

## Nursing students' perception of high-fidelity simulation activity instead of clinical placement: A qualitative study



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### SUMMARY

*Background:* The high-fidelity simulation (HFS) has been utilized in nursing education for more than 20 years. Advantages of the use of high-fidelity simulation in nursing education have been documented in the literature. Based on the advantages, it has been arranged as a part of the clinical study course of the first year baccalaureate nursing program in one of the nursing colleges in Macau recently.

*Objective:* The aim of this study is to explore undergraduate nursing students' perception of using high-fidelity simulation as part of their clinical study course in Macau.

*Design:* This is a qualitative study using open-ended questionnaire.

*Setting:* This study was implemented at the nursing laboratory between 1 April and 17 April 2015, which was the period of preliminary clinical study course of year one nursing students.

*Participants:* A purposive sample was sought from the voluntary year one undergraduate nursing students who participated in the clinical study course.

*Methods:* Students received two high-fidelity simulation sections during the course, while a self-administered open-ended questionnaire was allocated afterward. Qualitative content analysis was performed after data collection.

*Results:* Two themes emerged in this study, which included "appreciation" and "misunderstanding". They were further divided into five categories; as "positive feelings", "gaining a suitable atmosphere for learning", "assist of adequate emergency preparation: resourceful ability", "contempt", and "rote learning".

*Conclusion:* This was the first time to utilize HFS activities as a part of the clinical study course in one nursing college in Macau. These HFS activities instead of a part of real clinical placement were appreciated by nursing students. And it mainly contributed to the resourceful ability in students' view. During the HFS activities, nursing educators should consider the misunderstanding of HFS activities of students that a few nursing students despised simulator's life and got rote learning method.

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### Introduction

Simulation is recognized as an essential part of nursing clinical education by nursing institute (California Board of Registered Nursing, 2015; Colorado Department of Regulatory Agencies Board of Nursing, 2015) since it can provide a safe environment for students to learn clinical practice (Arthur et al., 2013). There has been an increasing utilization of high-fidelity simulation (HFS) in nursing education since the

1990s (Crytzer, 2011). HFS refers to the use of a computer-controlled full size manikin to demonstrate realistic clinical manifestations and clinical scenarios. It can also communicate and interact with the learners (Arthur et al., 2013; Gates et al., 2012). HFS has been arranged as part of the first year clinical study course of the baccalaureate nursing program in one of the nursing colleges in Macau recently. The aim of this study is to explore undergraduate nursing students' perception of using HFS as part of their clinical study course in Macau. It aims at providing insights into the future improvement of HFS-based clinical teaching in the nursing students.

### Literature Review

HFS can be used to train learners' management of imitated life-like clinical events in nursing laboratory (Levett-Jones et al., 2011). There is emerging evidence in the effectiveness of HFS in nursing education. Shin et al. (2015) conducted a meta-analysis on the effectiveness of

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simulation in nursing education by pooling 20 experimental and quasi-experimental quantitative studies. They found that HFS had a large size effect (0.81), which seemed to be larger than that in the overall simulation interventions (0.71) (Shin et al., 2015). Several systematic reviews further examined the impact of HFS in different aspects of nursing education. It was revealed in a systematic review that the mean scores of knowledge and skill exams were increased by 0.53 point and 1.15 points respectively after using HFS, but a mixed result was found in the score of objective structured clinical examination (OSCE) (Yuan et al., 2012b). Moreover, a mixed contribution of HFS was also seen in the confidence and competence in another systematic review (Yuan et al., 2012a).

The findings from some qualitative studies tend to be positive when exploring the perceptions of HFS in both faculty members and students. Silvia (2013) conducted a qualitative case study by interviewing and allocating qualitative questionnaires to 14 nursing faculty to explore how HFS can influence students' safe clinical practice. It was demonstrated that 78.5% of the faculty thought HFS activities could enhance learning outcome by providing safer patient care, while same percentage of them agreed HFS could increase nursing students' critical thinking skill (Silvia, 2013). Around 64% of them also thought that it enhanced the acquisition of skills (Silvia, 2013). Similar results were indicated in another study using semi-structured interview. Students reported an increase in knowledge, skill and confidence level in clinical placement after HFS (Ogilvie et al., 2011). Furthermore, students believed that HFS was very useful and should be set as a requirement before clinical study (Darcy Mahoney et al., 2013). This is also supported by the result of another study. It was reported that 80% of the nursing students agreed HFS as an authentic learning experience, while about 95% of them thought it could enhance patient safety, and the same proportion of them planned to apply the skills learnt in simulation to clinical practice (McCaughy and Traynor, 2010). Additionally, HFS activities could lead to students' sense of confidence, preparedness, and satisfaction with the clinical performance (Crytzer, 2011). Despite the advantages mentioned in these qualitative studies, some studies argued that HFS can also lead to anxiety in participants. A lack of communication skill during the simulated interaction was reported (Pike and O'Donnell, 2010). Students might also feel anxious as it made them think of the future placement and transition to a staff nurse (McCaughy and Traynor, 2010). There are some suggestions related to the possible improvement in HFS activities in the literature. Students suggested that it was necessary for them to have more time to be familiar with the functions of HFS (Wotton et al., 2010). The study of Ogilvie et al. (2011) showed that, students agreed that a positive HFS learning experience could be enhanced by a realistic clinical scenario experience under an appropriate facilitation, with a debriefing section. The importance of realism and facilitator was also emphasized in another study; it was argued that, students' learning experience could be influenced by the ability of engaging participants with the character and taking the activity seriously, while the knowledge and skills of facilitators were also reported to be significant during the process (Reid-Searl et al., 2011). Similar finding was also described in Pike and O'Donnell's (2010) study.

These suggest the essential elements in designing and implementing HFS activities. A simulation model on HFS activities was proposed in 2005 by Jeffries. It was widely used in guiding simulation activities; it has been applied to the simulation of end-of-life-care, self-confidence promoting etc. (Fabro et al., 2014; Samawi et al., 2014). Jeffries' simulation model comprises five elements, which are the best practices in education, student factors, teacher factors, simulation design characteristics and outcomes. Educational practices include active learning, immediate feedback, student/faculty interaction, collaborative learning, and high expectations, allowing diverse learning styles and time on task. Student factors mean that students should respond to their roles (actors and observers) during the simulation activity, while teacher factors involve the teaching and evaluating roles. The design of the simulation should be tailored to these three mentioned factors, and at the same time, be able to support course goals, skill

competencies, learning outcomes and include debriefing section. The outcomes should be associated with the goals, and can be divided into knowledge, skill performance, learner satisfaction, etc. (Jeffries, 2005).

In view of the mentioned advantages, HFS activities guided by Jeffries' simulation model has been arranged as part of the first year clinical study of the baccalaureate nursing (BSN) program in one nursing college in Macau recently. Nevertheless, to date, there is no qualitative data that explores the perception of BSN students of utilizing HFS as a clinical placement either directly or indirectly. Hence, the aim of this study is to explore undergraduate nursing students' perception of HFS activities instead of clinical placement. It aims at providing insights into the future improvement of HFS-based clinical teaching in the nursing students in Macau.

## Methods

This is a qualitative study using an open-ended questionnaire. Students received two four-hour HFS sections at nursing laboratory during the period of clinical study course, while a self-administered questionnaire was then allocated and a qualitative content analysis was performed. Jeffries' simulation model was employed in the design of the activity (Fig. 1), while Laerdal SimMan™ patient simulator was used during HFS activities. Several optional sections were held to introduce the simulator's function and the concept of HFS. A meeting was held by the subject teachers before class to discuss the design of the activity, while a mock section was also run among the teachers to ensure the maximization of learning experience and to seek improvement. Before the sections, a brief scenario introduction and relevant materials were uploaded onto the student learning platform.

The participants were divided into groups of 16 to 23 during each HFS activity. Three of them were assigned with different roles, mostly nurses, while the others were observers. On the other hand, as the HFS activities in this study were for learning purpose, the teachers' role was to provide support throughout the section.

The four-hour simulation class was divided into four sections for two groups respectively, which were briefing (half hour), preparation (half hour), running (half hour) and debriefing (half hour). During the briefing section, the simulated environment and technology involved were oriented, while the objectives, activity, amount of time given, role specifications and outcome expectancies were explained. Preparation time was allowed for initial discussion and being familiar with the simulated environment. The scenario was then run under a provided time frame. The role-players were required to practice using the think-aloud technique. Cues and help could be provided by both the observers and the teachers to offer ideas when required during the activity to enhance the idea of collaborative learning. Observers were also asked to take note of the clinical presentation, missing data, and given and required intervention. The whole process was recorded for debriefing reference. Students were encouraged to review and discuss the scenario after the running section under the guidance of the facilitators. Strengths and weaknesses were also discussed for future practice and improvement.

## Participants

A purposive sample was recruited from the year one undergraduate nursing students in one of the nursing colleges in Macau (there are two nursing colleges in Macau). The students who were willing to answer the open-ended questionnaire voluntarily after the HFS activities were included in this study. The targeted nursing students had already finished English I, Chinese, Psychology, Fundamentals of Nursing I, Anatomy, Physiology and Biochemistry. They were studying Sociology, Health Assessment, Pharmacology, Pathophysiology, Microbiology-Immunology, Fundamentals of Nursing II and English II in the semester.

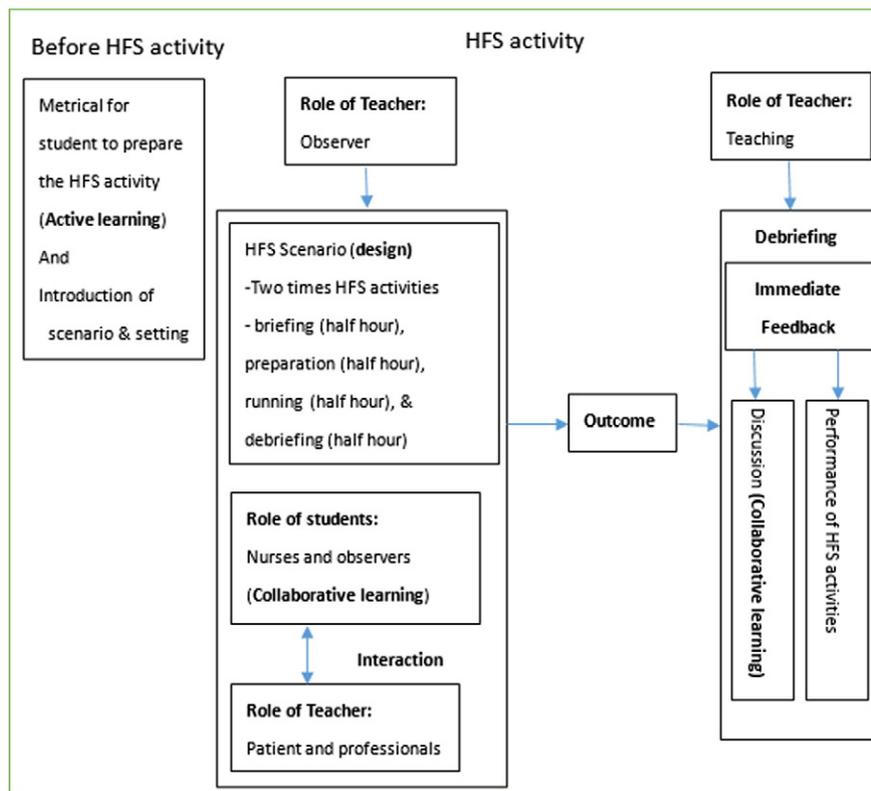


Fig. 1. Design of simulation activity with Jeffries' simulation model.

**Setting**

This study was implemented at a nursing laboratory between 1 April and 17 April 2015, which was the period of the participants' preliminary clinical study course. The preliminary clinical study course was associated with two subjects, which were “Health Assessment” and “Fundamentals of Nursing”.

**Data Collection and Analysis**

An open-ended questionnaire was developed to explore the perception of using HFS activities instead of clinical placement. It was assigned to the participants immediately after the HFS activities. The questions were:

1. What is your opinion on the high-fidelity simulation activity used during clinical study course (instead of real clinical placement)?
2. What are the advantages of using the high-fidelity simulation activity?

3. What are the disadvantages of using the high-fidelity simulation activity?
4. What did you gain from the high-fidelity simulation activity?
5. What did you lose from the high-fidelity simulation activity?
6. What is your suggestion for the high-fidelity simulation activity?

Finally, the data was analyzed using qualitative content analysis. Raw data was read by three authors separately to obtain code (“based on the content representation”) from each line (“breaking down data into smaller units”); themes (“grouping coded material based on shared concepts”) were then retrieved by coding and categorizing (Polit and Beck, 2012, p. 564) (Table 1). To ensure the trustworthiness, the framework of Lincoln and Guba was applied which encompassed several dimensions – credibility, transferability, confirmability, and dependability. Credibility engendered confidence in the truth of the data and researchers’ interpretations; transferability was that the qualitative findings could be transferred to other settings; confirmability meant that study results were derived from characteristics of the participants and the study context; and dependability referred to the evidence that

**Table 1**  
Example of content analysis.

Original sentence (examples)	Code	Category	Theme
“HFS activities were very good and vivid. The authentic response of SimMan could train my resourceful ability” (13)	Good and vivid	Positive feelings	Appreciation
“In short, it is very well. The HFS activities instead of real clinical placement could increase the experience of facing simulated patient, it could improve the way of dealing with patient” (74)	Very well		
“Good. It was more relaxing than real clinical setting as we can learn different health assessment methods under little stress” (04)	More relaxing	Gaining a suitable atmosphere for learning	
“The atmosphere of HFS activities was exciting. It could let me develop the resourceful ability for the urgent condition of patient which could be rarely encountered in real clinical setting” (20)	Exciting		
“I thought the arrangement of HFS activities during clinical study course could let me become familiar with the real hospital environment and develop the resourceful ability. It was good for me to be ready for the real clinical setting very soon” (01)	Resourceful ability	Assist of adequate emergency preparation: resourceful ability	
“It enhanced my resourceful ability with the emergency scenario through HFS activities; I will keep calm in any emergency situation in the future” (05)			

was consistent and stable (Polit and Beck, 2012, p. 175, 180). Based on the framework, the participants' honesty was encouraged before they answered the questionnaire. After the questionnaire had been completed, the themes and categories were given back to the participants to confirm the findings (credibility and confirmability). The process of the HFS activities, data collection, participants and setting were described in this study to assure the dependability and transferability of the study. Moreover, data analysis was implemented by three authors independently in order to promote confirmability (Polit and Beck, 2012; Streubert, 2011).

### Ethical Considerations

This study was conducted after receiving the agreement from the education department of the college. The project was introduced and explained to all targeted nursing students before the HFS activities, and the informed consent was obtained from those who were willing to join and answer the anonymous questionnaire in this study. The participants were informed that this subject would not be graded. Data access was limited only to the researchers of this study, and was only allowed for the use of teaching improvement and academic exchange. The completed questionnaire will be destroyed 5 years after the study has been completed according to the informed consent.

### Results

There were 80 first year nursing students participating in this study, including 6 males and 74 females aged from 18 to 22. Three of them retook the clinical study course this year. All 80 participants had simulation learning experience before. 41 participants had five-day real clinical placement after the HFS activities (class A) and 39 had the clinical placement before the HFS activities (class B). From the qualitative content analysis of the participants' script (focused on question 1 for this study), 2 themes covering 5 categories emerged as below.

#### Appreciation

For these year one students, there was two-week clinical study course to let them put the knowledge into practice at the end of the first academic year. They had desired the clinical study course very much. Despite that our college arranged HFS activities instead of the partial real clinical placement this year, the feelings of the participants of these HFS activities were positive, although HFS activities was not new for them. In addition, the HFS activities were carried out in a simulated ward of nursing laboratory; and the interaction was arranged between participants, teachers and SimMan through several scenarios which combined three subjects ("Health Assessment", "Fundamentals of Nursing", and "Pharmacology"). The participants (no matter class A or class B) thought it was an adequate preparation for caring real patients in suitable atmosphere. Both group A and group B focused on acquiring resourceful ability and health assessment ability. Only two participants, who wanted to go to real clinical setting, thought that the HFS activities should not be a part of clinical study course. All of the mentioned showed that the participants appreciated the HFS activities. Hence, the "positive feelings", "gaining a suitable atmosphere for learning", and "assist of adequate preparation" were the three categories under the theme "appreciation".

#### Positive Feelings

Over 70% of the participants emphasized that they had positive feelings toward HFS activities; no matter they joined the activities before or after real clinical placement. Only one participant said it was boring. And others (24%) did not express their feelings. Among the 74.8% of all participants, around 35% used the word "good, very good, very well or not bad", 14% described it as "interesting" and around 6% used "vivid" to describe the activity, while 3.8% of them thought the activity was essential.

Nearly 16% portrayed it as "practical", "fresh", "a rare opportunity" and "a good opportunity". These positive feelings indicate that students are satisfied with the HFS activities.

*"HFS activities were very good and vivid. The authentic response of SimMan could train my resourceful ability" (13).*

*"In short, it is very well. The HFS activities instead of real clinical placement could increase the experience of facing simulated patient; it could improve the way of dealing with patient" (74).*

#### Gaining a Suitable Atmosphere for Learning

85% of the participants considered that the HFS activities, instead of the real clinical placement, provided a suitable atmosphere for learning, as "relaxing", "exciting", "funny" etc. The 85% of participants reflected that the atmosphere let them acquire resourceful ability (55%), health assessment skill (28%), communication (9%), and knowledge application (8%). Related to the resourceful ability, 33% of the participants in group A and 22% of the participants in group B mentioned it. For health assessment ability, 12% of the participants in group A and 16% of the participants in group B expressed it. On the other hand, two more participants in group B than group A mentioned the learning of communication skill, while three more participants in group A than group B mentioned knowledge application. These results show that HFS activities could provide suitable atmosphere for learning, no matter the participants joined the HFS activities before or after the real clinical placement.

*"Good. It was more relaxing than real clinical setting as we can learn different health assessment methods under little stress" (04).*

*"The atmosphere of HFS activities was exciting. It could let me develop the resourceful ability for the urgent condition of patient which could be rarely encountered in real clinical setting" (20).*

#### Assist of Adequate Emergency Preparation: Resourceful Ability

One of the scenarios was designed for the subject "Fundamentals of Nursing – Basic Life Support"; the participants should save the life of the SimMan in an emergency condition. 55% of the 85% of participants thought that these HFS activities could train their resourceful ability. Hence, they had learnt how to find fast and smart ways to overcome difficulties. It was very useful for participants in terms of the future clinical placement.

*"I thought the arrangement of HFS activities during clinical study course could let me become familiar with the real hospital environment and develop the resourceful ability. It was good for me to be ready for the real clinical setting very soon" (01).*

*"It enhanced my resourceful ability with the emergency scenario through HFS activities; I will keep calm in any emergency situation in the future" (05).*

#### Misunderstanding

As mentioned, the HFS activities were carried out through SimMan (which was not a real human being) and scenario. A few participants misunderstood the purpose of HFS activities. They thought that SimMan's life was not an important issue; and some thought that the demonstration of scenario let them remember the situation for future. Hence, the "contempt", and "rote learning" were the two categories under the theme "misunderstanding".

### Contempt

5% (2 in group A and group B respectively) of all the participants thought that making mistakes was not an issue when providing care for SimMan. They also mentioned that they might keep this attitude when caring real-life patients. It was a negative influence of the HFS activities. It might affect the participants' attitude and action in the real clinical setting.

*"Although it is a high-fidelity simulator, it is still different from human beings in reality. Students may get used to the way of treating these simulators and keep the same attitude when treating real patients" (33).*

*"SimMan is not a real human being, I did not concern about the mistakes I made because I will still be forgiven anyway" (58).*

### Rote Learning

14% of the participants (9 in group A and 2 in group B) thought the HFS activities were used to promote their rote learning; they emphasized the importance of remembering the manifestations of SimMan. It was related to the learning style of the participants.

*"Remembering the patient's changes throughout the scenario was what I gained from the HFS activities" (40).*

*"The HFS activities could help us to remember the clinical manifestations in a short time" (45).*

### Discussion

This was the first time to utilize HFS activities as a part of the clinical course in our nursing college. This arrangement was the transition to the modified BSN program curriculum for the future. And the amount of hours of clinical study course would be reduced to less than 1840 h in the future curriculum to match other BSN nursing program all over the world. Hence, the HFS activities would be the replacement of the real clinical placement that follows the contents of subject lecture in our college in the future. And this study tries to explore the perception of nursing students related to the HFS activities instead of real clinical placement. 85% of nursing students appreciated the HFS activities instead of real clinical placement for learning. It emerged through "positive feelings", "gaining a suitable atmosphere for learning", and "assist of adequate emergency preparation: resourceful ability". And it was the first study to find out the "resourceful ability" as category or item of result (55% of the students mentioned it) which is not the same as other qualitative or quantitative literatures that showed the result as "acquisition of skills", "clinical performance", "confidence", "critical thinking", "knowledge", "preparedness", "safe patient care", and "satisfaction" (Crytzer, 2011; McCaughey and Traynor, 2010; Ogilvie et al., 2011; Silvia, 2013; Yuan et al., 2012a, 2012b). "Resourceful" is defined as "skilled in devising expedients or in meeting difficulties; full of practical ingenuity" (Oxford University Press, 2015). The result of "resourceful ability" may relate to the design of the scenario – basic life support. It aims at letting students gradually achieve the objective of BSN program curriculum of our college that "students could keep clam and act immediately during the emergency situation as a graduate" (Kiang Wu Nursing College of Macau, 2015). Based on the mentioned simulation model, it is very important to design the scenario that can support course goals (Jeffries, 2005). The scenario of these HFS activities was that there was a patient who suddenly became unconscious, where students should manage the situation and save the life of the SimMan through the skill of basic life support. The goals of the course are: (1) to demonstrate the ability of basic life support; and (2) to manage the emergency situation simply. And the result indicated that students thought that the HFS activities could train their resourceful ability. On the other hand, the "positive feelings" and "a suitable atmosphere for

learning" were two other categories of the theme "appreciation". No matter the students joined the HFS activities before or after the real clinical placement, they appreciated that the HFS activities were able to let them learn with positive feelings, especially the development of resourceful ability and health assessment ability. Both are the objectives of the HFS activities. But for the feedback about learning of communication skill, more participants in group B than group A mentioned about it. It was the same as the result of Pike and O'Donnell's (2010) that there was a lack of communication skill during the simulated interaction. The students of group B went to the clinic first, they had the experience of talking with real patients. Hence, they could talk more with the SimMan and target to learn communication skill. Students of both group A and group B also mentioned knowledge application. The result matched with the result of the study of Yuan et al. (2012b) that knowledge score would be increased after using HFS. It was evident that HFS contributed to the knowledge of students. As mentioned, there were advantages for arranging HFS activities before or after the clinical placement. It was not the same as the finding of the study of Darcy Mahoney et al. (2013).

Nursing educators should consider that nursing students would misunderstand the objective of HFS activities, the findings of this study showed that "contempt" and "rote learning" were the two categories of the theme "misunderstanding". During the HFS activities, a few students (no matter they were from group A or group B) thought SimMan's life was not an issue and might get the rote learning method. The mentioned findings could not be found in other studies. Nursing educators should pay attention to this because the result of McCaughey and Traynor (2010) showed that 95% of the students would plan to apply what they learnt in simulation to clinical practice. The reason might be that the students thought that the SimMan was not the real human being, so they could not put themselves in the scenario. And some students might use the surface learning style that promoted the rote learning. The design of scenario of HFS activities should be taken seriously to avoid the mentioned situations.

### Limitation

Due to the arrangement of clinical study course of the BSN program, only year one students were included in this study. Thus the perception expressed was from those who did not have much clinical experience. A comparison of the perception of different classes and long-term follow-up should be done in the future.

Since this is only an exploratory study, an open-ended questionnaire was used. This prohibited a further and deeper exploration of the information provided, while the data of facial expressions and body language were also missing. A face-to-face interview should be considered in future studies.

### Conclusion

This was the first time to utilize HFS activities as a part of the clinical study course in one of the nursing colleges in Macau. It was based on the advantages of the use of high-fidelity simulation, and was the preparation for the transition to the modified curriculum that decreases the amount of hours of the real clinical placement for the future. Hence, the HFS activities were carried out for year one students during clinical study course period. This study explored the perception of nursing students of HFS activities instead of clinical placement. The findings showed that these HFS activities instead of part of real clinical placement were appreciated by nursing students. And it mainly contributed to the resourceful ability in the students' view which was not found before. During the HFS activities, nursing educators should consider the misunderstanding of HFS activities of students that a few nursing students despised simulator's life and got rote learning method. The mentioned findings were also not found in other studies. The design of

scenario of HFS activities should be taken seriously to avoid the mentioned situations.

## References

- Arthur, C., Levett-Jones, T., Kable, A., 2013. Quality indicators for design and implementation of simulation experiences: a Delphi study. *Nurse Educ. Today* 33 (11), 1357–1361. <http://dx.doi.org/10.1016/j.nedt.2012.07.012>.
- California Board of Registered Nursing, 2015. Title 16, California code of regulations. Article 3. Prelicensure nursing programs. Retrieved from <http://www.rn.ca.gov/regulations/title16.shtml#1426>.
- Colorado Department of Regulatory Agencies Board of Nursing, 2015. Department of regulatory agencies: division of professions and occupations. Chapter 2 – rules and regulations for approval of nursing education programs. Retrieved from <http://cdn.colorado.gov/cs/Satellite/DORA-Reg/CBON/DORA/1251631690394>.
- Crytzer, M.L., 2011. The effect of high-fidelity home health simulations on nursing students' clinical performance (doctoral dissertation). Available from ProQuest Dissertations and Theses Global (UMI No. 3486967).
- Darcy Mahoney, A.E., Hancock, L.E., Iorianni-Cimbak, A., Curley, M.A.Q., 2013. Using high-fidelity simulation to bridge clinical and classroom learning in undergraduate pediatric nursing. *Nurse Educ. Today* 33 (6), 648–654. <http://dx.doi.org/10.1016/j.nedt.2012.01.005>.
- Fabro, K., Schaffer, M., Scharton, J., 2014. The development, implementation, and evaluation of an end-of-life simulation experience for baccalaureate nursing students. *Nurs. Educ. Perspect.* 35 (1), 19–25. <http://dx.doi.org/10.5480/11-593.1>.
- Gates, M.G., Parr, M.B., Hughen, J.E., 2012. Enhancing nursing knowledge using high-fidelity simulation. *J. Nurs. Educ.* 51 (1), 9–15. <http://dx.doi.org/10.3928/01484834-20111116-01>.
- Jeffries, P.R., 2005. A framework for designing, implementing and evaluating simulations used as teaching strategies in nursing. *Nurs. Educ. Perspect.* 26 (2), 96–103.
- Kiang Wu Nursing College of Macau, 2015. The Curriculum of Baccalaureate Nursing (BSN) Program. Kiang Wu Nursing College of Macau, Macau.
- Levett-Jones, T., Lapkin, S., Hoffman, K., Arthur, C., Roche, J., 2011. Examining the impact of high and medium fidelity simulation experiences on nursing students' knowledge acquisition. *Nurse Educ. Pract.* 11 (6), 380–383. <http://dx.doi.org/10.1016/j.nepr.2011.03.014>.
- McCaughey, C.S., Traynor, M.K., 2010. The role of simulation in nurse education. *Nurse Educ. Today* 30 (8), 827–832. <http://dx.doi.org/10.1016/j.nedt.2010.03.005>.
- Ogilvie, S., Cragg, B., Foulds, B., 2011. Perceptions of nursing students on the process and outcomes of a simulation experience. *Nurse Educ.* 36 (2), 56–58. <http://dx.doi.org/10.1097/NNE.0b013e31820b4fd5>.
- Oxford University Press, 2015. Oxford English dictionary: resourceful. Retrieved from <http://www.oed.com/view/Entry/163769?redirectedFrom=resourceful+#eid>.
- Pike, T., O'Donnell, V., 2010. The impact of clinical simulation on learner self-efficacy in pre-registration nursing education. *Nurse Educ. Today* 30 (5), 405–410. <http://dx.doi.org/10.1016/j.nedt.2009.09.013>.
- Polit, D.F., Beck, C.T., 2012. *Nursing Research: Generating and Assessing Evidence for Nursing Practice*. ninth ed. Lippincott Williams & Wilkins, Philadelphia, PA.
- Reid-Searl, K., Eaton, A., Vieth, L., Happell, B., 2011. The educator inside the patient: students' insights into the use of high fidelity silicone patient simulation. *J. Clin. Nurs.* 20 (9), 2752–2760. <http://dx.doi.org/10.1111/j.1365-2702.2011.03795.x>.
- Samawi, Z., Miller, T., Haras, M.S., 2014. Using high-fidelity simulation and concept mapping to cultivate self-confidence in nursing students. *Nurs. Educ. Perspect.* 35 (6), 408–409. <http://dx.doi.org/10.5480/1042.1>.
- Shin, S., Park, J.H., Kim, J.H., 2015. Effectiveness of patient simulation in nursing education: meta-analysis. *Nurse Educ. Today* 35 (1), 176–182. <http://dx.doi.org/10.1016/j.nedt.2014.09.009>.
- Silvia, S., 2013. Faculty perceptions of simulation on student learning for safe clinical nursing practice (Doctoral dissertation) Available from ProQuest Dissertations and Theses Global (UMI No. 3600876).
- Streubert, H.J., 2011. *Qualitative Research in Nursing: Advancing the Humanistic Imperative*. fifth ed. Lippincott Williams & Wilkins, Philadelphia, PA.
- Wotton, K., Davis, J., Button, D., Kelton, M., 2010. Third-year undergraduate nursing students' perceptions of high-fidelity simulation. *J. Nurs. Educ.* 49 (11), 632–639. <http://dx.doi.org/10.3928/01484834-20100831-01>.
- Yuan, H.B., Williams, B.A., Fang, J.B., 2012a. The contribution of high-fidelity simulation to nursing students' confidence and competence: a systematic review. *Int. Nurs. Rev.* 59 (1), 26–33. <http://dx.doi.org/10.1111/j.1466-7657.2011.00964.x>.
- Yuan, H.B., Williams, B.A., Fang, J.B., Ye, Q.H., 2012b. A systematic review of selected evidence on improving knowledge and skills through high-fidelity simulation. *Nurse Educ. Today* 32 (3), 294–298. <http://dx.doi.org/10.1016/j.nedt.2011.07.010>.