Enhancing self-regulated learning among nursing interns: The mediating role of clinical belongingness in academic support systems

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Abstract: Clinical education plays a pivotal role in shaping the professional competence and identity of nursing students. However, the transition from classroom learning to real-world practice presents substantial challenges for nursing interns, particularly in self-regulating their learning processes within emotionally and cognitively demanding environments. This study aimed to investigate the relationship between academic support and self-regulated learning (SRL) among nursing interns and to examine the mediating role of clinical belongingness in this relationship. A cross-sectional survey was conducted among 201 fourth-year nursing interns from a medical university in Jiangsu Province, China. Standardized instruments were used to measure academic support, clinical belongingness, and SRL. Descriptive statistics, Spearman correlation, and structural equation modeling (SEM) were applied to analyze the data. Participants reported high levels of SRL (Mdn = 3.81), slightly high academic support (Mdn = 6.39), and moderate clinical belongingness (Mdn = 3.42). SEM revealed that academic support had both a direct effect (β = 0.235) and an indirect effect (β = 0.086) on SRL through clinical belongingness, which accounted for 26.8% of the total effect. Academic support enhances nursing interns' SRL both directly and through improved clinical belongingness. These findings underscore the importance of integrating emotional and instructional support systems to promote autonomous, reflective learning during clinical placements.

Keywords: Academic support, Clinical belongingness, Interns; Clinical practice, Nursing education, Self-regulated learning.

1. Introduction

Clinical education is a cornerstone of nursing training, serving as the platform where theoretical knowledge is translated into practical competence and professional identity [1, 2]. Yet, the clinical environment introduces multiple stressors, such as: complex patient interactions, emotional burden, and high-performance expectations [3-5]. That make it significantly more challenging than classroom-based learning. Nursing interns, still in the process of forming their professional identity, often struggle to regulate their learning effectively within these real-world scenarios [6]. These challenges hinder not only their learning outcomes, but also their transition into confident and competent healthcare professionals [7, 8].

One construct that plays a vital role in helping students adapt to such demands is self-regulated learning (SRL) [9]. Rooted in Zimmerman's theory of learning as a metacognitive, motivational, and behavioral process, SRL enables students to plan, monitor, and adapt their learning strategies [10]. However, SRL does not occur in isolation [11]. According to Watson's Humanistic Nursing Theory [12] and Levett-Jones' Ascent to Competence model [13], learners require a supportive environment that fosters emotional well-being and professional integration. This is where clinical belongingness

becomes crucial, it refers to the feeling of being accepted, connected, and valued in the clinical team, and serves as an affective bridge between academic support and learning motivation [14, 15].

This study proposes and empirically tests a conceptual model wherein academic support (from peers, preceptors, institutions, and facilitators) influences SRL, both directly and indirectly through clinical belongingness. Clinical belongingness is hypothesized to mediate this relationship by providing emotional safety, role clarity, and a sense of identity, all of which are critical to maintaining intrinsic motivation and reflective practice in stressful environments. This integrative framework provides a new perspective for designing academic interventions that not only deliver skills and knowledge, but also foster relational and emotional scaffolding in clinical education.

This research is significant in three key ways. First, it addresses the persistent theory-practice gap in nursing education by identifying emotional and contextual variables, like belongingness; that influence how academic support translates into learning outcomes. Second, it integrates established theories from psychology and nursing to offer a comprehensive framework that connects institutional, interpersonal, and intrapersonal dimensions of learning. Finally, the study provides empirical evidence for a mediating model that can inform the design of support systems in clinical internships, particularly in high-pressure and culturally diverse environments like China.

This study aims to develop and validate a structural model linking academic support, clinical belongingness, and SRL among nursing interns. Specifically, the objectives are:

- To assess the levels of SRL, academic support, and clinical belongingness among nursing interns, focusing on key dimensions such as motivation, strategic learning behaviors, and affective connectedness.
- To examine the relationship between perceived academic support and SRL during clinical nursing practice.
- To investigate the mediating role of clinical belongingness in the relationship between academic support and SRL.

2. Literature Review

2.1. Self-Regulated Learning in Clinical Nursing Practice

SRL in clinical nursing practice refers to the active process by which nursing interns manage their own learning within real-world clinical environments [16]. Although it shares core principles with general SRL, its application in clinical settings is particularly complex due to the need for learners to integrate theoretical knowledge with practical decision-making and interpersonal care [17, 18]. Rooted in Bandura's social cognitive theory [19], SRL involves setting personal learning goals, taking deliberate action, monitoring progress, and adjusting behaviors in response to feedback. Zimmerman [10] expanded on this theory by emphasizing the interaction between motivation, cognition, and behavior, identifying SRL as the learner's ability to regulate these domains to achieve academic goals. Metacognitive strategies, such as planning, goal setting, and self-monitoring, are central, as are motivational factors like self-efficacy and intrinsic drive [11]. From this perspective, SRL empowers nursing interns to become autonomous, reflective, and adaptive learners in unpredictable and emotionally charged clinical settings [20, 21].

Effective self-regulated learners are characterized by their ability to plan and control learning processes, maintain effort over time, and strategically manage both internal states and external environments [22]. They utilize cognitive and metacognitive strategies, exhibit strong motivational beliefs, and employ volitional tactics to overcome distractions or setbacks [23]. In clinical nursing contexts, these abilities are critical for managing complex patient care, coping with stress, and maintaining professional growth [24]. In other words, self-regulated nursing students not only monitor their understanding and skill acquisition, but also proactively seek feedback, collaborate with mentors, and adapt strategies based on real-time clinical demands [9]. These competencies foster

deeper learning and resilience in high-stakes environments, underscoring the necessity of cultivating SRL in clinical education programs.

Given the critical role of SRL in successful clinical performance, this study seeks to understand how academic support systems and clinical belongingness interact to enhance or hinder the development of SRL among nursing interns. Guided by Zimmerman [10] SRL theory, Watson [12] Humanistic Nursing Theory, and Levett-Jones, et al. [25] Ascent to Competence framework, the study hypothesizes that academic support fosters SRL both directly and indirectly through clinical belongingness; a psychological state of acceptance and connectedness within the clinical team. Based on this theoretical foundation, the research aims to examine current levels of SRL, assess the mediating effect of belongingness, and identify factors that may influence or optimize the academic environment for nursing interns.

2.2. Influencing Factors of Self-Regulated Learning

As noted earlier, SRL is a dynamic and multifaceted process influenced by a range of individual and contextual factors. Among these, gender has been widely studied, though findings remain inconsistent. Several studies indicate that female students outperform males in SRL across various dimensions, including cognitive strategies, motivation, and behavioral regulation [26, 27]. Still, several studies report no significant gender differences in SRL within various educational learning context [28, 29], suggesting that the influence of gender may be context-dependent or mediated by other factors such as academic major and performance expectations.

Grade or year level of study is also another influential variable, though its relationship with SRL appears non-linear. Literature have shown a general increase in SRL with academic progression, as senior students face more complex clinical tasks, exams, and job-related pressures that necessitate greater use of metacognitive strategies [25]. However, other findings reveal fluctuations in SRL across year levels. For instance, Dogu, et al. [30] reported that second-year students outperformed their seniors, potentially due to mid-program exam stress and increased course load. In contrast, first-year students may experience heightened motivation due to novelty and transition challenges [20]. These mixed results highlight that grade-based differences in SRL are shaped not only by cognitive development but also by curriculum structure, assessment pressure, and support systems. Similarly, place of residence has yielded inconclusive findings: some studies report that urban students exhibit higher SRL [31], while others found no significant differences [32]. These contradictions suggest the need for more varied, mixed-method investigations that account for socioeconomic and cultural contexts.

Another key factor influencing SRL is professional identity; the degree to which students feel aligned with and committed to their chosen profession [33]. A growing body of research demonstrates that a strong professional identity correlates positively with intrinsic motivation and SRL behaviors [34, 35]. In other words, students who value their nursing role are more likely to engage in reflective learning, set meaningful goals, and persist through challenges. Likewise, family-related variables such as parenting style, parental education, and household income also affect SRL. Authoritative parenting, in particular, has been linked to higher SRL due to its supportive yet structured approach [36]. Parental education, specifically the mother's educational attainments, has also been associated with stronger SRL outcomes, possibly due to greater modeling and academic support [37]. While some studies suggest that higher family income leads to improved SRL, others argue that financial privilege may reduce academic drive, highlighting the complex and sometimes contradictory influence of background factors on student learning behaviors [38, 39].

Taken together, these findings underscore the importance of examining SRL as a multidimensional construct shaped by individual, familial, and contextual influences. In the context of clinical nursing education, understanding these factors is critical, as students must not only acquire knowledge but also apply it in high-stress, emotionally demanding environments. This study builds on these insights by investigating how perceived academic support and clinical belongingness interact with demographic and

psychosocial factors to influence SRL. By integrating Zimmerman's SRL theory with Watson's Humanistic Nursing Theory and Levett-Jones' Ascent to Competence framework, the study aims to provide a comprehensive model that can guide targeted interventions and support strategies in nursing education.

2.3. The Relationship Between Academic Support and Self-Regulated Learning

Academic support plays a pivotal role in enhancing students' SRL Mega, et al. [40] particularly in high-stakes and practice-intensive fields such as nursing [9]. According to Savitz-Romer, et al. [41] academic support encompasses formal and informal strategies, ranging from pedagogical practices to emotional and social scaffolding, that facilitate students' mastery of knowledge and skill development. Empirical studies consistently demonstrate that support from teachers, clinical preceptors, and peers directly influences students' motivation, engagement, and learning behavior. For instance, teacher autonomy support has been shown to fulfill students' psychological needs, thereby strengthening intrinsic motivation and improving SRL outcomes [42, 43]. Similarly, guidance on learning strategies, goal setting, and resource management provided by educators can mitigate the decline in SRL commonly observed during clinical practice [31]. These findings suggest that teacher involvement; especially when tailored to learners' developmental needs, can serve as a critical external regulator of self-directed learning processes.

Beyond instructional support, social and resource-based forms of academic support also contribute significantly to the development of SRL [44], while also instilling both cognitive and affective learning [45]. Research has shown that perceived social support, including emotional encouragement and access to collaborative learning, is positively correlated with academic self-efficacy, adaptability, and autonomous learning willingness among nursing students [46, 47]. In addition, tangible resource support, such as the like of simulation tools, virtual platforms, and open-access databases, can also bridge the gap between theory and practice, enhance clinical judgment, and boost learning confidence [48, 49]. Collectively, these findings underscore the multifaceted nature of academic support and its cumulative impact on SRL. A well-designed support system, such as integrating cognitive, emotional, social, and material dimensions, which can actually create a fertile learning environment wherein students are empowered to take ownership of their learning and adapt effectively to complex clinical contexts.

2.4. The Relationship Between Academic Support and Self-Regulated Learning

Clinical belongingness refers to the psychological experience of being recognized, accepted, and supported within the clinical environment, encompassing interactions with peers, instructors, and other healthcare professionals [50]. Grounded in Maslow's hierarchy of needs [51], belongingness represents a foundational human need that influences motivation, confidence, and engagement in learning [52]. In nursing education, a strong sense of belonging has been consistently associated with improved clinical satisfaction, reduced stress, enhanced self-esteem, and more effective SRL [53]. Students who feel excluded, unsupported, or fearful of making mistakes often experience a decline in motivation and disengagement from clinical learning tasks [54]. Conversely, environments characterized by inclusive interpersonal dynamics, encouraging leadership, and responsive mentorship foster students' intrinsic motivation and learning identity, enabling them to take greater ownership of their clinical development [55-57].

Empirical studies affirm that clinical belongingness not only improves students' learning satisfaction and self-efficacy, but also plays a mediating role in broader developmental outcomes. McKenna, et al. [58] demonstrated that a strong sense of belonging can enhance both clinical practice behaviors and the perceived professional value of nursing. Likewise, Albloushi, et al. [52] found that belongingness positively contributes to motivation, confidence, academic achievement, and long-term career planning. These findings showed that students who feel embedded in the clinical environment are more likely to regulate their learning through goal-setting, strategy use, and reflective

practice. Notably, Teng, et al. [59] revealed that clinical belongingness partially mediates the relationship between perceived social support and career decision-making self-efficacy, highlighting its central role in fostering both academic and professional growth. Together, these studies support the conceptualization of belongingness as a psychological bridge that transforms external support into internalized learning motivation, making it a critical mechanism in the development of SRL among nursing interns.

2.5. Synthesis and Research Gap

The literature highlights that SRL is essential for nursing interns navigating the complex transition from classroom to clinical practice. Drawing on Bandura [19] social cognitive theory and Zimmerman [10] SRL framework, researchers consistently identify metacognitive strategies, motivational regulation, and behavioral adaptation as core competencies enabling students to manage clinical challenges proactively. However, the development of SRL is not uniform and is significantly shaped by a range of influencing factors, including gender, grade level, place of residence, parenting style, and especially professional identity. For instance, students with a stronger identification with the nursing profession demonstrate more intrinsic motivation and greater use of strategic learning behaviors; yet findings on other factors, such as gender and socioeconomic background, remain inconsistent, suggesting the need for more context-sensitive research.

In parallel, extensive studies have underscored the role of academic support, such as from peers, instructors, preceptors, and institutions, in fostering SRL. Teacher autonomy support, clear guidance on learning strategies, and access to relevant resources such as simulations and clinical tools have been shown to enhance students' confidence, engagement, and independent learning capabilities. Moreover, emotional and social support systems contribute to students' academic self-efficacy, reduce burnout, and encourage adaptive learning strategies. However, academic support is not experienced uniformly across learners; its effectiveness depends on how it is perceived and internalized. This internalization process is closely linked to students' clinical belongingness; a psychosocial state in which learners feel accepted, respected, and valued within the clinical team. Rooted in Maslow's hierarchy of needs, belongingness serves as a psychological enabler of learning motivation and emotional security. Studies show that high levels of clinical belongingness correlate with reduced stress, increased self-esteem, and stronger SRL, while its absence can lead to disengagement and decreased learning effort. Importantly, clinical belongingness has also been found to act as a mediator between external support and various learning outcomes, including self-efficacy and practice behaviors, suggesting it may be a key mechanism through which support systems exert their influence.

Despite these findings, a critical research gap remains: while prior studies have examined the individual effects of academic support and clinical belongingness on SRL, few have empirically tested how clinical belongingness mediates the relationship between academic support and SRL; particularly within the high-pressure, emotionally demanding context of nursing internships in China. Addressing this gap is essential for developing comprehensive support models that not only provide resources but also foster a sense of belonging and emotional integration within clinical teams. To bridge this gap, the present study aims to develop and test a conceptual model that links academic support, clinical belongingness, and SRL among nursing interns. Drawing from Zimmerman [10] SRL theory, Watson [12] Humanistic Nursing Theory, and Levett-Jones, et al. [25] Ascent to Competence framework, this study sets out to assess current levels of SRL, examine the role of academic support, and explore the mediating influence of clinical belongingness, ultimately offering evidence-based insights for enhancing nursing education and internship support systems.

3. Method

3.1. Study Design

This study employed a quantitative research design using structural equation modeling (SEM) to examine the relationships among academic support, clinical belongingness, and SRL among nursing

interns. SEM integrates factor analysis and path analysis to assess the fit between a hypothesized conceptual model and observed data, making it suitable for exploring multivariate relationships [60]. Unlike traditional statistical techniques such as regression, SEM allows for simultaneous analysis of complex causal relationships among multiple latent and observed variables [61]. To address the study objectives, data were collected using structured questionnaires measuring the constructs of academic support, clinical belongingness, and SRL.

3.2. Participants and Sampling

The participants were fourth-year undergraduate nursing interns from Xuzhou Medical University, Jiangsu Province, China. The university was selected due to its designation as a national first-class nursing program and its leadership role in nursing education within the province. Eligible participants were (a) full-time undergraduate nursing interns aged 18 or above, (b) engaged in hospital-based clinical practice for at least two semesters, and (c) able to independently understand and complete the survey. Interns who were foreign students or unable to complete the questionnaire were excluded. Using an anticipated medium effect size of 0.30, a power level of 0.80, a significance level of .05, and accounting for 3 latent and 12 observed variables, the recommended sample size for SEM was 119 [62]. To account for a potential 20% attrition rate, the final targeted sample size was set at 201 [63]. Participants were selected using simple random sampling from October to November 2024 [64].

Table 1 presents the demographic profile of the 201 nursing interns who participated in the study. The mean age of the participants was 21 years. In terms of gender distribution, the majority were female ($n = 176$, 87.6%), while male participants accounted for 12.4% ($n = 25$). Regarding place of residence, 43.3% ($n = 87$) were from towns or rural areas, 26.4% ($n = 53$) from county-level cities, 22.9% ($n = 46$) from prefecture-level cities, and 7.5% ($n = 15$) from municipalities or provincial capitals. In terms of parenting style, nearly half of the participants (47.8%, $n = 96$) reported being raised under authoritative parenting. This was followed by permissive parenting (27.9%, $n = 56$), uninvolved parenting (16.9%, $n = 34$), and authoritarian parenting (7.5%, $n = 15$). When asked about their primary reason for choosing the nursing profession, the most common response was voluntary adjustment (34.3%, $n = 69$), followed closely by job security (31.8%, $n = 64$). Fewer participants chose nursing due to family advice (17.4%, $n = 35$) or personal interest (16.4%, $n = 33$). Lastly, with regard to professional identity, a large proportion of students (78.6%, $n = 158$) reported that although they did not particularly like nursing, they could accept it. In contrast, 14.9% ($n = 30$) expressed a strong liking for the profession, while 6.5% ($n = 13$) found it unacceptable.

Table 1.
Demographic Background of Participants (*N* = 201).

Demographic	Category	*n*	%
Gender	Female	176	87.6
	Male	25	12.4
Place of Residence	Municipalities/Provincial capitals	15	7.5
	Prefecture-level city	46	22.9
	County-level cities	53	26.4
	Town/Rural areas	87	43.3
Parenting Style	Authoritative parenting	96	47.8
	Authoritarian parenting	15	7.5
	Permissive parenting	56	27.9
	Uninvolved parenting	34	16.9
Reason for Choosing the Profession	Interest in nursing	33	16.4
	Family advice	35	17.4
	Voluntary adjustment	69	34.3
	Job guarantee	64	31.8
Professional Identity	Like it very much	30	14.9
	Don't like, but I can accept	158	78.6
	Unacceptable	13	6.5

3.3. Instruments

Data were collected using a standardized instrument composed of four parts:

- Participant Profile Questionnaire - This section gathered demographic data including gender, parenting style, place of residence, reason for choosing nursing, and level of professional identity.
- Self-Regulated Learning Scale in Clinical Nursing Practice – The instrument was developed by Iyama and Maeda [65], this 16 items scale measures SRL through two subscales: motivation (intrinsic and achievement motivation) and learning strategies (comprehensive knowledge and nursing skills, multidimensional thinking, and effort control). The Chinese version was translated and validated [66], which demonstrated strong reliability Cronbach [67] α = .95; test–retest reliability [68] = .94). Items were rated on a 5-point Likert [69] scale (1 = strongly disagree to 5 = strongly agree). Based on the computed average scores, SRL levels were interpreted as follows: scores from 4.50 to 5.00 indicate a very high level of SRL; 3.50 to 4.49 reflect a high level; 2.50 to 3.49 correspond to a moderate level; 1.50 to 2.49 suggest a low level; and 1.00 to 1.49 represent a very low level of SRL. Higher scores denote greater use of metacognitive strategies, motivational regulation, and behavioral control during clinical practice.
- Academic Support Scale in Clinical Practice - Originally developed by Arribas-Marín et al. [70] is a 23 items scale covers four dimensions: peer support, preceptor support, clinical facilitator support, and academic institution support. Items are rated on an 11-point Likert scale (0 = extremely disagree to 10 = extremely agree). The Chinese version of the instrument showed excellent internal consistency (Cronbach's α = .96) [71]. The interpretation of scores is as follows: scores between 9.50 and 10.00 are categorized as extremely high academic support; 8.50 to 9.49 as very high; 7.50 to 8.49 as high; 6.50 to 7.49 as somewhat high; and 5.50 to 6.49 as slightly high. A range of 4.50 to 5.49 indicates a moderate level of support, while 3.50 to 4.49, 2.50 to 3.49, and 1.50 to 2.49 reflect slightly low, somewhat low, and low levels respectively. Scores from 0.50 to 1.49 represent very low support, and 0 to 0.49 are interpreted as extremely low academic support.
- Belongingness Scale – Clinical Placement Experience (BES-CPE) - Developed by Levett-Jones et al. [25], this 26 items scale measures clinical belongingness across three dimensions: self-esteem (11 items), connectedness (6 items), and efficacy (8 items), with one unclassified item. The validated Chinese version of BES-CPE is computed with a Cronbach's α = .89 with subscales alpha values from .75 to .86 [72]. A 5-point Likert scale was used (1 = strongly agree to 5 =

strongly disagree), with higher scores indicating stronger belongingness. The interpretation of average scores is as follows: a score between 4.50 and 5.00 indicates a very high level of clinical belongingness; 3.50 to 4.49 corresponds to a high level; 2.50 to 3.49 reflects a moderate level; 1.50 to 2.49 is categorized as low; and 1.00 to 1.49 indicates a very low level. Higher scores suggest that nursing interns feel more accepted, connected, and confident within the clinical environment.

3.4. Data Collection Procedure

Data collection commenced following ethical approval from the university's institutional review board. Permissions were obtained from nursing administrators, and questionnaires were distributed online via QQ class groups to avoid potential bias. The first section of the online survey included an informed consent form. Participants could choose to proceed or withdraw voluntarily. The data collection platform was securely configured, allowing access only to the researchers and assistants. The purpose and instructions were clearly explained to participants, and confidentiality was emphasized. The questionnaire was anonymous, and participation had no academic consequences. A thank-you message was included upon completion.

3.5. Data Analysis

Data were coded and entered into a spreadsheet program, then analyzed using IBM SPSS and AMOS. For open-ended items, responses were categorized before coding. The following statistical analyses were performed to address each specific research objective:

- Descriptive statistics for participant profiles, SRL levels, academic support, and clinical belongingness.
- Spearman correlation to examine the relationship between academic support and SRL.
- SEM to assess the mediating effect of clinical belongingness on the relationship between academic support and SRL. Various standards were used to validate the model fit as prescribed by standards in reporting SEM results [73-76].

3.6. Ethical Considerations

Ethical approval for this study was obtained from the university's institutional review board. Participation was voluntary, and informed consent was obtained electronically before data collection. Participants had the right to withdraw at any time without consequence. To ensure confidentiality, all responses were anonymous and securely stored on a password-protected platform, accessible only to the research team. Data were used solely for research purposes and retained for two years. No significant risks were identified, and participants could skip any questions they found uncomfortable. The study followed the principles of autonomy, confidentiality, and fairness throughout the research process.

4. Results and Discussions

Table 2 displays the levels of SRL across five sub-dimensions. Results showed that nursing interns demonstrated an overall high level of SRL, with a median total score of 3.81 interquartile range; IQR = 3.31 to 4.28. Each of the five subcomponents also reached the "**High**" interpretation threshold: intrinsic motivation (Median; Mdn = 3.50), achievement motivation (Mdn = 3.67), synthesized knowledge and nursing skills (Mdn = 4.00), multidimensional thinking (Mdn = 3.50), and effort control (Mdn = 4.00). These results suggest that nursing interns are generally well-equipped to manage their learning in clinical settings through a combination of motivational and strategic regulation processes. The use of the median and interquartile range (P25–P75) is appropriate given the ordinal nature of Likert-type data and potential non-normal distribution, as these measures provide a more accurate representation of central tendency and variability without being overly influenced by outliers [77].

Table 2.
SRL Levels of Nursing Interns ($N = 201$).

Dimensions (Items)	Median (Mdn)	P25	P75	Interpretation
Intrinsic Motivation (1 to 4)	3.50	2.75	4.25	High
Achievement Motivation (5 to 7)	3.67	3.00	4.33	High
Synthesized Knowledge and Nursing Skills (8 to 12)	4.00	3.40	4.60	High
Multidimensional Thinking (13 to 14)	3.50	2.00	400	High
Effort Control (15 to 16)	4.00	3.50	4.50	High
Total score	3.81	3.31	4.28	High

Note: Mdn = Median; P25 = 25th percentile; P75 = 75th percentile. Interpretations are based on the verbal classification scales established for each instrument. Median and IQR were used due to the ordinal nature of Likert-type data and the non-parametric distribution of responses.

To reiterate, the nursing interns exhibited a high overall level of SRL during their clinical practice, with particularly strong scores in synthesized knowledge and nursing skills and effort control. All five SRL subdimensions: intrinsic motivation, achievement motivation, strategic learning behaviors, multidimensional thinking, and effort regulation, were interpreted within the "High" range based on median scores and interquartile spread. This indicates that most nursing interns were capable of actively managing their learning processes, staying motivated, and regulating their cognitive and behavioral efforts in complex clinical environments. These findings are consistent with the literature emphasizing the critical role of SRL in successful clinical performance. As noted by Kuiper and Pesut [18] and later reinforced by Irvine, et al. [9] SRL enables nursing students to not only integrate theoretical knowledge with clinical judgment, but also to adaptively respond to real-time demands in emotionally charged settings. The high levels observed in this study suggest that many nursing interns are already applying metacognitive and motivational strategies in ways that foster autonomy and professional growth, echoing [10, 11]. Conceptualization of learners as active, reflective agents in their educational journey.

Furthermore, the strong performance in domains like effort control and synthesized nursing knowledge aligns with findings from van van Houten-Schat, et al. [24] and Chou and Zou [23], who argued that strategic regulation and perseverance are essential for managing the stressors inherent in clinical training. However, it is worth noting that multidimensional thinking and intrinsic motivation, though still within the high range, presented slightly lower interquartile values. This nuance may reflect the strain interns experience in translating abstract knowledge into clinical decision-making; a known challenge in bridging the theory–practice gap [17, 21]. Lastly, the relatively high SRL levels reported here may also be attributed to students' growing exposure to structured clinical environments and feedback from mentors, both of which enhance learning ownership and reflective capacity [20, 22]. All together these outcomes reinforce the importance of not only equipping students with knowledge, but also fostering self-management, emotional resilience, and strategic adaptability through early and scaffolded clinical exposure.

For academic support, Table 3 showed the median total score was 6.39 (IQR = 5.39 to 7.33), interpreted as slightly high. Among its four sub-dimensions, preceptor support was rated highest (Mdn = 7.67, "High"), followed by peer support (Mdn = 6.17, "Slightly High"), clinical facilitator support (Mdn = 6.17, "Moderate"), and academic institution support (Mdn = 5.40, "Moderate"). These findings indicate that while interns perceived valuable support from their immediate clinical mentors and peers, institutional-level support was perceived as more limited.

Table 3.
Academic Support of Nursing Interns ($N = 201$).

Dimensions (Items)	Median (Mdn)	P25	P75	Interpretation
Peer Support (1 to 6)	6.17	4.83	7.50	Slightly High
Academic Institution Support (7 to 11)	5.40	4.50	6.70	Moderate
Preceptor Support (12 to 17)	7.67	6.33	9.17	High
Clinical Facilitator Support (18 to 23)	6.17	5.17	7.00	Moderate
Total score	6.39	5.39	7.33	Slightly High

Note: Mdn = Median; P25 = 25th percentile; P75 = 75th percentile. Interpretations are based on the verbal classification scales established for each instrument. Median and IQR were used due to the ordinal nature of Likert-type data and the non-parametric distribution of responses.

The findings revealed that nursing interns perceived an overall slightly high level of academic support, with the highest support coming from preceptors, followed by moderate levels from peers, clinical facilitators, and academic institutions. This pattern highlights the central role of immediate clinical mentors, especially preceptors, in shaping students' perceptions of support during their internships. These results are consistent with prior literature emphasizing the critical influence of teacher and mentor support on SRL [9, 42]. In addition, as noted by Savitz-Romer, et al. [41], academic support encompasses a range of formal and informal practices that build students' learning capacity, motivation, and skill mastery. In the present study, the stronger perception of preceptor support reinforces the importance of in-situ guidance during clinical encounters, where learners benefit from real-time feedback, role modeling, and direct interaction with experienced professionals [31, 43].

Furthermore, the relatively lower support scores from academic institutions and facilitators may suggest a gap in structural or systemic support mechanisms, such as clear communication channels, organized learning resources, or institutional follow-up during internships. This echoes Palmes, et al. [45] and Cranefield, et al. [44], who stressed that cognitive and affective learning require not only interpersonal scaffolding, but also institutional investment in educational infrastructure. Moreover, the moderate ratings for peer and facilitator support suggest that while horizontal (peer) and mid-level (facilitator) support networks exist, they may not be as influential as direct supervisory relationships in shaping students' clinical learning experience. Taken together, these findings underscore the multifaceted nature of academic support and the importance of a coordinated, multi-level support system that integrates emotional, cognitive, and material resources. Such systems empower students to manage complex clinical demands more effectively, thereby fostering stronger engagement in SRL [40, 49].

In terms of clinical belongingness, Table 4 showed the overall median score was 3.42 (IQR = 2.81 to 3.92), reflecting a moderate level. Among the sub-dimensions, connectedness was highest (Mdn = 3.50, "High"), whereas self-esteem (Mdn = 3.45) and efficacy (Mdn = 3.13) were both interpreted as moderate. These results imply that although interns generally feel connected within their clinical teams, there may be room for improvement in fostering greater confidence and recognition in their clinical roles.

Table 4.
Clinical Belongingness of Nursing Interns ($N = 201$).

Dimensions (Items)	Median (Mdn)	P25	P75	Interpretation
Self-Esteem (1, 3, 4, 7, 8, 12, 16, 17, 18, 20, and 25)	3.45	2.82	4.09	Moderate
Connectedness (10, 11, 19, 21, 22, and 26)	3.50	2.83	4.17	High
Efficacy (2, 5, 9, 13, 14, 15, 23, and 24)	3.13	2.50	3.75	Moderate
Total score	3.42	2.81	3.92	Moderate

Note: Mdn = Median; P25 = 25th percentile; P75 = 75th percentile. Interpretations are based on the verbal classification scales established for each instrument. Median and IQR were used due to the ordinal nature of Likert-type data and the non-parametric distribution of responses.

The overall level of clinical belongingness among nursing interns was found to be moderate, with connectedness scoring highest, and self-esteem and efficacy at moderate levels. This indicates that while students generally felt accepted and connected to the clinical team, there were lingering challenges related to their confidence and perceived effectiveness in clinical roles. These results are aligned with

the literature emphasizing the importance of belongingness as a psychological and relational construct essential to effective learning. According to hierarchy of needs, belongingness is foundational to motivation and engagement [51], and in the context of nursing education, it significantly affects emotional safety, motivation, and professional identity formation [14, 52]. The high score in connectedness suggests that many interns are able to establish positive interpersonal relationships with peers and clinical staff, an important factor in fostering a safe and inclusive learning environment [55, 56].

Nonetheless, the moderate levels of self-esteem and efficacy point to ongoing challenges in helping students develop confidence in their clinical roles. This aligns with findings from Panda, et al. [54], who noted that the fear of making mistakes or feeling excluded can dampen students' learning motivation and SRL. Additionally, studies such as Teng, et al. [59] and McKenna, et al. [58] have shown that strong clinical belongingness not only enhances motivation and engagement, but also contributes to improved decision-making and career readiness. The current results suggest that while nursing interns are making relational connections within clinical teams, additional efforts may be needed to foster psychological empowerment and role clarity. Strategies such as structured mentorship, regular affirmation of student contributions, and clear delineation of intern responsibilities may help enhance both self-worth and perceived efficacy, strengthening the overall impact of belongingness on SRL.

To examine the relationship between perceived academic support and SRL during clinical nursing practice, a Spearman rank-order correlation was conducted. The analysis revealed a significant **positive** correlation between academic support and SRL ($r = .262$, $p < .001$), indicating that higher levels of perceived academic support are associated with higher levels of SRL. This suggests that nursing interns who feel more supported, whether by peers, preceptors, facilitators, or institutions, are more likely to engage in goal setting, strategic learning behaviors, and self-monitoring during their clinical practice.

The finding of a significant positive correlation between academic support and SRL aligns well with existing literature emphasizing the role of social and instructional support in fostering autonomous learning behaviors. As Mega, et al. [40] and Irvine, et al. [9] suggest, academic support contributes not only to the acquisition of clinical skills, but also to the development of motivation, learning strategies, and self-reflection; core dimensions of SRL as defined [10, 11]. This result reinforces the theoretical assertion that SRL does not occur in isolation. Instead, it is shaped by environmental and social influences, particularly in emotionally demanding settings like clinical nursing practice. Support from preceptors, in particular, has been shown to encourage interns to set meaningful learning goals and reflect on their progress [31, 43]. Likewise, peer and facilitator support can provide opportunities for shared learning and feedback, which further reinforces the nursing intern's sense of competence and control over their learning process. Taken together, the correlation supports the idea that academic support serves as a foundational scaffold for SRL in clinical contexts. While correlation does not imply causation, these findings suggest that enhancing academic support, through both formal programs and informal mentoring, may be an effective strategy for improving SRL outcomes in nursing education.

To investigate the mediating role of clinical belongingness in the relationship between academic support and SRL. SEM was conducted to examine whether clinical belongingness mediates the relationship between academic support and SRL among nursing interns. The analysis revealed a significant total effect of academic support on SRL ($\beta = 0.321$, $SE = 0.072$, 95% CI [0.173, 0.454]), indicating that academic support positively predicts SRL. The direct effect of academic support on SRL remained statistically significant ($\beta = 0.235$, $SE = 0.077$, 95% CI [0.075, 0.377]), accounting for 73.2% of the total effect. The indirect effect, mediated through clinical belongingness, was also significant ($\beta = 0.086$, $SE = 0.034$, 95% CI [0.032, 0.169]), representing 26.8% of the total effect. As the 95% confidence interval for the indirect effect did not include zero, this confirms that clinical belongingness partially mediates the relationship between academic support and SRL. These findings suggest that while academic support directly enhances SRL, it also does so indirectly by fostering a stronger sense of

belonging in clinical environments. This supports the proposed conceptual model and highlights the importance of addressing both structural support and affective integration to improve learning outcomes among nursing interns.

Table 5.
Mediation Effects: Clinical Belongingness as Mediator.

Effect	Path	Effect Value	SE	95% CI	Proportion of Total Effect
Direct Effect	Academic Support → SRL	0.235	0.077	$0.075 - 0.377$	73.2%
Indirect Effect	Academic Support → Clinical Belongingness → SRL	0.086	0.034	$0.032 - 0.169$	26.8%
Total Effect	—	0.321	0.072	$0.173 - 0.454$	100%

The SEM results confirmed that clinical belongingness partially mediates the relationship between academic support and SRL among nursing interns. Specifically, clinical belongingness accounted for 26.8% of the total effect, while the remaining 73.2% was a direct effect of academic support on SRL. This finding highlights the dual pathway through which academic support enhances SRL; both directly, by providing cognitive and instrumental resources, and indirectly, by fostering emotional security, relational trust, and role integration within the clinical setting. This mediating role of clinical belongingness aligns with the Ascent to Competence model [13], which posits that emotional and relational integration (i.e., belongingness) is a prerequisite for learners to transition toward competence. Similarly, Watson's Humanistic Nursing Theory [12] underscores the significance of supportive and caring interactions in facilitating learners' psychological well-being and professional development. These theoretical foundations suggest that support systems are not merely transactional (e.g., delivering information) but transformational—contributing to identity formation, self-worth, and motivation, all of which are crucial to the activation of SRL mechanisms.

Empirical research has also pointed to belongingness as a key psychological bridge between external support and internal learning motivation. For example, McKenna, et al. [58] and Albloushi, et al. [52] found that students with a stronger sense of belonging exhibited greater confidence, initiative, and academic persistence. The current study reinforces these findings by showing that when nursing interns feel connected, respected, and included within the clinical team, they are more likely to regulate their learning through goal setting, self-monitoring, and adaptive strategies. Conversely, a lack of belongingness may dampen the impact of academic support by fostering insecurity, role ambiguity, and disengagement [54, 59]. Moreover, the relatively strong direct effect of academic support on SRL suggests that supportive instructional environments alone can significantly enhance self-directed learning behaviors, even without full mediation by belongingness. This reflects findings from Bai and Gu [42] and Zhang, et al. [31], who emphasized the critical role of teacher autonomy support and structured guidance in cultivating SRL in clinical settings.

Overall, this study contributes to a more nuanced understanding of how academic support functions, not only as a direct enabler of SRL, but also as a social-contextual catalyst that enhances learners' psychological integration into clinical practice. These findings suggest that for support systems to be truly effective, they must combine instrumental guidance with emotional and relational scaffolding, thereby creating environments that empower nursing interns to thrive both cognitively and affectively.

5. Conclusions and Recommendations
This study examined the relationships among academic support, clinical belongingness, and SRL among nursing interns in China. The results revealed that nursing interns exhibited a high level of SRL, particularly in areas such as synthesized nursing knowledge and effort control, indicating their capacity to manage learning in complex clinical environments. Academic support was perceived as slightly high overall, with preceptor support standing out as the most influential. Clinical belongingness, while moderate overall, showed strength in connectedness but remained lower in self-esteem and efficacy.

SEM confirmed that academic support positively predicts SRL both directly and indirectly, with clinical belongingness serving as a significant partial mediator. These findings validate an integrated model where both instructional and emotional support systems jointly shape learners' capacity for autonomous learning and professional growth during clinical practice.

In light of the findings, several practical recommendations are proposed for nursing educators and clinical institutions. First, academic support structures should be strengthened beyond preceptor relationships to include more consistent institutional and facilitator engagement. This may involve orientation programs, structured debriefings, or formalized peer mentorship to reinforce consistent guidance across all levels. Second, targeted efforts should be made to enhance clinical belongingness, especially by fostering self-esteem and perceived efficacy among nursing interns. This could include regular affirmation from supervisors, inclusive team integration, and clear role expectations during internships. Finally, educational interventions should intentionally integrate cognitive strategy training with relational and emotional scaffolding. By addressing both the external and internal dimensions of learning, nursing programs can cultivate self-regulated learners who are not only competent but also confident and resilient in real-world clinical settings.

While this study provides valuable insights, it is not without limitations. First, the use of self-report measures may introduce response bias, as participants may have over or under-estimated their actual learning behaviors or levels of support. Second, the cross-sectional design limits the ability to draw causal inferences about the directionality of the relationships among academic support, belongingness, and SRL. Third, although the sample size was adequate for structural modeling, all participants were drawn from a single medical university in Jiangsu Province, which may limit the generalizability of the findings to other cultural or institutional contexts. Lastly, demographic variables were collected for descriptive purposes, but not analyzed for their potential moderating or mediating effects. Future research should consider longitudinal or mixed-method approaches to explore how SRL and belongingness evolve over time and under varying educational conditions.

Institutional Review Board Statement:
The study was conducted in accordance with the Declaration of Helsinki. Study protocols were evaluated and approved by the panel of evaluators of the University of St. La Salle Graduate Program.

Transparency:
The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

Author Contributions:
Conceptualization, Y.Z., L.E.Y., and S.M.T.; methodology, Y.Z., L.E.Y., and S.M.T.; software, G.S.C.; validation, Y.Z., L.E.Y., S.M.T., and G.S.C.; formal analysis, Y.Z.; investigation, Y.Z., L.E.Y., S.M.T., and G.S.C.; resources, Y.Z., L.E.Y., S.M.T., and G.S.C.; data curation, Y.Z.; writing—original draft preparation, Y.Z.; writing—review and editing, Y.Z., L.E.Y., S.M.T., and G.S.C.; visualization, G.S.C.; supervision, L.E.Y. and S.M.T.; project administration, Y.Z., L.E.Y., and S.M.T.; funding acquisition, Y.Z., L.E.Y., S.M.T., and G.S.C. All authors have read and agreed to the published version of the manuscript.

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References

[1] K. W. Weeks *et al.*, "Developing and integrating nursing competence through authentic technology-enhanced clinical simulation education: Pedagogies for reconceptualising the theory-practice gap," *Nurse Education in Practice*, vol. 37, pp. 29-38, 2019. https://doi.org/10.1016/j.nepr.2019.04.010

[2] N. Zhou, L. Yang, J. Pan, and K. Lv, "Perspectives of clinical nurse educators on competency-based nursing teaching in blended learning environments during nursing internship: A descriptive qualitative study," *Nurse Education in Practice*, vol. 79, p. 104027, 2024. https://doi.org/10.1016/j.nepr.2024.104027

[3] D. Higuchi and A. Echigo, "Clinical education-related stressors and emotional states during clinical education among physical therapy students," *Physiotherapy Theory and Practice*, vol. 39, no. 2, pp. 405-413, 2023. https://doi.org/10.1080/09593985.2021.2017091

[4] B. Seyedamini, Y. Mahmoudifar, and Y. Esmaeillou, "Effective stressors in clinical education," *International Archives of Health Sciences*, vol. 5, no. 3, pp. 104-109, 2018. https://doi.org/10.4103/iahs.iahs_40_17

[5] Y. M. Rimando, L. A. A. Chua, S. M. Trajera, and G. S. Ching, "Lived experiences of clinical instructors in facilitating online related learning experiences among nursing students in the Philippines: Challenges, adaptations, and insights," *Edelweiss Applied Science and Technology*, vol. 9, no. 3, pp. 309-327, 2025. https://doi.org/10.55214/25768484.v9i3.5209

[6] A. A. Marañón and M. P. I. Pera, "Theory and practice in the construction of professional identity in nursing students: A qualitative study," *Nurse Education Today*, vol. 35, no. 7, pp. 859-863, 2015. https://doi.org/10.1016/j.nedt.2015.03.014

[7] E. N. Opoku, L.-A. J.-N. Khuabi, and L. V. Niekerk, "Exploring the factors that affect the transition from student to health professional: An Integrative review," *BMC Medical Education*, vol. 21, p. 558, 2021. https://doi.org/10.1186/s12909-021-02978-0

[8] K. C. Villaran, L. A. A. Chua, S. M. Trajera, and G. S. Ching, "Lived experiences of nursing education administrators during the COVID-19 pandemic: Challenges, adaptations, and insights," *Edelweiss Applied Science and Technology*, vol. 9, no. 3, pp. 2149-2169, 2025. https://doi.org/10.55214/25768484.v9i3.5756

[9] S. Irvine, I. Brooks, R. Lau, and L. McKenna, "Self-regulated learning instructional support for students enrolled in an accelerated nursing program," *Collegian*, vol. 27, no. 4, pp. 402-409, 2020. https://doi.org/10.1016/j.colegn.2019.11.007

[10] B. J. Zimmerman, "Theories of self-regulated learning and academic achievement: An overview and analysis," in Self-regulated learning and academic achievement: Theoretical perspectives, B. J. Zimmerman and D. H. Schunk Eds. New York, NY: Routledge, 2001, pp. 111-141.

[11] B. J. Zimmerman, "Becoming a self-regulated learner: An overview," *Theory Into Practice*, vol. 41, no. 2, pp. 64-70, 2002. https://doi.org/10.1207/s15430421tip4102_2

[12] J. Watson, "The theory of human caring: Retrospective and prospective," *Nursing Science Quarterly*, vol. 10, no. 1, 1997. https://doi.org/10.1177/089431849701000114

[13] T. Levett-Jones and J. Lathlean, "The ascent to competence conceptual framework: An outcome of a study of belongingness," *Journal of Clinical Nursing*, vol. 18, no. 20, pp. 2870-2879, 2009. https://doi.org/10.1111/j.1365-2702.2008.02593.x

[14] T. Levett-Jones, J. Lathlean, Jane Maguire, and M. McMillan, "Belongingness: A critique of the concept and implications for nursing education," *Nurse Education Today*, vol. 27, no. 3, pp. 210-218, 2007. https://doi.org/10.1016/j.nedt.2006.05.001

[15] T. Levett-Jones and J. Lathlean, "Belongingness: A prerequisite for nursing students' clinical learning," *Nurse Education in Practice*, vol. 8, no. 2, pp. 103-111, 2008. https://doi.org/10.1016/j.nepr.2007.04.003

[16] A. Keçeci, "Self-regulated learning in nursing: A study from a health education course," *Journal of Human Sciences*, vol. 14, no. 4, pp. 3830–3842, 2017.

[17] R. A. Kuiper, D. J. Pesut, and D. Kautz, "Promoting the self-regulation of clinical reasoning skills in nursing students," *The Open Journal Nursing*, vol. 3, pp. 76–85, 2009. https://doi.org/10.2174/1874434600903010076

[18] R. A. Kuiper and D. J. Pesut, "Promoting cognitive and metacognitive reflective reasoning skills in nursing practice: Self-regulated learning theory," *Journal of Advanced Nursing*, vol. 45, no. 4, pp. 381-391, 2004. https://doi.org/10.1046/j.1365-2648.2003.02921.x

[19] A. Bandura, "Social cognitive theory: An agentic perspective," *Annual Review of Psychology*, vol. 52, pp. 1-26, 2001. https://doi.org/10.1146/annurev.psych.52.1.1

[20] E. Kurt and Z. Eskimez, "Examining self-regulated learning of nursing students in clinical practice: A descriptive and cross-sectional study," *Nurse Education Today*, vol. 109, p. 105242, 2022. https://doi.org/10.1016/j.nedt.2021.105242

[21] M. K. Robb, "Self-regulated learning: Examining the baccalaureate millennial nursing student's approach," *Nursing Education Perspectives*, vol. 37, no. 3, pp. 162-164, 2016. https://doi.org/10.5480/14-1349

[22] E. Panadero, "A review of self-regulated learning: Six models and four directions for research," *Frontiers in Psychology*, vol. 8, p. 422, 2017. https://doi.org/10.3389/fpsyg.2017.00422

[23] C.-Y. Chou and N.-B. Zou, "An analysis of internal and external feedback in self-regulated learning activities mediated by self-regulated learning tools and open learner models," *International Journal of Educational Technology in Higher Education*, vol. 17, p. 55, 2020. https://doi.org/10.1186/s41239-020-00233-y

[24] M. A. van Houten-Schat, J. J. Berkhout, N. van Dijk, M. D. Endedijk, A. D. C. Jaarsma, and A. D. Diemers, "Self-regulated learning in the clinical context: A systematic review," *Medical Education*, vol. 52, no. 10, pp. 1008-1015, 2018. https://doi.org/10.1111/medu.13615

[25] T. Levett-Jones, J. Lathlean, I. Higgins, and M. McMillan, "Development and psychometric testing of the Belongingness Scale–Clinical Placement Experience: An international comparative study," *Collegian*, vol. 16, no. 3, pp. 153-162, 2009. https://doi.org/10.1016/j.colegn.2009.04.004

[26] F. H. Bezzina, "Investigating gender differences in mathematics performance and in self-regulated learning: An empirical study from Malta," *Equality, Diversity and Inclusion*, vol. 29, no. 7, pp. 669-693, 2010. https://doi.org/10.1108/02610151011074407

[27] W. Guo, "Gender differences in teacher feedback and students' self-regulated learning," *Educational Studies*, vol. 50, no. 3, pp. 341-361, 2024. https://doi.org/10.1080/03055698.2021.1943648

[28] M. N. Mwaura, "Gender difference in academic self-efficacy among students in public secondary schools in Nairobi County, Kenya," *International Journal of Multidisciplinary Research and Publications*, vol. 4, no. 3, pp. 34-40, 2021.

[29] F. An, L. Xi, and J. Yu, "The relationship between technology acceptance and self-regulated learning: The mediation roles of intrinsic motivation and learning engagement," *Education and Information Technologies*, vol. 29, pp. 2605–2623, 2024. https://doi.org/10.1007/s10639-023-11959-3

[30] O. Dogu, A. Karadas, and F. E. Bacaksiz, "The relationships between self-regulated learning in clinical nursing practice and self-efficacy: A cross-sectional study among nursing students," *Perspectives in Psychiatric Care*, vol. 58, no. 4, pp. 2107 - 2115, 2022. https://doi.org/10.1111/ppc.13037

[31] H. Zhang, C. Zhao, S. Zhang, and L. Wang, "A quantitative study of influencing factors of self-directed learning ability in medical undergraduates in China," *Chinese Journal of Medical Education*, vol. 43, no. 12, pp. 902-906, 2023. https://doi.org/10.3760/cma.j.cn115259-20221130-01504

[32] L. Li, M.-l. Zhu, Y.-q. Shi, and L.-l. Yang, "Influencing factors of self-regulated learning of medical-related students in a traditional Chinese medical university: A cross-sectional study," *BMC Medical Education*, vol. 23, p. 87, 2023. https://doi.org/10.1186/s12909-023-04051-4

[33] L. Thomas, E. Hovdhaugen, and R. Sweetman, "Professional or student identity and commitment? Comparing the experiences of nursing students with literature on student success," *Tertiary Education and Management*, vol. 29, pp. 93-106, 2023. https://doi.org/10.1007/s11233-023-09115-0

[34] L. Xu, P. Duan, L. Ma, and S. Dou, "Professional identity and self-regulated learning: The mediating role of intrinsic motivation and the moderating role of sense of school belonging," *Sage Open*, vol. 13, no. 2, 2023. https://doi.org/10.1177/21582440231177034

[35] J. Zhu *et al.*, "Relationships between professional identity, motivation, and innovative ability among nursing intern students: A cross-sectional study," *Heliyon*, vol. 10, no. 7, p. e28515, 2024. https://doi.org/10.1016/j.heliyon.2024.e28515

[36] D. Pino-Pasternak and D. Whitebread, "The role of parenting in children's self-regulated learning," *Educational Research Review*, vol. 5, no. 3, pp. 220-242, 2010. https://doi.org/10.1016/j.edurev.2010.07.001

[37] B. E. Duyile *et al.*, "Maternal education and child self-regulation: Do maternal self-regulation and responsiveness mediate the association?," *Academic Pediatrics*, vol. 25, no. 1, p. 102484, 2025. https://doi.org/10.1016/j.acap.2024.03.012

[38] L. Luo and M. Gao, "Family SES and self-regulated learning in Chinese preschoolers: A mediation analysis of parental educational expectation and home-based involvement," *Early Education and Development*, vol. 33, no. 3, pp. 452-468, 2021. https://doi.org/10.1080/10409289.2021.1958580

[39] J. Huang, C. Huang, J. Qin, and K. Huang, "Factors influencing self-regulated learning ability among Medical undergraduates in China: A cross-sectional study," *BMC Medical Education*, vol. 24, p. 1235 2024. https://doi.org/10.1186/s12909-024-06254-9

[40] C. Mega, L. Ronconi, and R. De Beni, "What makes a good student? How emotions, self-regulated learning, and motivation contribute to academic achievement," *Journal of Educational Psychology*, vol. 106, no. 1, pp. 121-131, 2014. https://doi.org/10.1037/a0033546

[41] M. Savitz-Romer, J. Jager-Hyman, and A. Coles, *Removing roadblocks to rigor: Linking academic and social supports to ensure college readiness and success*. The Education Resources Institute, 2009.

[42] X. Bai and X. Gu, "Effect of teacher autonomy support on the online self-regulated learning of students during COVID-19 in China: The chain mediating effect of parental autonomy support and students' self-efficacy," *Journal of Computer Assisted Learning*, vol. 38, no. 4, pp. 1173-1184, 2022. https://doi.org/10.1111/jcal.12676

[43] A. Carriedo, J. A. Cecchini, A. Méndez-Giménez, D. Sanabrias-Moreno, and C. González, "Impact of teachers' autonomy support in students' basic psychological needs, intrinsic motivation and moderate-to-vigorous physical activity," *Children*, vol. 10, no. 3, p. 489, 2023. https://doi.org/10.3390/children10030489

[44] J. Cranefield, P. Yoong, and J. R. Hill, "Reflections on resource-based learning environments: continuing the exploration of opportunities and obstacles," *International Journal of Knowledge and Learning*, vol. 3, no. 1, pp. 12-29, 2007. https://doi.org/10.1504/IJKL.2007.012639

[45] M. S. Palmes *et al.*, "The effect of online instructors' immediacy and presence on nursing students' motivation, cognitive, and affective learning," in Learning Technology for Education Challenges, vol. 2082, L. Uden and D. Liberona Eds.: Springer, 2024, pp. 252-265.

[46] S. Warshawski, "Academic self-efficacy, resilience and social support among first-year Israeli nursing students learning in online environments during COVID-19 pandemic," *Nurse Education Today*, vol. 110, p. 105267, 2022. https://doi.org/10.1016/j.nedt.2022.105267

[47] Y. Wang, L. Wang, L. Yang, and W. Wang, "Influence of perceived social support and academic self-efficacy on teacher-student relationships and learning engagement for enhanced didactical outcomes," *Scientific Reports*, vol. 14, p. 28396, 2024. https://doi.org/10.1038/s41598-024-78402-6

[48] D. King, S. Tee, L. Falconer, C. Angell, D. Holley, and A. Mills, "Virtual health education: Scaling practice to transform student learning: Using virtual reality learning environments in healthcare education to bridge the theory/practice gap and improve patient safety," *Nurse Education Today*, vol. 71, pp. 7-9, 2018. https://doi.org/10.1016/j.nedt.2018.08.002

[49] G. Makransky *et al.*, "Simulation based virtual learning environment in medical genetics counseling: an example of bridging the gap between theory and practice in medical education," *BMC Medical Education*, vol. 16, no. 98, 2016. https://doi.org/10.1186/s12909-016-0620-6

[50] J. A. Kruse, J. Didion, and K. Perzynski, "Strengthening student nurses' sense of belonging through attendance at a professional nursing conference," *AORN Journal*, vol. 112, no. 3, pp. 227-236, 2020. https://doi.org/10.1002/aorn.13141

[51] F. A. Freitas and L. J. Leonard, "Maslow's hierarchy of needs and student academic success," *Teaching and Learning in Nursing*, vol. 6, no. 1, pp. 9-13, 2011. https://doi.org/10.1016/j.teln.2010.07.004

[52] M. Albloushi, L. Ferguson, L. Stamler, S. Bassendowski, L. Hellsten, and A. Kent-Wilkinson, "Saudi female nursing students experiences of sense of belonging in the clinical settings: A qualitative study," *Nurse Education in Practice*, vol. 35, pp. 69-74, 2019. https://doi.org/10.1016/j.nepr.2019.01.008

[53] M. Kim and S.-Y. Park, "Factors affecting the self-directed learning of students at clinical practice course for advanced practice nurse," *Asian Nursing Research*, vol. 5, no. 1, pp. 48-59, 2011. https://doi.org/10.1016/S1976-1317(11)60013-3

[54] S. Panda *et al.*, "Challenges faced by student nurses and midwives in clinical learning environment: A systematic review and meta-synthesis," *Nurse Education Today*, vol. 101, p. 104875, 2021. https://doi.org/10.1016/j.nedt.2021.104875

[55] P. Vivekananda-Schmidt and J. Sandars, "Belongingness and its implications for undergraduate health professions education: A scoping review," *Education for Primary Care*, vol. 29, no. 5, pp. 268-275, 2018. https://doi.org/10.1080/14739879.2018.1478677

[56] D. L. Singer, A. Sapp, and K. A. Baker, "Belongingness in undergraduate/pre-licensure nursing students in the clinical learning environment: A scoping review," *Nurse Education in Practice*, vol. 64, p. 103422, 2022. https://doi.org/10.1016/j.nepr.2022.103422

[57] D. L. Singer, Y. Zhang, K. A. Baker, and D. Walker, "Modifiable factors contributing to belongingness of undergraduate nursing students in the clinical learning environment: An exploratory study," *Nurse Education Today*, vol. 133, p. 106065, 2024. https://doi.org/10.1016/j.nedt.2023.106065

[58] L. McKenna *et al.*, "Undergraduate midwifery students' sense of belongingness in clinical practice," *Nurse Education Today*, vol. 33, no. 8, pp. 880-883, 2013. https://doi.org/10.1016/j.nedt.2012.09.009

[59] Y. F. Teng, H. Yang, and Y. P. Cao, "Hùlǐ shíxíshēng línchuáng guīshǔgǎn zài lǐngwù shèhuì zhīchí yǔ zhíyè juécè zìwǒ xiàonéng jiān de zhōngjiè xiàoyìng [The mediating effect of clinical belongingness among nursing interns on perceived social support and career decision-making self-efficacy]," *Chinese Journal of Nursing Education*, vol. 19, no. 11, pp. 1007-1011, 2022. 10.3761/j.issn.1672-9234.2022.11.010

[60] R. B. Kline, *Principles and practice of structural equation modeling*. New York, NY: Guilford Press, 2011.

[61] G. S. Ching, P.-C. Chao, and W.-C. Lien, "Acculturative hassles and strategies: Relationship between study abroad related depression, anxiety, and stress," *International Journal of Research Studies in Psychology*, vol. 3, no. 5, pp. 3-25, 2014. https://doi.org/10.5861/ijrsp.2014.818

[62] E. J. Wolf, K. M. Harrington, S. L. Clark, and M. W. Miller, "Sample size requirements for structural equation models: An evaluation of power, bias, and solution propriety," *Educational and Psychological Measurement*, vol. 73, no. 6, pp. 913-934, 2013. https://doi.org/10.1177/0013164413495237

[63] D. Hui, I. Glitza, G. Chisholm, S. Yennu, and E. Bruera, "Attrition rates, reasons, and predictive factors in supportive care and palliative oncology clinical trials," *Cancer*, vol. 119, no. 5, pp. 1098-1105, 2013. https://doi.org/10.1002/cncr.27854

[64] R. W. Emerson, "Convenience sampling, random sampling, and snowball sampling: How does sampling affect the validity of research?," *Journal of Visual Impairment & Blindness*, vol. 109, no. 2, pp. 164-168, 2015. https://doi.org/10.1177/0145482X1510900215

[65] S. Iyama and H. Maeda, "Development of the self-regulated learning scale in clinical nursing practice for nursing students: Consideration of its reliability and validity," *Japan Journal of Nursing Science*, vol. 15, no. 3, pp. 226-236, 2018. https://doi.org/10.1111/jjns.12191

[66] Q. Chen, J. Wang, Z. Qian, G. Jin, and X. Zhang, "Línchuáng hùlǐ shíjiàn zìwǒ tiáojié xuéxí liàngbiǎo de hàn huà jí xìn xiàodù jiǎnyàn [Reliability and validity of the Chinese version of the Self-Regulated Learning Scale in clinical nursing practice]," *Chinese Journal of Modern Nursing*, vol. 27, no. 36, pp. 5021-5025, 2021. 10.3760/cma.j.cn115682-20210610-02572

[67] L. J. Cronbach, "Coefficient alpha and the internal structure of tests," *Psychometrika*, vol. 16, pp. 197-334, 1951. https://doi.org/10.1007/BF02310555

[68] L. Guttman, "A basis for analyzing test-retest reliability," *Psychometrika*, vol. 10, no. 4, pp. 255-282, 1945. https://doi.org/10.1007/BF02288892

[69] R. Likert, *A technique for the measurement of attitudes*. New York, NY: Columbia University Press, 1932.

[70] J. Arribas-Marín, V. Hernández-Franco, and C. Plumed-Moreno, "Nursing students' perception of academic support in the practicum: Development of a reliable and valid measurement instrument," *Journal of Professional Nursing*, vol. 33, no. 5, pp. 387-395, 2017. https://doi.org/10.1016/j.profnurs.2017.03.001

[71] C. Li, C. Zhang, Z. Hou, Y. n. Ji, L. Xie, and Y. Liu, "Shíxí hùshēng xuéyè zhīchí gǎnzhī liàngbiǎo de hàn huà jí xìndù xiàodù jiǎnyàn [Reliability and validity of the Chinese version of Academic Support in the Practicum Scale]," *Chinese Nursing Management*, vol. 18, no. 9, pp. 1192-1196, 2018.

[72] H. Wang and C. Jin, "Hùshēng línchuáng shíxí guīshǔgǎn liàngbiǎo de hàn huà jí xìn xiàodù jiǎnyàn [Reliability and validity test of Chinese version of the Belongingness Scale - Clinical Placement Experience]," *Chinese Nursing Research*, vol. 34, no. 12, pp. 2136-2139, 2020.

[73] C. Fornell and D. F. Larcker, "Evaluating structural equation models with unobservable variables and measurement error," *Journal of Marketing Research*, vol. 18, pp. 39-50, 1981. https://doi.org/10.2307/3151312

[74] L.-T. Hu and P. M. Bentler, "Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives," *Structural Equation Modeling: A Multidisciplinary Journal*, vol. 6, no. 1, pp. 1-55, 1999. https://doi.org/10.1080/10705519909540118

[75] J. B. Schreiber, A. Nora, F. K. Stage, E. A. Barlow, and J. King, "Reporting structural equation modeling and confirmatory factor analysis results: A review," *The Journal of Educational Research*, vol. 99, no. 6, pp. 323-338, 2006. https://doi.org/10.3200/JOER.99.6.323-338

[76] P. M. Podsakoff, S. B. MacKenzie, J.-Y. Lee, and N. P. Podsakoff, "Common method biases in behavioral research: A critical review of the literature and recommended remedies," *Journal of Applied Psychology*, vol. 88, no. 5, pp. 879-903, 2003. https://doi.org/10.1037/0021-9010.88.5.879

[77] S. Jamieson, "Likert scales: How to (ab)use them," *Medical Education*, vol. 38, no. 12, pp. 1217-1218, 2004. https://doi.org/10.1111/j.1365-2929.2004.02012.x