



The Effect of the Flipped Classroom Model on Learning Motivation and Outcomes in Evidence-Based Nursing: A Mixed-Methods Study of Nursing Students in Taiwan

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ARTICLE INFO	ABSTRACT
Article Type:	Evidence-based nursing is a core competency; however, students often struggle with its abstract concepts and high cognitive demands. Traditional lecture-based teaching often results in passive learning and limited applications. This study aimed to examine the effectiveness of a flipped classroom approach in improving learning outcomes and motivation, and to explore students' learning experiences in an undergraduate Evidence-based nursing course. A mixed-methods, one-group pretest–posttest design was used with 49 third-year nursing students in Taiwan. An eight-week flipped course was implemented using the “5As” framework. Learning outcomes and motivation were assessed using the Learning Outcome and Learning Motivation scales. Quantitative data were analyzed using paired t-tests, and qualitative data from journals and interviews were subjected to content analysis. The students demonstrated significant improvement in their learning outcomes ($t = 5.51, p < 0.001$). Although self-reported motivation showed no significant change, qualitative findings indicated that high behavioral engagement and confidence were facilitated by interactive strategies such as gamification and group discussions. In conclusion, the flipped classroom model effectively enhanced learning outcomes and promoted active engagement. Despite stable motivation scores, students demonstrated meaningful improvements in competence, supporting flipped learning as a valuable strategy for strengthening Evidence-based nursing education.
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Introduction

The primary objective of professional nursing education is to cultivate skilled professionals equipped with clinical competencies, critical thinking skills, and employability. In the context of Taiwan's Technological and Vocational

Education (IVE) system, there is a growing emphasis on technical skills and fostering students' self-directed learning and exploratory abilities to meet the demands of an innovative economy. To enhance competitiveness in the healthcare job market, educators are encouraged to adopt personalized learning approaches by integrating

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innovative teaching strategies and digital technologies into practical instruction [1].

However, the TVE system often faces significant challenges, particularly the dual issues of low learning motivation and varying academic outcomes following the massification of higher education [2].

This phenomenon is particularly pronounced in private universities of science and technology, which often serve a higher proportion of students from diverse academic backgrounds. Research indicates that these students may exhibit lower learning enthusiasm due to their low academic self-efficacy [3, 4]. Consequently, educators are confronted with an “unmotivated generation,” where gaps in motivation and learning attitudes have become critical issues in the current education system [5].

In recent years, the educational landscape has witnessed a distinct shift in student characteristics, particularly in the TVE sector. Influenced by globalization, sociodemographic changes, and a declining birth rate, studies indicate a noticeable decline in students’ academic readiness [2, 6], accompanied by widening disparities in individual aptitude. Furthermore, the prevalence of digital dependence has been linked to diminished classroom participation and a lack of academic confidence. Contemporary students, often characterized as “digital natives,” inhabit a visually and digitally rich environment [7]; consequently, they often struggle to engage with traditional passive lecture-based models.

Within this educational context, the “Evidence-Based Nursing” (EBN) course presents a unique challenge. While EBN is a critical core competency for modern nursing practice, its curriculum involves complex concepts, such as research methodology, statistical analysis, and critical appraisal of literature. Nursing students in the TVE system, who generally possess a strong preference for hands-on clinical skills over abstract theoretical reasoning, often perceive EBN as “dry,” “difficult,” and disconnected from immediate clinical utility. This misalignment between the rigorous nature of the course and students’ learning preferences further exacerbates low motivation.

To address these challenges, “flipped teaching,” a student-centered approach that shifts the locus of control from the teacher to the learner, offers a potential solution. By moving direct instruction to pre-class self-study and reserving class time for interactive problem-solving [8, 9], this model has proven effective in enhancing both learning motivation and outcomes [10]. This approach aligns with the Self-Determination Theory (SDT) [11], which posits that learning is optimized when pedagogical methods satisfy the basic

psychological needs for competence, relatedness, and autonomy. Specifically, the collaborative and guided nature of in-class activities in a flipped model is designed to fulfill the needs for competence and relatedness.

However, the successful application of this model requires contextual adaptations. Although Taiwan has witnessed a surge in instructional innovation, with the flipped classroom emerging as a dominant pedagogical strategy, its effectiveness is not universally guaranteed. Models successfully implemented in general universities [12] may encounter significant challenges when transplanted into the TVE context. Specifically, the requirement for pre-class preparation often triggers severe resistance among TVE students because of a lack of established self-study habits. This reaction, metaphorically described as “flipping the table” rather than the classroom, frequently leads to teacher burnout, given the intense pedagogical effort required to overcome such inertia [5].

Despite these challenges and the widespread adoption of the model, a critical research gap remains regarding its application in purely theoretical courses such as EBN, particularly within the Technological and Vocational Education (TVE) system. Existing local studies have predominantly focused on other disciplines, such as special early childhood education [13], sports curricula [14, 15], and mathematics (calculus) [16]. Furthermore, most research has been conducted in general university settings [15-17] or clinical practice environments [18, 19].

There is a paucity of evidence on how this pedagogical shift impacts TVE nursing students in the classroom setting, a demographic often characterized by a strong preference for hands-on practice over abstract reasoning and frequently labeled as the “unmotivated generation” or having low academic self-efficacy in research-oriented courses [5, 20].

Consequently, it remains unclear whether the flipped model can effectively mitigate the high cognitive burden of EBN for this specific population without causing resistance. This study bridges this gap by providing empirical evidence of the transformation of passive learning behaviors within the Taiwanese TVE context.

Therefore, this study aimed to apply flipped teaching principles to construct instructional strategies for the EBN course tailored to “unmotivated” nursing students in Taiwan. Specifically, this study aimed to (1) evaluate the effects of this intervention on students’ learning motivation and outcomes and (2) explore their learning experiences and feedback through qualitative inquiry.

Materials and Methods

Study Design

This study utilized a convergent parallel mixed-methods action research approach [21] that incorporated a one-group pretest-posttest quasi-experimental design. The reporting of this study followed the Transparent Reporting of Evaluations with Nonrandomized Designs (TREND) guidelines.

Participants

The study was conducted at a private university of science and technology in Taiwan during the 2023 academic year (September 2023–January 2024). Participants were third-year undergraduate nursing students recruited through purposive sampling from the researcher's EBN course. The inclusion criteria were: (1) enrollment in the third-year EBN course; (2) ability to access the online learning platform and participate in classroom activities; and (3) provision of signed informed consent form. The exclusion criteria were: (1) incomplete attendance (missing >20% of the intervention sessions) or (2) failure to complete either the pre-test or post-test assessments. A total of 49 students met the criteria and completed the study successfully.

Intervention Procedures

The flipped teaching intervention was developed based on the Action Research Model [22], comprising the cyclical phases of Planning, Action, Observation, Reflection, and Modification (Figure 1), and was

implemented over an 8-week period. The instructional activities were structured into three distinct phases (Figure 2). In the Pre-class Phase, approximately 10–15 minutes were allocated for students to access the online platform, watch instructional videos, and read materials to establish foundational knowledge [8]. Subsequently, the 100-minute In-class Phase was divided into four segments: a 10-minute warm-up using the Kahoot interactive system (Kahoot! AS, Oslo, Norway) (3 questions) to assess prior knowledge [23]; 40 min of instruction where the instructor clarified concepts; 35 min of collaborative activities, including “fastest finger” quizzes and hands-on literature appraisal; and a 15-minute summary to synthesize key points and award prizes. Finally, in the Post-class Phase, students spent approximately 10 minutes completing reflection logs to consolidate their learning.

Measures

Learning Motivation

Learning motivation was assessed using the Learning Motivation Scale (LMS), a revised 35-item version [24] of the Motivated Strategies for Learning Questionnaire (MSLQ) [25]. Participants rated items on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), with higher total scores indicating greater learning motivation. The scale demonstrated good internal consistency in this study, with Cronbach's alpha coefficients of 0.79 and 0.85 for the pre-test and post-test, respectively.

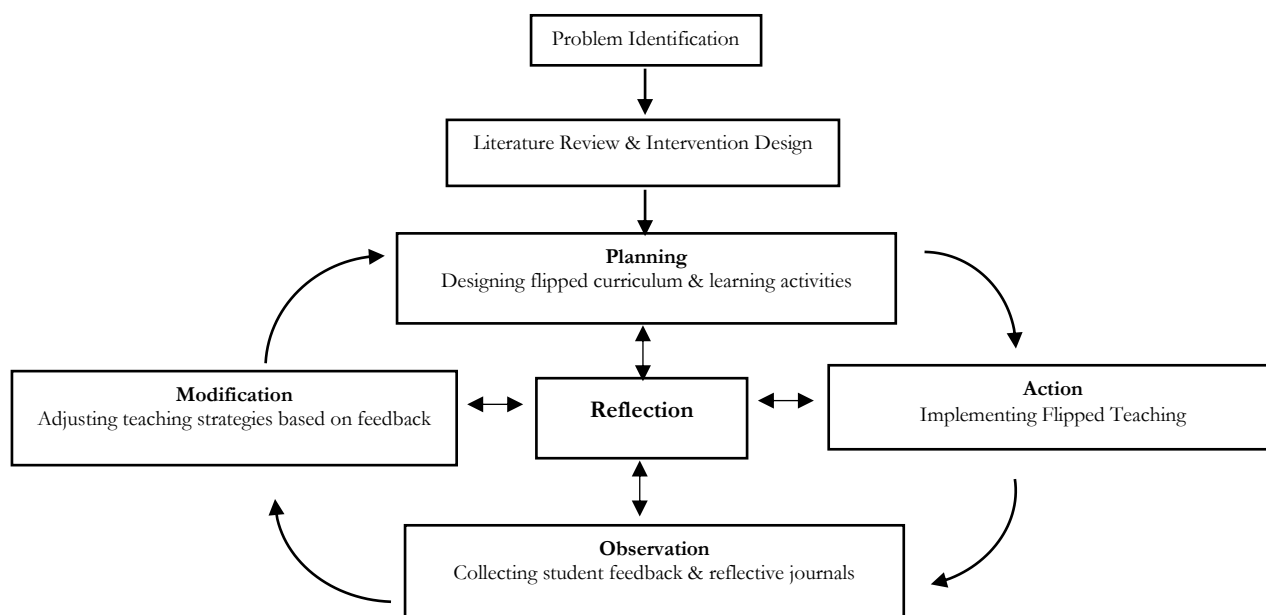


Figure 1. The Action Research Model applied in the flipped teaching intervention

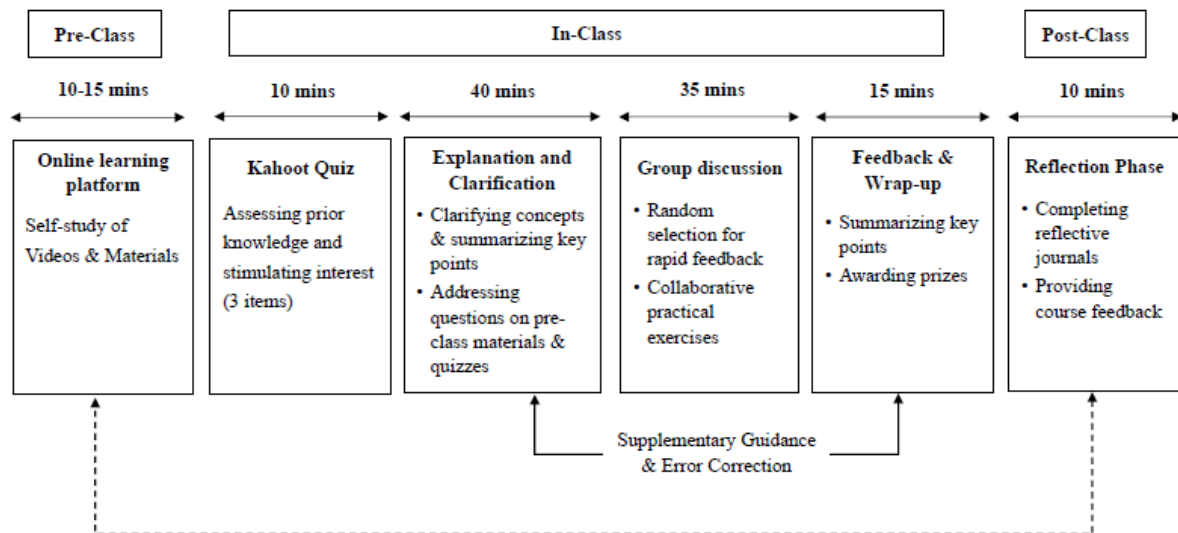


Figure 2. Schematic representation of the flipped classroom instructional phases. The intervention consists of three phases: (1) Pre-class phase: students engage with instructional videos and assigned readings on the online platform; (2) In-class phase: interactive activities including Kahoot quizzes and collaborative discussions; and (3) Post-class phase: completion of reflective logs.

Learning outcomes

Learning outcomes were evaluated using the Learning Outcome Scale (LOS), adapted from the “English Learning Self-Efficacy Scale” and modified for the EBN context [20]. The scale comprises 21 items designed to measure students’ confidence in presenting the evidence. Items were scored on a 5-point Likert scale (1-5), with higher scores indicating superior learning outcomes. The scale exhibited excellent reliability, with Cronbach’s alpha values of 0.91 and 0.97, respectively.

Sociodemographic Characteristics

Sociodemographic data, including age, gender, general interest in nursing, and willingness to pursue a nursing career, were collected using a structured self-report questionnaire.

Data Collection Procedures

Data were collected according to standardized protocols. At baseline (Week 1), participants received a detailed briefing regarding the study procedures before completing a self-administered pre-test (LMS, LOS, and demographics). Upon completion of the flipped course (Week 8), the same questionnaires were administered as post-tests. Concurrently, qualitative data, including group discussion worksheets, student interview records, and researcher reflective journals, were collected throughout the semester to inform the action research cycles.

Researcher Reflexivity and Trustworthiness

Given the researcher’s dual role as the course instructor, trustworthiness was enhanced through a reflective journal documenting the pedagogical decisions, underlying assumptions, and emotional responses. Additionally, audit trails were established, and qualitative analysis was independently reviewed by a co-researcher uninvolved in the teaching process to ensure that the interpretations were grounded in the data rather than subjective expectations.

Data Analysis

Quantitative data were analyzed using IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics, including means, standard deviations, frequencies, and percentages, were used to summarize the participant characteristics. Paired t-tests were conducted to examine pre- and post-intervention differences in learning motivation (LMS) and learning outcomes (LOS). Statistical significance was set at $p < 0.05$.

Qualitative data derived from the researcher’s reflective journals and focus group interviews were analyzed using conventional qualitative content analysis. The analysis followed a systematic process: (1) repeated reading of the transcribed texts to achieve immersion and a holistic understanding; (2) identification and coding of meaningful units related to learning experiences, challenges, and perceived

gains; and (3) clustering of related codes into categories, which were then further abstracted into overarching themes.

Mixed Methods Integration. A convergent mixed methods design was employed, with quantitative and qualitative data analyzed independently and integrated during the interpretation phase of the study. Integration focused on complementarity and expansion; whereby qualitative findings were utilized to explain and contextualize quantitative results. This triangulation enhanced the depth and comprehensiveness of understanding the educational impact of the intervention.

Results

Participant Characteristics

A total of 49 third-year nursing students participated in this study. As shown in Table 1, the mean age of the participants was 20.39 ± 1.13 years, and the majority were female (85.7%).

Regarding professional intent, over 70% of the respondents indicated a willingness to pursue a nursing career.

Table 1. Demographic Characteristics of Participants (N = 49)

Variable	N (%)
Gender	
Female	42 (85.7)
Male	7 (14.3)
Religion	
Yes	16 (32.7)
No	33 (67.3)
Education Entry Channel	
General High School	30 (61.2)
Vocational High School	18 (36.7)
Others	1 (2.1)
General Interest in Nursing	
Strongly agree	7 (14.3)
Agree	25 (51.0)
Neutral average	16 (32.7)
Strongly disagree	1 (2.0)
Willingness to Pursue a Nursing Career	
Very willing	10 (20.4)
Willing	25 (51.0)
Neutral average	13 (26.5)
Not willing	1 (2.0)

Effect of Flipped Classroom Intervention

The paired t-test analysis (Table 2) revealed that the flipped teaching intervention did not yield a statistically significant change in students' learning motivation ($p > 0.05$, Cohen's $d = -0.25$). Conversely,

the intervention resulted in a significant improvement in students' EBN learning outcomes ($t = 5.51$, $p < .001$), demonstrating a large effect size (Cohen's $d = 1.16$).

Qualitative Findings

Qualitative analysis of the researcher's reflective journals and student focus group interviews provided context to the quantitative results. To gain in-depth insights into the learning experience, four students voluntarily participated in focus group interviews following an open invitation to the class. Although the sample was self-selected, the participants offered rich, first-hand accounts of their learning journeys, contributing valuable perspectives on the processes and challenges associated with the flipped classroom intervention.

Despite the absence of a statistically significant increase in motivation scores, which may reflect the rigorous and demanding nature of the course, qualitative feedback suggested an overall positive reception of the flipped classroom model. Three main themes emerged from the qualitative data:

Theme 1: Gamification as a Driver for Pre-class Preparation

The researcher noted that traditional lectures often failed to engage the "unmotivated generation." However, the integration of Kahoot quizzes successfully "nudged" students into reviewing materials beforehand. Students reported that the immediate feedback from gamified quizzes helped them identify knowledge gaps and appreciate the value of pre-class study.

"The Kahoot tests in class helped me understand my own preparation status and urged me to review beforehand... I could realize what I didn't understand and then discuss it with the teacher." (Student A)

"Since the teacher had us report our pre-study progress... I was forced to preview. It made understanding the lecture much easier. Although finding time to preview is tiring, the method works well." (Student D)

Theme 2: Overcoming Challenges in Evidence Appraisal through Collaboration

Consistent with the quantitative improvement in "Ability Enhancement," students expressed that while the PICO process and literature search were cognitively demanding ("very tired"), the collaborative nature of the flipped classroom facilitated success. The researcher observed that group discussions allowed students to leverage individual strengths.

Table 2. Comparison of Learning Motivation and Learning Outcomes Between Pre-test and Post-test (N = 49)

Item	Pre-test	Post-test	t	p
Overall learning motivation	3.54 ± 0.56	3.38 ± 0.73	-1.52	.134
Overall learning outcome	2.76 ± 0.85	3.65 ± 0.67	5.51***	<.001

Note: Data are presented as Mean ± SD; *** p < .001

"I realized that finding the best evidence... and judging credibility is a difficult task. Although doing PICO was very tiring, we discussed how to distribute work fairly... assisting those with harder tasks trained our communication skills." (Student B)

"Compared to other courses... we were more engaged in discussing answers with group members. It also helps me review more efficiently later." (Student D)

Theme 3: Professional Identity and Future Applicability

Despite the challenging nature of the coursework, students recognized the practical value of EBN for their future careers. This aligns with the "Goal Achievement" improvement in the quantitative data. Students moved from passive receivers of information to active evaluators of evidence, a crucial skill for clinical decision-making.

"In this generation of rapid information flow... learning how to distinguish fake news is very important. The database search skills I learned will definitely help in my future workplace." (Student A)

"Mastering EBN is very helpful for our future... we can apply it in clinical care to make evidence-based decisions." (Student B)

Summary of Findings

The triangulation of data reveals a nuanced distinction between motivation and engagement. While self-reported learning motivation scores remained stable, potentially reflecting the influence of high cognitive load and the rigorous nature of the course, the qualitative data demonstrated high levels of behavioral engagement and effort. The flipped model successfully transitioned students from passive listening to active preparation, resulting in enhanced learning outcomes and professional confidence.

Discussion

This study aimed to evaluate the impact of a flipped classroom intervention on learning motivation and outcomes in an EBN course among third-year nursing students in Taiwan. The findings present a nuanced

picture: while the intervention significantly improved students' EBN learning outcomes, it did not result in a statistically significant increase in overall learning motivation. These results, triangulated with qualitative feedback, offer critical insights into EBN pedagogy.

Interpreting the Improvement in Learning Outcomes

The significant improvement in learning outcomes aligns with previous studies, indicating that flipped classrooms promote higher-order thinking skills [10]. EBN is traditionally considered a difficult subject because of the complexity of PICO formulation and critical appraisal. By shifting the acquisition of foundational knowledge to pre-class video viewing, in-class time was liberated for collaborative applications and immediate feedback. The qualitative findings support this, as students noted that collaborative discussions helped them overcome the "tiredness" of the PICO process. This suggests that the flipped model transforms EBN from a solitary, overwhelming cognitive task into a socially supported and manageable learning experience [26].

Distinguishing Motivation from Engagement and Effort

A notable finding of this study was the lack of significant change in quantitative learning motivation scores, which contradicts some literature suggesting that FCs inherently boost motivation [8, 10]. However, this discrepancy highlights a critical conceptual distinction between learning motivation (psychological intent or drive) and behavioral engagement (manifestation of effort and participation). While self-reported learning motivation scores remained stable, qualitative feedback confirmed that students were highly engaged behaviorally, actively participating in quizzes and collaborative discussions despite the perceived cognitive demands of the course [27].

Although cognitive load was not directly measured in this study, students described the process as "tiring" and noted being "forced to preview." These qualitative descriptions appear consistent with the concept of "desirable difficulties." The flipped model requires active self-discipline, which demands more mental effort than does passive listening. Consequently, it is plausible that the high effort

required may have tempered students' self-reported intrinsic motivation scores on the LMS scale. However, the qualitative feedback (Themes 1 and 2) confirmed that students were highly engaged behaviorally, as they actively participated in quizzes and discussions despite the pressure. This suggests that for complex subjects such as EBN, high learning outcomes may be achieved through sustained behavioral engagement and scaffolding, even when psychological motivation scores do not show a statistically significant increase.

The Role of Gamification and Collaboration

The qualitative themes highlighted the crucial role of gamification (Kahoot!) and peer collaboration to sustain engagement. The “fastest finger” quizzes served as an essential “hook” that bridged the gap between reluctance to preview and active participation, aligning with recent meta-analyses confirming that gamification significantly enhances engagement and learning outcomes in nursing education [23]. This validates the importance of integrating interactive elements into flipped classrooms to mitigate the resistance often observed in the “unmotivated generation” [5]. Furthermore, the peer support system inherent in group activities acted as a buffer against the anxiety associated with reading English literature and statistical appraisal, effectively fostering a sense of “expression confidence” as seen in the LOS results [27].

Clinical and Practical Implications

Nursing Education

Educators should recognize that self-reported “motivation scores” do not always correlate perfectly with actual “learning gains.” Consequently, implementing a flipped classroom in cognitively demanding courses such as EBN requires a strategic balance between rigor and support. To mitigate the resistance associated with being “forced” to prepare, scaffolding is essential; educators must provide clear, manageable pre-class materials, such as short videos, to make the workload manageable [9]. Furthermore, gamification tools like Kahoot should be viewed not merely as entertainment, but as critical pedagogical mechanisms [23] that verify pre-class learning and provide the immediate gratification necessary to effectively engage the current generation of nursing students.

Clinical Practice

The significant improvement in students' ability to appraise evidence and their recognition of distinguishing “fake news” has direct implications for ensuring patient safety. Nursing students trained using this model are better equipped to navigate

information-dense clinical environments. By fostering the habit of looking for evidence (rather than relying on intuition) during their undergraduate years [18], this pedagogical approach contributes to a future workforce that is more competent in providing evidence-based care.

Limitations and Recommendations

This study had several limitations. First, and most notably, the use of a single-group pretest-posttest design without a control group limits the ability to infer a direct causal relationship between the intervention and the observed outcomes. As noted, confounding factors such as maturation effects or concurrent clinical learning cannot be completely ruled out. Second, although we interpreted the stable motivation scores through the lens of “cognitive load,” this construct was not directly measured using a quantitative instrument in this study. Consequently, the relationship between cognitive load and learning motivation remains inferential, based on qualitative feedback rather than statistical evidence. Third, the sample size was relatively small ($N = 49$) and recruited from a single institution in Taiwan, which may limit the generalizability of the findings to other cultural and educational contexts. Fourth, the study duration was limited to eight weeks, the and long-term retention of EBN skills and their application in actual clinical practice remain unknown.

Based on these limitations, future research should employ a randomized controlled trial (RCT) design to rigorously compare the flipped model with traditional lecturing. Longitudinal studies are also recommended to track whether the EBN skills acquired translate into clinical behavioral changes during students' internships. Additionally, further studies should explicitly measure cognitive load alongside motivation to empirically test the hypothesis regarding “desirable difficulties,” and explore strategies to reduce the perceived burden while maintaining high learning outcomes.

Conclusion

In conclusion, this study utilized a convergent mixed-methods design to demonstrate that the flipped classroom intervention is a highly effective pedagogical strategy for enhancing EBN learning outcomes among Taiwanese nursing students. Although the rigorous nature of the active learning process meant that learning motivation scores did not statistically increase, qualitative evidence confirmed that students recognized the professional value of the training and engaged deeply through gamification and collaboration. The flipped model successfully shifted

students from passive recipients of knowledge to active and confident appraisers of evidence. Beyond classroom implementation, these findings advocate for a broader shift in institutional curriculum policy, suggesting that nursing education should prioritize active, scaffolded pedagogies to cultivate the critical thinking skills required in the modern healthcare workforce.

Authorship contribution statement

All authors have reviewed and approved the final version of the manuscript. Y, C & W conducted the study and collected the data; C & W performed the data analysis and interpretation.

Ethical Considerations

This study was conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from all participants. Students were explicitly assured that participation was voluntary and that refusal to participate would have no impact on their academic standing. To ensure confidentiality, all data were de-identified prior to analysis.

Conflict of interest statement

No conflict of interest has been declared

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Data Availability

The data supporting the findings of this study are available from the corresponding authors upon reasonable request.

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Declaration of Generative AI

The authors declare that they have not used any type of generative artificial intelligence for the writing of this manuscript, nor for the creation of tables, or their corresponding captions.

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