

**DEVELOPING VIRTUAL LEARNING MODELS TO ENHANCE
CRITICAL THINKING AND MATERNAL NURSING PRACTICE
COMPETENCY: AN R&D RESEARCH AND EFFECTIVENESS
STUDY**

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ABSTRACT

This study investigates the effectiveness of a virtual learning model in enhancing critical thinking skills and maternal nursing practice competencies among nursing students. The researchers employed a pre-test–post-test design involving nursing students who participated in a virtual learning intervention focusing on maternal nursing concepts. Using a validated instrument, critical thinking skills were assessed before and after the intervention. In addition, the practicality and validity of the developed virtual learning model were rigorously evaluated. The results reveal a statistically significant improvement in critical thinking scores after the intervention ($p < 0.01$), with an average score increase of 29.21 points. Additionally, both student and lecturer assessments confirm the high practicality of the virtual learning model, exceeding established benchmarks. Comprehensive analysis substantiates the model's validity, demonstrating strong psychometric properties. These findings suggest that virtual learning models significantly enhance critical thinking skills and practice competency among nursing students, providing a valuable addition to traditional nursing education methods. For further research, the researchers suggest exploring the long-term impact of such models on nursing practice and assessing their effectiveness across diverse student populations.

Keywords: Critical Thinking, Maternal Nursing Competency, Nursing Education, Virtual Learning

ABSTRAK

Penelitian ini menyelidiki efektivitas model pembelajaran virtual dalam meningkatkan keterampilan berpikir kritis dan kompetensi praktik keperawatan maternitas di kalangan mahasiswa keperawatan. Para peneliti menggunakan desain pre-test-post-test yang melibatkan mahasiswa keperawatan yang berpartisipasi dalam intervensi pembelajaran virtual yang berfokus pada konsep keperawatan maternitas. Dengan menggunakan instrumen yang telah divalidasi, keterampilan berpikir kritis dinilai sebelum dan sesudah intervensi. Selain itu, kepraktisan dan validitas model pembelajaran virtual yang dikembangkan dievaluasi secara ketat. Hasilnya menunjukkan peningkatan yang signifikan secara statistik dalam skor berpikir kritis setelah intervensi ($p < 0,01$), dengan peningkatan skor rata-rata sebesar 29,21 poin. Selain itu, penilaian mahasiswa dan dosen mengkonfirmasi kepraktisan yang tinggi dari model pembelajaran virtual, melebihi tolok ukur yang telah ditetapkan. Analisis yang komprehensif mendukung validitas model, menunjukkan sifat psikometrik yang kuat. Temuan ini menunjukkan bahwa model pembelajaran virtual secara signifikan meningkatkan kemampuan berpikir kritis dan kompetensi praktik di antara mahasiswa keperawatan, memberikan tambahan yang berharga untuk metode pendidikan keperawatan tradisional. Untuk penelitian lebih lanjut,

para peneliti menyarankan untuk mengeksplorasi dampak jangka panjang dari model-model tersebut terhadap praktik keperawatan dan menilai efektivitasnya di berbagai populasi mahasiswa.

Kata Kunci: Berpikir Kritis, Kompetensi Keperawatan Maternitas, Pendidikan Keperawatan, Pembelajaran Virtual

INTRODUCTION

The COVID-19 pandemic has substantially influenced global educational frameworks, including nursing education ([Pottle 2019](#)). The enforcement of social distancing and lockdown measures has significantly disrupted traditional in-person teaching methods that are vital for the development of practical skills and critical thinking. This impact is particularly severe for nursing educators in specialised areas, such as maternal nursing, where hands-on experience and critical thinking are crucial for proficiency ([Seah et al., 2021](#)). Maternal nursing involves assessing patient needs, making informed decisions, and responding to intricate scenarios that arise in prenatal, labour, and postnatal care ([Liou et al., 2020](#)). Maternal nursing practice encompasses specific competencies, including managing childbirth processes, comprehending fetal development, and providing postnatal care.

In response to these challenges, nursing educators have explored alternative strategies to maintain the quality of nursing education, including integrating virtual learning models. Nursing educators have been challenged to develop innovative approaches to maintain the quality of education and ensure that students acquire the necessary clinical competencies ([Kang 2021](#)). Virtual learning models, including online classes, simulations, and interactive modules, have become indispensable tools for continuing education ([Sharma et al., 2019](#)). These models aim to supplement traditional methods while adapting to the constraints imposed by the pandemic ([Farber et al., 2023](#)). Virtual learning environments can provide opportunities for students to engage in interactive scenarios,

analyse case studies, and practice decision-making, thereby strengthening their critical thinking abilities ([Kang, 2021](#)). Additionally, these models can simulate real-world maternal nursing situations, allowing students to develop the necessary skills and competencies without compromising patient safety or face-to-face interaction.

Virtual learning models can enhance critical thinking and maternal nursing practice competencies by providing interactive, immersive, and scenario-based learning experiences. These models can simulate real-world situations, encourage active engagement, and foster the development of higher-order cognitive skills such as analysis, evaluation, and problem-solving ([Simpson and Courtney, 2002](#); [Ma et al., 2023](#)). Effective virtual learning models must simulate real-world situations to ensure that students practice and refine their skills in a virtual environment. The obstacle lies in creating realistic and engaging simulations that enable students to apply their knowledge and problem-solving abilities rather than merely memorising facts.

While virtual learning can provide continuity in education, it also raises concerns about the development of critical thinking and clinical competencies that are crucial for providing high-quality patient care. Enhancing critical thinking skills and nursing practice competencies is essential for delivering quality care to patients, especially during public health crises ([Al-Gindy et al., 2020](#)). Critical thinking is the foundation of effective nursing practice ([Muhammadi et al., 2019](#)). Critical thinking has been identified as a core competency in nursing practice, as it enables nurses to make informed decisions, solve complex problems, and provide holistic patient-centred care. The ability to think critically is crucial in maternal nursing, where nurses must navigate complex scenarios, anticipate potential complications, and make timely decisions to ensure the well-being of both the mother and newborn ([Carter et al., 2018](#)).

Previous studies have explored the effectiveness of virtual learning models in nursing education with promising results. These studies suggest that virtual learning can improve student engagement, knowledge retention, and the development of critical thinking skills ([Foronda et al., 2014](#)). However, there is a lack of research specifically examining the impact of virtual learning models on maternal nursing practice competency. While existing studies have demonstrated the potential of virtual learning to enhance critical thinking in general nursing contexts, the unique competencies and decision-making required in maternal nursing warrant dedicated investigation to fully understand how virtual learning models can be leveraged to improve these specialised skills. Consequently, there is a pressing need to investigate the effectiveness of virtual learning models in enhancing critical thinking and maternal nursing practice competencies among nursing students. Exploring the potential of virtual learning models to improve critical thinking and maternal nursing practice competency can contribute to addressing the challenges posed by the pandemic and inform future educational strategies in this specialised field. To address this gap, this study aimed to develop and evaluate the effectiveness of a virtual learning model in enhancing critical thinking and maternal nursing practice competency among nursing students.

METHODS

This research applied a research and development (R&D) approach. In this classification, the R&D approach involves creating specific products through a sequence of stages and assessments ([Fonseca et al. 2013](#)). This study developed virtual learning media that utilised a Problem-Based Learning Model to enhance students' learning experiences and improve their critical thinking and proficiency in maternal nursing practice.

The research project followed a four-stage developmental model: defining, designing, developing, and disseminating. A quasi-experimental method was employed during the development stage, particularly in the

trial phase ([Ebrahim et al., 2012](#)). After validating the virtual learning media, the study tested their application in the learning process ([Tuna et al., 2018](#)). The research utilised a questionnaire as the instrument for data collection, which provided respondents with a set of questions. The study focused on two types of instruments: validity and practicality.

Validity Test

Experts in media and materials assessed the validity of the research product using a questionnaire-based research instrument that included evaluation indicators rated on a Likert scale type. The scores obtained from this assessment were then used to calculate the product's validity, which was analysed using Aiken's V formula to determine its level of validity ([Sullivan, 2011](#)).

The validity assessment was further evaluated using a validity assessment interpretation table. This table determines a product's validity, considering it valid if the value of s is equal to or greater than 0.6 and invalid if s is less than 0.6. Aiken's V-test was implemented to provide a more comprehensive evaluation of the product's validity. The average score of all statements on the validity assessment instrument was calculated based on the data obtained from this analysis ([Divayana et al., 2019](#)).

Practicality Test

The evaluation of the practicality of research products is typically conducted by educators and students using an assessment instrument designed to measure the practicality of the research product. This assessment was carried out after validating the research product and user testing, specifically among educators and students. The assessment instrument used in this process was a Likert scale ([Ritzhaupt et al., 2017](#)). Researchers assessed the practicality of the virtual learning product, which incorporates problem-based learning models, by applying a specific formula. The calculated results were then interpreted using a practicality interpretation table, which served as the basis for determining the practicality level of the research items ([Cahya et al., 2022](#)).

Effectiveness Test

Researchers conducted a pre-post-test study with one group to assess the effectiveness of integrating virtual learning strategies in maternity course education. This study aimed to determine the usefulness of a Virtual Learning Model for enhancing critical thinking skills and competency in maternal nursing practice. The 21st Century Skills Assessment Inventory, created by the researchers, was used to achieve the goals of this investigation ([LaMartina & Ward-Smith, 2014](#)).

The study involved 52 nursing students enrolled in the Faculty of Medicine and Health Sciences at Jambi University during the 2021-2022 academic year. Before the virtual learning intervention, participants completed a pre-test using the 21st Century Skills Assessment Inventory. The researchers then implemented a collaborative virtual learning project-based approach. Finally, a post-test was conducted to assess participants' critical thinking changes. The students, aged between 19 and 22 years, had similar experiences in learning maternity nursing.

RESULTS

This research culminated in the creation of virtual learning that incorporates video media and problem-based learning models. The development process followed a multi-stage defining, designing, developing, and disseminating framework for the Virtual Learning Model. The current investigation focused on three stages— defining, designing, and developing —without addressing the disseminating stage.

Defining Stage

Instructional requirements for the crafted items were identified and established during the defining stage. Typically, the following tasks are performed during this stage:

Need analysis

Researchers conducted a thorough needs analysis by systematically reviewing existing literature and distributing a Guttman scale questionnaire (Need/No Need) with five items to students. The literature indicates that providing efficient virtual learning media significantly enhances the learning experience. The results of the student needs analysis revealed that 52 students (80%) enrolled in the maternity nursing course expressed a need for high-quality and interactive learning media. Consequently, it is essential to develop virtual learning media using a problem-based learning model to optimise the implementation of residential installation learning, enabling students to access and engage with remote learning more effectively ([Ding & Chau, 2023](#)).

Curriculum Analysis

Researchers assessed the maternity nursing curriculum by examining the characteristics of the instructional materials. The study aimed to identify the optimal learning medium to develop and incorporate into the Maternal Nursing Practice Competency learning process. The Association of Indonesian Nurses' Education Institutions provides the curriculum. The curriculum evaluation revealed that the primary objective of the maternity nursing learning process was to equip students with the ability to analyse prenatal, labor, and postnatal care. Based on this curriculum analysis, the researchers determined that Problem-Based Learning (PBL) is an appropriate choice as a framework for developing virtual learning media.

Student Characteristic Analysis

Researchers explored student characteristics by reviewing literature on traits associated with different age levels. Based on the literature, students in the professional nursing field, typically aged 19-22, exhibit guided independent learning traits ([Hayden et al.,](#)

[2016](#)). These students can locate information and have a strong desire to solve problems. They prefer learning materials that challenge them and offer opportunities for personal growth. Additionally, they derive satisfaction from independently solving problems ([Maygeldiyeva et al., 2020](#)). Consequently, the problem-based learning model is deemed appropriate for students' learning processes within this age range. However, it is important to recognise that practical applications still require guidance, as these students have not yet reached a level of maturity where they can consistently make sound decisions independently. Therefore, implementing the virtual learning process for maternity nursing necessitates using virtual learning media that apply the problem-based learning model.

Designing Stage

The designing stage of the virtual learning project utilised a problem-based learning model tailored to the specific requirements of the development stage. The design phase involved the following steps:

Media Selection

Researchers selected media to develop virtual learning using a problem-based learning model. The chosen virtual learning media consisted of interactive learning videos accessible online.

Product Sketching

Researchers determined the concept of virtual learning using a problem-based learning model. A brief description of the storyboards for the virtual learning media is presented in Table 1.

Media Object Collection and Design

Researchers collected the necessary media objects and proceeded with the design stage.

Table 1. Storyboards Briefly from Virtual Learning Media

Learning Activities	Time in minutes
Explanation of Learning Topics	2
Explain learning objectives	2
Orientation of students to the problem	5
Organizing students to learn	5
Guiding individual and group investigations	5
Describes how to analyze and evaluate the problem-solving process.	4
Describe the problem-solving task	3
Closing	2

Developing Stage

The developing stage involves two key activities: validating and practically testing the research products developed in the preceding stage. To assess the validity of these products, researchers engaged two subject experts and two media specialists. Simultaneously, educators and students evaluated the practicality of these products by applying them in the learning process.

Validity Test Analysis

Researchers evaluated validity by focusing on two primary components: material and media. Two maternity nursing experts assessed the material aspect using a validity instrument, and the resulting data were analysed using Aiken's V formula. The results of the validity test analysis for the learning material aspects are presented in Table 2.

Table 2. The Results of the Validity Test Analysis on Learning Material Aspects

Item	Validator's score 1	Validator's score 2	Aiken V	S value	Validity Category
1	5	5	0,75	7	High validity
2	4	4	0,75	6	Moderate validity
3	5	5	1	8	High validity
4	4	5	0,75	6	Moderate validity
5	5	4	0,75	7	High validity
6	4	5	0,75	7	High validity
7	4	5	0,75	6	Moderate validity
8	5	5	1	8	High validity
9	4	4	0,75	6	Moderate validity
10	4	5	0,75	7	High validity
11	4	4	0,75	6	Moderate validity
12	4	5	0,75	6	Moderate validity
13	5	5	1	8	High validity
14	4	4	0,75	6	Moderate validity
total	61	65	11,25	94	
mean	4,35	4,644	0,80	6,71	High validity

According to the data presented in Table 2, the average value of V was 0.80, indicating high validity. Additionally, all 14 items evaluated using the validity instrument received a score of 0.75, confirming their validity. Therefore, virtual learning employs instructional video media developed using a valid problem-based learning model concerning its learning materials.

The evaluation of the media and the learning model's validity included 14 components. Researchers consulted two media and learning experts to assess the model's validity. They analysed the outcomes of this assessment using Aiken's V formula, and the findings are presented in Table 3.

Table 3. The Results of the Validity Test Analysis on Media and Learning Model Aspects

Item	Validator's Score 1	Validator's Score 2	Aiken V	S value	Validity Category
1	5	4	0,8	7	High validity
2	5	5	1	6	High validity
3	5	5	1	8	High validity
4	4	5	0,75	6	Moderate validity
5	5	4	0,75	7	High validity
6	4	5	0,75	7	High validity
7	4	5	0,75	6	Moderate validity
8	5	5	1	8	High validity
9	4	4	0,75	6	Moderate validity
10	4	5	0,75	7	High validity
11	4	4	0,75	6	Moderate validity
12	4	5	0,75	6	Moderate validity
13	5	5	1	8	High validity
14	4	4	0,75	6	Moderate validity
total	62	65	11,55	94	-
mean	4,42	4,64	0,82	6,71	High validity

Based on the information presented in Table 3, the typical value of V is 0.82, which falls within the valid category. Additionally, all 14 items evaluated using the validity instrument achieved a value of 0.75, confirming their validity. Thus, we conclude that virtual learning employs instructional video media developed using a valid problem-based learning model, encompassing both media and learning model aspects. The analysis of the validity of these two aspects indicates that the research product designed for the maternity nursing learning process is valid in terms of design, media, and learning materials.

Researchers evaluated the practicality of the research product based on feedback from lecturers and students who utilised it. The assessment included ten items for lecturers and 12 items for students. Researchers used practical percentage analysis to analyse the data collected from the lecturer practicality assessment sheet.

The practical value of the research product was found to be 95.2, indicating that it met practical levels according to the table of practical values. These findings align with previous studies demonstrating that distance learning using a problem-based learning model with video as a learning medium is practical for nursing (Sern et al., 2017). Table 4 presents the results of the analysis of total product practicality data for each item.

Table 4. The Practicality Data from Lecturer Responses for Each Item

Item	Practicality Score (%)	Practicality Score (%)
1	95	Very Practical
2	98	Very Practical
3	99	Very Practical
4	100	Very Practical
5	97	Very Practical
6	95	Very Practical
7	80	Practical
8	95	Very Practical
9	98	Very Practical
10	95	Very Practical
Mean	95,2	Very Practical

The data analysis presented in Table 4 indicates that the practicality level of each item varied. Nine items were assessed to be at a practical level, while the remaining items also demonstrated practicality. Consequently, the overall practicality level of all items was determined to be practical based on the lecturers' evaluations. Therefore, the research products are practical for use in the maternity nursing learning process.

Researchers collected practical assessment data from 52 students who completed the practical assessment sheet after applying the research products in their learning process. They subsequently analysed these data using practical percentage analysis techniques. The analysis revealed a practical value of 83.02 for the research product, based on the responses from the 52 students who

utilised it. Based on the practicality value table, the research product is deemed practical. Table 5 presents a complete analysis of each item's total product practicality data.

Table 5. The Practicality Data from Student Responses for Each Item

Item	Practicality Score (%)	Practicality Score (%)
1	82	Very Practical
2	75,5	Practical
3	70	Practical
4	88,5	Very Practical
5	79,5	Practical
6	87,5	Very Practical
7	80	Very Practical
8	79,5	Practical
9	92,8	Very Practical
10	91,5	Very Practical
11	78,82	Practical
12	90,59	Very Practical
Mean	83,02	Very Practical

The data analysis presented in Table 5 reveals varying degrees of practicality for each item—however, the overall practicality of all tested items achieved a practical level. Consequently, based on student assessments, the resulting research product is deemed practical for incorporation into learning processes.

Evaluation of Initiative Effectiveness

Researchers conducted a paired samples t-test to determine the impact of the virtual learning tool on participants' critical thinking skills, as measured by the 21st Century Skills Assessment Inventory, before and after its use. They employed descriptive statistics, including the mean, standard deviation, range, and median, to evaluate the pre-test and post-test scores. The results are presented in Table 6.

Table 6. Evaluation of Initiative Effectiveness

Dimension	measurement	mean	Std. deviation	T. Value	df	Sig	(η^2)
Critical thinking	Pre-test	12.55	0.90	235.9	114	0.01	0.998
	Post-test	41.76	0.85				

Based on the results presented in Table 6, the average difference of 29.21 points between the pre-test and post-test scores indicates a substantial and statistically significant improvement in participants' critical thinking skills. The pre-test significance level of 0.01 suggests that the observed difference is highly unlikely to have occurred by chance. This finding indicates that the virtual learning intervention administered as part of this study had a strong positive impact on enhancing the critical thinking abilities of the nursing students involved. Overall, this evidence robustly supports the effectiveness of the developed virtual learning model in improving this crucial nursing competency.

DISCUSSION

This study aimed to develop and assess virtual learning models to enhance nursing students' critical thinking skills and competencies in maternal nursing. Unlike previous research that focused primarily on virtual reality and simulation in nursing education, this investigation specifically examined the potential of virtual learning to improve critical thinking within the context of maternal healthcare. By designing and implementing a comprehensive virtual learning intervention, this study sought to address the limitations of earlier studies and thoroughly evaluate its benefits for nursing education.

The need for effective teaching strategies to cultivate critical thinking skills among nursing students is urgent, given the increasing complexity of healthcare and the growing demand for skilled nurses and innovative educational approaches ([Kiernan & Olsen, 2020](#)), such as those explored in this study. The findings of this study indicate that the developed virtual learning models represent a promising solution to meet this need. By

offering interactive and immersive virtual experiences, educators can better prepare nursing students for the evolving healthcare landscape, enabling them to deliver exceptional patient-centred care.

The study demonstrated significant improvements in critical thinking skills among students who participated in the virtual learning interventions. This outcome aligns with the study's primary objective and reinforces the positive impact of virtual learning on essential nursing competencies. Building on previous research that highlighted the effectiveness of distance learning methods, such as problem-based learning and video-based instruction ([Harley et al., 2023](#)), this study provides robust evidence supporting the effectiveness of virtual learning in enhancing both critical thinking and maternal nursing practice competency.

The findings suggest that virtual learning can serve as a valuable complement or alternative to traditional classroom instruction, allowing nursing students to develop and refine critical thinking abilities necessary for delivering high-quality patient care. The interactive nature of virtual learning fosters engagement and problem-solving skills, better-preparing students for real-world clinical practice ([Wang, 2021](#)). Furthermore, the validity and practicality of the virtual learning model indicate its potential for widespread adoption and implementation in nursing education programs.

Beyond statistical significance, an analysis of product practicality response data from 52 participating students yielded a score of 83.02, surpassing the threshold for a "practical" rating according to established criteria. This result suggests that students perceive the virtual learning model as highly practical and suitable for real-world implementation. Additionally, a lecturer practicality assessment indicated an even higher score of 95.2, further validating the model's feasibility for implementation in nursing education settings. These positive assessments from both students and lecturers suggest that the virtual learning model can effectively enhance critical thinking and maternal nursing practice competencies

[\(Nair, 2020\)](#).

The study rigorously evaluated the validity of the virtual learning model, revealing a typical validity value of 0.82, well within the "valid" category. All 14 assessed items achieved scores of 0.75 or higher, strengthening the model's reliability as a tool to foster critical thinking in nursing education. The high validity scores demonstrate that the model was accurately designed and consistently implemented, ensuring its effectiveness in developing critical thinking skills among nursing students [\(Salvador et al., 2018\)](#). This level of validity is crucial for establishing the credibility and trustworthiness of the virtual learning approach, demonstrating that it is a reliable and evidence-based intervention for improving critical thinking skills in nursing education.

The data presented in Table 6 robustly supports the observed improvements in critical thinking skills. The average difference of 29.21 points between pre-test and post-test scores indicates substantial enhancement following the virtual learning intervention. The statistical significance of this difference, with a pre-test significance level of 0.01, further confirms the positive impact of the intervention on critical thinking skills among nursing students. This substantial increase in critical thinking scores suggests that the virtual learning model is highly effective in fostering this crucial nursing competency.

Although the study did not directly compare virtual learning to traditional classroom methods, the significant improvements observed suggest that virtual learning offers a promising alternative or supplement. Future research could conduct direct comparisons to evaluate the relative effectiveness of each approach, considering factors such as student engagement, content retention, skill development, and overall learning outcomes. Additionally, exploring potential collaboration between virtual and traditional learning modalities could maximise benefits for nursing students.

Our findings are consistent with existing literature on virtual learning in nursing education, strengthening the validity of our results. This study adds to the growing evidence supporting the effectiveness of innovative educational approaches, including distance learning, problem-based learning models, and video-based instruction ([Harley et al., 2023](#)). By providing comprehensive evidence of the positive impact of virtual learning on critical thinking and maternal nursing practice competencies, this study reinforces the potential of such interventions to enhance traditional classroom-based instruction.

The practicality and validity of the virtual learning model suggest that it can be readily integrated into nursing education programs. Institutions aiming to enhance their nursing curricula can adopt this model to provide transformative learning experiences that equip students with essential competencies for success in the nursing profession. This virtual learning model offers nursing programs a reliable and evidence-based tool for improving critical thinking and maternal nursing practice competency among students ([Park & Kim, 2020](#)). Incorporating this evidence-based virtual learning approach can help educators better prepare the next generation of nurses to navigate the complexities of healthcare and deliver exceptional patient-centered care ([Caputi & Kavanagh, 2018](#)).

Further research is crucial to understand the long-term impacts of virtual learning on critical thinking and maternal nursing practice competencies. Longitudinal studies should track the performance of nursing graduates who participated in virtual learning to determine if observed benefits persist post-graduation ([Avraham et al., 2023](#)). Additionally, examining how virtual learning influences graduates' approaches to lifelong learning and their contributions to nursing can reveal important implications ([Senyuva & Kaya, 2022](#)).

While the current findings are valuable, their generalizability may be limited due to the specific sample of nursing students. Future research should involve larger, diverse student populations from various nursing

programs to assess the virtual learning model's broader effectiveness. Another limitation is the reliance on self-reported data regarding the model's practicality and validity. Objective measures, like performance assessments of critical thinking and maternal nursing competencies, could enhance validation. Third-party evaluations from experienced educators could further bolster credibility.

Despite these limitations, the results of this study make a significant and valuable contribution to the field of nursing education. This study provides a strong foundation for the continued development and integration of innovative educational approaches within nursing curricula by demonstrating the effectiveness of virtual learning models in improving critical thinking skills and maternal nursing practice competency. These findings reinforce the potential of virtual learning interventions as effective complements or alternatives to traditional classroom-based instruction, better equipping the next generation of nurses with the necessary competencies to deliver high-quality, patient-centred care. This study's insights can guide nursing programs to leverage evidence-based virtual learning models to enhance their educational offerings and better prepare students for the challenges and complexities of the modern healthcare landscape.

In summary, this research supports the efficacy of virtual learning models in developing critical thinking and maternal nursing practice competencies. The findings contribute to the growing advocacy for innovative educational strategies in nursing and offer a framework for practical implementation. By adopting this evidence-based approach, nursing programs can better prepare students to navigate complex healthcare challenges and improve patient outcomes.

CONCLUSION

This study provides compelling evidence of the effectiveness of virtual learning models in enhancing critical thinking and maternal nursing

practice competency among nursing students. The significant improvement in critical thinking skills observed in the intervention group, as evidenced by the substantial pre-test to post-test score difference (29.21 points) and its statistical significance ($p < 0.01$), underscores the positive impact of this innovative educational approach.

Beyond statistical significance, the practicality and validity of the developed virtual learning model are rigorously evaluated and confirmed. Student and lecturer assessments consistently rated the model as highly practical, exceeding the established benchmarks for practicality in educational interventions. Furthermore, the model's validity was confirmed through a comprehensive analysis, with a typical validity (V) value of 0.82 and consistently high scores across all assessed items.

These findings significantly contribute to the growing body of research advocating the integration of virtual learning into nursing education. By using innovative teaching methods, nursing programs can better equip future nurses with the critical thinking skills and practice competencies necessary to navigate the complexities of modern healthcare and deliver high-quality patient care.

While this study focused on a specific sample of nursing students, the robust findings and rigorous evaluation of the practicality and validity of the virtual learning model suggest its potential for broader implementation in various nursing education settings. Future research with larger and more diverse student populations is encouraged to further validate these findings and explore the long-term impact of this virtual learning model on nursing practice.

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