Review Article

Instructional Management Techniques for Nursing Science Students with Simulation Based Learning

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Abstract

Along with the transition to the 21st century, the instructional management for nursing science students at the present time has been on a progressive path. As nursing students are aimed to possess merits such as working as a team, practice of their intelligence, learning to have good citizenship, and succeeding to the appreciation of Thailand's traditions and values, instructors are unarguably required to adjust and transit the instructional roles from ones who offer lessons to the facilitators of learning, and to provide opportunities for the students to learn and practice from real or simulating situations as teamwork. Simulation Based Learning: SBL is the instructional method that enables the students to learn from practice, think, analyze and solve the situations they encounter. Accordingly, the method employs variety of applications that allow the students with opportunities to decide the content which they feel interested in, and to participate in learning activities and practice by themselves. Simulation Based Leaning: SBL is therefore another option of instructional management that could respond to the expected learning outcome of nursing students with good quality in the future.

***Key Words*:** Instructional management Techniques; Nursing science students; Simulation based learning

Introduction

The instructional management in the higher education level (Kunaviktikul, 2015) can be said to have an emphasis on developing students with knowledge according to a designated curriculum and a revision under the standard framework of qualification, virtue, morality, learning skills in the 21st Century, self-learning skill, Thai and foreign language skills, teamwork skills, technology intelligibility, and good health(Phothidara, 2011).It is also recommended that instruction should employ technology and media which allows students to freely learn at all time and from everywhere. Moreover, instructors serve as facilitators of learning and provide learning supports (Borommarajonnani College of Nursing, Uttaradit, 2017). Nursing education is a study of professional that provides theoretical, experimental, and practical instruction. It offers variety of instructional styles to increase learning experience for the students, for example, practice in real conditions, problem-based learning, case studies, discussion, and demonstration. These contributions aim at producing nursing graduates who possess the preferred characteristics and achieve the learning outcomes according to the standard qualification framework for higher education in nursing education which consist of skills in virtue and morality, knowledge skills, cognitive skills, interpersonal skills and responsibility, numerical analysis skills, communication and technological skills, professional skills (Borommarajonnani College of Nursing, Uttaradit, 2017). This paper aimed to review the knowledge as the guidelines for the instructional management for nursing science students with simulated situations. The primary concern of this paper highlighted the educational management including preparation of the simulated situation,

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learning procedures, learning assessment, and learning outcome in nursing science student instruction.

The Simulated Situations

The instructional management with simulated situations in this paper refers to the educational management for learning experiences of the nursing science students by creation in various imitations of partial or almost total realistic clinical situations which were divided into three different levels of fidelity in order to create learning settings that could prevent possible harms or risks directly happen to the actual patients (Gloe et al., 2013; Sinthuchai and Ubolwan, 2017).The instructional management can be said to differ in three levels as follows;

1. The low-fidelity simulation is based on a minimum level of simulated nursing practice. The patient mannequins used in this instructional level refers to the human patient simulators which do not show body reaction and body movement. It is employed to train basic clinical skills for the nursing students such as injection and peripheral venous catheter.

2. The medium-fidelity simulation with more realistic situations where the human patient mannequins can show pulse, heartbeat and pulmonary sounds. However, this level requires more complex nursing practice and clinical skills such as patient evaluation and cardiopulmonary resuscitation. The human patient simulators, at this level, do not present chest motions and eye movement.

3. The high-fidelity simulation can be described to demonstrate more realistic and complex situations. This level of simulated situations relies on the use of computer technology to demonstrate the body reactions as if the nursing students are training with real human patients. The patient simulators can show pulse, heartbeat and lung sounds, chest movement, eye movement, and speech. This allows instructors and students to participate through assigning roles such as patients, patient relatives, nurses, and doctors. Also, it enhances important skills such as critical thinking, teamwork, and nursing practice for critical cases (Kanhadilok and Punsumreung, 2016; Suwannakeeree et al., 2016).

The Human Patient Simulators

The human patient simulators refer to the mannequins used in the instructions of nursing and medicine students. The simulators show similarities of human body and can demonstrate signs of life such as automatic pupillary response, blinking, and pulse detection. It can also depict symptoms of respiratory obstruction, blood test, and peripheral venous catheter. The computer system of the human patient simulators can calculate the dosage and identify the drug names. The performance of human patient simulators was controlled by computer programs which can show display and audio via what is referred as “Linkbox” connecting the mannequin and the monitor screen. The linkbox can record the video of the students consisting of three different modes; Auto mode, Instructor mode - On the fly, and Instructor mode - Pre programmed. Additionally, instructors can designate a particular situation of patients or conditions for the simulator to perform on the program (Dieckmann et al., 2012; Cordeau, 2013; Edgecombe et al., 2013).

Why do we do Simulation?

The simulation-based learning (Khemmanee, 2014) method in this studycan be described as an instructional management that can help students learn according to expected objectives of learning by assigning the students to play roles on the assigned or simulated situations as if there were real patients. It allowed students to practice and interact in semi-realistic situations under the important learning objectives as follows; 1) safety: to create safety for patients, that is, students have to practice with the human patient simulatorswhich can be performed repeatedly or stopped at certain sessions until they have confidence and learn to adjust themselves to face with the actual situations where stress and pressure can be encountered, 2) experience: to add skills so that the students will not show fear, anxiety, crying, and feeling stressed out just the same way as pilot students before they have a flight where they have to possess the skills and ability to face with changeable situations, 3) practice: students have to practice with uniform in order to display

respect to their profession and to remind themselves of professional considerations and to apply knowledge in their performance, and 4) benefits: practice with the human patient simulators can be stopped and asked for suggestions and repeat again as the benefits of learning among students (Groomet al., 2014).

The Design of Simulated Learning

The instructional management in this study was adapted from the Theory of Experiential Learning by Kolb, 1999 which consists of 4 components as shown in Figure 1.

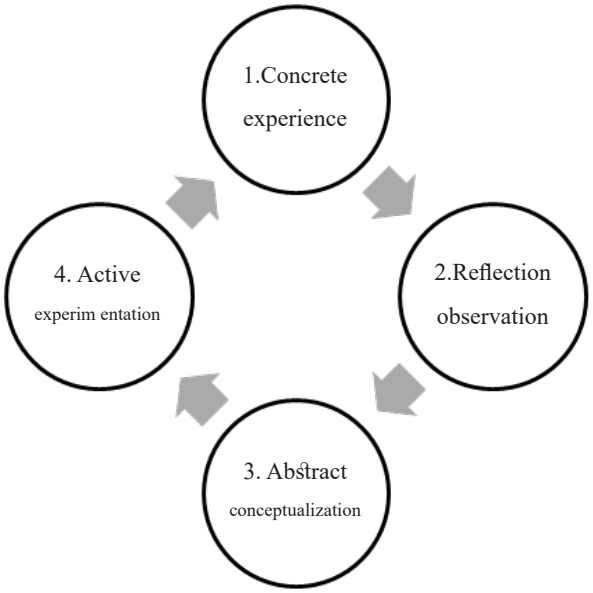

Figure 1 Cycles of Experiential Learning (adapted from Kolb, 1999)

According to Figure 1, the first component is the concrete experience where learners gain different experiences by themselves with instructors as assistants giving them correct suggestions. The second component is the reflection observation which can be gained from practice. This learning experience helps the learners absorb from other people's experience to create their own knowledge and understanding. The third component refers to the abstract conceptualization which learners applies the knowledge gained from reviewing documents, computer and information retrieval, background experiences, and the knowledge obtained from discussion after group work of the learners into conceptualization of what they have learned. The establishment of this kind of knowledge enables the learners to harvest from their various tasks as resources of knowledge and to apply their knowledge in their future work. Finally, the fourth component is the active experimentation. At this stage, learners are able to create their development path of work on the basis of conceptualization to practice, achievement assessment, and the ability to establish another cycle of experiential learning (Kolb, 1999).

To construct the instructional management for nursing students with simulated situations (Kolb and Kolb, 2005; Jeffries, 2005; Norkaeo, 2015)., the researchers adapted the guidelines by Jeffries and Rogers, 2007 which included practice directions, simulated practice, and summarizing. Moreover, the researchers condensed the guidelines by Jeffries and Rogers, 2007 and the theory of experiential learning by Kolb, 1999 into the instructional management in the study as follows;

The first step is the preparation of the instructors, learners, and laboratory which can be described as follows;

1. To design an instructional planning, the first consideration should be crucially assigned to the instructors. That is, the roles of instructors are mainly based on the focus to encourage and guide the students to apply their thinking skills to decide which nursing practice should be performed on the patients. Moreover, they should act as the leaders in brainstorming at the step of conceptualization of what the students have learned. They should also be able to provide the guidelines for the students in searching for empirical evidence and information necessary for their clinical judgement. The eligibility of simulated scenario designed by the instructor should account for the variety of health problems of patients, cultures of learning and students, levels of difficulty and complexity as they are designated to the simulated situations from the background knowledge of the students, learning objectives, and learning outcome. Therefore, the instructor should not reveal the content, and details related to the simulated situations to the students (Gloe et al., 2013).

2. To evaluate the students, the assessment of knowledge should be designed in accordance with the learning objectives. Moreover, the construction of assessment forms should be

carried out together with the manuals before instruction step takes place.

3. To prepare the students, the instructors should clearly give directions of the simulated tasks before the performance begins. Favorable agreements among the students and instructors should be suggested such as reviewing the previous lessons, proper attention, and exchange of knowledge after having performed the simulated scenario (Edgecombe et al., 2013).

The second step is the execution of instruction which includes the pre-briefing phase, the simulated scenario phase, and debriefing phase as will be discussed in the following section (Cordeau, 2013).

1. At the pre-briefing phase, the instructor provides advice for the students about learning objectives. The instructor should also give clear directions retaining to the use of the human patient simulators, instruments in the laboratory, the limit of time to execute the simulated training, and handouts suggesting details of the simulated situations.

2. At the step of execution the simulated scenario phase, the students are asked to carry out the practice of nursing skills on patients in different situations. It allows the students to learn from encountering problems, working as a team, and performing the assigned roles of individual students such as head nurse and practice nurse. The instructor, here, act as the facilitator of practice. The awaiting group of students observe the performances of other groups and reflect some their opinion from their observation.

3. The debriefing phase can be said to be the most important learning activity. That is, it encourages the students to analyze the process performance, rather to analyze the mistakes, that can create the atmosphere of trust among the students. The students are asked to examine what they have learned based on the learning objectives. The instructor re-states about the task so that the students can see the clear picture of their performance, and clarifies some details for the students to have better understanding. Finally, the students are assigned to study their strength and weakness according to the practice algorithms and professional standards of nursing.

The final step of the instruction is the assessment of knowledge which can be divided into two main aspects as follows;

1. The formative assessment is employed to investigate the knowledge and skills of the nursing students. It consists of quizzes on knowledge used during practice.

2. The summative evaluation functions to examine the knowledge according to the learning objectives. This type of evaluation requires the instructor to explain the details of tests and criterion of evaluation for the students so that the process of evaluation can be most accurate (Norkaeo, 2015; Kumkong and Chaikongkiat, 2017).

The validity and reliability of the assessment instrument

The validity can be evaluated from the assessment instrument for example an assignedteamwork can be directly assessed from the facial expression of the students within a group, and from the content validity(Jamjang,et al., 2015).The reliability can be evaluated from the fact that each assessor must be able to evaluate the performance of the students under the same criteria. Rechecking of assessment should be similar and can be done through viewing video records which is expected to have the same result of assessment. The following section presents facts and evaluation guidelines on the students' knowledge.

Table 1 The evaluation guidelines for the nursing students' performance with simulated situations

Facts	Evaluation guideline when the students make a mistake
- It is possible that a nurse makes a mistake	- It is also possible that a student makes a mistake (a mishandling error or forgets to do)
- Some mistake will not cause any harms	- Inform the student what the mistake is
- A mistake can be fixed (as it can be decreased or avoided)	- Inform the student of solution and have him/her perform again
- Teaching the students to know and learn to solve a mistake is a crucial skill of nursing profession	-Students should be to explains the possible risks in patients

The Instructional Management with Simulated Situations and the Enhancement of Learning outcome in Nursing Students

The finding of the study revealed that, after the instructional management with simulated situations, the learning outcome of the undergraduate nursing science students showed the knowledge and skills in nursing practice, critical thinking, self-confidence, and satisfaction in learning (Lewis et al., 2012; Howley, 2013). As for the knowledge aspect, it was found that the students have longer learning memory than regular instruction. As for the skills in nursing practice, the students showed their good attention to their performance and gained better capacity to execute nursing practice. As for the satisfaction in learning, the students felt content towards the opportunity given to think and perform by themselves. They realized their true potentials. In addition, the students showed their increased ability for critical thinking and higher self-confidence in performing clinical tasks and decisions (Kodate et al., 2012).

The Equipment, Instrument, Materials, and Medical Supplies in the Instruction

The instructional management by using the human patient simulators requires equipment, instrument, materials, and medical supplies which are consistent with the simulating situation. To arrange and prepare the classroom, they can be discussed as follows (Tantalanukul, et al., 2016).The first requirement is the human patient simulators with high capacity that can be calibrated in order to match the simulating situations. The second component is the computer and monitor. They are considered as important instrument to control the human patient simulators in the simulating situation. At the same time, the monitor shows information of the human patient simulators that students will learn to read, interpret, and analyze information of the patients. The third is the medical equipment for evaluating and giving care to patients such as Suction Defibrillator Monitor, NIBP, O2 pipeline, EKG, emergency car with infusion pump and other equipment consistent with the assigned simulating situation. The forth is materials and medical supplies which are ones excluded from treatment procedures such as Set IV Syringe Alcohol 70%, Specimen tube, O2 tank, urinary catheterization, ICD Set, Gastric Lavage Set, etc. The fifth is medical supplies including medicines, intravenous solution, blood and blood components which are required from various simulated diseases. The sixth is the medical records which are arranged according to forms of particular hospitals. And the last component is the stationery that should be sufficiently provided such as pens and paper.

Possible Problems in Performing Simulation

As performing simulation, it is possible to encounter some problems related to technology and the human patient simulators (Cooket et al., 2011).The instructors should be able to troubleshoot when such problems occur. The frequent problems can be such as the chest of the human patient simulators is not in consistent motion with breathing, blood pressure measurement can be different from the designated situation, the monitor appears blackout and the human patient simulators is not working, the human patient simulators does not sound, the patient monitor becomes unresponsive, or scenarios do not go as configured. These problems can be solved at ease such as if the chest of the human patient simulators is not in consistent motion with breathing, it should be checked if the blue valve is open and releasing air from the compressor. At times, the remaining air is found in the machine and may keep it from working properly. To cope with this, the red valve should be open to release the air, and restart the compressor again. Check if the tubes and joints connecting the compressor and the human patient simulators are in place. Besides, it is suggested to check whether the software is working by checking at the red light on the linkbox. If the light is on, that means the machine is working. In some cases, the one of learning objectives is to measure the correct blood pressure. However, it can be found that the blood pressure measured by the students might be different from that in the designated simulation. It can be fixed by checking the settings of Korotkoff Sounds, turning up to the highest level, calibrating the systolic and diastolic pressure at the human patient simulators and program at the same

level, adjusting the auscultatory gap on/off feature by checking if the earphones are switched on or off, or manually calibrating the blood pressure by two persons, that is, one going to controlling program of the human patient simulators and clicking at calibrate button to set the correct blood pressure according to the assigned situation, and the other pressing the cuff BP until the blood pressure match with each other. If the monitor appears blackout and the human patient simulators is not working, it can be done by checking at the linkbox if the red light is on or not. It is essential to make sure that the joints of wires between the linkbox and the human patient simulators are connected, and also check the connection between the human patient simulators and the monitor. Then, reboot the human patient simulators and the computer at the same time. The last frequent problem is that the scenario does not go as configured. This is often caused from the incorrect design of situations. This is because scenario always proceeds and cannot be set to return to the previous situation. Therefore, if one wishes to design the situations of a patient getting worse or better, it is required to determine the frame of new situations and click to connect the situations respectively by going to edit and design situations again (Adamson, 2015).

Conclusion

The instructional management with simulation learning in the nursing education is another method used in undergraduate and graduate levels in order to compensate or append the students' experiences in giving care to patients through the designed situations. It can be performed repeatedly with simulation computer programs such as past task trainer, standard patients, hybrid simulation, and high fidelity simulation to create a semi-realistic situation as if the instruction takes place in real situation. It can increase safety of patients, decrease nursing mistakes, and improve the four processes of giving care to patients which are 1) education by transforming theoretical knowledge into practice, 2) assessment by evaluating to control and improve the quality, 3) health system integration by improving and training the students to work as a team which can properly help manage human resource in the real situations, and 4) research by studying the behaviors of nursing personnel to develop its working process.

Currently, the content in nursing education has dramatically increased. Additionally, the safety and quality in giving care to patient become the main considerations of nursing education. There are such worries from the patients that they will be usedfor training when the nursing students are not fully capable of performing a nurse. At the same time, from the nursing students, they feel worried that they are not sufficiently trained to take care of patients. Such problems can be unraveled as the instructional method with simulation situation serves as connecting the gaps with the use of practice learning in the human patient simulators. It can build up the cognitive skills for the students because this method allows them to use thinking skills as they practice. This benefit is in line with the Thailand Qualification Framework (TQF) that suggests what is referred as curriculum mapping, that is, instructional management should connect the contentwithin a course with an emphasis on cognitive skills to produce nursing professionals in the public health system in the future.

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