indirect associations through both feedback components. Because the design was cross-sectional, these estimates should not be interpreted as evidence of temporal or causal mediation.

Sensitivity Analysis Using Cluster-Adjusted Path Models

As a sensitivity analysis, two observed-variable path models were estimated using TYPE = COMPLEX. Model 1 used children's cognitive mindset, measured by the Children's Mindset Questionnaire (CMQ), as the outcome. Model 2 used children's contextual mindset, measured by the Growth Mindset Scale for Children (GMC), as the outcome. In both models, student-perceived process feedback (SPTF-PF) and personality feedback (SPTF-PeF) were entered as parallel continuous mediators on their 0–4 count metric. Because the three feedback-category counts summed to four for every child, student-perceived outcome feedback (SPTF-OF) was the implicit complementary component rather than a third predictor. Each path model was just identified (zero degrees of freedom), so chi-square and degrees-of-freedom-based fit statistics were not available. These models adjusted standard errors for teacher-level clustering but did not distinguish within-teacher from between-teacher effects; their coefficients were therefore interpreted only as a robustness check on the direction and statistical significance of the multilevel findings.

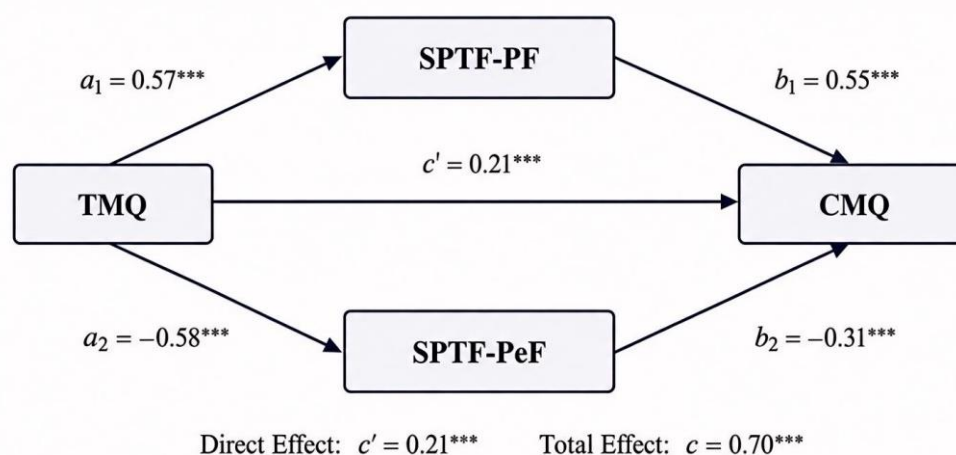


Figure 1. Cluster-adjusted sensitivity model predicting children's cognitive mindset

Note. Values are standardized path coefficients. TMQ = Teacher Mindset Questionnaire; SPTF-PF = student-perceived process feedback; SPTF-PeF = student-perceived personality feedback; CMQ = Children's Mindset Questionnaire; SPTF-OF served as the implicit complementary reference component. *** $p < .001$.

In Model 1, teachers' growth mindset was positively associated with SPTF-PF and negatively associated with SPTF-PeF. In turn, SPTF-PF was positively associated with children's cognitive mindset, whereas SPTF-PeF was negatively associated with it. The combined indirect effect through SPTF corresponded to an estimated 70.5% of the total association ($B = 0.27$, $SE = 0.01$,

$\beta = 0.49$; 95% *CI* for β : [0.45, 0.53]; $p < .001$), with the SPTF-PF pathway corresponding to 44.7% and the SPTF-PeF pathway to 25.9% of the total association (percentages calculated from full-precision standardised estimates as indirect/total effect and may not sum to exactly 100% due to rounding). The direct effect remained significant, $\beta = 0.21$, $p < .001$, indicating a statistically significant indirect association alongside a remaining direct association. Figure 1 presents the path diagram for Model 1.

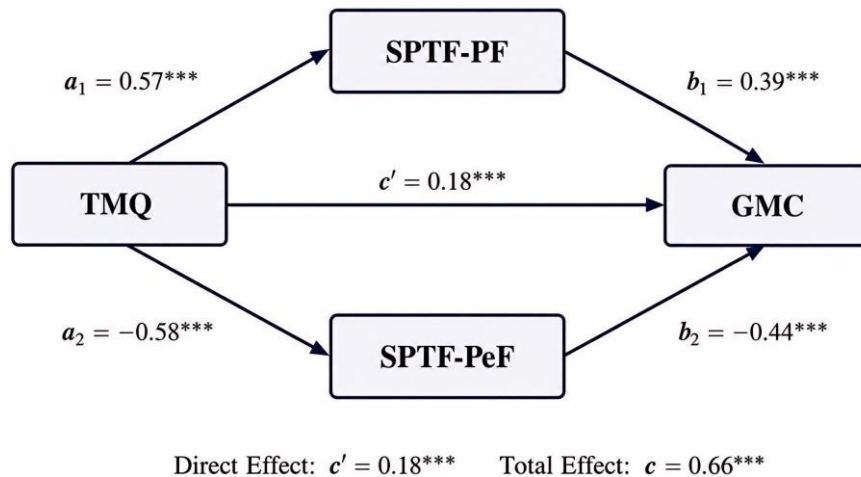


Figure 2. Cluster-adjusted sensitivity model predicting children's contextual mindset
Note. Values are standardized path coefficients. TMQ = Teacher Mindset Questionnaire; SPTF-PF = student-perceived process feedback; SPTF-PeF = student-perceived personality feedback; GMC = Growth Mindset Scale for Children. SPTF-OF served as the implicit complementary reference component. $***p < .001$.

In Model 2, the pattern of results was consistent with Model 1. The combined indirect effect through SPTF corresponded to an estimated 72.6% of the total association ($B = 0.03$, $SE = 0.001$, $\beta = 0.48$; 95% *CI* for β : [0.44, 0.52]; $p < .001$), with the SPTF-PeF pathway corresponding to 39.1% and the SPTF-PF pathway to 33.6% of the total association (percentages may not sum to exactly 100% due to rounding). The direct effect also remained significant ($\beta = 0.18$, $p < .001$), indicating a statistically significant indirect association alongside a remaining direct association. Figure 2 presents the path diagram for Model 2. Together, these findings supported Hypotheses 2a, 2b, 3a, and 3b. Sensitivity-analysis path coefficients and indirect-effect decompositions are presented in Table 4.

Table 4

Cluster-Adjusted Sensitivity Analysis: Path Coefficients and Decomposition of Indirect Effects Through SPTF

Panel	Model/path or effect	<i>B</i>	<i>SE</i>	<i>β</i>	<i>p</i>	95% CI for <i>β</i>	% of total
Path coefficients	Mediator equation (common to Models 1 and 2): TMQ → SPTF-PF	0.03	.002	.57	< .001	[.51, .62]	
	Mediator equation (common to Models 1 and 2): TMQ → SPTF-PeF	-0.04	.002	-.58	< .001	[-.64, -.53]	
	Model 1: SPTF-PF → CMQ	4.95	.19	.55	< .001	[.50, .59]	
	Model 1: SPTF-PeF → CMQ	-2.61	.19	-.31	< .001	[-.35, -.26]	
	Model 1: TMQ → CMQ (direct)	0.11	.02	.21	< .001	[.14, .27]	
	Model 2: SPTF-PF → GMC	0.41	.02	.39	< .001	[.34, .43]	
	Model 2: SPTF-PeF → GMC	-0.43	.02	-.44	< .001	[-.48, -.40]	
	Model 2: TMQ → GMC (direct)	0.01	.002	.18	< .001	[.11, .25]	
	CMQ: total indirect via SPTF	0.27	.01	.49	< .001	[.45, .53]	70.5%
	CMQ: SPTF-PF pathway	0.17	.01	.31	< .001	[.28, .34]	44.7%
Indirect effects	CMQ: SPTF-PeF pathway	0.10	.01	.18	< .001	[.15, .21]	25.9%
	CMQ: direct effect	0.11	.02	.21	< .001	[.14, .27]	29.6%
	GMC: total indirect via SPTF	0.03	.001	.48	< .001	[.44, .52]	72.6%
	GMC: SPTF-PF pathway	0.01	.001	.22	< .001	[.19, .25]	33.6%
	GMC: SPTF-PeF pathway	0.02	.001	.26	< .001	[.23, .29]	39.1%
	GMC: direct effect	0.01	.002	.18	< .001	[.11, .25]	27.3%

Note. SPTF-PF = student-perceived process feedback; SPTF-PeF = student-perceived personality feedback; CMQ = Children's Mindset Questionnaire; GMC = Growth Mindset Scale for Children; TMQ = Teacher Mindset Questionnaire. SPTF-PF served as the implicit reference component; therefore, SPTF-PF and SPTF-PeF pathways are interpreted relative to outcome feedback. Teacher ID was specified as the cluster variable, and standard errors were adjusted for teacher-level clustering. Each path model was just identified, so chi-square/df-based fit statistics were not available. Proportions were calculated as the standardized indirect or direct effect divided by the standardized total effect and may not sum to exactly 100% due to rounding.

Correspondence between Teachers' Reported Feedback and Children's Perceived Feedback

To evaluate this correspondence directly, we compared each child's dominant perceived feedback category with their own teacher's dominant self-reported category. Individual-level agreement was 63.4% ($\kappa = .445$). Aggregating to the classroom level and comparing each teacher's dominant category with the modal category perceived by their students, agreement was higher, at 84.0% ($\kappa = .751$; $n = 75$ teachers). Teacher-reported and classroom-mean student-perceived proportions were strongly correlated for process ($r = .861$) and personality feedback ($r = .883$), but only moderately for outcome feedback ($r = .457$). Teachers reported

giving more process feedback ($M = .380$, $SD = .416$) than students perceived receiving ($M = .317$, $SD = .262$), a small but significant difference (mean difference = $.063$, 95% CI $[-.010, .117]$, $t(74) = 2.37$, $p = .021$); the equivalent comparison for personality feedback was not significant (mean difference = $.019$, 95% CI $[-.035, .072]$, $t(74) = 0.71$, $p = .482$). Teachers' and children's reports thus corresponded closely overall, with teachers appearing to somewhat overestimate how much process feedback they provide relative to what children perceive.

Qualitative Explanatory Findings

Interview findings clarified how the quantitative pathways may be reflected in classroom interaction. Three themes were identified: growth-oriented teacher beliefs as feedback framing, process feedback as actionable guidance, and personality feedback as identity labelling and fixed-competence cues.

Theme 1: Growth-Oriented Teacher Beliefs as Feedback Framing

Some teachers with relatively stronger growth-oriented beliefs described children's difficulties as temporary, specific, and open to improvement. Rather than treating mistakes as evidence of carelessness or weak ability, these teachers described errors as points for diagnosis and further instruction. One teacher explained:

"When a child makes a mistake, I try not to say that the child is careless or weak in foundation. I ask which step was missed and what method can be tried again."

This excerpt illustrates how growth-oriented teacher beliefs may be expressed through feedback that directs children toward strategies, revision, and continued effort rather than stable ability. It aligns with growth mindset pedagogy, which emphasises effort, strategy use, learning from mistakes, and improvement (Rissanen et al., 2019; de Ruiter et al., 2020).

Theme 2: Process Feedback as Actionable Learning Guidance

Students' interview responses suggested that process feedback was experienced as practical guidance for what to do next. Rather than receiving feedback only as praise, correction, or evaluation, children appeared to value feedback that identified a specific problem and offered a possible strategy for improvement. One student explained:

"The teacher tells me which step was wrong and asks me to try another way, so I know what to do next."

This excerpt shows how process feedback may make difficulty feel changeable and manageable. By identifying the error and suggesting another strategy, the teacher's feedback provides concrete next-step information, consistent with formative feedback principles (Hattie & Timperley, 2007; Shute, 2008; Wisniewski et al., 2020). This helps explain why student-perceived process feedback was positively associated with children's cognitive and contextual growth mindsets.

Theme 3: Personality Feedback as Identity Labelling and Fixed-Competence Cues

The student interviews helped explain the quantitative negative association between student-perceived personality feedback and children's growth-oriented mindset indicators. Some children did not appear to interpret personality-focused comments merely as temporary corrections of behaviour or performance. Instead, they understood such comments as messages about who they were as learners. One student explained:

“When I hear that I am not careful enough or not smart enough, I feel that I am just that kind of student.”

This excerpt suggests that personality feedback may be internalised as a judgement about stable personal characteristics rather than as information about a changeable learning process. In early primary classrooms, trait-like comments such as “smart,” “not smart,” or “careless” may therefore act as fixed-competence cues, consistent with research on person-focused praise, criticism, and linguistic cues (Cimpian et al., 2007; Kamins & Dweck, 1999; Mueller & Dweck, 1998).

These qualitative findings help explain why perceived personality feedback functioned as a negative pathway in the mediation models. Even when intended as encouragement or correction, personality feedback may be interpreted by children as an ability-related label. Overall, the qualitative findings suggest that teacher beliefs may be reflected in how feedback is expressed and that children may interpret feedback in personally meaningful ways. Whether repeated feedback experiences over time contribute to children’s developing beliefs about ability, effort, and improvement was not directly measured in this cross-sectional study and remains an interpretation for future longitudinal investigation.

Discussion

SPTF as a Classroom Socialisation Pathway

This study examined student-perceived teacher feedback as a classroom pathway associated with teachers’ growth mindset and children’s mindset in early primary classrooms. The primary multilevel analyses indicated that between-teacher differences in classroom-mean student-perceived process and personality feedback statistically accounted for part of the association between teachers’ growth mindset and children’s mindset. The cluster-adjusted sensitivity analyses produced the same substantive pattern. These findings are consistent with social cognitive theory and with recent evidence calling for closer attention to the classroom processes associated with teachers’ mindsets and student outcomes (Bandura, 1986; Bardach et al., 2024). They do not, however, establish that teacher mindset or feedback caused changes in children’s mindset. Teachers’ growth mindset may instead be understood as a teacher-level belief associated with how errors, effort, progress, and ability are communicated and perceived in the classroom.

Distinct Roles of Process and Personality Feedback

Process and personality feedback appeared to carry different meanings for children’s beliefs about ability. Process feedback was positively associated with growth-oriented mindset indicators, suggesting that feedback focused on strategies, effort direction, and next steps may help children interpret difficulty as improvable. This is consistent with formative feedback perspectives emphasising specificity, actionability, and improvement orientation (Hattie & Timperley, 2007; Shute, 2008; Wisniewski et al., 2020). In contrast, personality feedback was negatively associated with growth-oriented indicators, suggesting that trait- or ability-focused comments may make fixed ability more salient, consistent with experimental evidence that person- and intelligence-focused praise directs attention toward stable personal qualities rather than controllable, improvable aspects of performance (Mueller & Dweck, 1998; Hu & Zhang, 2024; Muthukrishnan et al., 2024).

Teacher Intention and Student Interpretation

The correspondence between teachers' self-reported feedback and children's perceived feedback (reported above) was substantial rather than weak, particularly at the classroom level. The one reliable divergence was that teachers reported providing more process feedback than students perceived receiving, with no equivalent divergence for personality feedback. This selective pattern is informative: process feedback often involves identifying a specific step or strategy, a judgment teachers may over-report relative to what children actually register, especially when the guidance is not concrete enough to be actionable. Personality feedback, by contrast, involves shorter, more memorable trait labels ("smart," "careless") likely equally salient to teacher and child, which may explain why no comparable divergence emerged there. Rather than a general breakdown between intention and perception, teachers' reported feedback tendencies broadly corresponded with students' reported perceptions at the classroom level, with the qualified exception that process-oriented guidance may not always register as clearly as teachers believe.

In early primary classrooms, children may be especially attentive to teachers' evaluative language because they are still developing academic self-concept and ability beliefs, drawing motivational meaning from subtle adult feedback and evaluative cues (Cimpian et al., 2007; Gunderson et al., 2013; Kamins & Dweck, 1999). This finding adds nuance to work suggesting that teachers' self-reported growth mindset does not necessarily translate directly into growth-mindset-oriented feedback practice (Zhang & He, 2024), and to research emphasising that students actively construct meaning from feedback rather than receiving it as a fixed message (Eriksson et al., 2022; Laranjeira & Teixeira, 2024). Growth-mindset teacher education should therefore not assume that intended feedback is automatically received as intended, particularly for process-oriented guidance, and could help teachers check whether such feedback is concrete enough for children to notice and use.

Practical Implications

The findings suggest that growth-mindset work in early primary classrooms should move beyond general messages about ability being malleable and focus more directly on the feedback language teachers use when responding to children's errors, effort, and partial success. Simply encouraging teachers to believe that children can improve may be insufficient if classroom feedback still contains person-focused or ability-labelling cues (Savvides & Bond, 2021). Professional development should therefore include explicit feedback communication training that helps teachers identify comments such as "You are very smart" or "You are careless" and replace them with process-oriented guidance. For example, after an error, teachers can identify the specific step that needs revision, name a strategy the child can try, and connect effort to a clear next action.

The findings also suggest that schools should attend to the gap between teachers' intentions and children's perceptions. Feedback quality cannot be evaluated only from the teacher's perspective because children may interpret the same comment as guidance for improvement, judgement about ability, or a label about the kind of learner they are. Reflective practices such as peer observation, short video reflection, feedback-category checklists, and age-appropriate child-report tools may help teachers examine not only what they say, but how their feedback is likely to be received by children.

Finally, growth-mindset pedagogy for early primary children should be concrete, contextualised, and tied to real classroom tasks. For children in Grades 1–3, abstract messages about intelligence or brain plasticity may be less meaningful than repeated classroom experiences showing that mistakes can be examined, strategies can be changed, and improvement can follow revision. The practical implication is therefore not simply to teach growth mindset as a topic, but to organise classroom interaction so that children repeatedly hear and experience feedback as specific guidance for improvement.

Limitations and Future Research

Several limitations should be noted. First, the cross-sectional design precludes causal inference; the mediation findings should be read as theory-consistent indirect associations rather than causal mediation, and longitudinal or experimental designs are needed to test whether changes in feedback practice predict changes in children's mindset over time. Second, the sample was drawn from five schools in one coastal city in eastern China, too few to estimate school-level differences robustly; future work should sample more schools across regions and cultures. Third, feedback was assessed via situational judgement tasks and self/peer report rather than naturalistic observation, and hypothetical scenarios may not fully reflect real classroom feedback; video-based observation would strengthen future designs. Fourth, the feedback mediators and mindset outcomes were both child-reported, raising the possibility of common-method variance, and the process/personality/outcome counts were structurally interdependent; the multilevel primary analysis corroborates but does not fully resolve this dependency. Fifth, the Teacher Feedback Styles Questionnaire and QTFSC are researcher-developed measures that, although preliminary reliability evidence was obtained, the instruments require further evaluation of their content validity, response-process validity, internal structure, convergent validity, and cross-sample stability. Sixth, the very high CMQ–GMC correlation, and the inadmissible latent correlation obtained when they were modelled as separate factors, indicate that cognitive and contextual mindset could not be clearly distinguished in this sample, so differences between them should be interpreted cautiously. Seventh, the English-language measures were translated into Mandarin, and the interview quotations were translated from Mandarin into English. Although back-translation and bilingual review were used, some linguistic or cultural nuances may not have been fully preserved. Eighth, the teacher–student agreement analysis compared one teacher report with multiple student reports per classroom; the child-level estimates should be read with this many-to-one structure in mind. Finally, the study did not examine potential moderators such as classroom climate, teacher–student relationships, prior achievement, or subject domain, and future studies should also test whether children's general and context-specific mindset beliefs show distinct patterns across age, subject, and culture.

Conclusion

This study suggests that student-perceived teacher feedback may represent an important theory-consistent pathway linking teachers' growth-mindset beliefs with children's mindset in early primary classrooms. Higher teacher growth-mindset scores were associated with greater student-perceived process feedback and lower student-perceived personality feedback, and these perceived feedback patterns were, in turn, associated with stronger indicators of cognitive and contextual growth-oriented mindsets. The findings highlight the importance of teacher feedback language as classroom social information that children notice, interpret, and attach personal meaning to over time.

Statements and Declarations

Ethics Approval

This study was conducted in accordance with the principles of the Declaration of Helsinki. Institutional ethics approval was obtained from the Human Research Ethics Committee (Non-Medical), Universiti Malaysia Sarawak, prior to data collection. The ethics approval number is HREC(NM)/2024(1)/90.

Consent to Participate

Written informed consent was obtained from teachers, and parental consent and student assent were obtained before student participation. Participants were informed that participation was voluntary and that they could withdraw without penalty.

Competing interests

The author(s) declare no competing interests.

Funding

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Data availability

The datasets analyzed in the current study are not publicly available because they involve minors and school-level information. De-identified data may be made available from the corresponding author upon reasonable request and subject to ethics approval and institutional requirements.

Author contributions

Yan Lin and Julia Ai. Cheng. Lee contributed to the conceptualisation and methodology of the study. Yan Lin conducted the formal analysis, managed data curation, prepared the original draft, and administered the project. Both authors contributed to manuscript review and editing, approved the final manuscript, and agreed to be accountable for the work.

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