

Empowering Nursing Education: Enhancing Critical Thinking with Large Language Model

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Background and Problem

In NUS nursing, the undergraduate curriculum is structured by annual scaffolding, but students tend to forget earlier content and fail to integrate knowledge across clinical contexts which impedes the development of critical thinking and clinical reasoning skills (Figure 1).

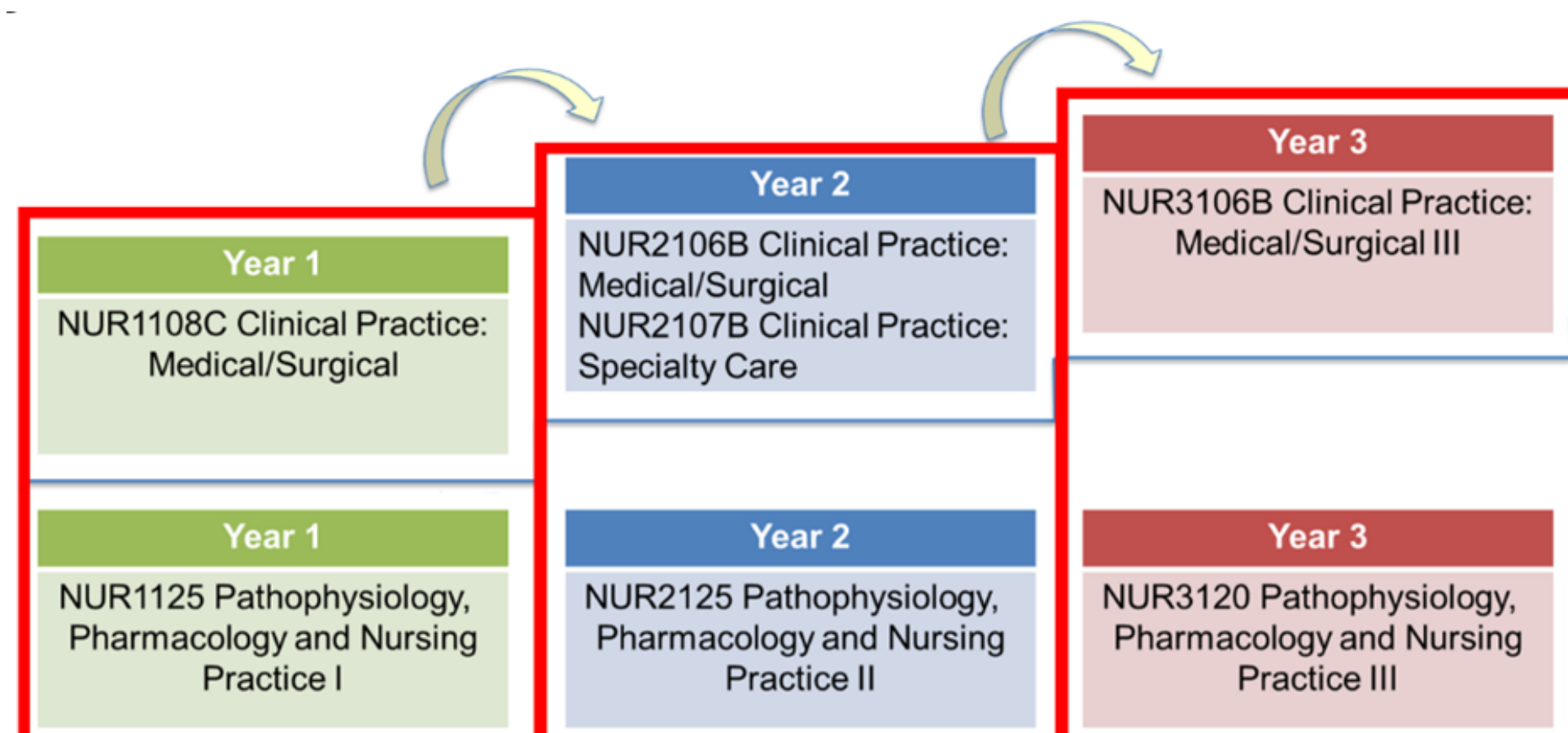


Figure 1 illustrates how nursing courses are structured and sequenced to build students' knowledge and competencies progressively throughout a three-year nursing program

Lacking strong critical thinking and clinical reasoning, nursing graduates are more likely to miss subtle patient changes, make poor judgments, and increase risks to patient safety and care quality. This deficiency heightens clinical errors, endangers patient safety, lowers care quality, and undermines nurses' confidence, development, career success, and healthcare standards.

With rising clinical and academic demands, over 94% of NUS nursing students use LLMs and GenAI tools for quick answers. While these tools provide accessible, personalized feedback, their convenience can discourage deep engagement and critical reflection. Therefore, fostering critical thinking and clinical reasoning in the curriculum is essential to prepare students for real-world practice.

To evaluate and advance an AI-enhanced Socratic platform that effectively strengthens critical thinking and clinical reasoning skills among undergraduate nursing students, while developing the platform for scalable integration across the nursing curriculum.

Development and Implementations

To enhance learning with generative AI, a large language model (LLM) platform was integrated into the nursing curriculum in 2024. This AI platform supports critical thinking and evidence-based decision-making by prompting students to assess complex situations and promoting a holistic understanding of nursing practice across disciplines. Using the Socratic method, it employs active questioning and engagement, encouraging analytical thinking beyond memorization. Students apply frameworks such as ADPIE and the Clinical Reasoning Cycle to real-world scenarios, deepening their clinical reasoning skills (Figure 2).

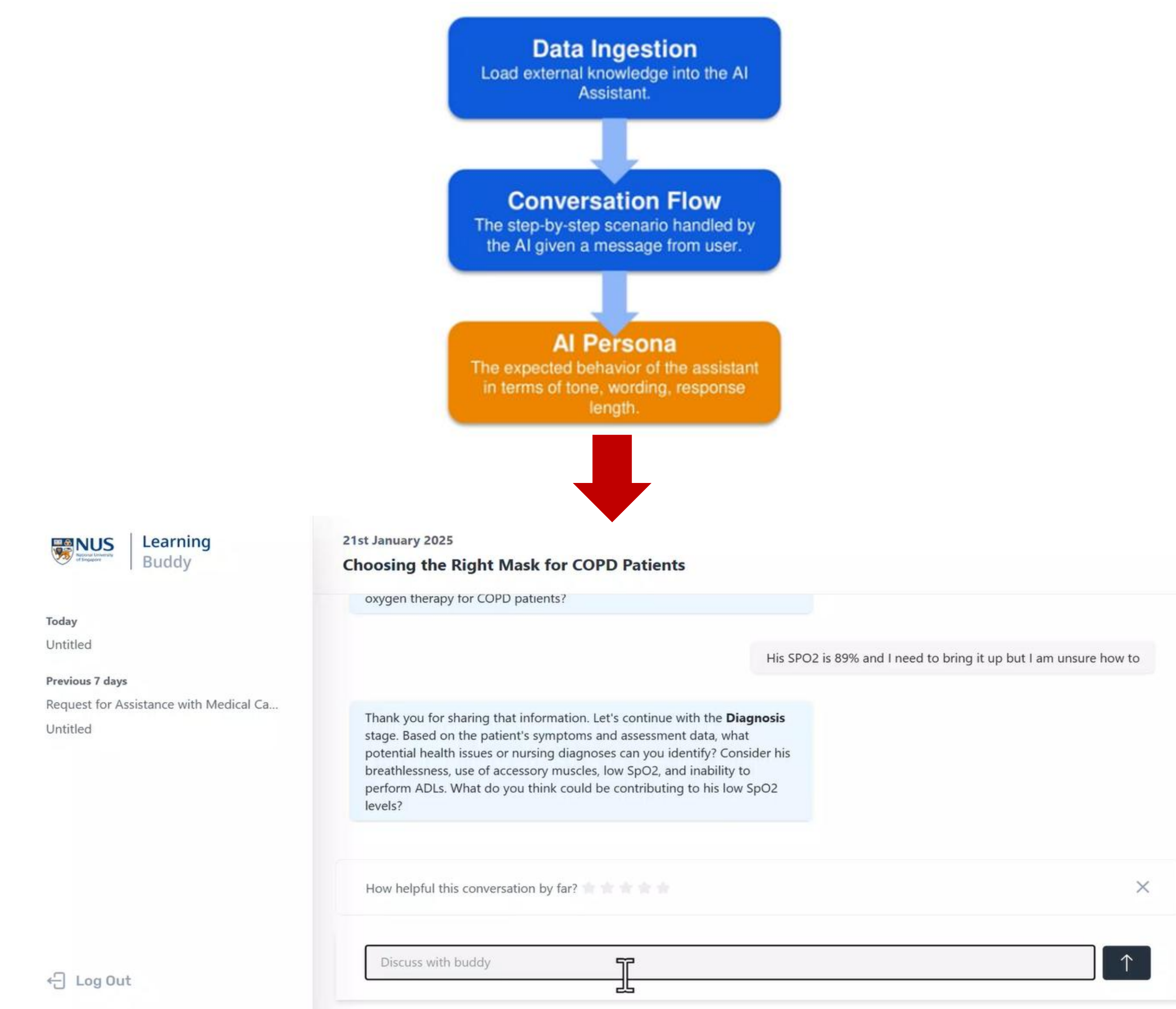


Figure 2 illustrates an AI-driven platform using LLM was integrated into the nursing curriculum to promote critical thinking and evidence-based decision-making through active questioning, real-world application, and nursing frameworks like ADPIE and the Clinical Reasoning Cycle

Training AI Learning Buddy to Simulate Socratic questioning

The platform uses prompts based on the Socratic method to guide students to reflect, analyze, and justify clinical decisions rather than just provide direct answers. The AI adapts its responses to student inputs, offering instant feedback and further questions to encourage deeper critical thinking and integration of knowledge.

Outcome

The NUS AI Learning Buddy has significantly enhanced nursing education by serving as an interactive, AI-driven platform that guides students through critical thinking and clinical reasoning. Used by 142 participants primarily to review disease processes, study case scenarios, and clarify clinical procedures, it acts as a virtual clinical tutor offering scenario-based, personalized learning, instant feedback, and adaptive support to individual needs. Students rated the platform highly for usability and feasibility, noting improvements in clinical reasoning, increased confidence, and better application of frameworks such as ADPIE (Table 1).

TABLE 1: Top 3 Highest Scoring Questions of Clinical Reasoning, Perceived Feasibility, System Usability and Intellectual Cognitive and Professional Values (N = 142)

	Top 3 Highest Scoring Questions	Mean Score (SD)
Clinical Reasoning	Interested in acquiring new information related to the field of work.	3.73 (0.89)
	Discover important problems base on the data.	3.72 (0.75)
	Look for answers to questions don't know on my own.	3.72 (0.82)
Perceived Feasibility	The NUS AI Learning Buddy helped me with using ADPIE to guide the thinking process.	3.85 (0.67)
	The contents from the NUS AI Learning Buddy is accurate and relevant to my learning.	3.82 (0.58)
System Usability	The NUS Learning Biddy is easily accessible.	3.80 (0.71)
	I think that I would like to use NUS AI Learning Buddy frequently.	4.20 (1.11)
	I would imagine that most people would learn to use the NUS AI Learning Buddy very quickly.	3.80 (0.88)
	I thought the NUS AI Learning Buddy tool was easy to use.	3.73 (0.84)

Challenges

Despite high adoption and perceived usefulness of AI tools like large language models among NUS nursing students, key problems persist. Students often exhibit diminished metacognitive awareness, metacognitive knowledge and risk superficial learning of AI-generated content. The following shares the challenges this project faced during implementation:

Initial Resistance to Change

Students were accustomed to quick, direct answers from conventional AI tools and initially resisted the guided, Socratic approach, finding it time-consuming compared to surface learning.

Technical and Usability Hurdles

While rated as easy to use, some students reported moderate complexity and occasional need for technical support, indicating areas for improving user experience.

Educator-Student Misalignment

Some educators were concerned about misinformation and the risk of deskilling, while students needed clearer guidance on effective integration of AI tools, leading at times to mistrust or confusion.

Contextual Constraints

The platform was used mainly as a supplementary aid, with varied integration into students' learning routines and limited formal curricular adoption.

Reflections

What makes this project - AI-powered Socratic Learning Buddy platform, innovative is its intentional, theory-driven design to leverage adaptive questioning, scenario-based prompts, and reflective exercises to foster deep engagement and higher-order thinking in nursing curriculum. Such innovative approach moves beyond simple answer retrieval to integrating with the critical thinking reasoning process and the nursing ADPIE framework. The platform also built on multiple educational frameworks, including cognitivism, metacognitive scaffolding, and structured feedback, informed by global best practices and evidence from the literature, ensuring it meets complex learning needs to enhance the development of essential critical thinking and clinical reasoning skills in nursing.

More essential, the AI Learning Buddy encouraged students to move beyond rote memorization by prompting reflection, analysis, and justification of clinical decisions. Students reported improvements in their ability to analyze clinical errors, consider alternative perspectives, and reflect on patient care plans.

Bridging Theory and Practice

Scenario-based, Socratic questioning helped students apply frameworks like ADPIE to real clinical situations, strengthening their ability to connect classroom knowledge to practice.

Personalized, Accessible Support

Students valued instant, personalized feedback and found the platform flexible for various needs—reviewing procedures, answering clinical queries, and supporting self-directed learning outside traditional settings.

Conclusion

In summary, this project stands out by weaving evidence-based AI, multi-theoretical pedagogy, and close clinical-industry collaboration into a scalable solution that aims to future-proof nursing education and produce graduates who are ready for complex, tech-enabled healthcare environments.



To learn more about the virtual reality (VR) journey at NUS Nursing, we invite you to also watch the video via this QR code which highlights how the school uses VR technology to train its nursing students.