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# Evaluation of the integrated model of the rational drug use into the Bachelor of Nursing Science program in Thailand: A mixed-methods study

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## Abstract

**Background:** Integration of rational drug use (RDU) into a nursing program to increase nurse graduates' RDU competencies is essential to solving the problem of irrational drug use.

**Objective:** This study aimed to evaluate the integrated model of the RDU into the Bachelor of Nursing Science (BNS) program developed by the Thailand Nursing and Midwifery Council (TNMC).

**Methods:** A mixed-methods study was designed using a sequential explanatory design. The whole population of 3,848 nurse educators and 9,249 nurse graduates from 86 nursing education institutions across Thailand in Academic Year 2018 were recruited for quantitative data collection. Fifty nurse educators selected as representatives of the nursing education institutions were recruited for qualitative data collection. Online questionnaires were sent to collect information regarding the context, input, process, and product relating to the model, while structured focus group guidelines were developed to obtain more details in assessing the model. The data were analyzed using descriptive statistics and content analysis.

**Results:** The findings showed that the context and policy of utilizing the model to increase nurse graduates' RDU competencies were well accepted. The nurse educators' RDU competencies, the input of the model, were rated at a high level. The process of the model was implemented as guided at almost all nursing education institutions. The product of the model, the RDU competencies of the nurse graduates, was reported at a high level.

**Conclusion:** The model of integrating the RDU into the BNS program developed by the TNMC was well performed and resulted in high RDU competencies of the nurse graduates. This integration model should be published and applied in nursing schools worldwide to enhance RDU competencies of nurse graduates.

## Keywords

rational drug use; Bachelor of Nursing Science program; RDU competency; nursing; Thailand

Rational drug use (RDU) is a significant issue that impacts the quality of health services. Ideally, drugs should be

appropriately and effectively provided to individuals and communities based on verified benefits while minimizing

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risks and costs (Chongtrakul, 2015). Unfortunately, despite this, only about half of patients take their medications correctly (Melku et al., 2021).

The term irrational drug use includes any situation such as under-prescribing, over-prescribing, incorrect prescribing, extravagant prescribing, and multiple prescribing (Ofori-Asenso & Agyeman, 2016). These situations have created a problematic effect on treatments and care.

In Thailand, irrational drug use has been a major problem and is considered the main factor leading to patient harm. For instance, the irrational use of antibiotics is found in many community sectors—people lack knowledge of antibiotics and how to use them. They are also unaware of the consequences of irrational antibiotic use. Consequently, people are at risk of antimicrobial resistance (Pumtong et al., 2020). Importantly, irrational drug use is common in persons with chronic illnesses such as cancer (Seangrue et al., 2020) and diabetes mellitus (Yensabai et al., 2016). In addition, a high prevalence of potentially inappropriate medication use was found among older Thai persons (Jenghua et al., 2019; Vatcharavongvan & Puttawanchai, 2019).

The irrational use of medicines is a major global health challenge with significant implications for patients, healthcare systems, and communities. The key factors contributing to the inappropriate use of drugs are likely to change over time, and policymakers need to stay up-to-date with current trends (Ofori-Asenso & Agyeman, 2016). In Thailand, promoting RDU competency of health care providers has been assigned as one strategic service plan (Health Systems Research Institute and Coordination and Integration Committee on Antimicrobial Resistance, 2017).

All healthcare personnel should be prepared to gain RDU competencies as they are all responsible for RDU. Nurses and midwives, in particular, should gain RDU competencies since they are frontline health care personnel. They are expected to be competent in prescribing medicines to patients and to monitor drug reactions. To some extent, nurses and midwives must have knowledge relevant to medicines, including pharmacology and potential side effects, and have a serious concern for drug administration and interactions between drugs and other medication, disease, and food (Asiret et al., 2017).

Based on the responsibility in relation to drug administration, registered nurses need to have RDU competencies. Therefore, the Thailand Nursing and Midwifery Council (TNMC) has developed the Model of Integrating the RDU into the Bachelor of Nursing Science (BNS) program to increase RDU competencies of nurses and midwives. The model was composed of 1) the context: the policy relating to utilizing the model to increase nurse graduates' RDU competencies, 2) the input: the nurse educators' RDU competencies, 3) the process: the integration of the RDU core contents into the BNS program and learning activity design, 4) the product: the RDU competencies of nurse graduates (Thailand Nursing and Midwifery Council, 2020). This model was implemented in

all nursing education institutions across Thailand in the academic year: B.E. 2561 (Thailand Nursing and Midwifery Council, 2018; Turner, 2019).

This study was therefore conducted to evaluate the model developed by the TNMC in the academic year 2018. Stufflebeam's CIPP (Context, Input, Process, and Product) model was used to guide the study. This model can be effectively used for evaluating the quality of education (Stufflebeam, D. L. in Aziz et al., 2018). The policy launched by the TNMC was assessed as the context. The RDU competencies of the nurse educators were clarified as the key input necessary for achieving the outcomes of the model. The process referred to the model implementation. The product was clarified as the nurse graduates' RDU competencies. The results of this study can be used to provide information for further development of teaching and learning strategies in order to promote RDU competencies of nurse graduates.

## Methods

### Study Design

A mixed-methods research design was used with a primarily quantitative data collection approach followed by a qualitative component. The quantitative method was conducted first, followed by the qualitative method, to address the research questions more deeply and to gain a greater understanding of the quantitative findings.

### Study Participants

The study population for quantitative data collection included 3,848 nurse educators and 9,249 nurse graduates from 86 nursing education institutions across Thailand in Academic Year 2018. Total population sampling was the sampling method used. The inclusion criteria were nurse educators or nursing graduates who were able to access an online questionnaire and were willing to participate in the study.

For qualitative data collection, 86 nursing education institutions were categorized into four groups under the Ministry of Education, Ministry of Public Health, Ministry of Defense, and Private institutions. Fifty nurse educators were selected from each group to be representatives of nurse educators. Purposive sampling was used to select 50 participants who satisfied the inclusion criteria, consisting of those who had experience utilizing the model and completed an informed consent form. The participants were separated into four groups for focus group discussions. The focus group discussions were continually conducted until data saturation was reached. The duration of the focus group discussions was about 60 minutes per group.

### Instruments

The instruments used to collect the data in this study were developed by the researchers as follows:

#### 1) A nurse educator questionnaire

A nurse educator questionnaire was developed to assess the context, input, and process of utilizing the

model. It was composed of four parts, including demographic data, a policy of the nursing school, competencies of nurse educators, and processes of model utilization. The first part asked for participants' personal information. The second part consisted of eight questions based on the TNMC policy for integrating RDU into the BNS program. Seven multiple-choice questions were used to assess how nursing schools established policies for integrating RDU into their BNS program followed by an open-ended question asking about problems faced by nursing schools while integrating RDU into their BNS programs. The third part was a nurse educator's competency questionnaire developed based on the Prescribing Competency Framework of the National Institute for Health Care Excellence and the Royal Pharmaceutical Society, United Kingdom (Royal Pharmaceutical Society, 2016) in the Thai language by the researchers. Forty-six questions were used to describe the levels of RDU knowledge, attitudes, and practice in proposed situations among nurse educators categorized into two core competencies, namely consultation and prescribing governance. The consultation competency comprised six sub-competencies (assess the patient, consider the options, reach a shared decision, prescribe, provide information, and monitor and review), while the prescribing governance comprised four sub-competencies (prescribe safely, prescribe professionally, improve prescribing practice, prescribe as part of a team). A five-point Likert scale was used for each question, ranging from 1 (very low) to 5 (very high). The mean score of the competency was categorized into five levels; a very high level (4.51-5.00), a high level (3.51-4.50), a moderate level (2.51-3.50), a low level (1.51-2.50), and a very low level (1.00-1.50). The fourth part consisted of 11 dichotomous questions asking about the process of the model implementation.

The questionnaire was tested for content validity by five experts. The sum score of the expert panel was used to calculate the Index of Item-Objective Congruence (IOC). The IOC values of parts 2, 3, and 4 of the questionnaires were equal to or greater than 0.80. All parts of the questionnaires had good internal consistency with Cronbach's alpha coefficients of 0.88 and 0.92 for Part 2 and Part 3, while the KR 20 score of 0.92 was obtained for Part 4.

## 2) A nurse graduate's RDU competency questionnaire

A nurse graduate's RDU competency questionnaire was developed in the Thai language by the researchers, based on the Prescribing Competency Framework of the National Institute for Health Care Excellence and the Royal Pharmaceutical Society, United Kingdom (Royal Pharmaceutical Society, 2016) to evaluate the model utilization which was considered as the product of the CIPP model. It was composed of two parts; the first part consisted of four open-ended questions to gather personal data of nurse graduates; the second part consisted of 46 items asking about perceived RDU competencies based on the

Prescribing Competency Framework, as mentioned in the part of nurse educators' RDU competencies. The format and score interpretation of this second part of the questionnaire was the same as those of Part 3 on the nurse educator questionnaire.

The content validity of the questionnaire was examined by five experts involved in RDU policy at the national level, including one physician and four nurses. The IOC of each item was equal to or greater than 0.75. The reliability of the questionnaire was checked using Alpha Cronbach's Coefficient, and it was 0.96.

## 3) A structured focus group guideline

A structured focus group guideline consisting of six questions was developed by the researchers to ask the nurse educators their opinions regarding the model utilization. The focus group discussions of the nurse educators were conducted to gain an in-depth understanding of the quantitative findings. The questions for focus group discussion were verified by five experts. Trustworthiness was obtained for conducting qualitative inquiries (Denzin & Lincoln, 2011), as follows: (i) Credibility: The researchers engaged in the focus group, shared the key results with participants, and asked them to check the accuracy of information obtained at the end of the focus group. The investigator triangulation was obtained by an agreement of research team members in data analysis; (ii) Transferability: The findings were described in detail for both behavior and context; and (iii) Confirmability and Dependability: Voice recordings of the focus group discussions provided sufficient repetition for other researchers to gain the information to demonstrate the confirmability of findings. The findings were also triangulated by a discussion between the researchers and experts to confirm the interpretation of data.

## Data Collection

The quantitative data regarding the institutions' policies, the nurse educators' RDU competencies, the processes of model implementation, and the nurse graduates' RDU competencies were collected using online questionnaires. The electronic questionnaires for nurse educators and nurse graduates were distributed to all nurse educators and nurse graduates in the academic year 2018 via their nursing schools. Focus group interviews were performed by the researchers and assistants to collect qualitative data.

## Data Analysis

### Quantitative Strand

The quantitative data were analyzed using the Statistical Package for Social Sciences Version 27 (SPSS 27) software package. Sample demographics were described using frequency (f) and percentage (%). The data regarding policies, RDU competencies of nurse educators and nurse graduates, and the processes of the model implementation were analyzed using mean (M) and standard deviation (SD).

### Qualitative Strand

The qualitative data from focus groups were analyzed using content analysis by the Giorgi approach (Giorgi, 1985). The verbatim transcription of each focus group recording was conducted to code each transcript. The analysis started by reading the entire transcript of each participant to gain their experiences or perceptions. The protocol included re-reading to adjust the delineated units. In the second step, a description of the phenomena in each unit was provided. A systematic structure was organized to grasp the coherence of experience through the research syntheses. Finally, the essential generality was expressed as the general structure of experiences (Giorgi, 1985). The themes and findings regarding the model emerged after this analytical process. Moreover, direct quotes were expressed to reflect participants' perceptions and to represent the clear phenomenon.

### Ethical Consideration

This research project received ethics approval from the Institutional Review Board of the TNMC on 22 May 2019. The IRB approval number was TNMC-IRB 04/2019.04.09. The participants were informed of the details of the study, and they were able to withdraw from the study at any time. The participants were required to read and understand the content written in the informed consent document. The informed consent document had to be read or completed before online questionnaires and the focus groups were conducted. The data were kept confidentially in a computer with a secure code. Data will be destroyed two years after the publication date.

## Results

The findings of the study are presented in two main parts, including the participants' characteristics and the CIPP evaluation (context, input, process, and product).

### Participants' Characteristics

The participants consisted of 1,052 nurse educators who responded to the questionnaire. Most of them were female (91.92 %), aged between 41 and 50 years (36.50%), graduated with a Master's degree (71.67%), and had experience working as a nurse educator for more than five years (48.29 %). For the 4,269 new graduate participants, the majority was female (93.70%), and their age ranged between 19 and 25 years (96.60%). Among the 50 nurse educators who participated in the focus group discussions at the RDU workshop, all of them were female (100%).

### The CIPP Evaluation

#### Quantitative Results

##### 1) The context evaluation (referred to the TNMC policy relating to the model utilization)

Almost all participants realized that their nursing education institutions (98.76%) established policies relating to the RDU policy issued by the TNMC and formally integrated its concepts into the BNS program. Approximately 75% of

respondents indicated that RDU competency was integrated into the curriculum learning outcomes and objectives. More than half of the participants reported that the institutional policy relating to RDU was officially enacted and implemented. Nearly two-thirds (61.50%) of respondents claimed that they attended an RDU training course.

##### 2) The result of the input evaluation (referred to the nurse educators' RDU competencies)

The total mean score of nurse educators' RDU competencies was rated at a high level ( $M = 4.25$ ,  $SD = 0.82$ ). All two core competencies, namely consultation and prescribing governance were rated at a high level ( $M = 4.27$ ,  $SD = 0.81$ ; and  $M = 4.21$ ,  $SD = 0.80$ , respectively). All sub-categories under the two core competencies were also rated at a high level. The highest score was for the sub-category of *patient assessment before giving them medicines* ( $M = 4.40$ ,  $SD = 0.73$ ), followed by *correct drug administration according to prescriptions*, and *ability to effectively give advice* ( $M = 4.34$ ,  $SD = 0.80$ ). These three sub-categories were under the Consultation main category. The nurse instructors identified the lowest level of competency in *collaboratively and appropriately selecting medicines as needed*, which is a sub-category of prescribing governance ( $M = 4.11$ ,  $SD = 0.83$ ).

##### 3) The result of process evaluation (the process of implementing the model)

It was found that almost all of the nursing education institutions (84%) implemented the policy of integrating RDU concepts and their principles into their nursing programs. About 77 percent of nurse-educators in these nursing education institutions were prepared for the implementation. This included arrangements of essential activities to enable them to understand how to use RDU learning modules (71.3%), integrate RDU competencies into the program learning objectives and learning outcomes (81.2%) and incorporate RDU topics and contents into the nursing courses (86.8%). Most institutions (81.8%) were informed how to design learning activities in response to RDU competencies. Various active learning methods, including group discussions, assignments, case-based learning, and simulations, were exemplified. More than half of the institutions (65.1%) annually evaluated the integration of the RDU contents in each course. Various methods of assessments were used in relevance to the RDU competencies.

##### 4) The result of product evaluation (identified as graduate's RDU competencies)

An evaluation of the product of the model was identified as the nurse graduates' RDU competencies. The total mean score of the nurse graduates' RDU competencies was at a high level ( $M = 4.31$ ,  $SD = 0.48$ ). The mean scores of the two core competencies, namely the consultation and prescribing governance, were also at a high level ( $M = 4.31$ ,  $SD = 0.48$ ; and  $M = 4.32$ ,  $SD = 0.50$ , respectively). Among



ten sub-categories of the competencies, the highest score was in the *prescribing as part of a team* ( $M = 4.39$ ,  $SD = 0.57$ ), followed by *prescribing professionally* ( $M = 4.38$ ,  $SD = 0.55$ ), and the lowest score was reported on the *issue of considering the options* ( $M = 4.22$ ,  $SD = 0.53$ ).

### Qualitative Results

The qualitative data was analyzed to complement quantitative data that facilitated the success of the model utilization. The four themes of qualitative data analysis emerged as follows:

#### Theme 1: Strong policy and participation-led actions

The policy and information from the TNMC that supported an indicative position of context had been introduced and converted into action at the educational institutions to integrate the RDU contents into the BNS program. As some of the participants stated that:

P11, the head of academic affairs of a nursing school: "My university followed the RDU policy of the TNMC because my director foresaw the importance of RDU and introduced the policies to the faculty for adding the RDU in the pharmacology course."

P17, a nurse educator: "I had joined an RDU workshop organized by the TNMC and understood the RDU policy. So that, I tried to convey this policy into my nursing course."

#### Theme 2: Preparation of nurse educators as the key persons for the success of the model utilization

The experiences of a nurse educator in each course played a significant role as the input of the model. Nurse educator preparation was therefore essential for the success of the model utilization. The TNMC organized a workshop and provided guidelines for integrating the RDU contents to help nurse educators understand how to integrate RDU contents into their nursing courses. As some of the participants who were nurse educators stated that:

P22: "I have been informed about the significance of RDU competencies and the model. Therefore, I have added RDU contents in basic concepts and principles of the nursing subject and an adult nursing subject. I can integrate the RDU contents into my courses."

P03: "I attended the workshop held by the TNMC about integrating RDU into a BNS program. It helped me understand how to do it."

P13: "The guidelines of the model for integrating RDU into the BNS program were very useful. I used these guidelines to prepare appropriate teaching methods for both theory and clinical practice."

P49: "The rational drug use of the pharmacology course in my college was created according to the guideline of the TNMC."

#### Theme 3: Good design leading to successful implementation

The participants revealed that the RDU contents were integrated into relevant courses, including professional nursing and foundation courses. Many processes were conducted in RDU courses based on a student-centered approach pedagogical design, including case study, group

discussion, conference, and simulation that high RDU competencies of the graduates. Therefore, appropriate evaluation could enhance the competency of nursing students or valuable products regarding RDU. The proper assessment included formative evaluation, summative evaluation, and comprehensive evaluation of the Thailand Nursing and Midwifery Council Board. As some of the participants who were nurse educators stated that:

P36: "I will teach 2nd year nursing students focusing on RDU before practicing in the clinic. I will need to redesign my course and emphasize drug administration safety."

P48: "We used many learning methods to get students to participate in learning activities, including conferences, case studies, and small group discussions."

P18: "The RDU knowledge was integrated into a formative test by evaluating both before and after class."

#### Theme 4: National compliance and collaboration resulting in expected product

It can be concluded from the points of view of the participants that the success of integrating RDU contents into the BNS program was from compliance and collaboration of the TNMC and all nursing schools in Thailand. The TNMC launched a clear policy, and all nursing schools participated. The schools carried out the implementation of the model with the participation of nurse educators, both at administrative and teaching levels. This nationwide compliance and collaboration among the professional organization and nursing schools across the country led to the success of the model utilization. Therefore, the nurse graduates' RDU competencies of all schools that represented the product of the RDU program were high. As some of the participants stated that:

P47, the head of academic affairs of a nursing school: "The TNMC invited the heads of schools, chiefs of academic affairs, and representatives of nurse educators responsible for nursing courses to attend a 2-day workshop to be informed about the model as well as how to implement it."

P12, a nurse educator: "We were informed about the model and tried to follow as much as we could."

## Discussion

#### Policies related to the integration of the RDU contents into the BNS program

As seen, almost all nursing education institutions identified their understandings and integrated the TNMC RDU policy into their BNS programs in the academic year 2018. This may be a result of the TNMC's clearly defined RDU policies and their formal introduction to all nursing education institutions across the country. The TNMC also appointed a working group to develop the RDU integration model guidebook to facilitate implementation at the curriculum level and facilitate the development of learning activities. In addition to this, a workshop for brainstorming and developing a shared understanding among representatives

from all nursing education institutions was also arranged before having them implement the policies into practice. The representatives then provided information regarding the policies and what was gained from the workshop to the administrators and instructors of their institutions. Each institution could either define its own documented policies or make an inside agreement of integrating RDU contents into its nursing program. Learning outcomes of RDU competencies were defined along with learning activities and assessment methods of the theoretical and practical courses. Furthermore, nurse educators were prepared for their RDU competencies and their readiness to teach. These findings confirmed the statement of [Kaliisa and Michelle \(2019\)](#) that a learning policy plays a crucial role in educational institutions and can be a guideline for educators to develop an educational achievement plan.

### RDU competencies of nurse educators

Identifying overall competencies at a high level simply means that the nurse educators had knowledge, skills, and a positive attitude towards the RDU concepts. It showed that the nurse educators who were directly responsible for conveying RDU related knowledge and for arranging teaching and learning methods had prepared themselves for the RDU competencies in order to be able to integrate RDU concepts into both theoretical and practical courses.

When each aspect was considered, it was found that the nurse educators identified the highest level of competency in *assessing patients prior to giving medicines*. A reasonable explanation for this may be that evaluating a patient's health is the first step in nursing care ([Sulosaari et al., 2012](#)). This process includes assessing histories of medical use, health and illness, allergies to drugs, and side effects from medicines. Therefore, this competency is inevitably crucial for nursing administrators and nurse educators.

The second-highest level of the competencies indicated by these groups was *the correct medication administration according to prescriptions*. This drug administration competency, including giving advice to patients, is also an essential role of nurses ([Zare et al., 2013](#)). Nurse educators thus must cultivate and teach their students to practice correctly.

The sub-category of the competencies indicated at the high level but had the lowest score among the ten sub-categories was *collaboratively and appropriately selecting medicines as needed*. This is probably because, in real situations, nurse educators are not commonly involved with the process of prescription of medicines. They thus identified this competency at a lower level.

### The processes of integrating the RDU contents into the BNS program

The processes of integrating the RDU contents into the BNS program in all nursing institutions were well implemented, starting from the initialization of the policy, assigning responsible persons, defining RDU competencies in the course/program objectives and learning outcomes, refining

the course design, organizing instruction, and evaluating the results. These were consistent with the processes of curriculum implementation ([Nnabuike et al., 2016](#)). It can be claimed that the TNMC working committee had developed a well-designed RDU integrating model that can be easily implemented. Clear policies of the TNMC toward the development of RDU competencies in the undergraduate nursing program also ensured high compliance of the leaders and nurse educators of the nursing education institutions. A well-developed policy throughout the educational plan can encourage sustainable effort practices and improve strategies among the staff ([Brown et al., 2013](#)). Similarly, [Samsul et al. \(2019\)](#) claimed that the educational system policy identified in the curriculum is packaged to develop natural resources or potential areas in learning activities.

A clear guideline for curriculum implementation, starting from assigning responsible persons for integrating the RDU model, played an essential role in this process. Similarly, [Lungu \(2019\)](#) stated that educators are the key to supporting students in classrooms. Incorporating RDU competencies in the learning objectives and learning outcomes was a necessary implementation process, though [Lungu \(2019\)](#) argued that passion in the courses also needed to be mentioned. At the same time, determining the objectives and learning outcomes of content can help instructors be aware of the vision to enhance students with the educational knowledge and improve students' skills in other areas ([Prastiwi, 2013](#)). Identifying relevant topics and contents in the nursing courses was essential for successful implementation ([Saputra, 2013](#)). [Samsul et al. \(2019\)](#) mentioned that learning contents in a learning process were expected to explain the overall learning course of students' performance. Various active didactic strategies and evaluation methods were significant aspects of the educational processes ([Lungu, 2019](#)). Moreover, [Samsul et al. \(2019\)](#) also agreed that it could be conducted as guided in the manual book.

### RDU competencies of nurse graduates as the product

By identifying high levels of RDU competencies of the nurse graduates, it can be inferred that integrating the RDU contents into the BNS program enhanced the knowledge and skills related to the consultation and care associated with RDU. These findings are congruent with the study of the first and final years of nursing students' medication competence by [Sulosaari et al. \(2012\)](#). They reported that the seniors had a higher level of knowledge and skill in pharmacology, drug administration, and care related to the provision of medicines. The lowest score of RDU competency in *considering the options* seems to show that *considering the options* was perceived as physicians' role. In contrast, nurses perceived their roles as giving advice and consultation regarding drug use following physicians' prescriptions ([Intahphuak, 2014](#)).

It can be claimed that integrating the RDU contents using the model developed by the TNMC was a reasonable measure to develop the RDU competencies of the nurse

graduates. This could be an example of scaling up RDU nurses' competency for other countries interested and have a similar context. Furthermore, case analysis as a didactic method might enable the students to be more confident in administering drugs. It was also noted that drug-using skills were associated with medical competency.

### Implications of the study

The findings suggest that the TNMC should continually enhance, monitor, and evaluate the operations for sustainable development of RDU competencies in both nurse educators and students, including 1) supporting the development of innovative didactic strategies and materials for RDU instructions; 2) continuously developing and evaluating the RDU competencies of nurse educators and nursing students; 3) organizing a platform for exchanging knowledge and experience among educational institutions. All nursing education institutions should continually play an important role in collaboration for RDU competency development for both nurse educators and nursing students, particularly in lower-scoring areas. RDU competencies and contents should be clearly incorporated within the BNS program. Nurse educators should be formally trained for effective instruction of RDU. Further research should be conducted to ensure the effectiveness and progress of integrating RDU into the BNS program. The success of the RDU competency-enhancing model developed by the TNMC could be an example for other nursing professional organizations globally. Future research should be conducted to explore the perception of nursing students to gain an understanding of the point of view of the students to develop appropriate activities for integrating the RDU contents.

### Limitations

As this mixed-methods research study was conducted on a large scale with all nursing education institutions in Thailand, the response rate for quantitative data collection from each institution varied. In addition, this study did not include nursing students, and the qualitative strand did not include nurse graduates because of limited time. Therefore, the qualitative data might not be able to support all aspects of the quantitative findings. Several variables and groups of samples also made the study complicated to be carried out and to be presented.

### Conclusion

In conclusion, the development of RDU competencies is an essential issue for all health professionals as irrational drug use has become a serious health problem worldwide. The TNMC played an important role in this by developing an integration of the RDU contents into the BNS program. This study used the CIPP model as a framework to evaluate the results of its implementation. Quantitative data were collected from nurse educators and nurse graduates of Academic Year 2018 from 86 nursing education institutions in Thailand. Supplementary

qualitative data were collected from 50 nurse educators. The findings showed that the policy of integrating the RDU contents into the BNS introduced by the TNMC was well accepted and translated into action at most nursing education institutions. The nurse educators reported a high level of RDU competencies and carried out the model for implementation as guided. This resulted in a high level of RDU competencies of the nurse graduates.

### Declaration of Conflicting Interest

The authors declare that there is no conflict of interest in this study.

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### Authors' Contributions

All authors helped develop the research proposal, discussed the study design, drafted the manuscript, revised it critically, and approved the final version of the paper. KT was the head of the research group, supervised the proposal development, ethical approval process, drafted, edited, and completed the article. KS, SC, MR, and PP made contributions to literature review, performed questionnaire validation processes, data collection, management, and analysis, and completed the manuscript. NA contributed to literature review. ST approved data acquisition and analysis. LV and ST agreed to its submission for publication.

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## Data Availability Statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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