Original Article

Clinical preceptor performance in Indonesian hospitals: A longitudinal analysis of workforce-related determinants

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Abstract

Preceptor performance is a key driver of clinical education quality; however, the influence of organizational factors on preceptor effectiveness remains understudied. The aim of this study was to examine whether communication quality mediates the relationships of organizational trust and supervisory support with preceptor performance and whether self-efficacy moderates the communication quality-performance pathway. A three-wave longitudinal study was conducted among clinical nursing preceptors in 12 teaching hospitals in Aceh and Lampung, Indonesia. The final analytic sample comprised 452 preceptors with complete data across all three waves. Organizational trust and supervisory support were measured at baseline, communication quality three months later, and preceptor performance six months after baseline. Multi-source performance data included preceptor self-report, student/preceptee evaluations, and supervisor ratings. Structural equation modeling tested direct and indirect effects, and PROCESS Model 14 tested moderated mediation. Internal consistency was high across instruments (Cronbach's alpha=0.86–0.93). Organizational trust (standardized β=0.31, p<0.001) and supervisory support (standardized β=0.28, p<0.001) significantly predicted preceptor performance. Communication quality partially mediated both relationships, with standardized indirect effects of β=0.14 (95% bootstrap CI: 0.08–0.21) for organizational trust and β=0.11 (95% bootstrap CI: 0.06–0.18) for supervisory support. Self-efficacy significantly moderated the communication quality-preceptor performance relationship (unstandardized B=0.18, p=0.003), with stronger conditional indirect effects at higher self-efficacy. Model fit was adequate (comparative fit index (CFI)=0.95; root mean square error of approximation (RMSEA)=0.04). These findings support structured mentoring and supervision, transparent trust-building practices, regular bidirectional feedback, and preceptor development activities designed to strengthen teaching self-efficacy.

Keywords: Preceptor performance, organizational trust, supervisory support, communication quality, self-efficacy

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Introduction

Clinical preceptors are integral to healthcare education as they link classroom theory with clinical practice for nursing students and new graduate practitioners [1,2]. The term "preceptor" is universally defined as an experienced clinician who provides personalized, holistic learning support to those in training at healthcare organizations [3]. Preceptorship directly impacts student satisfaction and clinical competence, which consequently affects patient care outcomes

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[4,5]. Although the importance of preceptors is recognized, there is a wide variation in their performance across clinical settings, and the organizational and individual characteristics that most consistently optimize preceptor performance remain insufficiently understood [6,7].

Because preceptor performance is enacted within an organizational system, differences in clinical teaching effectiveness may reflect not only individual teaching capability but also organizational resources that shape psychological safety, coordination, and day-to-day support. Organizational trust is a fundamental building block of effective clinical learning environments. Trust, defined as confidence that others or institutions will act in accordance with expectations, is a multidimensional construct that shapes professional relationships and performance outcomes [8,9]. Factors influencing trust in clinical education include characteristics of the trainee and supervisor, their relationship, the context, and the purpose or complexity of the task [10]. Trust among organizational stakeholders, administrators, and educational institutions can facilitate the psychological safety required for effective teaching and learning [11,12]. Conversely, clinical placement environments characterized by insufficient respect and trust may increase psychosocial risks and reduce placement satisfaction [13]. Furthermore, supervisor credibility and respect may also support self-efficacy and engagement, suggesting that trust functions as an organizational resource that can contribute to performance-enhancing processes [14].

Supervisory support is another major organizational determinant of preceptors' effectiveness. Clinical supervision provides regular, safe, and supportive opportunities for healthcare professionals to reflect on their practice [15]. Effective knowledge transfer between academic and clinical settings further highlights the importance of collaboration between these sectors [16]. In the context of advanced practice nursing, recent evidence suggests that evaluative and structured managerial support can positively influence engagement, although this effect may be undermined by threats to professional identity [17]. However, inadequate skills, time constraints, and the absence of a proper organizational structure have been reported as supervisory problems across healthcare settings, which justifies the need for structured support systems [18].

Communication quality may be a key mechanism through which organizational factors influence preceptor performance [19]. The preceptor's teaching approach and communication style can shape students' clinical learning and performance. Effective communication extends beyond clear instructions to include timely feedback, rapport building, openness, and dialogue between preceptors and organizational support systems [20,21]. Strong interpersonal relationships between preceptors and preceptees are reinforced by trust-based communication, while structured bidirectional feedback can improve role clarity, coordination, and team performance [22-24]. Alignment between educational institutions and clinical placement sites is also necessary to clarify supervisory goals and expectations [25]. Accordingly, effective communication is central to successful supervision, alongside teamwork and a supportive clinical learning environment [26].

In addition to communication quality, self-efficacy may be an important factor influencing performance in clinical education. Self-efficacy refers to an individual's belief in their ability to accomplish goals in specific contexts [27]. It influences motivation, effort, and persistence, thereby contributing to achievement [28]. Self-efficacy has also been recognized as a performance predictor in clinical education, specifically in the context of preceptorships [29]. Furthermore, self-efficacy has been reported to mediate the relationships between supervisory justice, trust in supervisors, and professional creativity, suggesting that fair supervision and trust may foster self-efficacy and enhance performance [30]. Preceptors who receive formal preparation and ongoing support also appear to be more effective in clinical teaching [31]. Similarly, self-efficacy has been associated with performance outcomes, including quality of care, teamwork, and administrative support in community mental health settings [32].

The proposed model is grounded in Social Cognitive Theory and the Job Demands-Resources model. Social Cognitive Theory conceptualizes self-efficacy as a personal belief that influences effort, persistence, and the translation of environmental information into behavior [33-35]. From this perspective, self-efficacy may influence how preceptors respond to communication within their organizational environment. The Job Demands-Resources model distinguishes job resources that facilitate motivation and performance. In the present study,

organizational trust and supervisory support are conceptualized as job resources, while communication quality represents a proximal process through which those resources are translated into preceptor performance [22]. Integrating these perspectives provides a theoretical basis for proposing that communication quality mediates the relationships of organizational trust and supervisory support with preceptor performance, and that self-efficacy moderates the relationship between communication quality and preceptor performance. Although previous studies examined relationships among these individual and organizational factors [19,29,31], an integrated model examining these relationships within a single framework remains insufficiently characterized. Furthermore, preceptor-level organizational and individual factors have often been examined separately, and previous studies have frequently used cross-sectional designs, limiting temporal inference [19,30]. This study addresses these gaps using a longitudinal, multisource, multisite moderated mediation model. The aims were to: (a) examine the direct associations of organizational trust and supervisory support with preceptor performance; (b) test communication quality as a mediator of both relationships; and (c) examine self-efficacy as a moderator of the communication quality-preceptor performance pathway and, consequently, of the indirect effects.

Methods

Study design

A three-wave prospective longitudinal design was used to establish temporal ordering among the study variables. Organizational trust, supervisory support, self-efficacy, and demographic characteristics were assessed at Time 1 (baseline); communication quality was assessed at Time 2, three months after baseline; and preceptor performance was assessed at Time 3, six months after baseline. The moderated mediation analysis was prespecified to test whether communication quality mediated the associations of organizational trust and supervisory support with subsequent preceptor performance and whether baseline self-efficacy moderated the communication quality-performance pathway.

The three-month interval between measurement waves was selected to align with the clinical placement cycle and to allow organizational resources to precede communication processes and subsequent performance assessment. Participants were followed across a typical 12–14-week clinical placement cycle, allowing communication patterns to stabilize before the Time 2 assessment. Preceptor performance was then assessed at Time 3, six months after baseline. Sensitivity analyses were subsequently conducted to evaluate the robustness of the temporal specification.

Study setting and participants

The study was conducted across 12 hospitals in Aceh and Lampung provinces to improve generalizability to different healthcare contexts across four geographic regions (two metropolitan, one suburban, and one rural). This multisite design overcomes the limitations of previous studies that were drawn from single metropolitan areas. The two provinces were purposely chosen because they are located in different cultural locales in Indonesia: Aceh uses Islamic law (Syariah) and has a collectivist hierarchy culture that may influence trust and supervision dynamics differently, whereas Lampung is a melting pot cultural province with a diverse ethnic makeup. The inclusion of both provinces allowed for the investigation of whether the proposed model functions uniformly across two culturally different healthcare environments, in response to evidence that organizational trust and supervisory relationships are culturally bound.

Hospitals were selected for participation based on their preceptorship programs and partnerships with nursing education institutions. Rural and suburban settings were included because of the evidence that clinical supervision in the given organizational context is different within organizational domains, contexts, and resource availability. The target population was registered nurses working as clinical preceptors who had supervised at least one nursing student or newly qualified nurse in the past 12 months.

Sample size determination

The required sample size was determined before data collection for the planned structural equation modeling (SEM) and moderated mediation analyses, following lower-bound sample-size considerations for SEM [36]. With a two-sided significance level of 0.05, statistical power of 0.80, the five-construct model, and a small-to-moderate anticipated effect size, a conservative minimum analyzable sample of 400 complete cases was set. To allow for approximately 20% attrition across the three waves, the minimum baseline recruitment target was 500 participants. The study obtained 542 valid baseline responses and 452 complete cases; thus, the final analytic sample exceeded the prespecified minimum by 52 participants and was considered adequate for estimating the direct, indirect, interaction, and conditional indirect effects.

For this study, geographic categories were assigned according to the participating hospitals' administrative/service-area classification used during site selection: metropolitan sites served major urban centers, suburban sites served peri-urban catchment areas, and the rural site served a predominantly non-metropolitan catchment area. The study used a non-probability purposive sampling approach at the site level, with Aceh and Lampung provinces and the participating hospitals selected purposively based on established preceptorship programs and partnerships with nursing education institutions. Within participating hospitals, all preceptors who met the eligibility criteria during the recruitment period were invited to participate until the recruitment target was achieved.

Eligibility criteria

The inclusion criteria were as follows: registered nurses with at least two years of clinical experience, current or former clinical preceptors within the past 12 months, full-time employment at a participating hospital, and willingness to participate in all three waves of data collection and provide informed consent. The exclusion criteria were: (a) preceptors on extended leave during any of the data collection points; (b) anyone serving solely in an administrative role without direct supervisory responsibility; and (c) preceptors who planned to transfer or resign within the clinical six-month study timeframe.

Study instruments

Demographic characteristics included age, sex, educational level, years of clinical practice, years of precepting experience, clinical department, geographic region, and number of students precepted during the previous 12 months. Preceptor performance was assessed using multi-source measurement to reduce reliance on a single respondent source.

Organizational trust (Time 1, self-report) was measured using the 12-item Organizational Trust Inventory (OTI) developed by Nyhan and Marlowe [37]. Items assessed preceptors' confidence in organizational leadership, fairness and reliability of organizational practices, and perceived institutional support for the preceptor role. Responses were recorded on a 5-point Likert scale (1=strongly disagree to 5=strongly agree).

Supervisory support (Time 1, self-report) was evaluated using a 10-item scale adapted from the Survey of Perceived Supervisory Support described by Kottke and Sharafinski [38]. Items assessed preceptors' perceptions of emotional, evaluative, informational, and procedural support provided by their immediate supervisors, including access to resources, feedback, recognition, and assistance relevant to the preceptor role. Responses were recorded on a 5-point Likert scale (1=strongly disagree to 5=strongly agree).

Communication quality (Time 2, self-report) was evaluated using an 8-item study-specific measure developed from communication domains emphasized in healthcare and preceptorship literature [20,21]. Items assessed clarity, timeliness, openness, feedback exchange, and effectiveness of communication between preceptors and organizational stakeholders, including supervisors, nursing education coordinators, and administrators. Responses were recorded on a 5-point Likert scale (1=strongly disagree to 5=strongly agree).

Preceptor self-efficacy (Time 1, self-report) was assessed using a 10-item adaptation of the General Self-Efficacy Scale framework of Schwarzer and Jerusalem [39], contextualized to clinical teaching. Items assessed confidence in teaching, providing feedback, managing clinical learning situations, creating learning opportunities, adapting teaching to learner needs, and

supporting student development. Responses were recorded on a 5-point Likert scale (1=not at all confident to 5=highly confident).

Preceptor performance was measured using a 15-item study-specific scale informed by established descriptions of effective preceptor behavior and competencies [19,29]. The scale covered five dimensions: effectiveness in clinical teaching, feedback provision, role modeling, student assessment, and creation of a supportive learning environment. A single 15-item content framework was used to create three parallel respondent versions: (a) preceptor self-report, (b) student/preceptee evaluation, and (c) direct-supervisor rating. Thus, these were three respondent adaptations of the same performance instrument rather than three different instruments. All versions used a 5-point Likert response format (1=strongly disagree to 5=strongly agree). A composite weighted score (self-report: 30%, student evaluation: 40%, supervisor rating: 30%) was derived for each preceptor. The weighting scheme gave the highest weight to student/preceptee ratings because they directly experienced the clinical teaching process, while supervisor ratings and self-reports contributed complementary external and internal perspectives. Sensitivity analyses using equal weights (33.3% each) and self-report-only scores confirmed that the findings were not dependent on the weighting scheme.

Marker variable (Time 1) was assessed using a theoretically unrelated three-item measure of attitudes toward the blue color. The marker variable was included to assess common method variance, following the marker-variable approach described by Lindell and Whitney [40]. Correlations between the marker variable and the substantive study variables were examined as a statistical sensitivity check.

Cross-cultural adaptation of instruments

The cross-cultural adaptation of the established instruments followed the principles described by Beaton *et al*. [41] and comprised six stages: (1) forward translation by two independent bilingual translators; (2) synthesis into a reconciled Indonesian version; (3) backward translation by two independent translators who had not participated in the forward translation; (4) review by an expert committee comprising five nursing education specialists and two psychometricians; (5) cognitive interviewing with 15 preceptors; and (6) pilot testing before the main study. The Organizational Trust Inventory, supervisory-support measure, and General Self-Efficacy Scale were the three instruments adapted from established source measures; the communication-quality and preceptor-performance measures were study-specific instruments that underwent the same expert review, cognitive interviewing, and pilot testing for linguistic and contextual suitability. Cognitive interviews were conducted separately in Aceh (n=8) and Lampung (n=7). Minor wording refinements were made to improve clarity and cultural equivalence, particularly for concepts related to hierarchy, authority, and trust. No province-specific versions were retained: the same final Indonesian-language instruments, with identical items, response options, scoring, and administration procedures, were used in both Aceh and Lampung. An adaptation log documented all wording changes arising from translation, expert review, cognitive interviews, and pilot testing.

Pilot study

A pilot study was conducted with 50 preceptors from two non-participating hospitals, one in Aceh and one in Lampung, representing urban and rural service settings. The pilot evaluated item clarity and comprehensibility, cultural and contextual appropriateness, feasibility of questionnaire administration, completion time, and the multi-source data-collection procedure. Participant feedback led to minor wording revisions before the questionnaires were finalized for the main study. Pilot participants were not included in the primary analysis. The details of the pilot study can be found in the supplementary data supporting the findings of this study.

Validity and reliability

An expert panel of five nursing education specialists and two psychometricians assessed content validity using the item-level content validity index (I-CVI) and scale-level content validity index (S-CVI). Items with I-CVI values below 0.78 were modified or discarded. Construct validity for each instrument was evaluated using confirmatory factor analysis (CFA). Convergent validity was assessed using average variance extracted (AVE), with values above 0.50 considered satisfactory.

Discriminant validity was assessed by comparing the square root of each construct's AVE with its inter-construct correlations and by examining heterotrait-monotrait (HTMT) ratios below 0.85. Cronbach's alpha and composite reliability (CR) were used to assess internal consistency, with values above 0.70 considered acceptable. Multi-group CFA was used to test configural, metric, and scalar measurement invariance across geographic groups; changes in CFI of no more than 0.01 were interpreted as supporting invariance.

Data collection procedure

Data were collected over a period of three waves, with a three-month interval between each wave, resulting in a total study period of six months. Research assistants administered the Time 1 questionnaires measuring organizational trust, supervisory support, self-efficacy, and demographic characteristics to eligible preceptors during scheduled departmental meetings. The communication quality questionnaires at Time 2 (3 months later) were completed by the same participants. At Time 3 (at the end of this study, six months after baseline), measures of preceptor performance were obtained from three sources as follows: self-report performance scales completed by preceptors and separate parallel rating forms rated both by students/preceptees supervised and the direct supervisor responsible for the participating preceptor. Participants received an information sheet before each wave that stated the purpose of the study, voluntary participation, and confidentiality of responses. Unique identification codes were used to link responses across waves while maintaining confidentiality. Two follow-up reminders were distributed at two-week intervals during each wave to encourage participation and improve response rates.

Common method bias assessment

Several procedural and statistical remedies were applied to minimize common method bias: (a) predictors, mediator, and outcome were temporally separated across three measurement waves; (b) the dependent variable was assessed from multiple sources; (c) anonymity and confidentiality were emphasized; (d) item order was counterbalanced within scales where feasible; (e) Harman's single-factor test was conducted; (f) a theoretically unrelated three-item marker variable was used; and (g) a common latent factor sensitivity analysis was performed within the structural equation modeling framework.

Data analysis

SPSS version 28.0 and AMOS version 28.0 were used for statistical analyses. Descriptive statistics summarized participant characteristics and study variables. The primary analytic sample comprised participants with complete data across the six-month, three-wave follow-up. Attrition was evaluated using independent-samples t tests and chi-square tests, and Little's missing completely at random (MCAR) test was used to assess missing-data patterns. Full information maximum likelihood (FIML) estimation in the baseline sample was used as a sensitivity analysis. Distributional assumptions were evaluated through inspection of skewness, kurtosis, and residual diagnostics before parametric analyses. Pearson correlations described bivariate associations. Confirmatory factor analysis (CFA) evaluated the measurement model, and multi-group CFA assessed measurement invariance.

In the first analytic stage, structural equation modeling (SEM) estimated the direct and indirect pathways from organizational trust and supervisory support to preceptor performance through communication quality. Mediation was assessed using 5,000 bootstrap resamples and 95% bias-corrected confidence intervals (CIs). In the second stage, PROCESS Model 14 for SPSS version 4.2 tested whether self-efficacy moderated the communication quality-preceptor performance pathway and the resulting conditional indirect effects. Factor-score composites from the CFA measurement model were used as observed inputs for PROCESS. Model adequacy was evaluated using comparative fit index (CFI) and Tucker-Lewis index (TLI) values of at least 0.90, root mean square error of approximation (RMSEA) below 0.08, and standardized root mean square residual (SRMR) below 0.08. Sensitivity analyses compared alternative performance-score specifications, geographic/provincial subgroups, covariate-adjusted models, and alternative temporal specifications.

Results

Participant characteristics

At Time 1, a total of 600 questionnaires were distributed, and 572 were returned. Thirty responses were excluded because data had been collected by telephone interview rather than the standardized self-administered questionnaire, yielding 542 valid baseline responses (usable response rate=90.3%). Of these, 498 participants completed Time 2 and 468 completed Time 3. The final analytic sample comprised 452 preceptors with complete data across all three waves. A supplementary FIML analysis using the 542 valid baseline responses produced results consistent with the complete-case analysis, with no meaningful changes in the direction, magnitude, or statistical significance of the estimated paths (changes in standardized coefficients ≤0.02).

A total of 452 participants were included in the final analysis, and their demographic characteristics are presented in **Table 1**. Baseline organizational trust, supervisory support, and self-efficacy composite scores were available for these participants. Little's MCAR test was not statistically significant (chi-square=142.38; df=131; p=0.23), indicating that the observed missing-data pattern was consistent with the missing completely at random assumption.

Table 1. Demographic characteristics of participants (n=452)

Characteristic	Frequency	Percentage
Sex		
Female	385	85.2
Male	67	14.8
Age (years)		
25–30	80	17.7
31–35	132	29.2
36–40	139	30.7
>40	101	22.4
Education		
Bachelor's degree	233	51.5
Master's degree	184	40.7
Doctoral degree	35	7.8
Clinical experience (years)		
2–5	64	14.2
6–10	150	33.2
11–15	137	30.3
>15	101	22.3
Precepting experience (years)		
1–3	113	25.0
4–6	162	35.8
7–10	115	25.4
>10	62	13.8
Geographic region		
Metropolitan A	136	30.1
Metropolitan B	124	27.4
Suburban	108	23.9
Rural	84	18.6
Clinical department		
Medical	120	26.5
Surgical	111	24.7
Critical care	85	18.8
Pediatrics	68	15.0
Other	68	15.0

Descriptive statistics and correlations

Descriptive statistics and Pearson correlation coefficients among the study variables are presented in **Table 2**. All correlations were statistically significant and in the expected direction. Internal consistency was good to excellent across the instruments, with Cronbach's alpha values ranging from 0.86 to 0.93. All AVE values exceeded 0.50. The square root of each construct's AVE exceeded its correlations with other constructs, supporting discriminant validity. The reported intraclass correlation coefficients for performance-rating sources ranged from 0.62 to 0.71 (all p<0.001), suggesting agreement while allowing for differences in raters' perspectives.

Table 2. Descriptive statistics, reliability, convergent validity, and inter-construct correlations among study variables (n=452)

Variable	M	SD	α	CR	AVE	1	2	3	4	5
1. Organizational trust (T1)	3.72	0.68	0.91	0.92	0.58	**0.76**				
2. Supervisory support (T1)	3.65	0.71	0.89	0.90	0.56	0.54*	**0.75**			
3. Communication quality (T2)	3.58	0.74	0.87	0.88	0.55	0.51*	0.48*	**0.74**		
4. Self-efficacy (T1)	3.81	0.63	0.93	0.93	0.62	0.39*	0.42*	0.46*	**0.79**	
5. Preceptor performance (T3, composite)	3.69	0.66	0.86	0.88	0.54	0.56*	0.53*	0.58*	0.49*	**0.73**

α: Cronbach's alpha; AVE: average variance extracted; CR: composite reliability; M: mean; SD: standard deviation; T1: baseline; T2: three months; T3: six months. Bold diagonal values represent the square roots of AVE (√AVE) for the corresponding constructs, rather than correlations of variables with themselves. Off-diagonal values represent Pearson's correlation coefficients between different constructs. $p<0.01$ for correlations marked with an asterisk. The diagonal √AVE values are presented to facilitate the assessment of discriminant validity using the Fornell–Larcker criterion.
* Statistically significant at $p<0.01$

Common method bias assessment

Harman's single-factor test showed that the first unrotated factor accounted for 28.4% of the total variance, below the commonly used 50% threshold. The marker-variable technique showed an average correlation of 0.03 between the marker variable and substantive study variables; adjustment for marker-variable correlations did not alter the significance of the hypothesized relationships. Adding a common latent factor did not significantly improve model fit (delta chi-square=12.34; delta df=10; $p=0.26$), and standardized path coefficients changed by less than 0.03. Together, these analyses suggested that common method bias was unlikely to have materially influenced the findings.

Measurement invariance

Measurement invariance was examined using multi-group CFA across the four geographic regions. Configural invariance was supported (CFI=0.94; RMSEA=0.05). Metric invariance produced only a small change in fit (delta CFI=-0.006; delta RMSEA=+0.003), and scalar invariance was also supported (delta CFI=-0.008; delta RMSEA=+0.004). Because the absolute changes in CFI were below 0.01, the measurement model was considered sufficiently invariant for cross-region comparisons.

Measurement models

A five-factor measurement model was examined using confirmatory factor analysis. Model fit was acceptable: chi-square/df=2.14; CFI=0.95; TLI=0.94; RMSEA=0.05 (90%CI: 0.04–0.06), and SRMR=0.04. Standardized factor loadings ranged from 0.64 to 0.89 and were all statistically significant ($p<0.001$). Alternative one-, two-, three-, and four-factor models showed significantly poorer fit than the hypothesized five-factor model (all delta chi-square $p<0.001$), further supporting discriminant validity.

Structural model and hypothesis testing

The structural model showed adequate fit (chi-square/df=2.28; CFI=0.95; TLI=0.95; RMSEA=0.04; 90%CI: 0.03–0.05, and SRMR=0.05). Direct, indirect, and total effects are presented in **Table 3**.

Both indirect effects were statistically significant because their 95% bias-corrected bootstrap confidence intervals excluded zero. In the analytic sample (n=452), communication quality partially mediated the relationship between organizational trust and preceptor performance (indirect effect=0.14; 95%CI: 0.08–0.21) and the relationship between supervisory support and preceptor performance (indirect effect=0.11; 95%CI: 0.06–0.18). After controlling for communication quality, both direct effects remained statistically significant, supporting partial mediation.

Table 3. Direct, indirect, and total effects from structural equation modeling (n=452)

Path	Direct effect (β)	Standard error (SE)	*p*-value	95%CI
OT (T1) → PP (T3)	0.31	0.06	<0.001	0.19–0.43
SS (T1) → PP (T3)	0.28	0.06	<0.001	0.16–0.40

Path	Direct effect (β)	Standard error (SE)	*p*-value	95%CI
OT (T1) → CQ (T2)	0.38	0.05	<0.001	0.28–0.48
SS (T1) → CQ (T2)	0.33	0.06	<0.001	0.21–0.45
CQ (T2) → PP (T3)	0.36	0.05	<0.001	0.26–0.46
Indirect effects	Effect	Boot SE		Boot 95%CI
OT → CQ → PP	0.14	0.03		0.08–0.21
SS → CQ → PP	0.11	0.03		0.06–0.18
Total effects				Effect
OT → PP (total)				0.45
SS → PP (total)				0.39

β: standardized regression coefficient; CI: confidence interval; CQ: communication quality; OT: organizational trust; PP: preceptor performance; SS: supervisory support; T1: Time 1; T2: Time 2; T3: Time 3. Brackets are used only for bias-corrected bootstrap 95% confidence intervals. Bootstrap resamples: 5,000 individuals.

Moderated mediation analysis

The moderated mediation analysis examined whether self-efficacy moderated the association between communication quality and preceptor performance and whether the indirect effects of organizational trust and supervisory support on preceptor performance through communication quality varied by self-efficacy level. The results are presented in **Table 4**.

Table 4. Moderated mediation analysis with self-efficacy as a moderator (n=452)

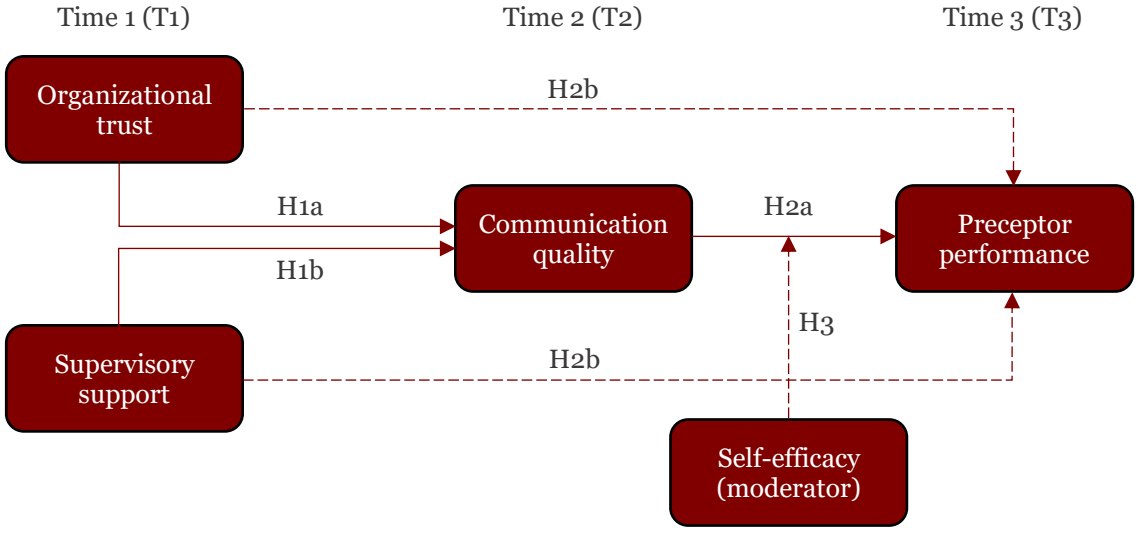
Predictor/indirect pathway	B/effect	SE/Boot SE	t	*p*-value	95%CI
Panel A. Moderation model					
Dependent variable: Preceptor performance (T3)					
Communication quality (T2)	0.34	0.05	6.80	<0.001	0.24–0.44
Self-efficacy (T1)	0.22	0.05	4.40	<0.001	0.12–0.32
Communication quality × self-efficacy	0.18	0.06	3.00	0.003	0.06–0.30
Model summary: R^2= 0.47; F(3, 448)= 132.67	—	—	—	<0.001	—
Panel B. Conditional indirect effects					
OT → CQ → PP: Low self-efficacy (−1 SD)	0.06	0.02	—	—	0.02–0.11
OT → CQ → PP: Mean self-efficacy	0.13	0.03	—	—	0.08–0.19
OT → CQ → PP: High self-efficacy (+1 SD)	0.20	0.04	—	—	0.13–0.28
Index of moderated mediation: OT pathway	0.07	0.03	—	—	0.02–0.13
SS → CQ → PP: Low self-efficacy (−1 SD)	0.05	0.02	—	—	0.01–0.10
SS → CQ → PP: Mean self-efficacy	0.11	0.03	—	—	0.06–0.17
SS → CQ → PP: High self-efficacy (+1 SD)	0.17	0.04	—	—	0.10–0.25
Index of moderated mediation: SS pathway	0.06	0.03	—	—	0.01–0.12

B: unstandardized regression coefficient; Boot SE: bootstrap standard error; CI: confidence interval; CQ: communication quality; OT: organizational trust; PP: preceptor performance; SD: standard deviation; SE: standard error; SS: supervisory support; T1: baseline; T2: three months; T3: six months.
Panel A presents unstandardized regression coefficients (B), conventional standard errors, t-statistics, p-values, and model-based 95% confidence intervals. Panel B presents unstandardized conditional indirect effects and indices of moderated mediation, with bootstrap standard errors and bias-corrected 95% confidence intervals based on 5,000 bootstrap resamples.

Communication quality was positively associated with preceptor performance (B=0.34; 95%CI: 0.24–0.44; p<0.001), as was self-efficacy (B=0.22; 95%CI: 0.12–0.32; p<0.001) (**Table 4**). The interaction between communication quality and self-efficacy was statistically significant (B=0.18; 95%CI: 0.06–0.30; p=0.003), indicating that the positive association between communication quality and preceptor performance was stronger at higher levels of self-efficacy. The conditional indirect effect of organizational trust through communication quality increased from 0.06 (95% bootstrap CI: 0.02–0.11) at low self-efficacy to 0.20 (95% bootstrap CI: 0.13–0.28) at high self-efficacy. Similarly, the conditional indirect effect of supervisory support increased from 0.05 (95% bootstrap CI: 0.01–0.10) to 0.17 (95% bootstrap CI: 0.10–0.25). The indices of moderated mediation were 0.07 (95% bootstrap CI: 0.02–0.13) for organizational trust and 0.06 (95% bootstrap CI: 0.01–0.12) for supervisory support. These findings support statistically significant moderated mediation associations without establishing causal effects.

Sensitivity analyses

Three sensitivity analyses were conducted to assess robustness. First, substituting self-report-only performance scores for the multi-source composite did not change the significance of the hypothesized paths. The standardized coefficients differed only modestly. Second, multi-group SEM by geographic region showed no statistically significant differences in structural path coefficients across metropolitan, suburban, and rural settings (all delta chi-square tests non-significant). Third, adjustment for age, education level, and years of precepting experience did not materially alter the hypothesized relationships (all changes ≤0.03). These analyses supported the robustness of the main findings. The hypothesized moderated mediation model is presented in **Figure 1**.



Solid arrows indicate hypothesized mediated paths.
Dashed arrows indicate hypothesized direct effects.
Self-efficacy is hypothesized to moderate the relationship between communication quality and preceptor performance.

H1a: Organizational trust positively influences communication quality.
H1b: Supervisory support positively influences communication quality.
H2a: Communication quality positively influences preceptor performance.
H2b: Organizational trust and supervisory support each have a direct positive influence on preceptor performance.
H3 : Self-efficacy moderates the relationship between communication quality and preceptor performance, such that the relationship is stronger at higher levels of self-efficacy.

Figure 1. Hypothesized moderated mediation model grounded in Social Cognitive Theory and the Job Demands-Resources model. Organizational trust and supervisory support were assessed at Time 1 (T1), communication quality at Time 2 (T2), and multi-source preceptor performance at Time 3 (T3). Self-efficacy, assessed at T1, moderates the communication quality-preceptor performance pathway. Hypotheses are labeled H1a (organizational trust → communication quality), H1b (supervisory support → communication quality), H2a (organizational trust → preceptor performance), H2b (supervisory support → preceptor performance), and H3 (self-efficacy moderation of the communication quality → preceptor performance pathway).

The structural equation model with standardized path coefficients (β) is presented in **Figure 2**. Organizational trust (β=0.31, p<0.001) and supervisory support (β=0.28, p<0.001) were positively associated with preceptor performance. The standardized path coefficients correspond to the estimates reported in **Table 3**.

As illustrated in **Figure 3**, self-efficacy significantly moderated the association between communication quality and preceptor performance (unstandardized B=0.18; 95%CI: 0.06–0.30; p=0.003). The positive association between communication quality and preceptor performance was stronger among preceptors with higher levels of self-efficacy, consistent with the significant interaction reported in **Table 4**.

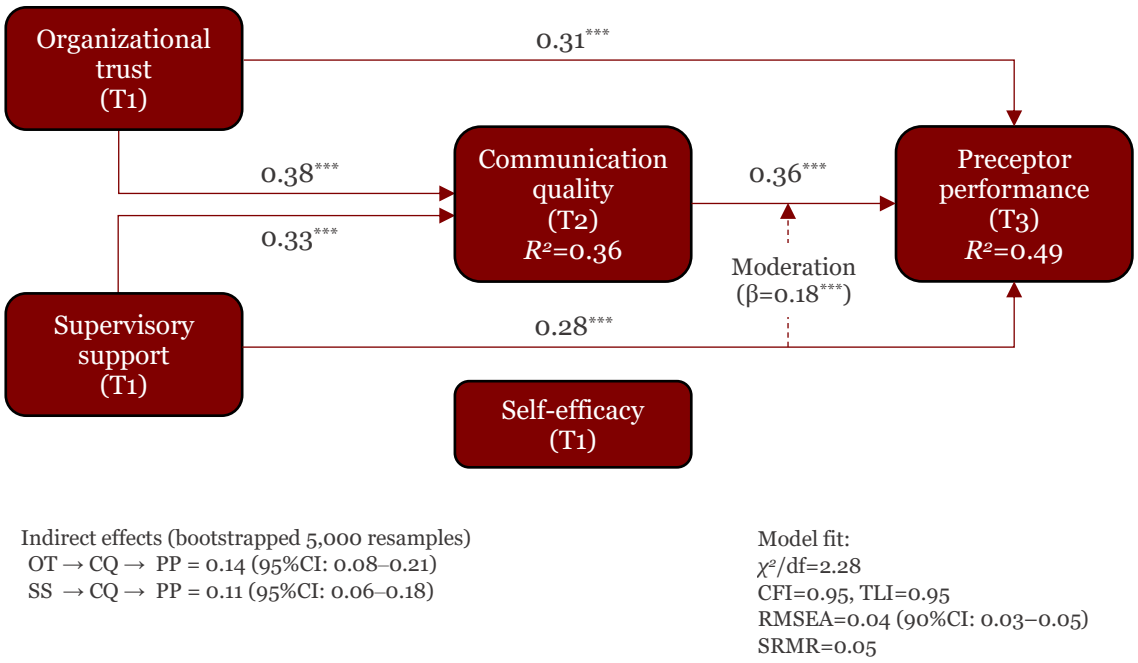


Figure 2. Structural equation model with standardized path coefficients. CFI: Comparative Fit Index; CQ: communication quality; OT: organizational trust; PP: preceptor performance; RMSEA: root mean square error of approximation; SRMR: standardized root mean square residual; SS: supervisory support; T1: Time 1; T2: Time 2; T3: Time 3; TLI: Tucker-Lewis Index. Statistically significant at $^{**}p<0.01$; $^{***}p<0.001$.

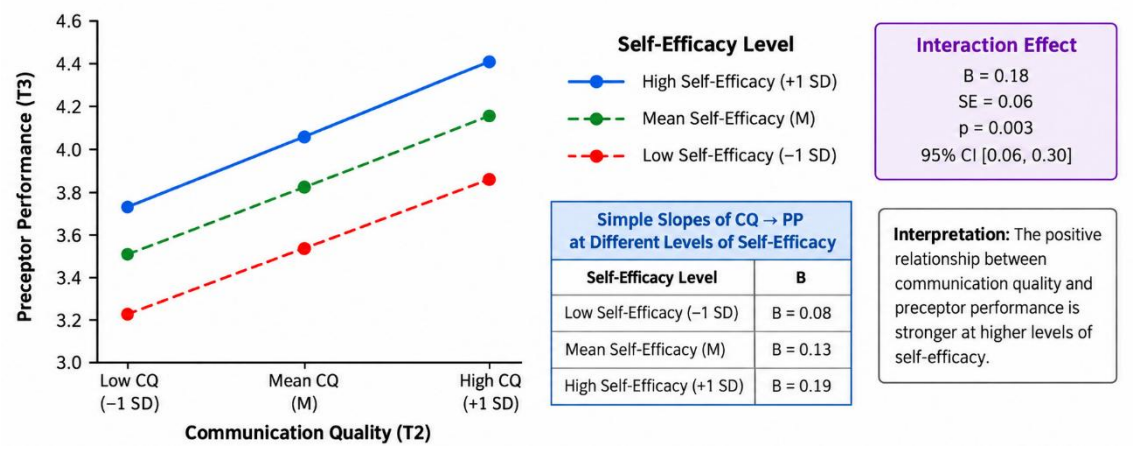


Figure 3. Interaction plot of the moderating effect of self-efficacy on the communication quality–preceptor performance relationship. The plotted slopes correspond to the low (−1 SD), mean, and high (+1 SD) self-efficacy levels reported in Table 4. B: unstandardized regression coefficient; CI: confidence interval; CQ: communication quality; p: probability value; PP: preceptor performance; SD: standard deviation; SE: self-efficacy.

Discussion

The main result showed that both organizational trust and supervisory support were linked to better preceptor performance at six months, with communication quality accounting for part of the association in both cases [42-44]. Because the study had a longitudinal design involving multiple sources and multiple sites, the temporal interpretation is stronger than that provided by cross-sectional evidence. Organizational trust could enhance performance by fostering psychological safety, predictability, and confidence in institutional processes, all of which help promote effective teaching and supervisory behavior. Evidence from clinical education shows that trust is built through repeated interactions, direct observation, and contextual experience, and is associated with more positive learning and professional environments [45-47]. These findings position organizational trust as an organizational resource that can support preceptor performance over time [48-51].

Supervisory support was also found to have an independent positive relationship with preceptor performance. This aligns with evidence indicating that clinical educators function more effectively when supervision provides protected time, feedback, access to resources, and a safe environment for reflection [52-54]. The current findings build on that evidence by showing that supervisory support not only has a direct effect on performance but also an indirect effect via improved communication quality [55]. In practice, structured supervisory arrangements can enhance role clarity and provide access to timely problem-solving, thereby strengthening preceptors' ability to support learners [56-59].

Communication quality partially mediated the relationships between organizational trust and preceptor performance, as well as between supervisory support and preceptor performance. Because organizational trust and supervisory support were assessed at Time 1, communication quality at Time 2, and performance at Time 3, the observed order is consistent with communication serving as a proximal mechanism through which organizational resources are converted into later performance. Clear, timely, open, and two-way communication can enhance feedback, role clarity, coordination, and alignment among clinical and educational stakeholders [19,60]. The persistence of significant direct effects indicates that communication quality is important, yet it does not fully explain how organizational trust and supervisory support affect preceptor performance [61].

Although communication quality is an important factor, the direct effects of organizational trust and supervisory support that extend beyond communication quality suggest that other mechanisms (for example, the provision of resources or the imposition of constraints) also shape preceptor performance [62-66]. Together with teamwork and supportive environments, effective communication is one of the three fundamental elements of successful supervision [67]. The findings of this study support the mediation pathway shown here while acknowledging that the organizational processes that contribute to preceptor performance are complex.

Beyond these mediating effects, self-efficacy significantly moderated the relationship between communication quality and preceptor performance. The positive association between communication quality and preceptor performance was stronger among preceptors with higher self-efficacy. This finding aligns with the view of self-efficacy as a personal resource that alters the strength of the relationship between communication and performance, rather than acting as the intervening mechanism in the current model [68-70]. According to Social Cognitive Theory, self-efficacy influences how people allocate effort, persist in the face of difficult tasks, and use environmental resources. Hence, preceptors with stronger teaching self-efficacy are better positioned to translate clear feedback and communication from the organization into effective clinical teaching behaviors [71].

Although some earlier models have treated self-efficacy as a mediator between organizational conditions and the outcomes in question, the current study treated self-efficacy as a moderator on theoretical and temporal grounds [51]. Organizational trust and supervisory support were considered job resources, communication quality was viewed as the immediate organizational mechanism, and self-efficacy was treated as a relatively stable personal resource measured at the start of the study that could either strengthen or weaken the effect of later communication on performance. The significant interaction between communication quality and self-efficacy, along with the non-zero values of the moderated mediation, supports this interpretation of a boundary condition. Future studies could directly compare alternative specifications of mediator and moderator by making use of additional measurement waves [72].

The moderated mediation analysis also showed that indirect effects through communication quality were statistically significant at all levels of self-efficacy and grew stronger as self-efficacy increased. This suggests that communication-oriented interventions could yield greater performance gains when paired with approaches that enhance preceptors' confidence in their clinical teaching [73]. As a result, mastery experiences, guided practice, peer modeling, and constructive feedback are appropriate elements of preceptor development programs.

The findings have several implications for healthcare organizations and nursing education programs. First, organizations should build trust by establishing clear policies, providing reliable support, and acknowledging the role of preceptors. Second, structured supervision systems should provide dedicated time for precepting, formal preparation, and ongoing mentorship.

Third, communication between preceptors and educational institutions should be strengthened through regular coordination meetings, accessible feedback mechanisms, and collaborative planning. Fourth, preceptor development curricula should incorporate strategies to strengthen self-efficacy, including providing mastery experiences, guided practice, peer modeling, and constructive feedback. Lastly, comprehensive interventions addressing organizational trust, supervisory support, communication quality, and self-efficacy may be more effective than isolated measures.

There are three limitations that are especially significant. First, the observational design precludes causal inference. Although measurements were taken at different times, baseline performance was not included in the model, and unmeasured variables such as workload or prior preparation might account for some of the associations observed. Thus, the results indicate only longitudinal associations, not the effect of any intervention. The second limitation is that both the predictors and the mediator were self-reported, a circumstance that could lead to response bias and correlated measurement error. While the use of performance ratings from multiple sources, together with statistical verification, alleviates some of these concerns, they cannot eliminate them entirely. The study-specific measures used in this study also require further validation in independent samples. Third, the hospitals were purposively selected from two provinces, and follow-up was limited to six months, restricting the generalizability of the findings across settings and over longer periods. Although full-information maximum likelihood was used to address missing data, selection bias may remain if participants with complete data differed systematically from those with incomplete data.

Conclusion

This study provides empirical support for an integrated model in which organizational trust and supervisory support are associated with better preceptor performance both directly and indirectly through communication quality. Self-efficacy moderates the relationship between communication quality and preceptor performance, strengthening the positive association between them. The use of temporally separated measurements, multisource performance assessment, and multisite sampling addresses several limitations of previous cross-sectional studies. Healthcare organizations can translate these findings into practice by establishing structured mentoring and supervisory programs, protected time for precepting, regular bidirectional feedback meetings, transparent trust-building policies, and training that develops teaching self-efficacy through guided practice and mastery experiences. A coordinated approach that addresses organizational trust, supervisory support, communication quality, and self-efficacy together may be more effective than isolated interventions.

Ethics approval

The study was approved by the Institutional Review Board (IRB) of Poltekkes Kemenkes Tanjungkarang (protocol no. 125. KEPK-TJK/I/2025). All participants (preceptors, students, and supervisors) provided written informed consent. All questionnaires were assigned numerical codes to ensure anonymity of the respondents. Participation was voluntary, and participants could refuse to participate in the study or withdraw at any time without penalty.

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Competing interests

All authors declare that there are no conflicts of interest.

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Underlying data

Supplementary data supporting the findings of this study were deposited in Figshare. https://doi.org/10.6084/m9.figshare.33534133.

Declaration of artificial intelligence use

During preparation of this revision, ChatGPT (OpenAI) was used to assist with language editing, sentence structure, readability, and drafting responses to reviewer comments. This use concerned manuscript preparation rather than statistical analysis or generation of research results. The authors are responsible for reviewing and editing the final text, checking citations against their sources, and approving the manuscript; they retain full responsibility for its content.

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