EFFECTIVENESS OF VIRTUAL LEARNING PROJECT ON CARDIAC ARREST PROTOCOL KNOWLEDGE AMONG STUDENT NURSES

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Abstract

Cardiac arrest protocol is an essential life saving set of clinical interventions performed by the medical and nursing team. Student Nurses require an established fundamental knowledge as they progress towards subsequent clinical and experiential learning. Virtual learning has emerged as a very important learning environment even for laboratory-based content learning in certain circumstances, where health safety is a concern. The purpose of this quasi experimental study is to describe the effectiveness of utilizing a virtual learning project on cardiac arrest protocol among 40 international senior nursing students in Thailand. The perception of effectiveness and the pre and post intervention knowledge were measured respectively. The methodology utilized weighted mean, standard deviation, and t-test. The results reveal that students perceived the virtual learning project to be highly effective and were able to significantly improve their scores. Learning projects administered virtually can effectively improve theoretical knowledge acquisition in cardiac arrest algorithm for nursing students similar to those in the other fields.

Keywords: virtual learning, cardiac arrest, nursing students

1. INTRODUCTION

Cardiac arrest protocol knowledge is important to the theoretical and practical training among student nurses. Effective utilization of this nursing knowledge often determines better patient outcome. Roel & Bjørk (2020) asserts that student nurses must be able to perform effective resuscitative nursing care which establishes the need to implement pedagogical approaches geared towards improving their performance to standards. Practice simulations enable students to hone their critical reasoning in developing their competence to provide a safe and caring environment to patients especially for patient scenarios that are difficult to gain clinical experiential learning (Aebersold, 2018). Simulation-based cardiac arrest resuscitation training is more effective in enhancing the nursing student's knowledge and skills including their satisfaction and self-confidence (Demirtas et al., 2021). While these recent researches further builds on the importance of high fidelity practical simulations as a gold standard in knowledge and psychomotor learning in cardiac arrest protocol.

Just as circumstances surrounding a patient's condition can change over time, learning environments for student nurses also changes due to number of parameters. Circumstances like the Covid-19 pandemic can inevitably force the learning process to shift into an internet based setting even for courses that are traditionally offered under laboratory conditions where mock patient clinical case scenarios are utilized.

Virtual learning has emerged as a very important learning environment, even more appropriate in certain circumstances where health safety of the student nurses is a concern. Virtually simulating a clinical situation can improve how nursing students retain knowledge and enhance their clinical analysis while increasingly satisfying their experiential learning (Padilha et al., 2019). The international curriculum requires the learners to contend with the highly technical vocabulary content of the subject matter they will be dealing with during their virtual group project. Project-based learning was observed to significantly improve the learning achievement of students in their vocabulary acquisition while notably promoting teamwork and learning by themselves (Ji & Chayanuvat, 2020). There are also other benefits to virtual learning. Sanderson, Cox, & Disch (2020) found that positive virtual learning experiences can prepare students for an internet based practice like telehealth given their initial exposure and resulting skills development in online engagement. Online instruction also calls for sensitivity and inclusiveness in designing a learning environment for diverse learners like international students (Kumi-Yeboah, 2018).

The learning environment shifting from a traditionally experiential laboratory-based is inevitable under certain circumstances when learner safety and health is considered. Evaluating how the desired learner outcomes are met under a virtual learning project can further clarify specific online learning strategies for students.

1.1 Purpose of the study

The primary objective of this study is to describe the effectiveness of utilizing a virtual learning project on cardiac arrest protocol among international nursing students in Thailand. Moreover, it sought to validate the aforementioned pedagogical approach adapted during the inevitable shifting of learning environment during pandemic.

2. LITERATURE REVIEW

Virtual project-based learning is a methodology that utilizes complex problem solving of reality based scenarios that requires students to perform teamwork, self-directed and group initiated peer learning via journals and other resources in a guided and supported learning (Derntl & Calvo, 2011; Bootchuy, Klaisang, Natakuatoong, 2018). The learning environment where the learning project takes place comes with several demands and requisites. Teachers should have developed skills in the promotion of a responsive teaching approach supported by their content and technology knowledge while requiring students the ability to navigate the learning environment independently while communicating with their peers and with other resources (Chantal et al.,2017; Siritarungsri,2020).

Multiple studies have qualified certain elements of virtual learning to be responsive in the context of cardiac arrest resuscitation in general within specific populations. According to Brown, Lawrence, Basson, & Redmond (2020) online learner engagement is facilitated with an integration of learner-center pedagogical approach. Other pedagogies are essential when

changes in learning environments are inevitable considering that video assisted teaching and simulation have been found to equally promote learning in cardiac arrest resuscitation among nurses (Sugiyanto, et al., 2020). Similarly theoretical and mobile-assisted video-based teaching methods have been effective in educating high school students to be effective bystander CPR providers (Onan et al., 2019). This implies utilization of pedagogical approach responsive to the learner's specific needs and learning environment requirements. Combining virtual clinical simulation with experiential learning enhanced both knowledge retention and clinical application (Padilha et al, 2019). An internet-based learning in cardiovascular education with basic life support training offered better performance of practical skills despite minor limited outcomes comparable with traditional training (Bylow et al., 2019). These studies reflect a knowledge gap in teaching cardiac arrest resuscitation in higher education specifically for future health care providers like nursing students.

Clearly different methodologies are more beneficial than others under certain types of learning conditions. Establishing the fundamental knowledge to support eventual practical learning is a very important prerequisite before teaching the psychomotor aspects of learning that are gained through clinical experiences in laboratory and externships.

3. METHODOLOGY

This quasi experimental study describes the effectiveness of utilizing a virtual learning project on cardiac arrest protocol in international nursing students in Thailand. The forty respondents were enrolled in an international nursing program of a private university in Thailand during the 2nd semester of the school year 2562. The respective students are nationalities from Thailand, Bhutan, Cambodia and China. Majority of the respondents are Thai consisting of Thirty three students (82.5%), followed by five Bhutanese students (12.5%), a student from Cambodia (2.5%) and China (2.5%) respectively comprised the forty respondents of the study.

The Likert-type questionnaire offered 5 levels of rating namely: highly effective (HE), sufficiently effective (SE), moderately effective (ME), slightly effective (SlE), and not effective(NE) measuring the learner's perception of the project's effectiveness. This questionnaire yielded a Chronbach alpha score of 0.887. A multiple choice questionnaire 20-items was developed to measure the student's knowledge on cardiac arrest protocol spanning the initial assessment up to the post resuscitation protocol has a reliability score of 0.963.

After the institutional approval was secured, the research was undertaken in coordination with the students' enrolled class in critical care. The students initially underwent lecture didactics about hospital algorithms of a cardiac arrest scenario. The virtual project presentation required student nurses to work together in order to produce a learning output demonstrating their understanding of the entirety of the protocol. During their learning project students were developed their own clinical case scenario depicting all the elements of cardiac resuscitation in a hospital setting. Learning rubrics were provided on how their project will be evaluated. Their theoretical knowledge was initially measured before they started working on their projects. They had 6 weeks to interact as group, collaborate, and work on their project after which their knowledge levels were measured again.

The respective results of their knowledge performance before and after their virtual learning project were analyzed using paired t-test while their perception of the project's effectiveness was examine using the weighted mean through SPSS v.11.

Ethical Considerations

This study was approved by the Review Board under the University's Research Department. The respondents were respectively assured of the confidentially of their responses, safety, and their freedom to withdraw their participation from the study before their consent was secured.

4. RESULTS AND DISCUSSION

Perceived Effectiveness of the Virtual Learning Project

The discussions after the project presentation were deemed by the respondents as highly effective among the effectiveness indicators of the virtual learning project(x=4.20). Meanwhile preparing before the group meetings has lesser perception of effectiveness (x=3.98). In general the students nurses perceived the learning project to be highly effective (x=4.11).

Table 1 Perceived Effectiveness of the Virtual Learning Project

	Indicators		
1	Project meetings helped me learn about the cardiac arrest protocol	4.15	HE
2	Project discussion helped me learn about the cardiac arrest protocol	4.03	SE
3	My project group members answers my questions about the protocol	4.03	SE
4	My project group members asks questions I have not thought before	4.13	HE
5	I study before I meet with the project group to prepare	3.98	SE
6	I study after I meet with my group to answer some questions	4.15	HE
7	Making the virtual project helped me learn about the topic	4.15	HE
8	Listening to my group's virtual project helped me learn	4.15	HE
9	Listening to other group's virtual project helped me learn	4.10	SE
10	Feedback after the project presentation helped me learn the protocol	4.13	HE
11	Discussion after the project presentation clarified my questions	4.20	HE
12	Comments after the presentation made me read more about the protocol	4.13	HE
	Total	4.11	HE

Legend:
4.2-5.0= highly effective(HE) 3.4-4.1= sufficiently effective(SE) 2.7-3.3= moderately effective(ME)
1.9-2.6= slightly effective (SlE) 1.0-1.8=not effective(NE)

Effectiveness of the Virtual Learning Project

The students nurses significantly showed higher scores in their post test (11.15, SD=3.20) compared to their pre-test (7.83, SD=2.70) indicating a significant difference after their virtual learning project ($p< 0.01$). The student's scores indicated a significant improvement from the initial evaluation of their knowledge in cardiac arrest resuscitation protocol application until the post resuscitation care after working with their team in creating learning presentation depicting their understanding of the concepts. The foundational lectures and didactics provided resulted to an average score of 7.8, however, after working on a group project their knowledge on cardiac arrest resuscitation were enhanced to an average of 11.15.

Table 2 T-Test results on the cardiac arrest protocol knowledge among student nurses

Pre-test		**Post-test**		**Total**			
Mean	**SD**	**Mean**	**SD**	t-value	Df	Sig. (2-tailed)	
7.83	2.70	11.15	3.26	-5.124	39	0.000	

* $p< 0.01$

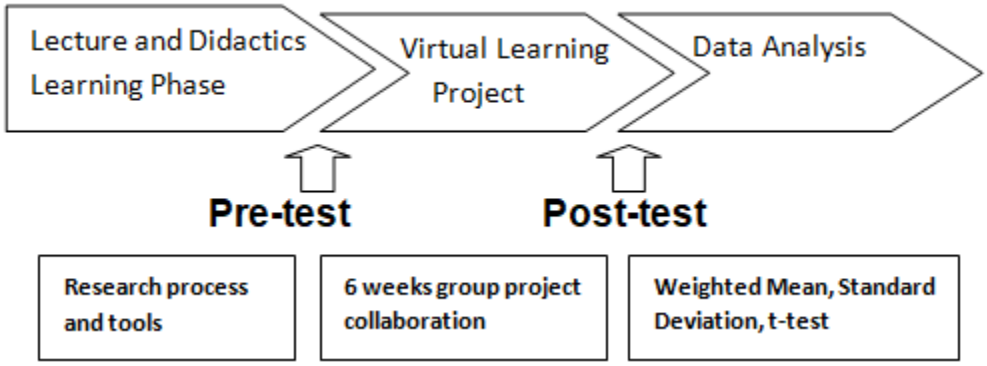

Figure 1 Research Framework

Discussion

The revealing results of the study focuses how certain elements of the pedagogical approach help explain the significant improvements on the student nurses knowledge after the virtual learning project. Students responded best to the virtual project's feedback mechanism immediately after the project presentation indicating the importance of teacher validation over the student's work. This is similar to effectively combining videos and face to face lecture that improved the knowledge and attitudes of students nurses learning cardiac arrest resuscitation (Moon & Hyun, 2019). Among the indicators of effectiveness in the virtual learning project, the international nursing students perceived self preparation prior to their group meetings with lesser effectiveness. This may be attributed to the technical vocabulary aspects of the learning topic themselves. While pre-learning with skill and simulation practice more effectively improves knowledge, self-confidence, and clinical performance of students response in taking care of patients with cardiac arrest(Chae & Choi, 2016), the study's cohort response seem to imply the importance of teacher's role in motivating and prompting students before a learning activity in the context of international students.

The effectiveness of the virtual learning project mirror findings that students can effectively learn through internet self directed learning while working together (Ji &

Chayanuvat, 2020). The virtual learning project allowed the students more control in how they would be communicating and collaborating with each other to present their understanding of the care necessary during an episode of cardiac arrest resulted to peer learning (Chantal et al., 2017; Siritarungsri, 2020; Brown et al., 2020). This learning enhanced their creativeness in understanding and expressing their learning close to what Yuktirat's observed improved creative thinking skills for groups learning using a learning media kit than their counterparts learning under normal settings (2020).

The effectiveness of this pedagogy in developing the student's understanding of the how to provide care during episodes of cardiac arrests reinforces similar methodologies where video based teaching yielded higher expressed more confidence in being able to provide CPR (Onan et al., 2019; Sugiyanto et al., 2020). Just as with other teaching methods, limitations in the expected outcomes can occur. While simulation offer better outcomes in teaching cardiac arrest resuscitation during cardiac arrest (Demirtas et al., 2021; Sugiyanto et al., 2020) especially in relation to the psychomotor learning, the virtual learning project offers a comparable outcome to establish crucial foundational knowledge required in understanding the concepts of cardiac arrest protocol.

Limitations

In light of the positive results regarding the utilization of this pedagogy in this particular learning content area, the authors acknowledge the potential challenges and limitations. The study primarily focused on the theoretical knowledge of the cardiac arrest protocol. Response formation, critical thinking and practical skills formation and retention for the different aspects of cardiac arrest resuscitation are recommended to be examined separately under separate conditions not within the scope of this study.

5. CONCLUSION

International nursing students are able to effectively learn the theoretical fundamentals of a cardiac arrest protocol through a virtual learning project. Changing learning environments must be understood to effectively utilize and design an appropriate pedagogical approach to facilitate learning retention. Virtual learning project is among the teaching methodologies responsive to the learning demands of students and capable of ensuring that the learning outcomes are achieved within the limitations of a given learning environment.

This study recommends conducting a follow up study on the virtual learning project effectiveness in terms of the practical skills required to perform the appropriate nursing care during cardiac arrest. Further, studies are also recommended to measure the length of the knowledge retention and psychomotor learning in given time periods after the learning intervention. Studies on how virtual learning project impact similar topics, even those from other fields of studies, are encouraged.

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