Effects of developing scenario learning in a fundamental nursing course: a pilot study

Kyoung-Hwa Baek¹, Jeong-Hwa Cho² and Jongmin Park³*

Abstract
Background: This pilot study aimed to investigate the effects of developing scenario learning (DSL) on team efficacy, systems thinking, and proactivity in problem-solving in a fundamental nursing course.

Methods: A total of 53 second-year nursing students were enrolled in the study; the DSL nursing education program was implemented for 15 weeks from March 4 to June 17, 2021. Data on team efficacy, systems thinking, and proactivity in problem-solving were measured before and after the DSL-based nursing education program. The collected data were analyzed using the IBM SPSS Statistics version 22.0.

Results: The results demonstrated that nursing students’ team efficacy (t = −8.228, p < .001, Cohen’s d = 1.079), systems thinking (t = −9.757, p < .001, Cohen’s d = .731), and proactivity in problem-solving (t = −8.635, p < .001, Cohen’s d = .992) significantly increased after the program.

Conclusions: The findings of this study can contribute to the development of nursing competency in nursing students without experience in nursing practicum. The authors recommend incorporating DSL in the nursing curriculum to promote early adaptation in clinical settings.

Keywords: Developing scenario Learning, Nursing student, Team efficacy, Systems thinking, Proactivity in problem-solving

Background
Practical forms of knowledge critical to the core competencies valued in the twenty-first century—problem-solving, language competence, self-directedness, and leadership—are imperative for learners. These help promote success in life and/or advance their professional career [1]. Curricula for nursing students, who must acquire nursing competencies, encompass theoretical and practical field knowledge and are designed to help students build a thought process appropriate for nursing professionals [2]. Education enables nursing students to become competent nurses who plan and administer multi-dimensional and cost-effective care by integrating their knowledge and skills based on social duty and ethics [3]. Although the dramatic advances in the healthcare environment in recent years have bolstered patient safety, emphasis on patients’ rights has decreased the opportunities for nursing students to acquire hands-on experience in patient care and deal with nursing issues in clinical settings [4]. Additionally, the excessive emergence of new nursing schools to meet the growing demand for nurses has led to a shortage of nursing practicum sites, further shifting the hands-on learning paradigm required for practicum to observation-focused learning [5]. Newly-graduate nurses face a transition shock, work-related stress, and perceived inadequacy due to the disparity between their education in school and the competencies demanded by the clinical practice [6]. This, in turn, leads to a high turnover rate and an increasing number of nurses on leave, thereby creating gaps in

*Correspondence: jmpark@pusan.ac.kr

¹ College of Nursing, Research Institute of Nursing Science, Pusan National University, Yangsan, Republic of Korea
Full list of author information is available at the end of the article
their nursing careers. Therefore, a nursing curriculum based on program outcomes emphasizes the use of various teaching methods for practice-focused competency training [7], and teaching approaches such as problem-based learning (PBL), simulation, flip learning, and action learning are employed.

Developing scenario learning (DSL) is a learning strategy combining elements of PBL and role-play; it allows students to reflect on various perspectives and interpretations of a scenario by developing the scenario themselves [8]. PBL is a fundamentally static learning strategy that facilitates and nurtures students’ competencies through a structured process with clear-cut problems [9]. Even if a scenario reflecting a real-world clinical situation is implemented, the set framework of the scenario cannot be altered during learning; thus, the focus is purely on an individual’s ability to respond to problems [8, 10]. DSL trains students to respond to environmental changes and reevaluate a piece of information beyond the initial interpretation as the problem at hand evolves. Hence, it facilitates the achievement of learning goals by promoting a problem-solving process that reflects the clinical scenario, critical thinking, confidence, and creativity [9, 11]. Moreover, coupling the key advantage of role plays—performing an unfamiliar role and perspective based on their individual beliefs [12]—with nursing major courses is believed to help nursing students adjust quickly to clinical settings by acquiring core competencies required for the same.

Multidisciplinary approaches are needed to resolve patients’ problems in patient-centered care, with team efficacy being an essential competency demanded of nursing students. Team-learning activities provoke intrinsic motivation, such as team efficacy, and contribute to stimulating the proactive sharing of information among college students [13]. In a meta-analysis of 67 studies, Gully et al. [14] reported that team efficacy boosts confidence among team members and significantly influences work generalization and the outcomes of work. Thus, it is necessary to investigate whether DSL, which involves developing a scenario and resolving problems, is a learning strategy that enhances team efficacy.

Systems thinking refers to the ability to integrate various pieces of knowledge and intuitively view interactions among constructs to learn the entire system effectively [15]. To gain an adequate understanding of system-based patient-centered care to promote the safety and quality of care, nursing students are required to develop an understanding of the overall health management system, as opposed to tackling fragmentary problems affecting individuals [16]. There is no single process for deriving and resolving a problem [8]. Thus, systems thinking has benefits in the complex process of listing various relevant factors when identifying the problem and discussing the various methods to solve the same.

Proactivity in problem-solving refers to recognizing the problem at hand and appropriately responding to any issues that arise while solving the task [17]. As patients in need of care face a disease-specific and multi-dimensional problem situation, nurses are demanded to employ proactive and systematic problem-solving skills. However, an observation-focused nursing practicum is a serious barrier to problem-solving training among nursing students; further, it hinders their use of problem-solving skills in clinical practice following graduation [18]. Therefore, the nursing curricula should expose nursing students to various problem-solving situations and foster a participatory attitude toward problem-solving in the organization. Scenario-based learning has been reported to increase knowledge and/or creative ability for problem-solving by inducing a deep understanding of information [19].

One of the studies that reported the effects of DSL, which also involved the sharing of feedback, examined the effects of emergency patient triage training through a scenario development process and role-play [20]. Further, a hybrid study examined nursing students’ perception of rudeness using DSL [21]; additionally, another study developed a corrective learning program using role-play for nursing students [22]. However, these studies did not adopt a clear definition of DSL and present evidence. DSL has often been studied without being distinguished from learning strategies that combine existing learning methods. Moreover, the strategies were focused on the outcome-centered feedback from the instructor, as opposed to the development of a scenario, thus impairing the understanding of the essence and learning outcomes of DSL.

This study aimed to implement a DSL program for second-year nursing students following the multi-phase protocol outlined by Dalziel [8] and the Core Clinical Nursing Skills Assessment Protocol Version 4.1 (2018), developed by the Korean Accreditation Board of Nursing Education (KABONE). The objective was to assess the effects of DSL on team efficacy, systems thinking, and proactivity in problem-solving to determine the program’s efficacy. The authors believe that DSL can help educate nursing students, enabling them to demonstrate their core clinical competencies in nursing practicum. This will ensure that they quickly adjust to clinical settings as newly graduated nursing professionals embarking on their nursing careers.

This pilot study aimed to develop and apply a DSL strategy in a fundamental nursing course and evaluate the effects of DSL on nursing students’ team efficacy, systems thinking, and proactivity in problem-solving.
Methods

Study design
This pilot study employed a one-group pretest-posttest design to investigate the effects of DSL on team efficacy, systems thinking, and proactivity in problem-solving in second-year nursing students.

Participants
Fifty-three second-year nursing students signed an informed consent form to participate in the study. The sample size was determined using the G*power 3.1.2 program. For the difference from constant (one sample case) with an effect size of 0.5, a significance level of 0.05, and a power of 0.90, the minimum sample size was calculated to be 44. The sample size was determined to be 53, considering a 20% dropout rate. Students who took the 15-week fundamental nursing course from March 4 to June 17, 2021, completed the study questionnaire. There are no incomplete questionnaires; all data from 53 students were included in the final analysis.

Study procedure

Development of the DSL-based nursing education program
To develop the DSL-based fundamental nursing education program, the course syllabus and lesson flow chart were prepared. Thus, the five phases of the DSL model were applied, underpinned by the theoretical basis of core clinical nursing skills and objectives of the fundamental nursing course (Table 1). The DSL model comprises five phases: phase 1—introducing the overall learning experience—sharing of pre-learning; phase 2—preparation of the components—fishbone—identifying the problem, in which students reflect on the scenario through discussions; phase 3—development of a scenario—writing lines, in which students come up with a draft scenario; phase 4—finalization of scenario—application of background, investigation of theoretical evidence, and finalization of the storyboard, in which students reached a consensus on the final scenario; and, phase 5—re-finalization of the scenario—reformulation based on discussion, in which students reviewed and reflected on the interpretations of the initial scenario [9]. The program was designed as a 15-week, 2-credit course (2 hours) in accordance with the curriculum of the school of study. The program was developed by a panel comprising three professors with more than 10 years of clinical nursing experience and 3 years of teaching experience in the fundamental nursing course and three staff assistants with greater than 5 years of clinical nursing experience.

In the content development stage, four core nursing skills (intermittent gastric tube feeding, intradermal injection, subcutaneous injection, and intramuscular injection) were selected from 20 core nursing skills presented by the KABONE, considering the rate of students’ needs. The assessment protocol for the corresponding core nursing skills was used. Further, online video lectures were recorded, and templates were prepared, for therapeutic communication analysis and skill-centered scenario development report for the program.

Implementation of the DSL-based nursing education program
Of the total 15 weeks of fundamental nursing classes, 3 weeks of orientation were conducted. After 4 weeks
of lectures by areas, learning activities were conducted
to develop scenarios through phases 1 to 4 for 4 weeks.
The participants were divided into five teams, and each
team comprised seven to eight individuals. In the 13th
week, a video was produced while role-playing with the
final scenario. In the 14th week, the instructor provided
feedback using the learning goal and scenario evalu-
ation tool through a presentation, and the learning activ-
ities of phases 4 and 5 were completed. The theme of
the DSL-based nursing education program developed
by each team is presented in Table 2. An example of the
developed finalized scenario is presented in Table 3.

In this study, Phase 1 of DSL involved the sharing
of initial learning experiences within teams. The stu-
dents viewed the video lectures, read studies related to
core basic nursing skills in advance, and shared their
understanding and interpretation of the learning mate-
rials with their team during the class. Phase 2 com-
prised students developing an outline of their scenario
through discussion. They chose one core nursing skill
and set their skill-focused learning goals and events
that may occur while administering the skill accord-
ingly. They used a fishbone diagram to ensure diversity
and clarity of nursing problems that may occur while
performing the skill. Phase 3 consisted of students
developing the draft scenario. They experienced the
development of diverse scenarios by writing out sev-
eral possible cases of conversation scripts and analy-
ses, integrating each event with the identified nursing
problems, continuously discussing them with the team,
and searching for theoretical evidence. In Phase 4, stu-
dents reached a consensus on the scenario develop-
ment. They developed a scenario storyboard using the
script chosen by the team members and reflecting the
contextual features of the patients involved. In Phase
5, students reviewed the interpretations of the initial
scenario. They assigned each other roles based on their
team’s storyboard and performed the role-play. They
filmed their role-play for presentation and discussion
during the class. Further, they wrote a reflection jour-
nal to share and reflect on their experiences during sce-
nario development.

Table 2 Theme of the Developing Scenario Learning-Based Nursing Education Program Developed by Each Team

| Team | Theme of the Scenario |
|------|-----------------------|
| I    | Case of antibiotic skin reaction test by ignoring the history of side effects of antibiotics |
| II   | Case of side effects after antibiotic administration without checking the skin test |
| III  | Case of hypoglycemia due to an error in the insulin dose to be administered |
| IV   | Case where aspiration occurred because the position of the gavage was not confirmed before gavage |
| V    | Case where the purpose of administration and precautions were not explained before intramuscular injection |

**Instruments**

**Team efficacy**

The authors used the eight items of the team efficacy
subscale used in the study by Marshall and Lori [23] and
modified and validated by Kwon [24]; these were rated on
a five-point Likert scale. The total score ranges from 8 to
40, and a higher score indicates higher team efficacy. The
reliability of the tool was Cronbach’s $\alpha = .96$ in the study
by Kwon [24] and .88 and .95 before and after the inter-
vention, respectively, in this study.

**Systems thinking**

The tool developed by Lee et al. [25] was used. This
20-item tool comprises five domains, with four items
each for systems thinking, personal proficiency, mental
model, shared vision, and team learning. Each item is
rated on a five-point Likert scale. The total score ranges
from 20 to 100, and a higher score indicates greater sys-
tems thinking. The reliability of the tool was Cronbach’s $\alpha = .83$ at the time of development of the tool and .81 and
.86 before and after the intervention, respectively, in this
study.

**Proactivity in problem-solving**

From the five-factor scale for team skills developed by
Marshall and Lori [23], the authors used the eight items
of the adaptability factor adapted by Kwon [24]. Each
item is rated on a five-point Likert scale. The total score
ranges from 8 to 40, and a higher score indicates greater
proactivity in problem-solving. The reliability of the tool
was Cronbach’s $\alpha = .77$ in the study by Kwon [24] and .77
and .92 before and after the intervention, respectively, in
this study.

**Data analysis**

The collected data were analyzed using the IBM SPSS
Statistics version 22.0 (SPSS New York, USA). The par-
ticipants’ demographic characteristics were analyzed
with the real number and percentage of mean and stand-
ard deviation. Further, the changes in team efficacy, sys-
tems thinking, and proactivity in problem-solving after
the implementation of the DSL nursing education pro-
gram were analyzed with paired t-tests. To investigate
effect sizes (Cohen’s d), the authors calculated the mean difference of outcomes between the pre- and post-intervention.

**Results**

**Demographic characteristics**
The participants’ mean age was 19.90 ± 1.95 years. The sample comprised 77.4% female and 22.6% male nurses.

| Learning Goals | Developed Scenario content | Scenario Report Evaluation Item |
|----------------|-----------------------------|---------------------------------|
| Effective communication before antibiotic skin test | ■ (Washing hands. Confirming the patient’s prescription and preparing the item)  
■ Nurse: Hello, my name is OOO. (Washing hands) What is your name?  
■ Patient: This is △△△.  
■ Nurse: (Checking the patient’s bracelet and medication label) 123,456 △△△ has been confirmed. Have you ever taken antibiotics in the past?  
■ Patient: Yes. I had a very bad cold and was hospitalized.  
■ Nurse: Alright. Have you ever had side effects such as skin rash, itching, heat, and chest tightness after taking antibiotics?  
■ Patient: Itchy and red marks around the arm; penicillin or something is not good for me.  
■ Nurse: Yes. I know. From now onward, as there is a risk of infection through surgery, antibiotics will be administered. First, to determine if there is a hypersensitivity reaction to antibiotics before administration, we will start with a skin test. | - Hand hygiene  
- Patient identification  
- Problem assessment  
- Select related core skills |
| Perform the intradermal injection accurately | ■ Nurse: (Choose an injection site and take a comfortable position and wash hands) I will do a skin test on your right arm. It will sting slightly (draw the injection site boundary after intradermal injection, and write the date, time, and drug name).  
■ Patient: Ah ~ ~ Ah ~ ~ It hurts.  
■ Nurse: Were you very sick? I’ll check the skin reaction in 15 minutes. Do not touch or rub the area drawn with the ballpoint pen (Washing hands after organizing). | - Performing core skills  
- Proceed with the correct procedure |
| Solve problems through verbal and non-verbal communication | ■ Nurse: (After 15 minutes) Show me the area marked with the ballpoint pen (check the degree of redness and swelling). There is a possibility that the test will be positive. Have you ever touched the injection site? Let’s check again.  
■ Patient: Why are you doing it again? Isn’t it strange that it’s an antibiotic or something? You said I was allergic. Shouldn’t you find out more before giving an injection?  
■ Nurse: Yes. You’re right. As this can happen, I asked you a question before the reaction test, but there is a point after which I am not supposed to check again without consulting the doctor. I’ll check for itching or hives. Are you feeling out of breath?  
■ Patient: Did someone else’s injections go wrong?  
■ Nurse: You haven’t been on antibiotics yet. As I explained at the beginning, the antibiotic was not administered because the reaction test was performed before the antibiotic injection. So don’t worry too much. We asked you several troublesome questions to protect your safety. Thank you for answering the question, although it is difficult. Do you have any more questions? | - Problem-solving  
- Determining whether the situation is to be reported to the doctor |
until the preceding semester was 3.0–3.9 (71.7%), followed by < 3.0 (17.0%) and ≥ 4.0 (11.3%) (Table 4).

**Effect of the DSL-based nursing education program**

The mean team efficacy score significantly increased statistically from 3.70±.46 before the intervention to 4.23±.52 after the intervention (t = −8.228, p < .001, Cohen’s d = 1.079). The mean systems thinking score significantly increased statistically from 3.50±.36 before the intervention to 3.79±.43 after the intervention (t = −9.757, p < .001, Cohen’s d = .731). Regarding the subscales of systems thinking, the mean scores significantly increased statistically for systems thinking (t = −5.791, p < .001, Cohen’s d = .631), mental model (t = −4.539, p < .001, Cohen’s d = .630), shared vision (t = −6.180, p < .001, Cohen’s d = .504), and team learning (t = −3.811, p < .001, Cohen’s d = .479) after the intervention. However, the mean scores for personal mastery (t = −0.678, p = .501, Cohen’s d = .060) did not change significantly (Table 5). Further, the mean proactivity problem-solving score significantly increased statistically from 3.56±.41 before the intervention to 4.07±.60 after the intervention (t = −8.635, p < .001, Cohen’s d = .992) (Table 5).

**Discussion**

This pilot study aimed to develop, implement, and evaluate the effects of the DSL in a fundamental nursing course on team efficacy, systems thinking, and proactivity in problem-solving in nursing students. The participants’ team efficacy score increased from 3.70 before the program to 4.23 after the program. This is consistent with a previous study’s findings that demonstrated an improvement of team efficacy after team-based learning, such as simulation education and blended learning [26, 27]. Team efficacy refers to team members’ belief that their team can successfully undertake a particular task; team members are influenced by other members’ beliefs, faith, and behavior as they coordinate their own behaviors [14]. It is believed that the DSL introduced in the course naturally increases team efficacy by making the group actively create scenarios and perform the role-playing process with various perspectives.

The participants’ systems thinking improved from 3.50 before receiving the program to 3.79 after the program. These results were similar to those of Cho and Hwang [28], who studied nursing students by utilizing the same tool and obtained lower scores than those of Im and Lee [29], who applied a writing program to improve systems thinking. Systems thinking is a useful method to analyze the whole without being constrained by the cross-sectional area, understand the interactions of various factors

---

**Table 4** Demographic Characteristics of the Participants (N = 53)

| Characteristics       | Categories       | N (%) or M ± SD |
|-----------------------|------------------|-----------------|
| Age (years)           | 19.90±1.95       |                 |
| Gender                |                  |                 |
| Male                  | 41 (77.4)        |                 |
| Female                | 12 (22.6)        |                 |
| Religion              |                  |                 |
| Yes                   | 18 (34.0)        |                 |
| No                    | 35 (66.0)        |                 |
| Motivation for admission |             |                 |
| Self-select           | 8 (15.1)         |                 |
| Recommendation of others | 13 (24.5)    |                 |
| Employment            | 31 (58.5)        |                 |
| According to grades   | 1 (1.9)          |                 |
| Adaptation of nursing |                  |                 |
| Good                  | 8 (15.1)         |                 |
| Moderate              | 43 (81.1)        |                 |
| Bad                   | 2 (3.8)          |                 |
| Nursing satisfaction  |                  |                 |
| Satisfaction          | 26 (49.1)        |                 |
| Usually               | 26 (49.1)        |                 |
| Dissatisfaction        | 1 (1.8)          |                 |
| School grades         |                  |                 |
| ≥ 4.0                 | 6 (11.3)         |                 |
| 3.9 – 3.0             | 38 (71.7)        |                 |
| < 3.0                 | 9 (17.0)         |                 |

*Note: M mean, SD standard deviation*

**Table 5** Effect of Developing Scenario Learning-Based Fundamental Nursing Education Program (N = 53)

| Variables                  | Categories | Pre M ± SD | Post M ± SD | t       | p       | Cohen’s d |
|----------------------------|------------|------------|-------------|---------|---------|-----------|
| Team efficacy              |            | 3.70 ± .46 | 4.23 ± .52  | −8.228  | <.001   | 1.079     |
| Systems thinking           |            | 3.50 ± .36 | 3.79 ± .43  | −9.757  | <.001   | .731      |
|                           | Systems thinking | 3.23 ± .62 | 3.70 ± .85  | −5.791  | <.001   | .631      |
|                           | Personal mastery | 3.99 ± .51 | 4.02 ± .48  | −678    | .501    | .060      |
|                           | Mental model | 3.00 ± .54 | 3.37 ± .63  | −4.539  | <.001   | .630      |
|                           | Shared vision | 3.41 ± .49 | 4.02 ± 1.64 | −6.180  | <.001   | .504      |
|                           | Team learning | 3.87 ± .48 | 4.13 ± .60  | −3.811  | <.001   | .479      |
| Proactivity in problem-solving |        | 3.56 ± .41 | 4.07 ± .60  | −8.635  | <.001   | .992      |

*Note: M mean, SD standard deviation*
when making decisions, and solve problems [30]. In this study, it is believed that the systems thinking ability was expressed while analyzing cyclical scenario questions, discussion process, and dialog book according to the step-by-step procedure of the theoretical framework and while writing a reflection journal. Further, in this study, personal proficiency, mental model, and shared vision—the subscales of systems thinking—significantly improved after the program. Systems thinking is the ability to think with the attributes of a dynamic system, a holistic view, and a transformational aspect [29, 31]. DSL involves analysis and transformational thinking for a wide range of environments through self-change and constant interaction with the outside world in the process of moving forward. Moazee et al. [32] investigated nurses’ perceptions of nursing stability and systems thinking. They stated that systems thinking was an influential factor in enhancing nurses’ stability and quality; in terms of healthcare, it has been studied as a major competency in preventing infection control and negative health-related outcomes [33]. Thus, systems thinking will be established as an essential competency in dealing with nursing problems composed of complex causal relationships and improving the nursing process.

Proactivity in problem-solving in nursing students improved to 3.56, which further improved to 4.07 after the program was provided. These results are inconsistent with the study of Byeon [34], which indicated no significant change in proactivity in problem-solving before and after the simulation-based integrated practicum. However, in their study, proactivity in problem-solving improved to a level similar to that in previous studies using the same tools for the same subject group [17, 28, 35], which is consistent with the results of this study. Problem-solving is a cognitive and behavioral process that requires a high-level thinking process. It provides a series of practical solutions to accumulate effective decision-making processes and select the most appropriate solution [36]. The approach to problem-solving is an essential factor for nursing students educated to become professional nurses. This is because rational and reasonable thinking, creativity, intuition, and imagination are introduced to enable clinical judgment or reasoning on nursing problems. DSL approaches are believed to have raised the level of proactivity in problem-solving of the study participants by providing opportunities to collaborate through communication and coordination with members and actively participate in problem-solving [37] in the curriculum.

This study’s findings identified that DSL is effective in team efficacy, systems thinking, and proactivity in problem-solving in nursing students. Considering that DSL was effective for lower-grade students without clinical experience, it is necessary to repeatedly study it as a learning method to help nursing students adapt early to the clinical settings.

Conclusions
This pilot study provides initial evidence that a DSL-based nursing education program in a fundamental nursing course improves nursing students’ team efficacy, systems thinking, and proactivity in problem-solving. However, this study has limitations in generalizing the results because the convenience sampling method was used to recruit nursing students from one university, and the control group was not assigned. Based on the above results, the following recommendations are made. First, it is necessary to increase the accuracy of the DSL effect by assigning experimental and control groups and controlling exogenous variables due to the educational environment. Second, it is necessary to introduce DSL methods into various subjects in addition to the fundamental nursing education program and develop and apply modules.

Abbreviations
DSL: Developing Scenario Learning; PBL: Problem-Based Learning; KABONE: Korean Accreditation Board of Nursing Education.

Acknowledgments
The authors thank all the students who participated in the study.

Authors’ contributions
K-H.B. and J-P. developed the study concept and design. K-H.B. and J-H.C. analyzed and interpreted the data and drafted the manuscript. J-P. critically revised the manuscript. All authors read and approved the final manuscript.

Funding
This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Availability of data and materials
The datasets generated and/or analyzed during this study are not publicly available due to the datasets containing information that could compromise research participant consent. However, the datasets are available from the corresponding author upon reasonable request.

Declarations
Ethics approval and consent to participate
This study was performed according to the Helsinki Declaration, and the Institutional Review Board of the Pusan National University approved the study protocol (approval number: PNU IRB/2021_08_HR). Written informed consent was obtained from all the participants.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.
Author details

1 Department of Nursing, Gyeongbuk College of Health, Gimcheon, Republic of Korea. 2 Department of Nursing, Daejeon Institute of Science and Technology, Daejeon, Republic of Korea. 3 College of Nursing, Research Institute of Nursing Science, Pusan National University, Yangsan, Republic of Korea.

Received: 3 February 2022 Accepted: 10 May 2022
Published online: 25 May 2022

References

1. Tick A. Application of problem-based learning in classroom activities and multimedia. In: 5th Slovakian hung joint symposium on applied machine intelligence and informatics. Poprad; 2007. p. 363–75. Retrieved from http://bfm.hnu/conferences/sami2007/36_Ande.pdf.
2. Nehir B, Vanaki Z, Mokhtari Nouri J, Khademolhosseini SM, Ebadi A. Competency in nursing students: a systematic review. Int J Travel Med Glob Health. 2016;4:3–11. https://doi.org/10.20986/ijtmgh-04013.
3. American Association of Colleges of Nursing. The essentials: Core competencies for professional nursing education. Unpublished draft November 2020. p. 5.
4. Kim E, Kang S. Effects of the simulation on the Ego resiliency, self-efficacy and satisfaction of major of the nursing students. J Korea Acad Ind Coop Soc. 2016;17:324–30. https://doi.org/10.13576/KAIS.2016.17.1.324.
5. Chung MS, Park JS, Ryu E, Shin G, Jun HY, Kim BJ. Teaching effectiveness and adequacy of practical training in nursing students. J Korea Acad Soc Nurse Educ. 2015;2:1550–60. https://doi.org/10.5977/jkasne.2015.214.550.
6. Jung D, Lee SH, Kang SJ, Kim JH. Development and evaluation of a clinical simulation for new graduate nurses: a multi-site pilot study. Nurse Educ Today. 2017;49:84–9. https://doi.org/10.1016/j.nedt.2016.11.010.
7. Kim YM, Park H. Current trends of teaching-learning methods in Korean undergraduate nursing education. J Learn Cent Curric Instr. 2016. https://doi.org/10.22251/jcc.2016.16.11.945.
8. Dalziel J. Developing Scenario Learning and its implementation in LAMS. In: Cameron L, Dalziel J, editors. Proceedings of the 7th International LAMS conference: surveying the learning design landscape. Sydney: LAMS Foundation; 2012. p. 32–9.
9. Chan ZC. Role-playing in the problem-based learning class. Nurse Educ Pract. 2012;12:21–7. https://doi.org/10.1016/j.nepr.2011.04.008.
10. Cameron L. Why re-invent the wheel? Sharing teaching strategies that work. In: Abas ZW, Jung I, Luca J, editors. Proceedings of the Global Learn Asia Pacific, USA. Association for the Advancement of Computing in Education, 2010. p. 796–804.
11. Olausen C, Heggdal K, Tvedt CR. Elements in scenario-based simulation associated with nursing students’ self-confidence and satisfaction: a cross-sectional study. Nurs Open. 2020;7:170–9. https://doi.org/10.1002/nop2.375.
12. Cogo ALP, Pao DD, Aliti GB, Hoefel HK, Azzolin KD, Busin L, et al. Case studies and role play: Learning strategies in nursing. Rev Bras Enferm. 2016;69:1231–5. https://doi.org/10.1590/0034-7167-2016-0277.
13. Kim E. The structural relationship between team intrinsic motivation, knowledge sharing, and team efficacy for college students. Korea Assoc Yeoion Educ. 2017;25:199–219.
14. Gully SM, Incalcaterra KA, Joshi A, Beaunin JM. A meta-analysis of team-efficacy, potency, and performance: interdependence and level of analysis as moderators of observed relationships. J Appl Psychol. 2002;87:819–32. https://doi.org/10.1037/0021-9010.87.5.819.
15. Lee H, Lee E. Effects of systems thinking on high school students’ science self-efficacy. J Korean Earth Sci Soc. 2016;37:173–85. https://doi.org/10.5667/KESS.2016.37.3.173.
16. Stalter AM, Mota A. Using systems thinking to envision quality and safety in healthcare. Nurs Manag. 2018;49:32–9. https://doi.org/10.1097/01.NUMA.0000529925.66375.d0.
17. Yune SY, Lee EY, Park KH. Relationship between communication, interpersonal understanding, proactivity in problem solving and team efficacy of medical students and nursing students. JMAHS. 2018. https://doi.org/10.21742/JMAHS.2018.02.37.
18. Kang S, Lim Y. Development and application of integrated nursing practice program preceded role-play related to clinical communication situation. J Korea Acad-Ind Coop Soc. 2014;15:3037–45. https://doi.org/10.5762/KAIS.2014.15.5.3037.
19. Mikkelsen J, Reime MH, Harris AK. Nursing students’ learning of managing cross-infections–scenario-based simulation training versus study groups. Nurs Educ Today. 2008;28:664–71. https://doi.org/10.1016/j.nedt.2007.11.003.
20. Deilavaz S, Hassanikhani H, Roshangar F, Dadashzadeh A, Sarbakhsh P, Ghafourifard M, et al. Comparison of scenario based triage education by lecture and role playing on knowledge and practice of nursing students. Nurse Educ Today. 2018;70:54–9. https://doi.org/10.1016/j.nedt.2018.08.006.
21. Abedini Z, Parvzy S. Student’s perceptions of using scenario-based education to improve civility: a mixed method study. J Adv Med Educ Prof. 2019;7:165–74. https://doi.org/10.3407/jamp.2019.74933.
22. Jeong HJ. The development of compensated learning program using role-playing and measurement of learning outcomes on maternity nursing practical education for nursing students. J Korea Enteratin Ind Assoc. 2015;9:137–46. https://doi.org/10.21184/jkea.2015.02.9.0.137.
23. Marshall LC. The relationship between* efficacy, teamwork, * effort and patient satisfaction. Los Angeles: University of Southern California; 2003.
24. Kwon EM. The correlation among team efficacy, interpersonal understanding, proactivity in problem solving and team performance. Unpublished master thesis. Graduate school of education. Seoul: Ewha Woman’s University; 2010.
25. Lee H, Kwon H, Park K, Lee H. An instrument development and validation for测量 high school students’ systems thinking. J Korean Assoc Res Sci Educ. 2013;33:995–1006. https://doi.org/10.14697/jkare.2013.33.5.995.
26. Hong CM. The effects of simulation on nursing students’ clinical competence, communication skills, and team efficacy. AJMAHS. 2016;8:397–405.
27. Kim KH. Team-based blended-learning’s effect on critical thinking disposition, problem-solving, and team-efficacy of female nursing students. Korean J Women Health Nurs. 2017;18:55–69.
28. Cho O, Hwang K. The effects of simulation-based education on nursing students’ presence in education, systems thinking and proactivity in problem solving. J Korea Acad Soc Home Health Nurs. 2016. https://doi.org/10.22075/jkshnh.2016.23.2.147.
29. Im YE. Lee H. Development and analysis of effects of writing educational program for improving system thinking ability. J Learn Cent Curric Instr. 2014;14:407–27.
30. Dolansky MA, Moore SM. Quality and safety education for nurses (QSEN): the key is systems thinking. Online J Issues Nurs. 2013;18:1.
31. Stalter AM, Phillips JW, Ruggiero JS, Scandaville DL, Memdiam D, Dolansky MA, et al. A concept analysis of systems thinking. Nurs Forum. 2017;52:323–30. https://doi.org/10.1111/nuf.12196.
32. Moaaz M, Mi S, Foroughameri G, Farokhzadian J. Nurses’ perceptions of systems thinking and safe nursing care: a cross-sectional study. J Nurs Manag. 2020;28:822–30. https://doi.org/10.1111/jnmm.13500.
33. Fura LA, Wissel KZ. Development and evaluation of a systems thinking education strategy for baccalaureate nursing curriculum: a pilot study. Nurs Educ Perspect. 2017;38:270–1. https://doi.org/10.1097/01.NEP.0000000000000165.
34. Byeon DH. The effect of simulation-based integrated clinical practice education on the flow, learning presence and proactivity in problem solving for nursing students. Korea Soc Nurs Res. 2019;3:85–95.
35. Park M, Choi D. The effect of simulation integrated with problem based learning on system thinking, learning flow, proactivity in problem solving and performance ability for medication in nursing students. J Digit Converg. 2018;16:221–31. https://doi.org/10.4400/JDC.2018.16.8.221.
36. Yildirim JG, Caft AC, Ardahan M. Problem-solving skills of university nursing students and factors affecting them: a cross-sectional study. J Pak Med Assoc. 2019;69:1717–20. https://doi.org/10.5455/JPA.2635.
37. Kang M, Chung K, Cho J. A design and effect of design thinking-based team project learning in clinical nursing practice. J Korea Contents Assoc. 2019. https://doi.org/10.5392/JKCA.2019.19.03.336.

Publisher’s Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.