

Construction of an Autonomous Learning Platform in Next-Generation Nursing Education: Algorithmization of the Wellness Nursing Process and a Multilayered Practicum Model for the DX Era

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Abstract

Background: In modern perinatal nursing clinical practice, students face two major obstacles. First, there is the “bloat of records,” where students spend a great deal of time documenting the vast amount of physiological data that is updated daily. With the traditional blank record format, the content of the writing depends on the individual student’s ability, resulting in inconsistent record quality and causing students’ attention to focus on the record sheet rather than the patient. Second, there is the “stagnation of integration of the clinical field,” where acute care in the hospital and community-based support are fragmented, making it difficult to cultivate a perspective of continuous support. **Objective:** The purpose of this study is to clarify the educational usefulness of an “autonomous learning platform.” This platform aims to transform clinical practice from a mere data transcription task into a time of “autonomous learning.” Here, students make professional judgments using their own abilities. This is achieved by clearly presenting the “information that instructors want students to acquire.” **Method:** The “Educational Design Research (EDR)” framework, using a qualitative self-reflective evaluation design based on professional knowledge, was applied to address problems in educational settings. As an intervention, we introduced a “clinical reasoning algorithm” designed to allow students to critically examine information using their own abilities by vertically integrating the curriculum from the second to third year, conducting a 10-day cyclical clinical rotation visiting hospitals, maternity clinics, and community settings, and organizing vast amounts of physiological data into steps requiring a “Yes/No” decision (where “Yes” indicates normal

or expected states). The usefulness of this platform was verified by the developer through a “self-reflective evaluation based on professional knowledge,” using a triangulation method that assessed three indicators: logical consistency with the university’s educational policies (DP/CP), student transformation based on the clinical rubric, and information integration ability. It should be noted that the presented model is a generalized “thinking pattern,” and ethical considerations were taken to avoid including information that identifies individuals or facilities. **Results:** The creators’ evaluation revealed the following achievements: The introduction of the algorithm eliminated the disparities in competence observed in traditional record-keeping methods, establishing a process in which students proactively conduct assessments while comprehensively capturing the “information to be acquired” as intended by instructors. This accelerated decision-making and dramatically reduced the burden of record-keeping, creating “cognitive surplus” that could be used for professional exchanges of opinions with instructors and for deep empathy and intervention with patients. Furthermore, students transformed into “autonomous learners” who autonomously recognized their own knowledge deficiencies and proactively conducted literature research. A shift in perspective from “patients” in the hospital to “individuals living in the community” was also observed, enabling the integration of information within the framework of post-discharge life and the logical proposal of concrete support plans. Moreover, the “internship contract” prior to the internship and the presentation of clear evaluation criteria laid the foundation for responsible, autonomous nursing professionals. **Discussion and Conclusion:** This platform freed students from administrative tasks and set a new educational standard that balances “empathy” and “logical thinking,” the essence of nursing. The logical framework developed in this study will be extremely effective as a “logical engine” for detecting student judgment errors and supporting autonomous learning in future nursing education utilizing AI and digital technologies and will serve as a transformative model for training the next generation of nursing professionals.

Keywords

Maternal Nursing Education, Autonomous Learning, Wellness Nursing Process, Clinical Reasoning Algorithm, Digital Transformation (DX)

1. Introduction

In recent years, students engaged in perinatal nursing clinical practice have been confronted with two formidable obstacles. The first is the “hypertrophy and complexity of documentation.” Students expend an inordinate amount of time documenting the vast physiological data of mothers and neonates, which is updated on a daily basis. Consequently, students’ attention tends to become fixed on the record sheets, shifting away from the actual subjects of care. This immersion in “documentation as labor” serves as a critical factor that deprives students of the essen-

tial objectives of clinical practice: achieving deep empathy for the subjects and experiencing the intellectual joy of clinical reasoning. The second obstacle is the difficulty of integration across diverse clinical fields. Although the curriculum encompasses both the “hospital,” where advanced medical interventions occur, and the “community,” which represents the environment of life after discharge, it is not an easy task for students to recontextualize hospital-based care within the framework of community life. This challenge remains a significant barrier to fostering a perspective of continuous, seamless support.

These trends are fundamentally inconsistent with the acquisition objectives for “core nursing practice competencies in undergraduate programs” as advocated by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) [1]. They also conflict with the “Code of Ethics for Nurses” established by the Japanese Nursing Association [2], and the ethical regulations of the International Council of Nurses (ICN) [3] [4]. Furthermore, these issues constitute major obstructive factors in realizing the “comprehensive judgment” and “autonomous learning abilities” articulated in the university’s Diploma Policy (DP), as well as the “organic linkage between theory and practice” targeted by the Curriculum Policy (CP) [5]. To embody the university’s educational philosophy within clinical settings, a paradigm shift is urgently required: moving away from the conventional “documentation-driven practice” toward a model that actively cultivates professional judgment and empathy.

Purpose of the Study:

The purpose of this study is to clarify the utility of an “Autonomous Learning Platform.” This platform uses an integrated practicum model built on the “Algorithmization of the Wellness Nursing Process” and the “Seamless Coordination of Multilayered Fields,” including hospitals, midwifery centers, and communities. It was developed in accordance with this university’s Diploma and Curriculum Policies. This study focuses on how the platform frees students from clerical documentation and supports their transformation into autonomous professionals. It also examines how the platform helps achieve holistic maternal and child support.

2. Methods (Implementation and Intervention of the Educational Curriculum)

2.1. Philosophical Alignment with Institutional Policies

The pedagogical model in this study was carefully designed to match the Diploma Policy (DP) and the Curriculum Policy (CP) of the Faculty of Nursing at this university. These core principles were put into practice in clinical settings. To achieve the “comprehensive judgment skills” described in the university’s DP and the “organic linkage between exercises and clinical practice” intended by the CP, students need a structural tool. This tool helps maintain logical thinking without being overwhelmed by excessive physiological data.

We aimed for students to achieve “evidence-based judgment and assessment-based nursing practice skills”—a main learning objective in the university’s cur-

riculum map and a requirement of the Ministry of Education, Culture, Sports, Science and Technology (MEXT) [1]. To support this, we developed a unique clinical algorithm as part of an original learning platform. **Table 1** shows how the university's institutional policies align logically with this educational model.

The Clinical Practice Guidelines for the Faculty of Nursing, edited by the author [6], consolidate the learning objectives and educational content for this platform. These guidelines provide a consistent instructional framework from on-campus exercises to clinical practice. **Table 2** summarizes the practicum objectives, learning goals across five domains, and curriculum details.

Table 1. Logical alignment of university educational policies (DP/CP/AP) and this educational model.

Hierarchy (Academic Standards)	Institutional Policy Essence (University's Definition)	Practical Implementation in This Study (Operational Methodology)
DP (Learning Outcomes)	Acquisition of comprehensive judgment and problem-solving skills based on specialized knowledge and techniques.	Implementation of Horizontal and Conclusion-First Algorithms to structure and accelerate clinical reasoning processes (see Appendix A).
CP Curriculum Organization	Organic linkage between lectures, exercises, and clinical practice. Deepening of experience through "Practical Nursing Exercises" before and after the practicum.	Strategic integration through "Nursing Practice Exercise III," featuring case studies and the formalization of Clinical Contracts to bridge theory and practice.
CP (Implementation Strategy)	Practicums designed with awareness of "Life-stages" and "Places." Enhancement of evaluation for both pre- and post-practicum learning.	Development of a Seamless Rotating Practicum (Hospital → Midwifery Center → Community). Completion of self-evaluation via Four-quadrant Rubrics (Appendix B) and information integration via Holistic Wellness Concept Maps (Appendix C).
AP (Desired Student Profile)	Individuals who strive to perceive matters calmly and logically. Those capable of understanding the dignity of human life.	Scaffolding logical thinking through structured recording formats with marginal comments. Embodying ethical attitudes through the formal signing of Clinical Practice Informed Consent.
Curriculum Map/Tree	Enhancing nursing practice skills based on assessment.	Explicit definition of assessment indicators connecting Clinical Evidence (Left) to Nursing Diagnosis (Right).

Notes: Source: Seitoku University Student Handbook 2025: The Three Policies (DP/CP/AP). Seitoku University, pp. 1-250, Published in 2024 [5]. DP (Diploma Policy): Graduation Certification and Degree Awarding Policy. CP (Curriculum Policy): Curriculum Formulation and Implementation Policy. AP (Admission Policy): Admission and Student Acceptance Policy. Curriculum Map/Curriculum Tree: Visual representations of the structured learning path and competency progression within the undergraduate program.

Table 2. Structure of practicum objectives, goals, and educational content.

Practicum Goals (Full Text)	Educational Content (Key Concepts and Keywords)
1) Professionalism and Ethical Attitude Understanding ethical attitudes and professional responsibilities, with the ability to implement them in practice.	Privacy protection, confidentiality, Reproductive Health and Rights, compliance with rights, rules, safety management, and infection control; self-health management.
2) Collaboration and Leadership Ability to collaborate with coordination as a member of a multidisciplinary team and exercise leadership.	Appropriate reporting, contacting, and consulting (Hou-Ren-Sou); information sharing; understanding the roles and functions of multidisciplinary teams (from Hospital to Child-rearing stage); participation in constructive discussions.
3) Nursing Practice Competency Implementing individualized nursing care based on specialized knowledge of maternal nursing.	Information gathering, assessment, Wellness Diagnosis (physiological changes, pathophysiology, signs); nursing care planning (evidence-based, community resources); implementation of care; providing individualized support to perinatal families.
4) Self-Directed Learning and Problem-Solving Deepening self-learning and enhancing the ability to solve clinical challenges.	Reflective practice (ethical dilemmas); proactive literature review and its application; clinical research methodology; practicum preparation and environmental adjustment.
5) Communication Skills Facilitating effective communication with subjects, families, and multidisciplinary professionals to contribute to collaboration.	Active listening and empathy; establishing trust (individualized consideration); accurate information provision; Informed Consent; collaboration with multidisciplinary teams and community facility staff.

Note: The practicum goals and curriculum structure are based on the *Clinical Practice Guidelines for Maternal and Pediatric Nursing* edited by the author [6].

2.2. Specific Intervention Steps

This model was designed for clinical implementation via a structured, hierarchical approach. **Table 3** shows the timeline and specific educational interventions. Details for each step are provided below.

2.2.1. Vertical Integration of the Curriculum (Years 2 to 3)

A consistent 6-credit educational program was established to transition 2 credits

of clinical practice into applied professional knowledge (**6 credits in total; in the Japanese university education system, 1 credit corresponds to approximately 45 hours of student workload, encompassing classroom lectures, self-study, and practical training**). The program starts in Year 2 with theoretical foundations in “General Principles.” In Year 3, it adds wellness nursing process exercises in “Methodology” (see **Table 3**). During these exercises, students develop a case study (e.g., Postpartum Day 3) using the same recording formats found in clinical practice. They gather information, perform assessments, make nursing diagnoses, create interrelationship diagrams (concept mapping), and plan health guidance. This method helps students master the platform’s logical structure and documentation before the practicum. As a result, they can immediately focus on subject assessment in the clinical setting rather than on recording procedures.

Table 3. Curriculum integration structure for maternal nursing (6 Units Total).

Academic Year/Period	Course Title	Key Learning Contents and Functions
Year 2/Spring	Introduction to Maternal Nursing	Concepts of Bioethics, Maternal Development, and Reproductive Health/Rights
Year 3/Spring	Maternal Nursing Methodology	Exercises in the Wellness Nursing Process (Postpartum model cases). Acquisition of specialized knowledge/skills and mastery of Interrelationship Diagram techniques for individual cases.
Year 3/Autumn	Nursing Practice Exercise III	Pre-practicum Prep-session (4 sessions, 360 min total). Conclusion of the “Practicum Contract” and orientation for clinical entry.
Year 3/Autumn	Developmental Nursing Practicum	Integration of knowledge through a 10-day Cyclical Practicum. Case-specific interrelationship diagram development during the final conference (Day 3 of hospital practice). Transformation into practical wisdom across multi-layered fields (Hospitals, Midwifery Clinics, and Communities).

Note: This curriculum, implemented for about 80 students annually, featured a 2-week clinical rotation (comprising 10 clinical days) from late September to December. Each student was supported by three faculty members, focusing on hands-on experience, skill development, and collaboration. The practicum goals and curriculum structure are based on the *Clinical Practice Guidelines for Maternal and Pediatric Nursing* edited by the author [6].

2.2.2. Transition to Practitioner (Nursing Practice Exercise III)

The four sessions (totaling 360 minutes) immediately preceding clinical practice were positioned as the “Pre-practicum Prep-session.” These sessions were designed to deepen students’ understanding of practicum objectives and evaluation criteria (rubrics). The curriculum was grounded in the Clinical Practice Guidelines [6] and the Code of Ethics for Nurses by the Japanese Nursing Association [2]. During this phase, students formalize their commitment by signing clinical practice contracts and consent forms. These sessions serve as ceremonial steps to finalize students’ psychological readiness and to transition them into their professional roles.

2.2.3. Multi-Layered Clinical Practice (Horizontal Integration)

A 10-day cyclical clinical practice model was used to ensure integration across different settings. The rotation includes Hospital (3 days), Midwifery Clinic (1 day), Community (3 days), and On campus (3 days) (see **Table 4**). In the hospital setting, students provide acute care in the obstetrics ward and observe outpatient departments. This gives them experience from pregnancy through the postpartum period.

Furthermore, a Partnership Nursing System (PNS) was adopted, in which two students jointly provide care for a mother and child. This collaborative approach promotes mutual learning and enhances clinical reasoning. This design aligns with contemporary trends in midwifery education programs [7] and evolving clinical needs [8].

Table 4. Schedule and learning objectives (Endpoints) of the cyclical practicum across multi-layered fields.

Practicum Setting	Duration	Focus of Learning (Endpoint)
Hospital (Acute Care)	3 Days	Safety management under advanced medical care and judgment of physiological adaptation.
Midwifery Clinic & Community Support Facilities	4 Days	Understanding the mother and child as community members (living their lives) and the utilization of community resources.
On campus (Integration)	3 Days	Improvement of metacognition through conferences and self-assessment rubrics.

Note: This curriculum, implemented for about 80 students annually, featured a 2-week clinical rotation (comprising 10 clinical days) from late September to December. Each student was supported by three faculty members, focusing on hands-on experience, skill development, and collaboration. Clinical and community settings included four acute care hospitals, two midwifery clinics, and various community-based support environments, such as a social welfare child-rearing plaza, a specialized maternity salon, a community cafe, and a parent-child swimming program. On-campus sessions took place on the final day of Week 1 and the last two days of Week 2.

2.2.4. Algorithmization of Clinical Reasoning in Nursing Documentation

To make recording easier, we used a conclusion-first, horizontal layout. Clinical evidence (data and observations) is on the left. The nursing diagnosis (professional judgment) is on the right. Assessment indicators, including symptom checklists and risk factors, are beneath the diagnosis. This setup makes the evaluative criteria clear (see **Table 5**).

A logic-based Yes/No tool automates clinical reasoning and reduces cognitive load for novice students (see Appendix A). The platform uses an ordered data structure—meaning information is collected in a predefined sequence set by instructors, rather than as blank, unstructured entries. Students then mark clinical facts as either “None” or “Present,” and as either “Normal” or “Abnormal” within this order. This structured entry method is called Binary Validation, where each

piece of information is checked as Yes/No. This leads directly to a formal binary (Yes/No) nursing diagnosis based on the wellness framework [9]. By standardizing entries, the platform helps students avoid missing key clinical indicators (see **Table 5** and Appendix A). The student performance and mastery of these clinical reasoning steps are evaluated using the standardized rubrics (see Appendix B).

Table 5. Thinking process example of the “horizontal, conclusion-first algorithm” (designed for clinical safety).

(1) Data Collection (Facts)	(2) Nursing Diagnosis (Conclusion)	(3) Assessment Items (Basis of Reasoning)
☐ Fundal height (Fingerbreadths above/below umbilicus) ☐ Consistency (Hard/Medium/Soft) ☐ Lochia (Color, Amount: Scant/Moderate/Heavy) ☐ Afterpains/Episiotomy pain (No/Yes)	Post-Cesarean Section: #Satisfactory recovery of reproductive organs (Yes/No)	☐ Uterine involution is progressing smoothly (Yes/No) ☐ Willingness to engage in behaviors promoting recovery (Yes/No)
*Specific annotations are provided in the margins of the records to clarify clinical indicators.	*Binary judgment (Yes/No).	*Assessment items are placed directly below the nursing diagnosis.

Methodological Note: These items are taken from the “Wellness Nursing Process” (Ota, 2021) [9] and restructured to support clinical reasoning by organizing data and using simple “None” or “Present” checks. In this system, “Yes” means the typical or expected state, and “No” shows something different that needs attention. For safety, the normal state is always listed on the left.

2.3. Research Design and Evaluation Strategy

2.3.1. Research Type (Design)

This research applies the framework of “Educational Design Research (EDR)” to the design and implementation of an autonomous learning platform as a foundation for next-generation nursing education. This approach develops an “educational system (blueprint)” aimed at solving practical problems in clinical settings and demonstrates its logical utility, rather than investigating specific individual students.

2.3.2. Evaluation Methods

The author, as the developer, confirmed the platform’s usefulness using “Expert-based Self-Reflective Evaluation.” To improve objectivity, I compared three indicators across multiple perspectives to enhance triangulation:

- The algorithm for this model (Appendix A) aligns logically with both the university’s Graduation Certification and Diploma Policy (DP, which outlines the academic requirements for graduation) and the Curriculum Policy (CP, which defines the structure and content of academic programs), as detailed in **Table 1**.
- In my leadership role, I observed a shift in students’ learning, as they moved from following instructions to becoming autonomous learners. This change was measured by their achievement in the platform’s rubrics, which are scoring guides that evaluate specific skills or criteria (Appendix B).
- I used interrelationship diagrams (**Figure A1** in Appendix C) to judge if stu-

dents logically integrated complex clinical data into a “life story.” This judgment used the qualitative standard of final outputs.

2.4. Technical Presentation and Reproducibility

The algorithms (see Appendix A) are step-by-step problem-solving procedures, while the interrelationship diagrams (see Appendix C) are visual representations that show how different elements are connected. In this paper, they are presented as “illustrative examples” of the platform’s logical structure. Rather than representing real-world data from specific individuals, they reflect “ideal thinking patterns” abstracted from curriculum insights. As such, these presentations contain no information that can identify individuals or institutions.

By publishing detailed step-by-step operational procedures (**Table 3**) and clearly defined evaluation criteria (Appendix B), this approach ensures reproducibility for other institutions.

2.5. Ethical Considerations

This paper presents a generalized educational platform and conceptual thinking patterns developed through the curriculum without involving human subject interventions or collecting identifiable personal data. Accordingly, formal Institutional Review Board (IRB) approval was not applicable. The clinical practice guidelines, curriculum formats, and operational procedures utilized in this platform were formally approved through university governance and conducted in accordance with official practice agreements established between the university and participating clinical facilities. All instructional logs and reflective evaluation tools applied in system design respect confidentiality and privacy standards. All figures and model cases included in this paper are stylized illustrative examples and contain no information that can identify specific individuals or facilities.

3. Results (DP/CP Achievement and Student Transformation)

The operation of this model resulted in the following four transformations in relation to the educational objectives set forth in the university’s Diploma Policy (DP) and Curriculum Policy (CP).

3.1. Standardization of Reasoning and Collaboration within Groups

The introduction of a common “horizontal, conclusion-first algorithm” (Appendix A) and practical experience in pre-training (maternal nursing methodology) dramatically accelerated students’ reasoning speed in clinical settings. Specifically, the algorithm clarified the information to be collected, enabling students to proactively teach each other and supplement information, allowing everyone to complete recording without delay. The surplus time created by the reduction in recording time was used to develop early relationship diagrams based on the orga-

nized information. This enabled more specialized and high-quality exchanges of opinions with instructors and multidisciplinary teams on “how to improve maternal and child wellness.”

3.2. Deepening Autonomous Learning through Mid-Term Evaluation and Response

The instructors’ reflection and immediate feedback during the mid-term evaluation strongly stimulated students’ inquisitiveness. Through reflection, including ethical considerations, conducted midway through the practical training, students became objectively aware of their own knowledge deficiencies [10]. In response to the instructor’s advice, students spontaneously conducted literature research and repeatedly reaffirmed their skills at the university, demonstrating the development of their “ability to continue learning independently.”

3.3. Transformation of Roles and Deepening of Empathy: Understanding Diverse Settings and Life Stages

Due to reduced record-keeping burden and effective cyclical training with hospitals and community settings (like community cafes), students’ perspectives shifted from seeing people as “patients” to viewing them as “community members.” By engaging in dialogue with mothers and children, students understood the link between hospital care and community life, which sharpened their assessment skills. Presenting individual wellness diagrams (**Figure A1** in Appendix C) on the final day showed how acute-phase physiological data connect with life after discharge. All groups made discharge decisions suited to the mother’s and child’s needs, proposed proactive interventions (such as brochures), and used community resources (postpartum care, home visits, etc.). This showed that student assessments shifted from disease management to improving quality of life (QOL).

3.4. Completion of Professional Awareness through Rubric Self-Assessment

The ceremonial step of the “practical training contract” in the pre-training exercise (Nursing Practice Exercise III) and the prior presentation of evaluation indicators (rubric) (Appendix B) strongly fostered a sense of responsibility among students as nursing professionals. After signing the contract, students became aware of their roles as “responsible practitioners.” They remained committed to continuous self-correction without compromise until the final day of practical training. Ultimately, students assessed their achievements using an objective rubric and completed the training as “autonomous learners,” as required by our university’s DP program.

4. Discussion (Educational Philosophy to Communicate to the World)

The autonomous learning platform constructed in this study structured students’ thinking—which had previously been bogged down in documenting vast amounts

of data—into “judgment of the presence or absence of information (Appendix A),” significantly reducing recording time. This surplus time was dedicated to empathy with the subjects and metacognition (Appendix B), and the wellness relationship diagram (Appendix C), developed on the final day of hospital clinical practice, integrated acute care data and predictions of community life after discharge into a single line. As a result, an improvement in autonomous nursing practice ability that grasps “mothers and children as individuals living their lives” across multi-layered fields was observed.

4.1. “Humanity” Opened up by “Structuring (Algorithm)”

Ironically, systematizing thinking gave students freedom to empathize deeply with mothers and children. This structured approach maximized compassion in nursing education. Practicing the wellness nursing process in a step-by-step way allowed students to apply it smoothly during hospital practice. Using objective tools, such as the APGAR Score, in neonatal assessment [11] helped standardize judgments. It also made it easier for students to respond empathetically to complex situations, such as mismatches between expectations and realities in painless childbirth [12].

The relationship diagram presented on the third day of hospital practice does more than simply combine information. It also helps students assess whether a patient is ready for discharge by evaluating physiological adaptation. Even if students do not finish their hospital instruction due to time limits, their plans are shared with the next phase, such as the midwifery clinic or community clinical staff. Students then receive feedback from clinical instructors. This process helps students connect what they learn across multiple settings into a single system for supporting mothers and children.

4.2. Social Implementation and Standardization of Theory: A “Circulation of Knowledge” beyond Fields

The transformation of Ota’s wellness theory [9] into an algorithm usable by anyone (Appendix A) has significance as a social implementation that eliminates the personal nature of education and standardizes its quality. What is particularly noteworthy is that this structured thought process functioned as a common language that transcended the “field barriers” between university and clinical practice, or between hospitals and the community.

Even if instruction was not completed in a case assigned at the hospital, students were able to present their instruction plans to the next stage, the midwifery clinic or community clinical staff (clinical instructors), and receive expert feedback. This “seamless clinical supervision” created a “cycle of knowledge” that connected acute hospital assessments to community-based support for daily living. This aligns with the acquisition objectives for core nursing practice skills in undergraduate programs [1], as advocated by the Ministry of Education, Culture, Sports, Science and Technology, and offers one solution to recent trends in midwifery

education programs [7].

4.3. The Logical Engine of DX/AI Education: Digital Transformation of Nursing Decision-Making

The logical structure presented by this platform (Appendix A, B, C) is not merely an analog educational tool but also holds the potential to serve as a “logical engine” for future AI-powered learning support and clinical reasoning assistance. Currently, the use of AI in nursing education is being explored, but the biggest challenge is “data-generating the ambiguous thought processes of nurses.”

The algorithm based on “the presence or absence of information” developed in this research, and the wellness-related diagram that integrates them, structures nursing decisions as an objective dataset. This structured thinking model can potentially serve as the foundation for future prompt engineering, such as generative AI and alert systems that automatically detect student judgment errors. Automating evaluation and reasoning based on objective indicators not only reduces the burden on instructors but also has the potential to improve the quality of nursing education worldwide through digital technology. This educational model can be said to present a pioneering “logical model” for this purpose.

4.4. Limitations of the Study and Future Challenges

This report covers one cycle of maternal nursing clinical practice at a single university and has certain limitations:

Firstly, the sample size is limited, and the results are from a single educational institution. Therefore, the general applicability of this platform requires further verification against national educational standards and the current status of other universities [1] [13]. Moreover, aligning community-based frameworks with national postpartum care guidelines [14] will be important for broader implementation.

Next, the results depend on students’ self-ratings and teachers’ reviews. Feedback from clinic staff, patients, or families has not yet been included.

Future challenges include the need for follow-up studies on the long-term impact of introducing this platform on post-graduation clinical practice abilities and career development as midwives and public health nurses. Furthermore, from a digital transformation (DX) perspective, empirical research exploring the feasibility of implementing the logical structures in Appendices A-C as a learning support system is anticipated.

In future iterations of this educational model, expanding the evaluation rubric to include indicators such as professionalism, ethical attitude, and speed of clinical judgment will be essential to further quantify the transformative impact of this binary reasoning algorithm.

5. Conclusions

This study addressed long-standing challenges in maternal nursing clinical train-

ing. The main issues were excessive record-keeping—defined as repetitive, unnecessary paperwork—and fragmented clinical practice fields, where coordination among educators and healthcare sites was often lacking. To resolve these issues, an autonomous, self-directed learning platform was developed. This platform is based on clearly defined, algorithm-based, step-by-step wellness nursing procedures. These procedures are systematic guides that describe and standardize each nursing care action.

The introduction of this platform enabled students to develop rigorous logical thinking. Decisions were based on binary judgments [9], meaning students made choices using only Yes/No answers—a binary system in which responses were either affirmation (Yes) or negation (No), with no partial or ambiguous options. This structured approach freed students from bureaucratic record-keeping. As a result, they had the cognitive surplus needed to foster deeper empathy and enhance metacognition. By using self-assessment rubrics (Appendix B), students evaluated their own thinking. This helped them lay the foundation for becoming autonomous professionals, as advocated by the university's diploma policy [5].

The wellness-oriented diagram (Appendix C) shows how health is interconnected throughout the care process. “Seamless on-site guidance” refers to hands-on support and direction provided directly in clinical or community settings. In hospitals, midwifery clinics, and community settings, students gained a unified perspective. This perspective bridges advanced medical care and community life. The approach combined diverse experiences into a single concept: “maternal and child wellness.” The structured logic engine is a framework for making step-by-step, evidence-based decisions, offering a clear, systematic foundation for clinical decisions. This system surpasses a simple analog tool, meaning a manual, non-digital method of support. It is positioned to support nursing decision-making in next-generation DX (digital transformation, or integrating digital technology into all areas of education and nursing practice) and AI (artificial intelligence, or the simulation of human intelligence by computers) education [8].

In conclusion, this platform not only reduces cognitive load and maximizes key human interactions but also sets a transformative new benchmark for nursing education. Equipping students to lead, innovate, and shape the future of healthcare, it empowers the next generation of nursing professionals to excel in an ever-evolving environment.

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Author Contributions

Yuko Harding is the sole author of this manuscript and was fully responsible for the conceptualization, educational design, data collection, analytical evaluation,

writing, and final revision of the entire study.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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Appendix

Appendix A: Structural Clinical Reasoning Sheets

Methodological Note: The following assessment items and diagnostic statements are adapted and restructured by the author from the “Wellness Nursing Process” (Ota, 2021) [9] to facilitate clinical reasoning for students through a binary (Yes/No) decision-making algorithm.

Each sheet is structured into three layers: Domain (Sub-heading), Wellness Diagnosis (#), and Assessment Indicators (•).

I. Prenatal Period

1) Maternal Condition

#1 Maternal condition is smooth according to gestational weeks (Yes/No)

- Physical changes are appropriate for the gestational weeks (Yes/No)
- Signs of preterm labor: (None/Present)
- Risk factors affecting the course: (None/Present)
- Self-care actions in response to physical changes are being taken (Yes/No)

2) Status of Fetus and Adnexa

#2 Status of the fetal adnexa is favorable; fetal growth is smooth and healthy (Yes/No)

- Fetal position and presentation are normal (Yes/No)
- Fetal growth is progressing smoothly according to gestational weeks (Yes/No)
- Fetal health status is favorable (Yes/No)
- Status of the fetal adnexa (placenta, amniotic fluid, etc.) is favorable (Yes/No)

3) Psychological and Adaptation Process

#3 Maternal psychological state is stable; beginning to adapt to the maternal role (Yes/No)

- Psychological state is stable (Yes/No)
- Maternal role transition has begun (Yes/No)
- Factors hindering the psychological adaptation process: (None/Present)
- In cases of abnormal pregnancy: Accepting the situation calmly (Yes/No)

4) Family and Adaptation Process

#4 Proceeding with role adjustments to welcome the new family member (Yes/No)

- Spousal and family relationships are favorable (Yes/No)
- The husband is considering pregnancy, birth, and childcare, and beginning to adapt to the father's role (Yes /No)
- Both sets of grandparents accept the pregnancy and the birth of the child (Yes/No)
- Family support is available (Yes/No)

5) Living and Social Environment

#5 Living and social environment are prepared for pregnancy, birth, and childcare (Yes/No)

- The living environment is suitable for the prenatal period (Yes/No)

- Necessary social resources and various systems are being utilized (Yes/No)
- Barriers to employment or community connections: (None/Present)

II. Labor and Delivery Period

1) Progress of Labor

#1 Labor progress is appropriate for the current stage (or each stage after delivery) (Yes/No)

- Abnormalities in the progress of labor (None/Present)
- Maternal and fetal conditions allow for expected labor progress (Yes/No)

2) Maternal Condition

#2 Maternal condition is smooth according to labor progress (Yes/No)

- Abnormalities in vital signs (BP, Pulse, Temp) are present (No/Yes)
- Physical exhaustion or pain exceeds manageable levels (No/Yes)
- Bladder or bowel functions are obstructed (No/Yes)

3) Status of Fetal (Newborn) and Adnexa

#3 Fetal and adnexal status demonstrate sufficient tolerance to labor stress (Yes/No)

- Fetal health status is favorable (Yes/No)
- Status of the fetal adnexa is favorable (Yes/No)

4) Psychological and Adaptation Process

#4 Psychological adaptation to birth is proceeding (Yes/No)

- Acceptance of labor progress and psychological stability (Yes/No)
- Active and subjective engagement in the birth process (Yes/No)
- Birth status leads to a sense of satisfaction (Yes/No)
- Presence of support facilitating the psychological adaptation process (Yes/No)

5) Family and Adaptation Process

#5 Family adaptation to birth is favorable (Yes/No)

- Spousal and family relationships are favorable (Yes/No)
- Family members are eagerly awaiting the birth of the child (Yes/No)

6) Living and Social Environment

#6 Living and social environment are favorable (Yes/No)

- Environment ensures safety and comfort for the mother and family (Yes/No)
- Stable economic and social status (Yes/No)

III. Postpartum Period (Retrogressive Changes)

1-a) Retrogressive Changes (Vaginal Delivery)

#1-V Capacity for actions to reduce risks hindering retrogressive changes (Yes/No)

- Involution of reproductive organs is smooth for postpartum days (Yes/No)
- Systemic recovery is progressing smoothly (Yes/No)
- Capacity for elimination behaviors to promote retrogressive changes (Yes/No)
- Factors hindering retrogressive changes (infection, etc.) are absent (Yes/No)

1-b) Retrogressive Changes (Cesarean Section)

#1-C Involution of reproductive organs is smooth (Yes/No)

- Uterine involution status is progressing smoothly (Yes/No)
- Motivation for actions to promote uterine involution is present (Yes/No)
- #2-C Post-operative systemic recovery is smooth (Yes/No)
- Smooth recovery from anesthesia and absence of complications (Yes/No)
- Fluid and electrolyte balance is in an adaptive state (Yes/No)
- Smooth expansion of mobilization is achieved (Yes/No)
- 2) Psychological and Adaptation Process
- #2 Adaptation process as a mother is smooth (Yes/No)
- Positive acceptance of the birth and stable psychological state (Yes/No)
- Motivation for childcare and appropriate expression of anxiety (Yes/No)
- Environment allows for acquiring necessary knowledge/skills (Yes/No)
- Impact of post-discharge life on maternal role transition is managed (Yes/No)
- 3) Family and Adaptation Process
- #3 Family and father's adaptation process is smooth (Yes/No)
- Father's/Family's acceptance of the newborn is smooth (Yes/No)
- Family role adjustments and support systems are prepared (Yes/No)
- Capacity to consider future family planning (Yes/No)
- 4) Living and Social Environment
- #4 Beginning to prepare the childcare environment after discharge (Yes/No)
- Predictability of life matched with physical recovery (Yes/No)
- Post-discharge environment is suitable for childcare and support services (Yes/No)

IV. Postpartum & Newborn (Progressive Changes)

Methodological Note:

To ensure the distinction between maternal recovery and neonatal development, the author assigned specific prefixes to the Wellness Diagnoses: “#P” (Progressive Changes for Mother) and “#N” (Health Status and Development for Newborn).

[Maternal Domain: Progressive Changes]

#P1 Knowledge and skills for breastfeeding are being acquired (Yes/No)

- Breasts in a physical form suitable for breastfeeding (Yes/No)
- Breasts in a condition that allows for continued breastfeeding (Yes/No)
- Motivation and desire for breastfeeding present (Yes/No)
- Lactation status progressing appropriately according to postpartum days (Yes/No)
- Infant vigor observed and direct breastfeeding initiated (Yes/No)
- Past experiences, current frequency of breastfeeding, and breastfeeding environment effectively promoting progressive changes (Yes/No)
- Active efforts being made to acquire necessary knowledge and techniques (Yes/No)

[Neonatal Domain: Newborn Status and Development]

1) Newborn Health Status

#N1 Adaptation to extrauterine life is smooth (Yes/No)

- The start of the adaptation process to extrauterine life is smooth (Yes/No)
- Physiological changes remain within normal limits (Yes/No)

- Abnormal breathing: (None/Present)
 - Vomiting or nausea: (None/Present)
 - Abnormalities in head/fontanelle: (None/Present)
 - Skin rash or jaundice: (None/Present)
- 2) Growth and Development
- #N2 Intrauterine development was favorable (Yes/No)
- Physical development and CNS status are appropriate for gestational age (Yes/No)
 - Factors hindering growth and development are absent (Yes/No)
- 3) Nutrition and Care
- #N3 Receiving nutrition and care that promote growth and development (Yes/No)
- Necessary nutrition is being consumed and appropriate care is received (Yes/No)
- 4) Family Adaptation Process
- #N4 The newborn is accepted as a member of the family (Yes/No)
- Mother/Father-infant relationships are forming smoothly with healthy interaction (Yes/No)
 - Family accepts the changes in roles and relationships (Yes/No)
- 5) Living Environment
- #N5 The living environment promotes growth and development (Yes/No)
- In-hospital and post-discharge environments are appropriate and prepared (Yes/No)

Appendix B. Clinical Practice Evaluation Rubric (Detailed 20-Item Version)

[Scoring Methods and Criteria]

Self-Evaluation and Instructor Evaluation: Each item is scored as Attained = 1 point or Not Attained = 0 points.

Evaluation Scale: The final assessment is completed by providing Evidence (Reflections and specific examples) based on a Four-Quadrant Descriptor (Levels 1 - 4).

Domains	No.	Item Name	Evaluation Criteria and Evidence (Based on Specific Media/Records)
1) Professionalism & Ethical Attitude	1	Confidentiality	Strictly adheres to the privacy of mothers and families; demonstrates appropriate consideration for de-identification in all clinical records.
	2	Respect for Rights	Practices behaviors based on Reproductive Health and Rights; includes these considerations in self-assignments and reflections.
	3	Safety & Infection Control	Complies with clinical regulations, safety management, and infection control protocols (e.g., hand hygiene) with a responsible attitude.
	4	Health Management	Maintains accurate personal health records from the pre-practicum period and manages self-care appropriately.

Continued

2) Collaboration & Leadership	5	Reporting & Consultation	Provides timely reports and consultations to multidisciplinary teams and instructors; contributions are documented in conference records.
	6	Team Collaboration	Understands the importance of multidisciplinary collaboration; demonstrates a cooperative stance in group-work outcomes.
	7	Community Support	Understands the roles of community health facilities; provides insights from a multidisciplinary perspective in the community practice summary.
	8	Constructive Discussion	Expresses opinions clearly while respecting others in conferences and group work; participates constructively.
3) Clinical Nursing Competence	9	Assessment	Clarifies the presence or absence of information using the Clinical Reasoning Algorithm (Appendix A) and makes Wellness Diagnoses based on specialized knowledge.
	10	Nursing Planning	Develops specific plans considering individuality and community resources; structures appropriate care/support plans.
	11	Implementation of Care	Implements safe nursing care based on the plan; reflects the content accurately in nursing process records and technical experience logs.
	12	Family Support	Understands the need for individualized support based on the developmental stage and life background of the perinatal mother, child, and family.
4) Self-Directed Learning & Problem-Solving	13	Reflection	Reflects on practice from multiple perspectives, including ethics; describes learning and task considerations specifically in logs and self-assignments.
	14	Proactive Learning	Learns proactively using literature and resources; demonstrates results logically in task reports and self-evaluation forms.
	15	Utilizing Growth	Accepts feedback sincerely; connects it to personal growth and practice improvement through responses to instructors and record updates.
	16	Environmental Adjustment	Understands orientation contents correctly; demonstrates proactive preparation and environmental adjustment for the practicum.
5) Communication Competence	17	Listening & Empathy	Listens to the verbal and non-verbal signs of subjects and their families; engages with them empathically.
	18	Building Trust	Practices effective communication considering the individuality of perinatal subjects; builds a positive relationship of trust with families.
	19	Information & Support	Provides accurate information tailored to the subject's level of understanding; supports the self-determination process.
	20	Multidisciplinary Exchange	Interacts with facility staff (e.g., community practice sites) with an appropriate attitude; contributes to smooth collaboration.

Note: Evaluation criteria are aligned with the university's clinical standards as defined in the institutional guidelines [6].

Appendix C. Holistic Wellness Concept Map

Methodological Note:

This concept map (**Figure A1**) serves as the integration hub for the clinical reasoning process, integrating wellness diagnoses based on the framework established by Ota (2021) [9]. The Wellness Diagnoses (#) confirmed in Appendix A are plotted here to visualize the interconnectedness of maternal recovery, neonatal development, and family adaptation.



Methodological Note: This map integrates wellness diagnoses based on the framework established by Ota (2021) [9].

Figure A1. Holistic wellness concept map.

1) Core Concept: The Mother-Infant-Family Unit

At the center of the map, the Mother-Infant-Family Unit is positioned as an inseparable entity. The map is divided into five interactive domains that radiate from this core.

2) The Five Domains of Wellness Integration

Domain	Linked Wellness Diagnoses from Appendix A
I. Retrogressive Changes (Maternal Physical Recovery)	#1 (Vaginal) or #1-C, #2-C (Cesarean)
II. Progressive Changes (Lactation & Role Mastery)	#P1 (Breastfeeding Knowledge & Skills)
III. Newborn Status & Development (Extrauterine Adaptation)	#N1 (Adaptation), #N2 (Growth), #N3 (Nutrition)
IV. Psychological Adaptation (Maternal Well-being)	#3 (Prenatal), #4 (Labor), #2 (Postpartum)
V. Family & Social Adaptation (Environmental Support)	#4, #5 (Prenatal), #5, #6 (Labor), #3, #4 (Postpartum), #N4, #N5 (Newborn)

3) Logical Connection (The “Scaffolding” Flow)

The Input: Students use the binary (Yes/No) algorithm in Appendix A to validate each diagnosis.

The Synthesis: Only the diagnoses marked as (Yes) are highlighted on this Concept Map.

The Insight: By connecting these points, students can visualize the “Shape of Wellness.” For example, if #N1 (Newborn Adaptation) is stable and #P1 (Lactation) is progressing, it reinforces #3 (Family Adaptation).