

BMJ Open Self-efficacy as a mediator in the relationship between clinical learning environment and core nursing competence of intern nursing students: a multicentre cross-sectional study

Yunxia Pu ^{1,2}, Hongmei Xie,^{3,4} Lan Fu,^{3,4} Xiaoxia Zhang,^{2,5} Ting Long,⁶ Xiaotian Su,^{3,4} Xiaojuan Feng,^{3,4} Xianqiong Feng ^{2,7}

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YP and HX contributed equally.

YP and HX are joint first authors.

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For numbered affiliations see end of article.

Correspondence to

Dr Xianqiong Feng;
fengxianqiong66@126.com

ABSTRACT

Objective The aim of this study was to examine the relationships between Chinese intern nursing students' self-efficacy, the clinical learning environment, and core nursing competence. In addition, self-efficacy was investigated as a mediator in the association between the clinical learning environment and core nursing competence. **Design** This study used a cross-sectional, descriptive research design.

Setting 15 nursing colleges and universities in China were the setting for the study.

Participants The participants were 552 nursing student interns.

Primary and secondary outcome measures The participants completed measures of general self-efficacy and nursing student core competencies.

Results Participants' mean scores indicated they were satisfied with the clinical learning environment (123.02 ± 19.62), their self-efficacy was at a medium-high level (29.71 ± 5.25), and their core competence was at the upper intermediate level (148.73 ± 22.63). Core nursing competence was positively correlated with self-efficacy and the clinical learning environment ($r=0.597$, $p<0.001$; $r=0.549$, $p<0.001$). The clinical learning environment ($\beta=0.362$, $p<0.001$), duration of clinical practice ($\beta=0.131$, $p<0.001$) and self-efficacy ($\beta=0.406$, $p<0.001$) were identified as significant predictors of core nursing competence. Self-efficacy partially mediated the association between perception of the clinical learning environment and core competence level, accounting for 45.88% of the overall effect.

Conclusions Self-efficacy played a role in explaining the beneficial association between the clinical learning environment and core nursing competence among Chinese intern nursing students. These findings suggest that nursing managers and educators should initially promote nursing students' self-efficacy to increase their confidence in overcoming clinical obstacles, and subsequently cultivate their core nursing competence.

INTRODUCTION

Nurses are the largest group of healthcare professionals worldwide and fulfil a key

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ The study included a large sample of nursing students from 15 nursing universities in China.
- ⇒ We used convenience sampling, and the participants were primarily full-time undergraduate students, the majority of whom completed their internships in tertiary Grade A hospitals. Therefore, the results may not be representative of Chinese intern nursing students with different educational backgrounds working at different types of hospitals.

role in providing ethical, effective and safe healthcare services tailored to the needs of the population.¹ The WHO² reported that the education and training of new nurses, including intern nursing students, is a major concern of the nursing profession. Competency-based education is used extensively in the nursing profession because it can teach nurses to deliver high-quality care to satisfy the expanding demands for healthcare worldwide.³ Therefore, ensuring that nursing students learn solid professional skills to facilitate nursing industry development is critical.

As core nursing competence is the most important ability nursing professionals must acquire, nursing educators should focus on cultivating this set of skills.⁴ In 2003, the International Council of Nurses defined nurses' core competence as "the special knowledge, skills, judgment and personal characteristics required by nurses to provide safe and ethical nursing services".⁵ Although different countries require different components and standards of core nursing competence, they all emphasise that it is a necessary ability for nursing work.^{6–8} As the future workforce of the nursing profession, the development of clinical intern nurses' professional competencies

is crucial for the development of the nursing profession and enhancing the quality of nursing care.

Clinical practice is an indispensable training component for nursing students. The nursing regulations in China require nurses applying for registration as nurse practitioners to undergo at least 8 months of clinical internship in a teaching or general hospital.⁹ Meanwhile, the latest regulations of the European Union state that nursing education must include at least 2300 hours of clinical learning in different environments.¹⁰ Clinical learning should enable students to integrate their theoretical knowledge with actual clinical situations, acquire professional competence and become qualified nurses.¹¹ The clinical learning environment comprises all of the components that interact in the clinical setting and influence nursing students' learning. It is where nursing students learn nursing skills, socialise their roles and develop a sense of professional responsibility for nursing.¹² The quality of the clinical learning environment (eg, the physical environment, teaching personnel and other healthcare experts) can affect nursing students' professional attitudes, level of nursing knowledge, behavioural skills and ability to solve clinical problems.¹³ Therefore, the clinical environment can be instrumental in cultivating core competence in intern nursing students.

Efforts to cultivate core nursing competence among nursing students should also focus on their self-efficacy, which refers to their subjective judgement of their ability to perform a certain task.¹⁴ Bandura's¹⁵ social cognition theory posits that self-efficacy can be a motivating factor and may affect one's sense of agency. The stronger a person's sense of self-efficacy, the greater their confidence in overcoming difficulties.¹⁶

Investigating the status and influencing variables of nursing students' core competence is also critical to support the growth of their nursing careers. A survey of 1796 nursing students graduating from six countries, including Germany, Finland and Ireland, showed that their nursing abilities were generally good.¹⁷ According to research on the core competence of Chinese nursing internship students, undergraduate nursing students possessed core competence at or above an intermediate level,^{18 19} whereas Chinese intern nursing students (including undergraduate, junior college and technical secondary school students) were at an intermediate²⁰ or below intermediate level.²¹ These findings suggest that relative to nursing students from other nations, Chinese nursing students must further develop their core nursing competence.

Research has demonstrated a positive correlation between the clinical competence of nursing students and both their self-efficacy and the clinical learning environment.^{22 23} Self-efficacy alone has also been found to have a positive correlation with the clinical learning environment.²⁴

Previous research has focused more on the independent relationships among these variables, as opposed to hypothesising a mediation model. To clarify the relationships

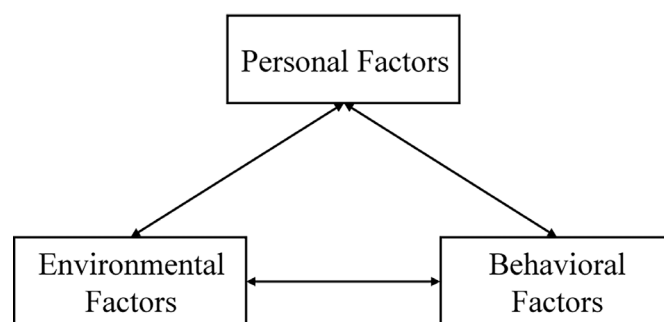


Figure 1 Bandura's triadic reciprocal determinism.

between these factors, the present study aimed to accomplish the following objectives: (1) assess the perceptions of intern nursing students in China regarding the clinical learning environment, self-efficacy and core nursing competence; (2) investigate the interconnections among self-efficacy, the clinical learning environment and core competence and (3) investigate the mediating role of self-efficacy in the relationship between the clinical learning environment and core nursing competence.

Bandura's²⁵ triadic reciprocal determinism theory was the theoretical foundation of the current investigation. Bandura postulated that the environment, behaviour and individual personal factors interact to exert mutual influence (figure 1). This study used the self-efficacy of nursing students as the individual personal factor, core nursing competence as the behaviour and the clinical learning environment as the environment. Drawing on prior investigations and Bandura's theoretical framework, we proposed the following two hypotheses (figure 2):

H1: core nursing competence is positively related to both self-efficacy and the clinical learning environment.

H2: self-efficacy mediates the association between the clinical learning environment and core nursing competence.

METHODS

Participants

This study employed a convenience sampling method to recruit clinical nursing students from 15 medical universities across China as participants between December 2022 and March 2023. Inclusion criteria: only nursing

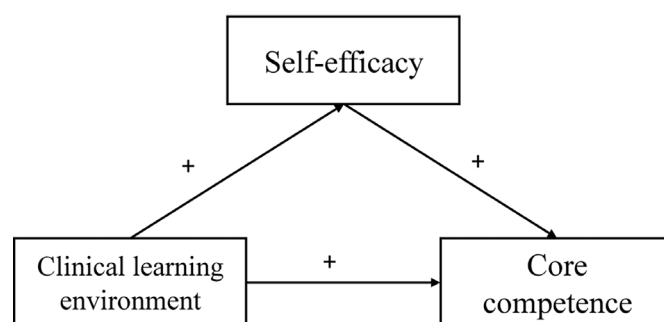


Figure 2 Hypothesised model.

students enrolled in technical secondary schools, junior colleges or undergraduate programmes were eligible to participate. All participants provided informed consent prior to their voluntary participation in the study. Exclusion criteria: (1) nursing students with physical or mental health conditions that prevented them from completing the questionnaire and (2) internship nursing students who had not successfully completed clinical practice or were subject to sanctions, including those who failed to comply with hospital practice regulations.

According to Preacher and Kelley,²⁶ to estimate a sufficient number of parameters, the number of participants for path analysis should be 10–20 times greater. To account for a 20% margin of error in the questionnaires and 30 variables (including demographic, core competency, self-efficacy and clinical learning environment variables), a sample size of 375–750 participants was necessary for this study.

Sociodemographic information questionnaire

A sociodemographic questionnaire was developed for use in this study. The questionnaire asked participants to provide information on their age, gender, education level, professional interests, home location, length of clinical practice, classification of their hospital, whether they serve as a class leader and whether they were an only child.

Competency Inventory for Nursing Students

The Competency Inventory for Nursing Students (CINS), which was designed by Hsu and Hsieh²⁷ to comprehensively assess the fundamental abilities of nursing students, was subsequently translated into Chinese by Ruixue *et al.*²⁸ The CINS includes 38 items in six dimensions: care, ethics and responsibility, general clinical skills, critical thinking and reasoning ability, lifelong learning and clinical biomedical science. The responses to the items are provided on a 5-point Likert scale ranging from 1='completely incompetent' to 5='completely competent'. The total scores range from 38 to 190, with high scores indicating a high level of student nursing competence. The Chinese version of the CINS demonstrated good internal consistency, reliability and stability, with Cronbach's alpha values ranging from 0.83 to 0.95 for each subscale and 0.97 for the total scale.²⁸ In this investigation, Cronbach's alpha for the total scale was 0.95.

General Self-Efficacy Scale

The Chinese adaptation of the General Self-Efficacy Scale (GSES), created by Zhang and Schwarzer,²⁹ was used to assess general self-efficacy. The GSES is a self-report instrument consisting of 10 items that are rated on a 4-point Likert scale ranging from 1='completely incorrect' to 4='completely correct'. The cumulative score of all 10 items represents the total score;

a high score indicates a high level of general self-efficacy. The Chinese version of the GSES has been used extensively in China and is highly reliable with a Cronbach's alpha of 0.87.³⁰ The Cronbach's alpha in this investigation was 0.90.

Environment Evaluation Scale for Clinical Nursing Internship

The Environment Evaluation Scale for Clinical Nursing Internship, developed by Hu *et al.*,³¹ comprises 30 items divided into six dimensions: organisational support, teaching methods, teacher quality, learning opportunities, interpersonal relationships and work atmosphere. The responses to the items are provided on a 5-point Likert scale ranging from 1='completely disagree' to 5='completely agree'. The total score ranges from 30 to 150, with higher scores indicating a more robust clinical learning environment for nursing interns. The scale has demonstrated good internal consistency, reliability and stability, with Cronbach's alpha values of 0.96 for the total scale and 0.84 to 0.95 for each subscale. In this investigation, Cronbach's alpha for the total scale was 0.96.

Procedures

The Medical Ethics Committee of the West China Hospital of Sichuan University approved this study (approval number 2022–1903). The study adhered to the principles of informed consent and voluntary participation. The researchers first contacted the instructors responsible for overseeing students' internships at the university's school of nursing and affiliated hospitals. They provided a detailed explanation of the study's purpose, content and questionnaire completion process. Subsequently, questionnaires were administered through convenience sampling to clinical placement nurses from 15 healthcare institutions such as Chengdu University, Chengdu Medical College, Chengdu University of Traditional Chinese Medicine, North Sichuan Medical College, Hubei Three Gorges Polytechnic, West China Health School, Leshan Vocational and Technical College, Panzhihua University, Sichuan Nursing Vocational College, Sichuan Vocational College of Health and Rehabilitation, Sichuan College of Traditional Chinese Medicine, Southwest Medical University, Ya'an Vocational and Technical College, Tianfu College of Southwest University of Finance and Economics and Yunnan University of Traditional Chinese Medicine. The questionnaire was administered through the Questionnaire Star software, and the unified guidance language was used in the questionnaire to explain the study's purpose, completion method and informed consent process. Participants submitted the questionnaire anonymously on completion.

To maintain the accuracy and comprehensiveness of responses, each item in the questionnaire required a response, and participation was restricted to a single

attempt to complete the questionnaire from a given IP address. After completed questionnaires were collected and reviewed, invalid questionnaires were eliminated. A cohort of 580 intern nurses participated in the study; however, 28 questionnaires were deemed invalid. Consequently, the final sample consisted of 552 participants, resulting in a valid response rate of 95.17%.

Data analysis

SPSS V.26.0 was used to analyse the data. Due to the normal distribution of data in this study, frequency, percentage, mean and SD were used to analyse the demographic characteristics of the participants. t-tests and analysis of variance (ANOVA) were used to examine the variations in fundamental nursing competence based on the characteristics of the nursing interns. Pearson's correlation coefficients were calculated to determine the relationships between the variables. Multiple linear stepwise regression was conducted to ascertain the factors substantially correlated with core nursing competence. The effects of self-efficacy and the clinical learning environment on core nursing competence were analyzed using structural equation modeling (SEM) with the Analysis of Moment Structures (AMOS) software (version 23.0). Modification indices were used to fit the data. Furthermore, the mediating role of self-efficacy in the relationship between the clinical practice environment and core nursing competence was examined using bootstrap methods. The estimated

effect was deemed significant if the 95% bootstrap CI for the mediating effect did not include zero. Statistical significance was set at $p < 0.05$.

Patient and public involvement

There was no patient or public involvement in this study.

RESULTS

Sociodemographic characteristics

A total of 552 intern nursing students (mean age: 21.06 ± 1.05 years) participated in this study. Of these, 80 (14.49%) were men and 472 (85.51%) were women. Regarding education level, 23 (4.17%) were enrolled in technical secondary schools, 178 (32.24%) in junior colleges and 351 (63.59%) in undergraduate programmes (table 1).

Descriptive statistics

The clinical learning environment score was 123.02 ± 19.62 , the self-efficacy score was 29.71 ± 5.25 and the core nursing competence score was 148.73 ± 22.63 . These scores indicated the participants were satisfied with the clinical learning environment, their self-efficacy was at a medium-high level and their core competence was at the upper-intermediate level (table 2).

Univariate and correlation analysis

Significant variations in core nursing competence were observed based on factors such as the duration of

Table 1 Sociodemographic characteristics of the participants (n=552)

Variable	N	%	Variable	N	%
Gender			Home location		
Female	472	85.51	City	191	34.60
Male	80	14.49	Town	121	21.92
Education level			Rural area	240	43.48
Technical secondary school	23	4.17	From a one-child family		
Junior college	178	32.24	Yes	193	34.96
Undergraduate	351	63.59	No	359	65.04
Length of clinical practice			Professional interest (do you like nursing?)		
<12 weeks	106	19.20	Yes	387	70.11
12–24 weeks	237	42.94	Neutral	139	25.18
25–36 weeks	145	26.27	No	26	4.71
>36 weeks	64	11.59	Whether served as a class leader		
Internship hospital level*			Yes	280	50.72
Tertiary Grade A hospitals	499	90.40	No	272	49.28
Tertiary Grade B hospitals	28	5.07			
Others	25	4.53			

*Hospitals are classified according to the Hospital Classification Management Standards. The hospitals are divided into three levels, and each level is divided into grades A, B and C. Tertiary hospitals are added with special grades. Therefore, hospitals in China are divided into three levels and 10 grades. Tertiary Grade A hospitals offer the most comprehensive medical services, followed by tertiary Grade B hospitals.

Table 2 Self-efficacy, clinical learning environment and core nursing competence scores (n=552)

Variable	Score range	Mean±SD
Self-efficacy	10–40	29.71±5.25
Competency Inventory for Nursing Students	38–190	148.73±22.63
Clinical biomedical science	5–25	18.10±3.51
General clinical skills	6–30	22.55±3.97
Critical thinking and reasoning ability	3–15	10.96±2.16
Care	5–25	19.71±3.46
Ethics and responsibility	14–70	57.88±9.29
Lifelong learning	5–25	19.51±3.38
Clinical learning environment	30–150	123.02±19.62
Teaching methods	5–25	20.57±3.53
Teacher quality	5–25	20.97±3.48
Learning opportunities	5–25	20.12±3.66
Interpersonal relationships	5–25	20.57±3.41
Work atmosphere	5–25	20.58±3.46
Organisational support	5–25	20.18±3.73

clinical experience, level of education, place of residence and professional inclination (table 3). Pearson correlation analysis revealed that self-efficacy was positively correlated with core nursing competence

($r=0.597$, $p<0.001$) and clinical learning environment ($r=0.610$, $p<0.001$), and clinical learning environment was positively correlated with core nursing competence ($r=0.549$, $p<0.001$).

Regression analysis

Predictors of the core nursing competence were identified by performing multiple linear regression analyses. The independent variables, namely self-efficacy, clinical learning environment, professional interest, length of clinical practice, education level and home location, were found to be significant in the univariate analyses. After accounting for the influence of the other variables, the clinical learning environment ($\beta=0.362$, $p<0.001$), length of clinical practice ($\beta=0.131$, $p<0.001$) and self-efficacy ($\beta=0.406$, $p<0.001$) emerged as significant predictors of core nursing competence. These factors accounted for 48.6% of the variance (table 4).

The mediating effect of self-efficacy

The dependent variable was core nursing competence, the mediating variable was self-efficacy and the independent variable was clinical learning environment (figure 3). As a result of the initial inadequate fit of the model, this study used two modification indices corrections. Following the revision, the fit indices were as follows: $X^2/df=3.887$, goodness of fit=0.945, Comparative Fit Index=0.912, Tucker-Lewis

Table 3 Univariate analysis of core nursing competence by sociodemographic characteristics (n=552)

Characteristic	Core nursing competence		F/t	95% CI	
	Mean	SD		Lower	Upper
Length of clinical practice			5.991**		
<12 weeks	142.82	28.13		137.40	148.23
12–24 weeks	147.72	21.26		145.00	150.44
25–36 weeks	151.15	22.11		147.52	154.78
>36 weeks	156.81	14.44		153.20	160.42
Education level			8.080**		
Tertiary	153.69	29.76		140.82	166.56
Postsecondary	153.80	21.82		150.57	157.03
Full-time undergraduate	145.84	22.06		143.52	148.16
Home location					
City	150.95	26.59	4.166*	147.16	154.75
Town	151.47	19.47		147.96	154.97
Rural area	145.59	20.27		143.01	148.17
Professional interest			10.303**		
Yes	151.50	22.42		149.26	153.74
Neutral	142.81	19.58		139.52	146.09
No	139.19	31.71		126.38	152.00

Only significant results are listed. * $p<0.05$, ** $p<0.001$.

Table 4 Regression analysis predicting core nursing competence (n=552)

Variable	B	SE	β	t	P value
Self-efficacy	1.752	0.157	0.406	11.119	<0.001
Clinical learning environment	0.418	0.042	0.362	9.877	<0.001
Length of clinical practice	3.261	0.762	0.131	4.275	<0.001

$R^2=0.488$; adjusted $R^2=0.486$; $F=174.433$.

Index=0.955 and root mean square error of approximation=0.030. The fit of the model fell within a permissible range.

The findings from the AMOS analysis demonstrated that a direct and positive relationship existed between self-efficacy, the clinical learning environment and core nursing competence (table 5). A 95% CI was applied to the test of significance for the mediating effect after 5000 samples of the original data were replicated using the bootstrap method. The mediating effect is significant if zero is not included in the CI. The results indicated self-efficacy partially mediated the relationship between the clinical learning environment and core nursing competence. The total effect of the clinical internship environment on core competence was 0.497 ($p<0.01$, 95% CI 0.396 to 0.592). The direct effect was 0.270 ($p<0.01$, 95% CI 0.184 to 0.350), and the mediating effect was 0.228 ($p<0.001$, 95% CI 0.175 to 0.296), accounting for 45.88% of the total effect (table 6).

DISCUSSION

This study included intern nursing students with different educational backgrounds from 15 nursing colleges in Southwest China. The students were completing a nursing internship at tertiary A, tertiary

B and secondary A hospitals. The sample predominantly comprised undergraduate students and students at tertiary A practising hospitals, indicating that the participants had high professional qualities. They were all new interns who participated in a standardised clinical internship for the first time. Although the internship duration followed a normal distribution, the nursing students were in different internship cycles. Similar to the male-to-female nurse-to-student ratio in China,³² the majority of the students were female. Consequently, the study sample provides a reasonable representation of intern nursing students in China.

Core nursing competence, self-efficacy and the clinical learning environment of nursing students

In this study, the clinical learning environment score indicated that the nursing students were satisfied with the clinical learning environment. These findings align with those of Yuxuan *et al*³³ and are marginally higher than those of Xiang *et al*.¹⁶ Among the dimensions, teacher quality received the highest score and learning opportunity the lowest, which is consistent with the findings of Jing *et al*.³⁴ This result could be attributed to the fact that the majority of the study participants were educated in tertiary Grade A hospitals, which are renowned for their teaching

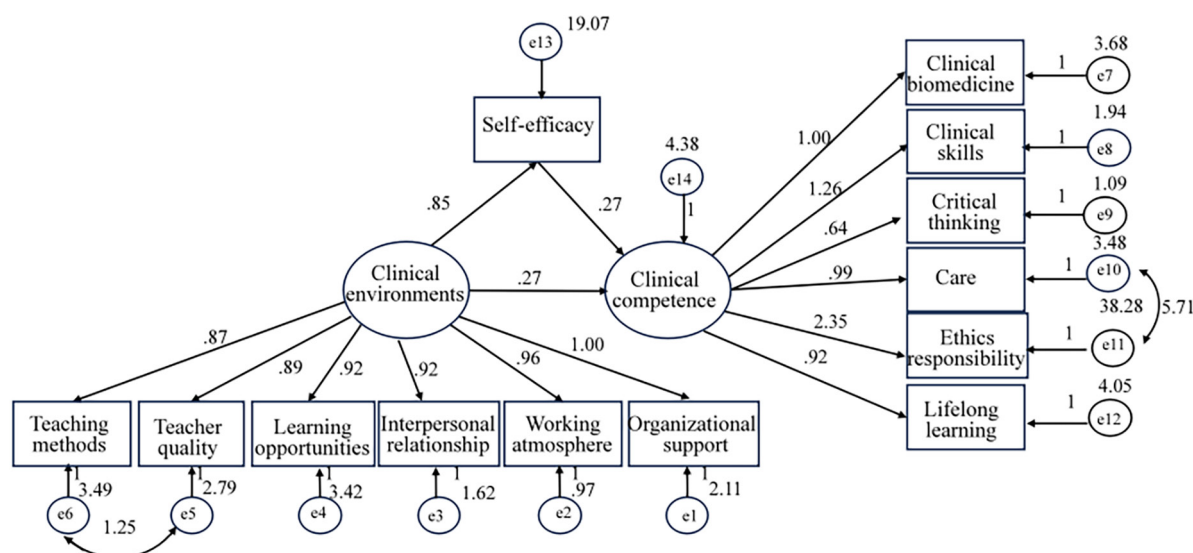
**Figure 3** Path model showing the mediating effect of self-efficacy in the relationship between the clinical learning environment and core nursing competence.

Table 5 Path inspection

Path	Unstandardised regression coefficient	Standardised regression coefficient	SE	Critical ratio	P value
Clinical learning environment → self-efficacy	0.847	0.555	0.057	14.832	<0.001
Self-efficacy → core nursing competence	0.269	0.479	0.023	11.713	<0.001
Clinical learning environment → core nursing competence	0.270	0.315	0.035	7.737	<0.001

The arrow symbol (→) denotes the hypothesised path direction (independent variable → dependent variable), based on the SEM analysis.

capabilities. These hospitals can provide nursing students with a strong clinical learning experience because they have excellent hardware and software facilities, mature practical and teaching work, standardised management, orderly and well-organised clinical environments and experienced clinical teachers. However, to avoid risk, teachers do not allow students to complete simple, mechanical and repetitive nursing operations. In addition, patient trust in nursing students remains limited, resulting in few practical opportunities despite the students' strong technical capabilities.³⁵ Therefore, nursing students should be given more practical opportunities to operate independently while their clinical safety is guaranteed.

The self-efficacy score of the intern nursing students indicated a medium-high level of self-efficacy. This finding aligns with the results reported by nursing students in other countries, such as the Philippines, Spain and Slovakia.^{36 37} However, it surpasses the level of confidence found in the study conducted by Li *et al*,³⁸ which targeted 836 Chinese intern nursing students. This difference may be related to the nursing students' education level and clinical learning environments in the different studies, given that differences in self-efficacy can be related to the clinical context and patient population.³⁹ The proportion of undergraduate nursing students in this study exceeded 60%, which is higher than the proportion reported by Li *et al*.³⁸ Compared with junior college and technical secondary school students, undergraduate nursing students have greater learning autonomy, more solid theoretical knowledge and greater self-confidence in the face of difficulties; consequently, undergraduates

tend to have greater self-efficacy. Furthermore, over 90% of the nursing students who participated in this study were affiliated with tertiary Grade A hospitals, which are renowned for their extensive clinical teaching experience and clinical learning environment that enhance students' self-efficacy.⁴⁰ To foster self-efficacy among nursing students, nursing educators and administrators should establish a positive clinical learning environment by offering a comprehensive, high-quality learning experience that promotes learning autonomy.

The core competence score of the nursing students in this study was at the upper-intermediate level. This finding is marginally higher than the outcomes reported in other studies involving Chinese students^{11 41} but lower than the collective core competence level of nursing interns from six Asian countries.⁴² Ethics and responsibility obtained the highest score, while clinical biomedical science and critical thinking and reasoning ability obtained the lowest scores. These findings are largely consistent with those of previous studies.^{11 41}

The above variances may be due to the following reasons. First, in this study, most participants were undergraduate nursing students in tertiary Grade A hospitals. Students in Grade A hospitals would have a higher level of education and training than those in other hospitals, and the nursing students' professional quality would be higher. Therefore, the students' level of core nursing competence in the present study would be greater than that of students in other relevant studies in China. Second, according to a study by Grande *et al*⁴² on students' core nursing competence in other Asian countries, 80% of nursing

Table 6 Analysis of the mediating, direct, and total effects on core nursing competence

Effect	Impact	SE	95% CI		P value	%
			Lower	upper		
Mediating effect	0.228	0.030	0.175	0.296	<0.001	45.88
Direct effect	0.270	0.041	0.184	0.350	0.001	54.12
Total effect	0.497	0.050	0.396	0.592	0.001	

students have a 5-year learning cycle. In China, the learning period for undergraduate nursing students is 4 years, and that for junior college students is 3 years. The longer the learning cycle, the greater the likelihood that students have mastered their knowledge and, therefore, the greater their core nursing competence. Third, the highest score in the dimension of ethics and responsibility is possibly related to the emphasis placed on the patient-centred nursing model in China and on the cultivation of ethics and a sense of responsibility in nursing students. Thus, these results exemplify the success of the current focus on quality-oriented education for nursing students. Fourth, the clinical biomedical science and critical thinking and reasoning aptitude dimensions received low scores. Despite medical colleges and universities recognising the significance of fostering students' critical thinking skills, this is not consistently reflected in instructional activities. The systematic assessment of learning is mostly limited to book knowledge; consequently, students generally pay more attention to memorising theoretical knowledge than developing critical thinking skills.²⁰ The clinical biomedical sciences include pathology, biology and the physical examination and treatment of patients in clinical environments.²⁷ As most of the participants in this study had experienced a short internship period, they had yet to accumulate clinical experience in biomedical areas. According to the aforementioned results, the fundamental nursing skills of Chinese nursing students have advanced compared with the level of proficiency reported in previous studies. Nevertheless, further education and training are required to develop students' proficiency in clinical biomedical science and critical thinking and reasoning.

Correlations and path analysis of the clinical learning environment, self-efficacy and core competence

A substantial positive correlation was identified in this study between the clinical learning environment and core competence, indicating that a strong clinical learning environment for intern nurses is associated with strong core competence in nursing students, which is consistent with the findings of Liao and Liu.¹¹ Research has indicated that the effectiveness of instruction is significantly influenced by the clinical learning environment. In other words, nursing students are more likely to actively participate in the learning process when the clinical learning environment is evaluated positively.^{43 44} In addition to learning attitudes, the clinical learning environment greatly affects nursing students' knowledge, behavioural skills and problem-solving abilities.⁴⁵ Hence, establishing clinical environments conducive to learning is imperative to foster the development of core nursing competence.

The present study revealed a positive correlation between self-efficacy and the clinical learning environment, suggesting that a robust clinical learning environment is linked to higher self-efficacy. This finding is consistent with the results reported by Xiang *et al.*¹⁶ This may occur because nursing students gain self-efficacy through the support, resources, opportunities and development space provided by a positive clinical learning environment.⁴⁶ Such an environment also facilitates the development of nursing students' confidence in their ability to manage problems that arise in nursing practice. Nursing educators and administrators can thus foster the development of self-efficacy among nursing students by providing a superior clinical learning environment.

The relationship between the clinical learning environment and core nursing competence was partially mediated by self-efficacy; this suggests that self-efficacy could partially explain the association between the clinical learning environment and the core competence of nursing students. This relationship can be understood in terms of self-efficacy's influence on an individual's motivation¹⁵ and confidence in overcoming difficulties.¹⁶ On entering the clinical environment, student nurses face many mental and physical challenges. They may have difficulty applying the knowledge and experiences from classroom learning to the problems they encounter in the clinical setting. Consequently, students may have reactions such as withdrawal, avoidance and burnout, which can result in low motivation for clinical and academic work that will manifest in their core competence. However, a strong clinical learning environment plays a positive role in stimulating the self-efficacy of nursing students, and the level of self-efficacy affects the learning attitude and clinical learning quality of nursing students,²⁴ thereby affecting their core nursing competence. Therefore, to foster the growth of intern nursing students' fundamental nursing competence, it is critical to provide students with a robust clinical learning environment and opportunities that cultivate their self-efficacy for effectively navigating the diverse challenges of clinical practice.

Limitations

This study has certain limitations that should be addressed in future research. First, although the nursing students were recruited from different institutions in China, we used convenience sampling, and the participants were primarily full-time undergraduate students with internships at tertiary Grade A hospitals. Therefore, the results may not be representative of Chinese intern nursing students with different educational backgrounds working at different types of hospitals. In the future, multicentre, large sample, stratified random sampling can be conducted to improve sample representativeness. Second, the influencing factors included in this study

were limited. Future studies should consider additional factors and mediators affecting the core nursing competence of intern nursing students. Third, while the cross-sectional design effectively captures variable associations at a specific time point, it inherently limits temporal causal inference. Future research could adopt longitudinal designs to enhance methodological rigour. Furthermore, although standardised scales were administered in the survey, reliance on self-reported data may introduce social desirability bias and interpretation discrepancies. These limitations could be mitigated in future research through sample size expansion and external validation via objective metrics.

CONCLUSIONS

This study found that Chinese nursing interns were satisfied with their clinical learning environment, they had a medium-high level of self-efficacy, and their core competence was at the upper-intermediate level. Furthermore, self-efficacy partially mediated the relationship between the clinical learning environment and core nursing competence. To foster the development of fundamental nursing competence in students, nursing administrators and instructors must not only establish a conducive clinical learning environment but also provide students with motivation and validation, bolster their assurance in clinical tasks and enhance their sense of self-efficacy.

Author affiliations

¹Department of Targeting Therapy & Immunology, Cancer Center, West China Hospital, Sichuan University, Chengdu, Sichuan, China

²West China Hospital School of Nursing, Sichuan University, Chengdu, Sichuan, China

³Department of General Surgery, West China Hospital, Sichuan University, Chengdu, Sichuan, China

⁴Breast Disease Center, West China Hospital, Sichuan University, Chengdu, Sichuan, China

⁵Division of Head & Neck Tumor Multimodality Treatment, Cancer Center, West China Hospital, Sichuan University, Chengdu, Sichuan, China

⁶Outpatient Department, West China Hospital, Sichuan University, Chengdu, Sichuan, China

⁷Department of Nursing, West China Hospital, Sichuan University, Chengdu, Sichuan, China

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Data availability statement Data are available upon reasonable request.

Deidentified participant data can be accessed by contacting the 1107069424@qq.com following approval of a methodologically sound proposal.

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ORCID iDs

Yunxia Pu <http://orcid.org/0009-0001-0216-6560>

Xianqiong Feng <http://orcid.org/0000-0002-0104-8968>

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