An educational needs assessment for enhancing innovative skills in nursing students

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Abstract

Background: The educational need for enhancing innovative skills perceived by nursing students has been integrated into the nursing innovation course in the Bachelor of Science in Nursing (BSN) curriculum, and should improve competencies for nurses in the future.

Objectives: To explore the current and desired state of innovative skills and to identify the educational needs for enhancing innovative skills of nursing students in Phraboromarajchanok Institute (PBRI).

Methods: This is descriptive research. The stratified random sampling technique was used to select four nursing colleges and 380 junior and senior year nursing students enrolling in the academic year 2020 were recruited. The 49-item innovative skills need assessment questionnaire was used to collect data. Descriptive statistics were used to analyze data. In addition, the Modified Priority Needs Index ($PNI_{Modified}$) was used to identify the priority needs of innovative skills.

Results: The overall mean scores of current and desired innovative skills were 3.86 (SD = .51) and 4.26 (SD = .74), respectively. The overall $PNI_{Modified}$ was 0.10. The needs of innovative skills were ranked in descending order of the $PNI_{Modified}$ as innovation discovery skills ($PNI_{Modified}$ = 0.13), innovation deployment skills ($PNI_{Modified}$ = 0.10), innovation design skills ($PNI_{Modified}$ = 0.09), innovation development skills ($PNI_{Modified}$ = 0.08), and innovation definement skills ($PNI_{Modified}$ = 0.06). Innovation discovery sub-skills items were rated as the top three highest needs.

Conclusions: Innovative competencies could be the most critical competencies for nurses in the future. Therefore, nursing instructors should design courses and curricula to enhance the innovative competencies of nursing students.

Keywords: educational needs assessment, innovative skills, nursing students

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การประเมินความต้องการทางการศึกษา ในการเสริมสร้างทักษะนวัตกรรมในนักศึกษาพยาบาล

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บทคัดย่อ

บทนำ : การศึกษาถึงความความต้องการทางการศึกษาของนักศึกษาพยาบาลในการพัฒนาทักษะด้านนวัตกรรมในรายวิชานวัตกรรมการพยาบาลในหลักสูตรพยาบาลศาสตรบัณฑิต ช่วยส่งเสริมสมรรถนะของพยาบาลในอนาคต

วัตถุประสงค์การวิจัย : เพื่อศึกษาสภาพปัจจุบันและความต้องการของทักษะการพัฒนานวัตกรรม และเพื่อระบุความจำเป็นในการพัฒนานวัตกรรมของนักศึกษาพยาบาลคณะพยาบาลศาสตร์ สถาบันพระบรมราชชนก

วิธีการวิจัย : การวิจัยเชิงบรรยาย ตัวอย่างเป็น นักศึกษาพยาบาล สุ่มตัวอย่างแบบชั้นภูมิ จำนวน 380 คน ที่ลงทะเบียนเรียนในปีการศึกษา 2565 จากวิทยาลัยที่ถูกคัดเลือกเป็นตัวอย่างในการศึกษา การรวบรวมข้อมูลใช้แบบสอบถามการประเมินความต้องการด้านทักษะนวัตกรรมจำนวน 49 ข้อ วิเคราะห์ข้อมูลเชิงปริมาณด้วยสถิติเชิงพรรณนาและ Modified Priority Needs Index ($PNI_{Modified}$) ใช้ในการจัดลำดับความต้องการด้านทักษะนวัตกรรม

ผลการวิจัย : คะแนนเฉลี่ยโดยรวมของทักษะนวัตกรรมในปัจจุบันและที่ต้องการคือ 3.86 (SD=0.51) และ 4.26 (SD=0.74) ตามลำดับ คะแนน $PNI_{Modified}$ ภาพรวมเท่ากับ 0.10 โดยค่าคะแนน $PNI_{Modified}$ รายทักษะเรียงลำดับจากมากไปน้อย คือ ด้านการค้นพบนวัตกรรม ($PNI_{Modified}$ = 0.13) ด้านการนำนวัตกรรมไปใช้ ($PNI_{Modified}$ = 0.10) ด้านการออกแบบนวัตกรรม ($PNI_{Modified}$ = 0.09) ด้านการพัฒนานวัตกรรม($PNI_{Modified}$ = 0.08) และการเขียนโครงร่างนวัตกรรม ($PNI_{Modified}$ = 0.06) คะแนน $PNI_{Modified}$ รายข้อสูงสุดสามอันดับแรกอยู่ในทักษะด้านการค้นพบนวัตกรรม

สรุปผล : ความสามารถด้านนวัตกรรมอาจจะเป็นสมรรถนะที่สำคัญที่สุดสำหรับพยาบาลในอนาคต ดังนั้นอาจารย์พยาบาลจึงควรออกแบบหลักสูตรและหลักสูตรเพื่อเพิ่มขีดความสามารถเชิงนวัตกรรมของนักศึกษาพยาบาล

คำสำคัญ : การประเมินความต้องการทางการศึกษา ทักษะนวัตกรรม นักศึกษาพยาบาล

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Introduction

The paradigm shift and revolution of society, healthcare, technology, and education have significantly changed since the Kuhn era in 1996.[1] Then the innovation paradigm has widely evolved in order to develop new technologies and transform the economic system nationally and globally.[2] Many countries, including Thailand, have established national policies using an innovation-driven economy.[3] In order to achieve these aims, Thailand has planned to integrate innovation, technology, and creativity in all sectors, including higher education.[4] The heart of this policy is to prepare Thais' readiness in terms of education, skills, and support for being first-world citizens.[5]

Since nursing students are the future nursing and healthcare workforce, nursing education must be well-designed in order to enhance the necessary competencies of registered nurses.[6] Innovative skills were mentioned as one of the nurses' core competencies. Nursing students could be innovators who generate or create innovations for developing the quality of nursing practice in the future.[6] Likewise, Thailand Nursing and Midwifery Council[7] anticipated that nursing students must implement an innovative process for solving healthcare and nursing problems. Only a few studies explored innovative skills in Thai and Chinese nursing students, but most previous studies explained how innovative skills were important for registered nurses.[8-9] Registered nurses were expected to master innovative skills; therefore, nursing students must be taught and trained on how to perform these skills.

Innovative skills can help nursing students comprehensively discover problems and generate creative ideas for solving problems.[8-9] Nursing students with innovative mastery can also provide better nursing care that affects the quality of healthcare service, work productivity, and client satisfaction.[8-9] In the meantime, innovative nursing care can decrease health expenditure and inequality in access to healthcare services.[9-10] Nursing students, therefore, must be trained to foster innovative skills. Innovative competency becomes one of the required skills for graduates in the 21st century.[11-12] The benefits of innovative skills have been found at the individual, institutional, and national levels.[11] Students with higher levels of innovative competency can think and analyze problems critically and systematically and then seek alternative and creative approaches to solve problems.[13-14] Students who master innovative competency are more likely to succeed in their learning and practice.[14-15] Moreover, the success of students in developing innovation reflects the quality of educational institutions.[11,16] Besides, students with innovation mastery can develop economic, social, and healthcare systems eventually.[11]

In response to the world's needs, many higher education institutions are seeking the best strategies to enhance students' innovative skills.[15] The best approach for doing this is to integrate innovation concepts into the educational system.[14] Many higher education institutions, including colleges of nursing under the jurisdiction of the faculty of nursing, Praboromarajchanok Institute (PBRI) applied innovative concepts in the curriculum and designed innovative courses specifically in their disciplines.[11,14] However, there was no study indicating how to integrate innovation concepts into the nursing curriculum.[8] It remains unknown what the educational needs are for innovative skills development and how to design an effective training program for enhancing innovative skills in nursing students. To better design activities for enhancing these skills, the initial step is to assess the current and desired phenomena from students' perspectives.

Research Objectives

The research aimed to explore the current and desired state of innovative skills and to identify the educational needs for enhancing innovative skills in nursing students studying at colleges under the jurisdiction of the faculty of nursing, PBRI.

Methods

Research design

The current research was developed based on the 5D model of innovation.[17] The cross-sectional descriptive study was designed to explore the perspectives of nursing students toward the present and needed innovative skills.

Setting and samples

Nursing colleges under the jurisdiction of PBRI across Thailand were selected using multi-stage random. Thirty colleges were divided into four regional groups and then one college in each region was randomly selected. Four colleges were recruited in total.

The study population consisted of 4,220 nursing students enrolled at PBRI nursing colleges during the 2022 academic year. The sample size was calculated using the Raosoft sample size calculator based on a 5% margin of error, a 95% confidence level, and a 50% response distribution. The minimum sample size was 353. To prevent data collection errors, an additional 10% of minimum sample size was added. The total sample for this study was 388 nursing students.

Nursing students were recruited following inclusion and exclusion criteria. Participants who met the following criteria were recruited for the study: 1) being third- or fourth-year nursing students at the selected colleges, 2) having been enrolled in nursing innovation courses, and 3) giving consent to participate in the study. In contrast, first- and second-year nursing students who never enrolled in any nursing innovation courses and refused to give their consent were excluded from the study.

Measurement and data collection

The 49-item innovative skills need assessment (ISNA) questionnaire was used for data collection. It was developed by the researchers based on a literature review. The ISNA questionnaire consisted of three sections. The first section was demographic data, i.e., gender and class year. The second one was the current state of five innovation skills. The last one was the expectation state of five innovation skills. Five innovation skills consisted of 1) innovation discovery skills (11 questions), 2) innovation definement skills (9 questions), 3) innovation design skills (11 questions), 4) innovation development skills (9 questions), and innovation deployment skills (9 questions). The current state item was rated on a 5-point Likert scale from very untrue (1) to very true (5). The expectation state was also rated on a 5-point Likert scale from extremely unexpected (1) to extremely expected (5). Higher scores indicated greater current and desired innovative skills. The ISNA questionnaire was tested for content validity by a panel of five experts. Indices of item-objective congruence (IOC) ranged from 0.7-1.00. Then the ISNA questionnaire was tested for reliability with 30 nursing students at another university. The Cronbach's alpha coefficient was equal to 0.90.

After the study was approved by the Institutional Review Board (IRB) of the Graduate school of Srinakharinwirot University, the researchers sent the official permission request letter for data collection to the director of each nursing college. After the permission was granted, the researchers contacted the research department of each college to distribute invitation notifications to participants. Participants who responded to the researcher's email received the second email that included an online participant information sheet, informed consent, and questionnaire. After participants received the email, they were required to qualify for the inclusion and exclusion criteria of research samples. If they did not meet the inclusion criteria, they were navigated to the end of the questionnaire. For participants who met the inclusion criteria, they were asked to sign the electronic informed consent and then they were asked to answer the questionnaire. The questionnaire took 15-20 minutes to complete. After two weeks of data collection, only 380 participants completed the questionnaire.

Data analysis

Descriptive statistics, frequency, percentage, mean, and standard deviation, were used to analyze quantitative data. The Modified Priority Needs Index ($PNI_{Modified}$) was used to set the priority of the items.[19] The $PNI_{Modified}$ was computed using the difference between the desired and current scores divided by the current score. The higher PNI score indicated the highly needed innovative skills.

Ethical considerations

The study was approved by the IRB of the Graduate school of Srinakharinwirot University (Approval number SWUEC/E/G-457/2564 on 29 November 2021). Participants received invitation notifications through their emails which included a participant information sheet, electronic informed consent, and questionnaire. Before signing and submitting informed consent, participants were required to read a participant information sheet. Participants decided to participate and gave informed consent without coercion before the beginning of the study. Participants were informed that they had the right to stop participating in the research or withdraw at any time without penalty.

Results

Demographics

There were 380 participants submitting the complete online questionnaire. Eighty-five percent of participants were female (n = 323). Fifty-five and forty-five percent of participants were junior (n = 209) and senior year nursing students (n = 171), respectively.

The Current and Desired State of Innovative Skills in Nursing Students

The overall mean scores of current and desired innovative skills were 3.86 (SD = .51) and 4.26 (SD = .74), respectively. The highest and lowest current innovation skill scores were innovation definement (*M*=3.96, SD=0.53) and innovation discovery (*M*= 3.77, SD=0.56), respectively. While the highest desired innovation skill score was innovation deployment (*M*=4.25, SD=0.63). Innovation design (*M*=4.22, SD=0.70) and innovation development (*M*=4.22, SD=0.75) were rated as the lowest desired innovation skills. The overall $PNI_{Modified}$ was 0.10 (see Table 1). The needs of innovative skills were ranked in descending order of the $PNI_{Modified}$ as innovation discovery skills ($PNI_{Modified}$ = 0.13), innovation deployment skills ($PNI_{Modified}$ = 0.10), innovation design skills ($PNI_{Modified}$ = 0.09), innovation development skills ($PNI_{Modified}$ = 0.08), and innovation definement skills ($PNI_{Modified}$ = 0.06), respectively.

Table 1 The Current and Desired State of Innovative Skills in Nursing Students

Innovative Skills	The Current State		The Desired State		The Modified PNI	Ranking
	M	SD	*M*	SD		
Innovation Discovery	3.77	.56	4.25	.63	0.13	1
Innovation Deployment	3.85	.61	4.26	.74	0.10	2
Innovation Design	3.85	.54	4.22	.70	0.09	3
Innovation Development	3.88	.61	4.22	.75	0.08	4
Innovation Definement	3.96	.53	4.23	.69	0.06	5
Overall	3.86	.51	4.26	.74	0.10	

Table 2 represents the three main priorities of each innovation skills dimension. Innovation discovery sub-skills items were rated as the top three highest needs. The $PNIs_{Modified}$ of innovation definement sub-skills were ranged from .10 to .12. Whereas the $PNIs_{Modified}$ of innovation design, innovation development, and innovation deployment were ranged from .10 to .13.

Table 2 The Needs for Developing Innovative Skills in Nursing Students

Innovative Skills	Items	The Modified PNI
Innovation Discovery	Discover new ideas or interventions.	.16
	Analyze problems to discover new ideas.	.15
	Generate innovative works based on old ideas.	.15
Innovation Definement	Make systematic and stepwise project execution plans.	.12
	Follow innovative project execution plans.	.10
	Make innovative project budget plans.	.10
Innovation Design	Generate unique innovative ideas or innovative work designs.	.13
	Outline innovative works thoughtfully and systematically.	.13
	Outline methods to evaluate the effectiveness of innovative works.	.10
Innovation Development	Develop innovative prototypes.	.13
	Develop innovative prototype instructions.	.11
	Develop innovative prototype descriptions.	.10
Innovation Deployment	Assess the execution of innovative prototypes.	.13
	Monitor the results of innovative prototypes continually.	.13
	Create innovative prototype manuals or video user guides for users.	.10

Discussion

The results of the study showed that nursing students had different perceptions of the current and desired state of innovative skills. The gap between the current and expected states of innovation skills indicated the priority. The priority of innovation skills was innovation discovery skills. This skill was rated as the lowest current innovative skill and the highest $PNI_{Modified}$, indicating participants perceived their present skills significantly less than their expectations. Innovation discovery is the first step of innovation development, in that innovators must assess and analyze existing information to discover problems and

possible solutions.[17] The finding was in line with the results of previous studies, signifying innovation discovery skill was a primary competency that innovators must perform to seek and explore problems of interest.[19-23] Innovation discovery was the most challenging step for novice innovators because it requires multi-dimension skills such as observation, information seeking, creative thinking, and critical thinking. [20-23] Nursing students who are novice innovators may face many difficulties while initially assessing information and finding the existing problems, in particular analyzing problems and old ideas to discover new ideas or interventions.[23] To enhance discovering skills, new innovators must become divergent thinkers who see and think from different perspectives.[22] New innovators can discover problems easier by using semi-systematic literature reviews, community workshops, and key stakeholder interviews.[20-23] Moreover, new innovators should use specific criteria to identify problems of interest such as current status analysis, stakeholders' needs, external impact factors, financial factors, possibility, available infrastructure, and conceptual framework.[20-23] These methods can help new innovators to understand customers' needs, identify existing innovations, and discover certain problems.[19-23]

After problems of interest were discovered, new innovators can proceed with the innovation define step. In the current study, innovation definement skill was ranked as the last priority. This represented that participants were good at this skill. The finding was inconsistent with previous studies indicating innovation definement skill was a top three needed skills.[23-24] Innovation definement skill was defined as the capability to define problems of interest into innovative project charters describing all details of the proposed project.[17,20] Since the project charter was a formal document designed by institutions, new innovators can easily write and work following the project requirements.[23] Typically, the project charter form includes certain scope, specific aims, available resources, stakeholders' needs, possible risks, potential benefits, timeframe, and financial statement for conducting the project.[17,20] Since participants have already discovered the problems of interest, they may perceive the easiness of developing innovation project charters. Thus, innovation definement skill was rated as the lowest needed skill in the study.

The next important innovative skills are innovation design and development skills. Even though these skills are crucial in developing prototypes[9], they were prioritized in the third and fourth ranks, respectively. This meant that nursing students did not need to enhance these skills in the first place. The findings were aligned with previous studies pointing out that nursing

students had higher levels of creative thinking and innovation development skills.[9-10,23,25] Since creative thinking was significantly related to innovation development skills[10], students who think creatively were more likely to perceive ease in designing and developing innovation prototypes. Precious studies claimed that PBRI nursing students have been trained to develop divergent and convergent creative thinking and design skill throughout the BSN program.[23,25] Nursing instructors also implemented many teaching strategies to develop these skills.[23,25] Therefore, PBRI nursing students may perceive more confidence in designing innovation prototypes.[23]

Another interesting finding of the current study was that the second needed skill was innovation deployment skill. The finding was consistent with previous findings explaining that nursing students lacked innovation deployment skill in terms of innovation testing. [9-10,23,25] Nursing students who lack this skill may perceive difficulty in implementing and testing the feasibility and effectiveness of innovation prototypes.[9,10,23] In the last step of the innovation development process, nursing students must use research methods to test innovation prototypes such as submitting IRB applications, contacting research settings and participants, collecting data, and analyzing data.[10] One explanation for this finding might be supported by nursing innovation and nursing research courses of each college being different. Some colleges design nursing innovation courses for sophomore or junior year students, whereas some colleges integrate nursing innovation and nursing research into one course for junior year nursing students. Junior nursing students may have fewer experiences in innovation deployment, compared to senior year students. Nursing students' expectations and experiences toward innovation development reflected different angles of innovative skill priority. The needed innovative skills were in different sequences, compared to the 5D innovation. Therefore, nursing students should be trained to enhance the most needed innovative skills.

Implication and limitations

Innovative competencies could be the most critical competencies for nurses in the future. Nursing instructors should design courses and curricular to enhance the innovative competencies of nursing students. The main emphasis of programs should be on the discovery, deployment and design of innovation. Then the nursing instructors should conduct a futuristic study using a research and development method to test the quality and effectiveness of innovative vocational education programs.

There were few limitations on generalization and literature review in the present study. Although the sample size was

sufficient, participants who were selected from only four of the thirty nursing colleges may not be genuine representatives of the population. Due to the diversity of educational circumstances and curricula, the current and desired innovative skills among nursing students at each college may be different. Another limitation was a lack of previous studies of the research topic. The research instrument that was developed based on the literature review could limit the scope of the study.

Conclusion

The development of innovative skills is a systematic process that involves collaboration across multiple sectors, including policy makers, nursing education administrators, nursing professors, nursing students, healthcare employers, healthcare professionals and clients. A first step in the development process is to find out how these nursing students view their innovative skills. Nursing education administrators and nursing faculty members may use the results of this study to develop appropriate training programs or nursing curricular for improving innovative skills of nursing students.

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Author contribution

The research study and manuscript were conducted by YC under the supervision of CY and CP. All authors have read and approved the final manuscript.

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