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Growth Mindset and Teaching Self-Efficacy of PPG Students: The Mediating Role of Self-Regulated Learning

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ABSTRACT

Teaching self-efficacy is linked to pre-service teachers' readiness, yet the mechanism connecting it to beliefs that ability can be developed remains rarely tested in Indonesian teacher profession education (PPG). This study examined the association between growth mindset and teaching self-efficacy and the statistical mediating role of self-regulated learning (SRL). A cross-sectional quantitative survey involved 85 pre-service PPG students from three teacher education institutions. Sampling used a proportionate stratification frame by institution and study program with voluntary participation (85 of 250 invited students were analyzed). Data were analyzed with descriptive statistics, reliability and item-total correlations, Pearson correlations, and PROCESS Model 4 mediation (Hayes, 2022) with 5,000 bootstrap samples. Growth mindset was positively associated with SRL ($a = 0.430$; $p < 0.001$) and teaching self-efficacy ($c = 0.346$; $p < 0.001$). SRL was positively associated with teaching self-efficacy with growth mindset controlled ($b = 0.457$; $p < 0.001$). The indirect effect was significant ($ab = 0.196$; 95% CI [0.092, 0.312]), whereas the direct effect was not ($c' = 0.150$; $p = 0.085$), an indirect-only pattern consistent with a pathway through SRL. Because the design is cross-sectional and self-reported, findings are interpreted as associations rather than causal evidence, and the reverse-ordered model cannot be distinguished using these data. PPG programs may consider combining mindset development with SRL training, with effectiveness to be tested experimentally.

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1. INTRODUCTION

Teacher Professional Education (Pendidikan Profesi Guru, PPG) is the final stage of professional teacher preparation in Indonesia. Students perform two roles at once: adult learners mastering pedagogy and content, and prospective teachers who must soon act in real classrooms. This pressure makes self-beliefs about one's capability an important

psychological resource. Teaching self-efficacy, the belief of a teacher or prospective teacher that he or she is able to plan and carry out the actions required to produce effective learning [1], [2] is related to persistence in the face of difficulty teaching quality, and student engagement [3], [4], and can be enhanced through appropriately designed professional development [5]. Understanding what is associated with it during PPG matters for the quality of teachers entering schools.

One frequently discussed candidate is growth mindset, the belief that intelligence and abilities can develop through effort, strategies, and feedback [6]; individuals with this belief interpret failure as information for improving strategy rather than as a verdict on their capacity. Yet the literature calls for caution. Meta-analyses show small average effects of growth mindset interventions that vary according to target, delivery, and context [7], and another questions their effect on achievement once methodological bias is considered [8]. The question has therefore shifted from "whether growth mindset works" to "through what mechanisms and under what conditions" [9], [10]. Growth mindset is associated with challenge-seeking, but this depends on environments that provide opportunities to act [6]. Among teachers, intervention effects are stronger when teachers' mindsets support the message delivered to students [11], and teachers' mindsets are associated with the development of students' mindsets [12].

Research on pre-service teachers suggests that growth mindset is relevant to professional beliefs, although the constructs measured differ from those examined here. A light-touch mindset training for pre-service teachers (N = 83) preserved their beliefs about students' developable abilities during a tutoring period, whereas the untrained group declined [13]. Among 797 pre-service teachers in China, growth mindset was associated with career decision-making efficacy, not teaching efficacy, through self-esteem [14], and a two-sample Czech study found that teachers' growth mindset (beliefs about students' abilities) and self-efficacy were both related to the meaningfulness of teaching [15]. Existing evidence thus positions self-efficacy as an outcome or mediator for different constructs, without explaining the learning process that could connect beliefs about ability with beliefs about teaching capability.

A plausible mechanism is self-regulated learning (SRL), the process by which learners set goals, monitor, control, and reflect on their cognition, motivation, and behavior [16]. SRL is trainable: meta-analyses show that SRL training improves achievement, learning strategies, and motivation [17], including in online and blended environments [18], and classroom observation studies confirm that explicit strategy instruction and indirect activation both foster SRL [19]. SRL is related to perceived competence and procrastination management during learning crises [20], to time management [21], and to differences between high and low achievers on long-term tasks [22], and support for metacognition is regarded as a practical lever for learning outcomes [23].

The growth mindset–SRL relationship has empirical support: a systematic review of ten studies with fifteen samples reported a positive association with an average correlation of about 0.40, while stressing the need for studies of mediating and moderating factors [24]. The SRL–self-efficacy relationship is supported by social-cognitive theory, because the mastery experiences generated by planned and monitored learning are a

primary source of self-efficacy [1], [25]. Among teachers, competence as a self-regulated learner is related to the ability to act as an agent of SRL for students [26], and the development of teachers' efficacy in promoting SRL is influenced by prior experience, mindset, and SRL skills [27]. In Indonesia, self-regulation and technology self-efficacy are related to TPACK mastery among pre-service elementary teachers [28], and perceptions of feedback mediate the relationship between psychosocial factors and SRL among Islamic university students [29].

Three gaps are apparent. First, the evidence is fragmented: some studies examine pairs of variables, some examine in-service teachers, and only a few test all three simultaneously among pre-service teachers currently undergoing PPG. Second, research in Indonesia does not appear to have examined SRL as a pathway connecting growth mindset with teaching self-efficacy; this is based on a search of Scopus, Web of Science Core Collection, ERIC, Garuda, and Google Scholar (top 200 results) conducted on 2–18 June 2026, using titles, abstracts, and keywords in English and Indonesian: ("growth mindset" OR "implicit theory of intelligence" OR "pola pikir bertumbuh") AND ("self-regulated learning" OR "self-regulation" OR "regulasi diri belajar") AND ("teaching self-efficacy" OR "teacher self-efficacy" OR "efikasi diri mengajar" OR "efikasi guru") AND ("pre-service teacher" OR "preservice teacher" OR "teacher candidate" OR "teacher education" OR "PPG" OR "calon guru"). Included studies were quantitative empirical articles on pre-service teachers that measured at least two of the three variables, and none tested all three simultaneously among PPG students in Indonesia. Third, most mediation evidence on this topic is cross-sectional, so temporal order has not been tested [30]. This study is an initial test with the same design; results are therefore reported as associations, with an alternative model, open limitations, and transparent reliability reporting [31].

Based on this framework, this study examines (1) the association between growth mindset and teaching self-efficacy, (2) between growth mindset and SRL, (3) between SRL and teaching self-efficacy with growth mindset controlled, and (4) the statistical mediating role of SRL. The hypotheses are: H_1, growth mindset is positively associated with teaching self-efficacy (total effect, path c); H_2, growth mindset is positively associated with SRL (path a); H_3, SRL is positively associated with teaching self-efficacy with growth mindset controlled (path b); and H_4, the indirect effect of growth mindset on teaching self-efficacy through SRL ($a \times b$) is significant. The direct effect (c') is reported to determine the type of mediation. The contribution is theoretical (testing a theory-consistent pathway between implicit beliefs and beliefs about professional capability) and practical (identifying a point that merits testing as an intervention target in the PPG curriculum). Figure 1 presents the conceptual model.

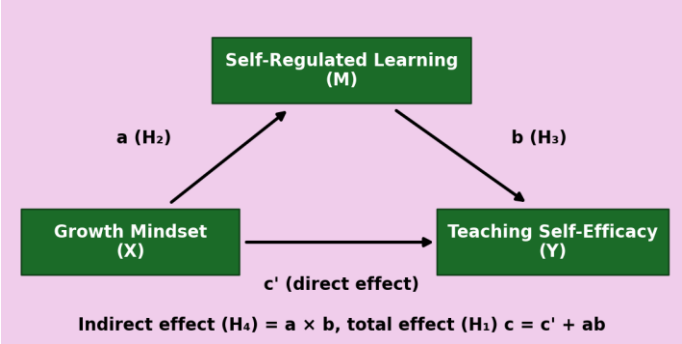


Figure 1. Conceptual model of the study (simple mediation, PROCESS Model 4)

2. METHOD

2.1. Research Design

This study used a quantitative approach with an explanatory cross-sectional survey design, chosen because the aim is to test statistical relationships among variables in a defined population, not to explore meaning in depth. The model is a simple mediation with growth mindset as the independent variable (X), SRL as the mediator (M), and teaching self-efficacy as the dependent variable (Y), all as composite scores (item means). The analysis used the PROCESS Model 4 macro (Hayes, 2022), which estimates OLS regression paths and the indirect effect through bootstrapping, because the distribution of the indirect effect (the product of two coefficients) tends to be non-normal, making the Sobel test less appropriate [32].

2.2. Population, Sample, and Sample Size Justification

The target population was current-cohort Pre-Service PPG students at three teacher education institutions (LPTK) that run the program. A total of 250 students were invited using a sampling frame stratified by LPTK and study program (proportionate stratified sampling). Because the online questionnaire was voluntary, the final sample consisted of willing respondents within that frame; its composition (Table 2) is therefore not guaranteed to be proportional to the population, and it is treated as a voluntary stratified sample rather than a probability sample, with cautious generalization. Of the 250 students invited, 92 responses were collected (response rate 36.8%); seven were eliminated because they failed the attention check, were incomplete, or showed uniform response patterns (straight-lining), so the analytic sample was N = 85 (34.0% of those invited).

Sample size followed power-based justification [33]. For a mediation model with medium-to-large a and b paths (about 0.39 in standardized units), simulation studies show that bootstrap power of 0.80 is reached at around 70 to 80 respondents [34], [35], whereas small-to-medium paths require a much larger sample. Path a can be anticipated to be medium to large based on previous reviews (average correlation of about 0.40; [24]), whereas path b has no direct empirical benchmark in this population and is assumed to be medium to large on the rationale of social-cognitive theory [1], [25]. Under these assumptions, 85 students were adequate for testing the indirect effect, but less robust for detecting a small direct effect and inadequate for confirmatory factor analysis on 40 items.

2.3. Instruments

All instruments used a Likert scale from 1 (strongly disagree) to 5 (strongly agree), and each variable's score is the item mean. Growth mindset (X) was measured with an adaptation of the 8-item Implicit Theories of Intelligence Scale [36], derived from the implicit theory of intelligence [37] and treated as unidimensional; fixed-mindset items were reverse-scored. Self-regulated learning (M) was measured with a 20-item scale based on Zimmerman's [16] three-phase model, namely forethought, performance, and self-reflection. Teaching self-efficacy (Y) was measured with the 12-item short form of the Teacher Sense of Efficacy Scale [2], covering instructional strategies, classroom management, and student engagement. Table 1 summarizes the instruments and their pilot reliability evidence.

Table 1. Research instruments and pilot reliability evidence (N = 30)

Variable	Theoretical basis	Items	Dimensions	Cronbach's α	Corrected item-total r
Growth mindset (X)	Dweck (1999, 2006), implicit theory of intelligence	8	Unidimensional	0.86	0.40–0.76
Self-regulated learning (M)	Zimmerman (2002), three phases	20	Forethought, performance, self-reflection	0.94	0.41–0.79
Teaching self-efficacy (Y)	Tschannen-Moran & Hoy (2001), short form	12	Instructional strategies, classroom management, student engagement	0.94	0.52–0.83

The instruments underwent back-translation [38], expert judgment by three experts with Aiken's $V \geq 0.80$ [39], and a limited pilot test with 30 PPG students from the three LPTK who were not included in the final sample. The pilot yielded Cronbach's alpha coefficients of 0.860 (growth mindset), 0.943 (SRL), and 0.938 (teaching self-efficacy), all above the minimum threshold of 0.70 [40]. Corrected item-total correlations ranged from 0.40–0.76 (growth mindset), 0.41–0.79 (SRL), and 0.52–0.83 (teaching self-efficacy), all above 0.30 [41], and deleting any item did not meaningfully increase α, so no items were revised.

2.4. Procedure and Ethics

The questionnaire was distributed online in weeks 6 to 8 of the PPG program, when students had gained initial teaching practice experience. Participation was voluntary, respondents gave electronic informed consent, the data were anonymized, and the study received ethical approval. To reduce common method bias, scale order was randomized and three attention-check items were inserted; Harman's single-factor test was run after data collection as a rough check only.

2.5. Data Analysis

The analysis was conducted in seven stages: (1) data screening and assumption testing (skewness and kurtosis for normality, Breusch-Pagan for homoscedasticity, VIF for multicollinearity, and Durbin-Watson for error independence); (2) descriptive statistics and score categorization (low 1.00–2.33; moderate 2.34–3.66; high 3.67–5.00, with scores rounded to two decimals before categorization); (3) reliability (Cronbach's $\alpha \geq 0.70$; [40]), item consistency (corrected item-total correlation ≥ 0.30; [41]), and preliminary examination of construct distinctiveness through inter-construct correlations (< 0.85; [42]); (4) Pearson correlations; (5) PROCESS Model 4 mediation analysis with 5,000 bootstrap samples and 95% percentile confidence intervals for the indirect effect, whereas the total and direct effects were tested with OLS (t-test); (6) sensitivity analysis with gender, age, and teaching experience as covariates; and (7) examination of a model with alternative direction. The mediation model is expressed by the following three regression equations.

$$M = iM + aX + eM \quad (1)$$

$$Y = iY + c'X + bM + eY \quad (2)$$

$$Y = iY^* + cX + eY^* \quad (3)$$

The indirect effect is computed as $IE = a \times b$, the total effect as $c = c' + (a \times b)$, and the proportion mediated as $PM = (a \times b) / c$. Mediation is declared significant if the bootstrap confidence interval of the indirect effect does not contain zero. Following Zhao et al. [43], a significant indirect effect with a non-significant direct effect is termed indirect-only (often called full mediation) and is not read as the absence of a direct effect, especially in small samples. Because the design is cross-sectional, relationships among variables are read as theory-based directional associations, not causal evidence [30].

3. RESULTS AND DISCUSSION

3.1. Respondent Characteristics

The final sample consisted of 85 Pre-Service PPG students from three LPTK (Table 2). About 42% of respondents had teaching experience before PPG (as honorary teachers and private tutors), so this experience was controlled in the sensitivity analysis.

Table 2. Respondent characteristics (N = 85)

Characteristic	Category	f	%
Gender	Female	61	71.8
	Male	24	28.2
Age (M = 24.6; SD = 2.8; range 21–36 years)	≤ 24 years	46	54.1
	25–29 years	32	37.6
	≥ 30 years	7	8.2
PPG study program	Primary School Teacher Education	28	32.9
	Mathematics	22	25.9
	Islamic Religious Education	19	22.4
	Indonesian Language	16	18.8
Teaching experience before PPG	Yes	36	42.4
	No	49	57.6
LPTK of origin	LPTK A	33	38.8
	LPTK B	29	34.1
	LPTK C	23	27.1

3.2. Data Screening, Item Consistency, and Assumption Tests

The skewness of each variable ranged from −0.62 to −0.31 and the kurtosis from 0.12 to 0.44 (Table 4), so the distributions are approximately normal. A VIF of 1.30 (tolerance 0.77) indicates no multicollinearity, a Durbin-Watson statistic of 1.94 indicates no error autocorrelation, and the Breusch-Pagan test was not significant for either the SRL model ($p = 0.21$) or the self-efficacy model ($p = 0.34$), so homoscedasticity can be considered met. The single factor in Harman's test explained 31.4% of the variance; this is only a rough check, since factor analysis of 40 items at N = 85 is unstable, and it is not read as evidence that common method bias is absent.

Table 3. Item consistency, reliability, and inter-construct correlations

Variable	Number of items	Corrected item-total r	α	Highest correlation with another construct	Conclusion
Growth mindset	8	0.41–0.72	0.87	0.48	Consistent, reliable
Self-regulated learning	20	0.34–0.69	0.93	0.57	Consistent, reliable
Teaching self-efficacy	12	0.38–0.71	0.92	0.57	Consistent, reliable

All items had a corrected item-total r above 0.30 and all scales had good internal consistency (α 0.87 to 0.93). The maximum inter-construct correlation was 0.57, below the 0.85 threshold (Kline, 2016), so the three constructs appear empirically distinguishable. This evidence is limited: composite-score correlations are attenuated by measurement error, item-total r indicates consistency rather than validity, and none of this equals CFA. Replication with a larger sample, a full measurement model, and reporting of ω and discriminant validity (e.g., HTMT) are recommended [31].

3.3. Descriptive Statistics and Categorization

All three variable means were above the scale midpoint (3.00), with teaching self-efficacy the highest (Table 4). Categories followed the boundaries in Subsection 2.5; Figure 2 shows the distribution.

Table 4. Descriptive statistics of the study variables (scale 1–5)

Variable	M	SD	Min	Max	Skewness	Kurtosis
Growth mindset (X)	3.92	0.58	2.00	5.00	−0.48	0.21
Self-regulated learning (M)	3.78	0.52	2.15	4.95	−0.31	0.12
Teaching self-efficacy (Y)	4.01	0.49	2.33	5.00	−0.62	0.44

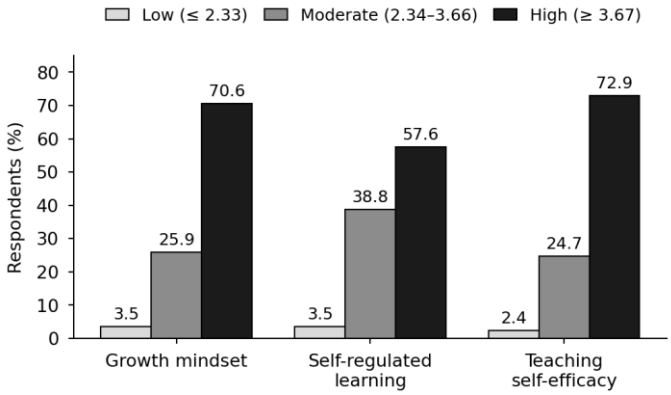


Figure 2. Distribution of score categories for each variable (% of respondents, N = 85)

A total of 70.6% of respondents (60 of 85) had high growth mindset and 72.9% (62 of 85) had high teaching self-efficacy. SRL had the lowest mean and the largest share in the moderate category (38.8%, 33 of 85). Descriptively, beliefs about developable abilities and teaching beliefs were relatively high, whereas SRL was at a lower mean position; this concerns mean position, not greater variation, because the SD of SRL (0.52) was not larger than that of growth mindset (0.58). The pattern does not indicate causes or test whether the moderate-SRL group differs in other respects.

3.4. Correlations among Variables

Table 5. Pearson correlation matrix (95% Fisher CI)

Variable	1	2	3
1. Growth mindset	1		
2. Self-regulated learning	0.48** [0.30, 0.63]	1	
3. Teaching self-efficacy	0.41** [0.22, 0.57]	0.57** [0.41, 0.70]	1

Note. ** $p < 0.001$ (two-tailed).

All correlations were positive and significant, with medium to large magnitudes by Cohen's conventions. The correlation between growth mindset and SRL ($r = 0.48$) was slightly higher than the average of about 0.40 reported by the systematic review [24]. The correlation between SRL and teaching self-efficacy ($r = 0.57$) was numerically higher than

that between growth mindset and teaching self-efficacy (r = 0.41), but this difference between dependent correlations was not tested and is not interpreted further.

3.5. Mediation Analysis Results (PROCESS Model 4)

Table 6. Regression coefficients in the mediation model (N = 85)

Model and predictor	b	SE	t	p	95% CI	β
Model 1. Outcome: SRL (R^2 = 0.230; F(1, 83) = 24.8; p < 0.001)						
Constant	2.094	0.342	6.12	< 0.001	[1.414, 2.774]	
Growth mindset → SRL (path a)	0.430	0.086	4.98	< 0.001	[0.258, 0.602]	0.480
Model 2. Outcome: teaching self-efficacy (R^2 = 0.349; F(2, 82) = 22.0; p < 0.001)						
Constant	1.696	0.400	4.24	< 0.001	[0.900, 2.492]	
Growth mindset → TSE (path c')	0.150	0.086	1.74	0.085	[−0.021, 0.321]	0.177
SRL → TSE (path b)	0.457	0.096	4.77	< 0.001	[0.266, 0.647]	0.485
Model 3. Outcome: teaching self-efficacy, without mediator (R^2 = 0.168; F(1, 83) = 16.8; p < 0.001)						
Constant	2.652	0.335	7.91	< 0.001	[1.985, 3.319]	
Growth mindset → TSE (path c)	0.346	0.085	4.10	< 0.001	[0.178, 0.515]	0.410

Note. b = unstandardized coefficient; β = standardized coefficient; TSE = teaching self-efficacy; CIs for regression coefficients are based on the t-test.

Growth mindset was associated with 23.0% of the variance in SRL; each one-point increase in growth mindset was followed by a 0.430-point increase in SRL (H_2 supported). Together, they explained 34.9% of the variance in teaching self-efficacy. SRL was significantly associated with teaching self-efficacy (b = 0.457; β = 0.485; H_3 supported), whereas the direct path from growth mindset shrank to c' = 0.150 and was no longer significant (p = 0.085; CI contains zero). The total effect was significant (c = 0.346; H_1 supported). Algebraic consistency was checked as follows:

$$c = c' + a \times b \Rightarrow 0.346 = 0.150 + (0.430 \times 0.457) = 0.150 + 0.196 \quad (4)$$

Table 7. Decomposition of the effect of growth mindset on teaching self-efficacy

Effect	Estimate	SE	95% CI	CI method	Conclusion
Total effect (c)	0.346	0.085	[0.178, 0.515]	OLS (t-test)	Significant
Direct effect (c')	0.150	0.086	[−0.021, 0.321]	OLS (t-test)	Not significant
Indirect effect through SRL (a × b)	0.196	0.058	[0.092, 0.312]	Percentile bootstrap, 5,000 samples	Significant
Standardized indirect effect	0.233	0.068	[0.109, 0.371]	Percentile bootstrap, 5,000 samples	Significant
Proportion mediated (PM)	56.7%	–	–	–	Indirect-only

Note. The SE for a × b is the bootstrap SE. PM is a point estimate; its confidence interval is not reported and this proportion is unstable in small samples.

The confidence interval of the indirect effect did not contain zero (0.092 to 0.312), so H_4 was supported. Because the direct effect c' was not significant (the interval contains zero), the pattern is classified as indirect-only [43]. Interpretation must be cautious: the point estimate of c' remains positive (0.150), about 43% of the total effect; the PM estimate of 56.7% is descriptive and unstable at N = 85; and power to detect a small direct effect is

low. The pattern must therefore not be read as the absence of a direct effect. Figure 3 summarizes the estimated model.

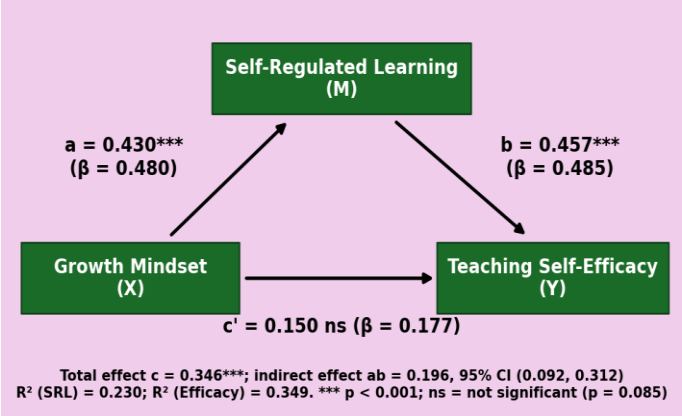


Figure 3. Estimated mediation model (unstandardized coefficients; in parentheses: standardized coefficients)

3.6. Sensitivity Analysis

After gender, age, and teaching experience were entered as covariates, the pattern did not change: path a = 0.421, path b = 0.446, path c' = 0.147 (not significant), and the indirect effect = 0.188 (95% CI [0.082, 0.306]). None of the covariates was significantly related to self-efficacy (all $p > 0.10$), although at N = 85 three covariates reduce estimation precision. Teaching practice performance during PPG and institutional effects (LPTK) were not controlled (see limitations).

3.7. Examination of the Alternative-Direction Model

In cross-sectional data, the X → M → Y and X → Y → M models are both saturated and cannot be distinguished by model fit. Table 8 gives the standardized coefficients of the alternative model (growth mindset → teaching self-efficacy → SRL), computed from the correlation matrix in Table 5.

Table 8. Alternative model: teaching self-efficacy as a mediator between growth mindset and SRL (standardized coefficients)

Path	β
Growth mindset → teaching self-efficacy	0.410
Teaching self-efficacy → SRL (growth mindset controlled)	0.449
Growth mindset → SRL (direct, teaching self-efficacy controlled)	0.296
Standardized indirect effect (0.410 × 0.449)	0.184

The alternative model yielded a positive standardized indirect effect (0.184) with a direct path that remained large (0.296), pointing toward partial mediation rather than indirect-only; computed from the correlation matrix without bootstrap confidence intervals, it is only descriptive. The data alone cannot determine direction: high teaching self-efficacy could encourage self-regulated learning as plausibly as the reverse, and a third factor could influence both. The results in Subsection 3.5 are therefore read as consistent with a pathway through SRL, not as evidence of that pathway.

3.8. Discussion

Growth mindset and teaching self-efficacy (H_1). The positive association ($c = 0.346$) is in line with studies that position beliefs about developable abilities as part of professional resources [13]–[15]. The comparison requires caution: those studies examined beliefs about students' abilities, career decision-making efficacy, or the meaningfulness of teaching, whereas this study measured growth mindset as an implicit-theory construct and teaching self-efficacy as domain-specific, and the fit between the objects of belief may affect the magnitude. The medium-sized association is also not directly comparable with the small and heterogeneous average effects of growth mindset interventions [7], [10], because the former is cross-sectional and the latter are intervention effects; a more suitable comparison is the correlational literature on implicit theories and self-regulation [44].

Growth mindset and SRL (H_2). The fairly large path a ($\beta = 0.480$) is in line with the systematic review that found a positive association between growth mindset and SRL strategies [24]. Theoretically, individuals who believe that abilities can grow have reason to invest in planning, monitoring, and reflection because effort is seen as producing progress [16], [37]. The review also names mindset operationalization and socioeconomic conditions as possible moderators [24], untestable here. At the teacher level, it agrees with evidence that mindset is related to the development of teachers' efficacy in promoting SRL [27].

SRL and teaching self-efficacy (H_3). Path b ($\beta = 0.485$) and path a ($\beta = 0.480$) are numerically almost equal; their difference was not tested. Social-cognitive theory offers the most relevant explanation: learners who plan, monitor, and evaluate their learning generate concrete mastery experiences, the most influential source of self-efficacy [1], [25]. Among pre-service teachers, these may appear as designing lesson plans, adjusting strategies after reflection, and managing preparation time [21]. The finding is consistent with Indonesian research linking self-regulation with technology self-efficacy and TPACK mastery [28] and with findings that teachers' SRL skills are related to their efficacy in teaching SRL [26], [27]. However, mastery experiences during PPG (for example, microteaching performance) may influence SRL and efficacy simultaneously; this was not measured, so path b may partly reflect it, and the reverse direction is also plausible (Subsection 3.7). In addition, SRL items on strategy, planning, and reflection may overlap in content with efficacy items on the instructional strategies subscale, so part of the SRL–teaching self-efficacy correlation ($r = 0.57$) may reflect content overlap rather than a substantive association; this cannot be separated without item-level analysis or CFA.

SRL mediation (H_4). The indirect effect through SRL was significant while the direct effect was not; about 56.7% of the total association is statistically accounted for through SRL, but this figure is unstable at $N = 85$ and has no confidence interval, so it is only a rough indication. The pattern is consistent with the idea that beliefs about ability relate to beliefs about teaching capability mainly when accompanied by habits of goal setting, monitoring, and reflection, but these data do not establish this. It is also in line with the explanation that mindset messages alone often produce small and uneven effects because they depend on opportunities and structures for [6], [7], [9], [10]. However, this design cannot establish temporal order, and the alternative-direction model also yields a

positive indirect effect with a different direct-path pattern (Table 8). The direct estimate remaining positive suggests that SRL is probably not the only pathway; other mechanisms such as self-esteem [14] or the meaning attached to the profession [15] may operate in parallel and merit testing in parallel mediation models.

Implications that PPG providers may consider. These implications are working hypotheses to be tested experimentally, not recommendations proven by these data. First, mindset development can be paired with explicit SRL training; meta-analytic evidence shows that SRL training improves achievement, strategies, and [17], [18], and explicit strategy instruction is more effective when combined with indirect activation in authentic tasks [19]. Second, metacognitive reflection, for example post-teaching reflective journals with micro-goal setting, can become a fixed component of microteaching and the Field Teaching Practicum (PLP) [23]. Third, feedback from lecturers and mentor teachers can focus on strategies and improvement rather than talent, because educators' mindsets are associated with their students' mindsets [11], [12]. Fourth, descriptively, 38.8% of respondents were in the moderate SRL category (Figure 2); whether this group is the most appropriate intervention target needs testing, for example through moderation analysis or intervention trials with larger samples (see [20], [22] for differences in learner characteristics).

Limitations and research agenda. This study has ten limitations. (1) The cross-sectional design cannot establish temporal order; the alternative-direction model cannot be distinguished (Subsection 3.7) and causal claims are avoided [30]. (2) Self-reports are vulnerable to social desirability bias and shared method variance; Harman's test is only a rough check and unstable at N = 85. (3) The sample is only 85 respondents from three LPTK with voluntary participation (response rate 36.8%; analytic sample 34.0% of those invited), so nonresponse bias may exist, power to detect the direct effect is low, CFA could not be run, and generalization to In-Service PPG or other regions requires caution; detecting a direct effect the size of this study's estimate ($f^2 \approx 0.037$) at power 0.80 and $\alpha = 0.05$ requires about 215 respondents. (4) Other mediators were not modeled. (5) Factors that may influence SRL and efficacy simultaneously, especially teaching practice performance during PPG and prior academic grades, were not controlled. (6) Institutional effects were not controlled; with three LPTK, a feasible approach is LPTK as a covariate (two dummy variables), not a multilevel model. (7) Growth mindset was measured as an implicit theory of general intelligence, whereas the outcome is teaching-specific; measures of beliefs about teaching ability or students' abilities may differ. (8) Content similarity between SRL and efficacy items may inflate their correlation. (9) Reliability was reported as α without ω, construct validity was not tested with CFA, and confidence intervals for the proportion mediated and for the alternative model's indirect effect were not reported. (10) The comparison of two dependent correlations ($r = 0.57$ vs 0.41) was not tested. Future research should use longitudinal or cross-lagged designs, trace-data-based measurement of SRL behavior or observation of teaching practice, teaching-domain-specific mindset measures, and experimental tests of whether SRL training strengthens the path from mindset to self-efficacy.

4. CONCLUSION

This study shows that growth mindset is positively associated with the teaching self-efficacy of PPG students, and that this association is consistent with a pathway through self-regulated learning. Growth mindset was associated with SRL (a = 0.430), SRL was associated with teaching self-efficacy (b = 0.457), and the indirect effect was significant (ab = 0.196; 95% CI [0.092, 0.312]) with a non-significant direct effect (c' = 0.150; p = 0.085), an indirect-only pattern with the caveat of limited power. Theoretically, these findings are consistent with the idea that implicit beliefs about ability are associated with beliefs about professional capability when accompanied by planned, monitored, and reflected learning practices. Practically, PPG programs may consider combining mindset strengthening with explicit SRL training, metacognitive reflection in microteaching and PLP, and strategy-focused feedback, with effectiveness to be tested further. Because the design is cross-sectional and self-reported, and the alternative-direction model cannot be distinguished, the results are read as associations, not causal evidence. Future research needs longitudinal or experimental designs, parallel mediators and important controls (practice performance and institutional effects), a larger sample (about 215 respondents or more to detect a direct effect the size of this study's estimate), and extension to In-Service PPG.

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