The Efficacy of an Educational Program on Extended Reality Knowledge among Damietta University Nursing Students

Walaa K. Tawfeek Farghaly

Family and Community Health Nursing , Faculty of Nursing- Damietta University

Abstract

Background: Since nurses make up the majority of hospital employees, having an adequate number of qualified nurses on staff is crucial for providing high-quality treatment. Mastering clinical nursing techniques promotes a successful and self-assured nursing professions in addition to raising the standard of patient care overall. In the realm of medicine and healthcare, extended reality (XR) is a revolution. The use of extended reality technology in medical professional education has gained traction. Using XR in practice made the students feel as though they were actually in a clinical setting. **Aim:** this study aimed to evaluate the efficacy of an educational program on extended reality knowledge among Damietta University nursing students. **Design**: Quasi-experimental design (one group pre / post-test) was utilized in the current study. **Sample**: A purposive samples of 40 undergraduate nursing students at level four was selected. **Setting:** The study was implemented at Faculty of Nursing - Damietta University. **Methods:** one method for data collection was used; a Google form questionnaire was applied to collect data pertinent to the study. **Results:** a highly statistically significant difference between total score knowledge among undergraduate nursing students in pre and post-tests. **Conclusion:** the current study revealed the effect of the educational program on changing nursing students' knowledge regarding XR to higher score level. **Recommendation:** design specialized health education sessions by integration with Faculty of Computer and Artificial Intelligence to upgrades nursing students' knowledge with EX applications.

Key words: extended reality (XR), knowledge, nursing students.

Introduction

The immersive technologies that comprise extended reality (XR) Current technological advancements and changes include augmented reality (AR), virtual reality (VR), and mixed reality (MR). They are becoming more and more advanced and incorporated into various industries and domains, particularly nursing and healthcare **(Research & markets, 2019).** Extended reality is an umbrella term used to describe all immersive technologies. Virtual and immersive technologies were first conceptualized many years ago, even before computers **(Tersel, 2017).** The term "extended reality" refers to the immersive technologies that are currently accessible and may be developed in the future **(Marr, 2019).** It includes augmented reality, mixed reality, and virtual reality (*Figure 1*).

Figure 1: Graphical presentation of XR spectrum **(Souza & Semenchenko, 2020).**

A computer-generated 3-D simulation known as virtual reality provides the user with a multitude of sensory inputs, enabling them to interact with virtual objects and experience a sense of physical presence. Nursing students can hone their abilities in virtual medical environments with the aid of VR **(Bayram & Caliskan, 2020).** AR could be a variety of VR, where computerized substance or objects are overlaid onto the physical environment. AR innovations have three characterizing characteristics: € œ1) combines genuine and virtual, 2) intuitively in genuine time, 3) enrolled in 3Dâ€ • . More recently, the definition of AR has also been expanded to include virtual images that are blended seamlessly with the real world **(Mendez, Piasecki, Hudson, Renda, Mollenkopf, Nettles & Han, 2020).**

MR simulation could be a strategy of converting the virtual and genuine universes utilizing gadgets such as computers, and it can give education in any case of the area. Clients can see the learned exercises from diverse perspectives and MR increments the engagement of clients in education through the recreation of different scenarios. MR simulation education isn't exorbitant, not at all like high-fidelity recreation, and is adaptable regarding environmental limitations, because it can be conducted in any space with a computer (**Kim, Choi & Kim, 2021).**

Simulations are a secure way for students to perform activities and exercises in situations that reproduce genuine or potential situations. It is effective and viable because it helps students learn how to utilize equipment and create problem-solving and decision-making abilities before they step into actual clinical settings where training is difficult, and unsafe (**Bayram & Caliskan, 2020).** Nursing simulation is an educational strategy that empower learners to move foreward their knowledge of nursing, critical thinking, and problem-solving aptitudes through debriefing the process after solving problems in different simulated scenarios that will happen in clinical settings (**Kim, Kim & Lee, 2019**).

Up to now, several clinical trials have appeared empowering results on immersive virtual reality to help manage anxiety, controlling pain, diversion for children going through painful procedures, physical recovery and cognitive preparing for elderlies, all procedures performed by nurses (**Syed-Abdul et al., 2019).** Instructive innovations offer the potential for encouraging more secure, more reasonable, and cost-effective learning encounters through which true education and preparing assignments can be

simulated **(Curran, Xu, Aydin & Meruvia, 2022).**

Mistakes in real clinical settings debilitate patient security. Hence, nursing students ought to perform primary nursing interventions over and over in laboratories and create fundamental psychomotor aptitudes prior they enter clinical practice. Simulations imitate real-world circumstances in which nursing students can pick up clinical experience without putting patients at hazard **(Silveira & Cogo, 2017).** Simulations give viable learning situations where nursing students can gain experience and create collaboration, administration, critical thinking, communication, clinical decision-making, and problem-solving skills without hurting patients, and boost their certainty and preparation for real clinical practice **(Kardong, Breitkreuz, Werb, Foreman & Ellertson, 2019).**

Significant of the study

A simulation program upgrades nursing students' clinical thinking aptitudes and self-confidence **(Chen, Leng, Ge, Wang, Li, Chen & Sun, 2020)**. Simulation training moves forward nursing students' knowledge and abilities without patients confronting any harm **(Shin, Park & Kim, 2015)**. With XR in healthcare as of now expanding get to , diminishing costs, and progressing medical outcomes for people around the world, the success and rising acknowledgment of these advances illustrate that a future where XR helps makes a difference shape healthcare is unavoidable. XR has moreover been related with progressed learning inspiration, interest, imagination, academic achievement as well as being a time-efficient elective to conventional strategies of instruction and learning **(Ruthberg, Tingle, Tan, Ulrey,**

Simonson-Shick & Enterline et al., 2020).

In spite of all tendencies and progressing ventures, XR in nursing has not been well investigated or looked into methodically. In most cases, papers centered separately on VR, AR and MR has been created, of those not all are inquire about papers. Other wording, right now accessible papers either do not represent evidence-based approach or they don't cover XR as an entire.

Subjects and Methods

Aim of the study

The aim of this study was to evaluate the efficacy of an educational program on extended reality knowledge among Damietta University nursing students.

Research hypothesis

To fulfill the aim of this study, the following research hypothesis was formulated:

H1: nursing students who exposed to the educational program will have higher mean knowledge scores in the post-test than in the pretest.

Research Design

A quasi- experimental design (one group Pre / Posttest) was utilized to fulfill the aim of the study. The design includes the manipulation of independent variables to observe their impact on dependent variables but does not have randomly assigned groups. By utilizing one group pretest- posttest design, single case is observed at two time points, one before execution of educational program and one after execution.

Setting

The study was conducted at Faculty of Nursing -Damietta University.

Sample

A purposive sample of 40 undergraduate nursing students (level four) was selected. The main objective of purposive sampling is to

focus on specific characteristics of a population that are of interest, which will best empower you to reply research hypothesis **(Rai & Thapa, 2015).**

Tool for Data Collection

After reviewing related national and universal literature the researcher designed a simple questionnaire based on literature review. The tool was applied online utilizing a Google form and was used as pre-posttest. It included 24 questions to assess undergraduate nursing students' knowledge regarding extended reality.

Scoring system

The questions where related to definition of XR, types, uses and practices of XR in education, advantages and disadvantages of XR. For each yes, no or I don't know question, yes answer was scored 3, no answer was scored 2 and I don't know was scored 0. Some questions are formulated as multiple choice questions; where more than one alternative can be selected; correct and complete answer was scored 3, correct and incomplete answer scored 2and incorrect answer was scored 1. A total score of knowledge was computed by summing correct responses of all questions. Total knowledge was categorized as high from 49.5- 66 score ($\geq$75%), moderate from 33- to less than 49.5 score (50% to < 75%) and low knowledge less than 33 score (<50%) out of total score of 66.

Content validity

Three expert professors within the field of community health nursing & computer and artificial intelligence science served as a board for the content validity of the study tools. The researcher asked the experts to set up a connection between each objective and its comparing item, evaluate the item's relevance to the content addressed by the objectives, and decide

whether they thought the tool's items adequately represented the content in the domain of interest. Reliability of the tools was examined through assessing internal consistency of the tool using item analysis.

Ethical Considerations

Primary approval was obtained from the dean of the Faculty of Nursing Damietta University to conduct the study and by the dean of Faculty of Computer and Artificial Intelligence in order to apply the study on one sample of nursing procedure at the faculty virtual labs. Students who agreed to participate in the study were asked for their informed consent, which stressed that participation in the study is completely optional and that subjects are free to leave the study at any moment. Subjects were guaranteed that this information will not be reused in another investigate without their consent, and the information collected will be utilized as it were for the reason of this inquire about.

Procedure

1- Assessment phase:

This phase included appraisal of undergraduate nursing students' knowledge regarding extended reality utilizing the online Google form.

2-Planning phase:

Based on assessment phase results, and comprehensive review of significant writing literature, the researchers designed educational program regarding extended reality.

3-Implementation phase:

The designed program was conducted in the form of two teaching sessions; the primary session done at faculty of nursing centered on introducing students with EX and its applications and it takes approximately one hour . The second session was online and it included illustrative recording regarding application of EX in nursing in order to improve the

theoretical portion which was clarified in the past session.

4-Evaluation phase:

This is the final phase of the program; the center of it was the evaluation of the educational program. It was done immediately after completing the program execution by utilizing the same preprogram tools (post- test) with the same students who participated in the study in order to evaluate the changes in their knowledge after the program.

Statistical design

Statistics was done by using version 22 of statistical package for social science (SPSS). Frequency, percentage, mean, and standard deviation were used for numerical data. ANOVA (analysis of variance) test was used for correlation between demographic data and scores. Results were considered significant if p <0.05 and highly significant if p <0.01.

Figure (2) shows that, 67.50% of undergraduate nursing students have high score level regarding their knowledge about EX, while 12.50% of them had moderate score, and only 20% of them had low score level related to EX knowledge.

Figure (3) reveals that, all undergraduate nursing students (100%) have high score level in post-test after application of the educational program regarding EX.

Table (1) reflected a highly statistically significant difference between total knowledge score among undergraduate nursing students in pre and post-tests (P value = 0.000). This table covered the study research hypothesis.
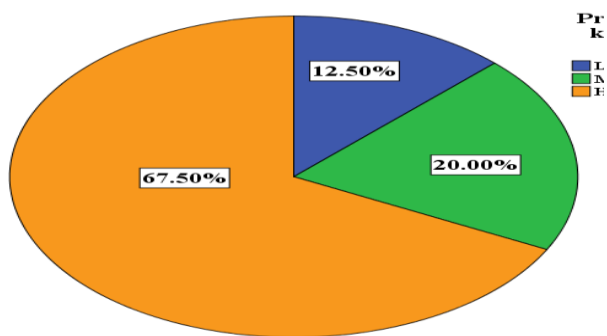
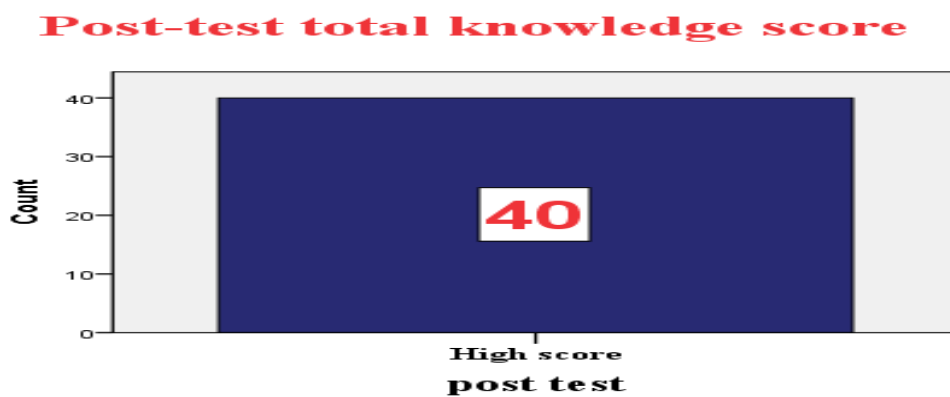*Figure 2*: Frequency distribution of pre-test total knowledge score

Figure 3: Frequency distribution of post- test total knowledge score

Table (1): comparison between total knowledge score (pre & posttest) (N= 40).

Dimensions	Pre-test		Post-test			
	Mean	**SD**	**Mean**	**SD**	**t**	
Total Knowledge						**P**
	2.5500	.71432	3.0000	.00000	22.578	0.000**

Discussion

Regarding undergraduate nursing students' knowledge about EX and its application within the field of nursing, the findings of the current study appeared that, 67.50% of undergraduate nursing students have high knowledge score within the pretest, and 20% of them had low score level related to EX knowledge. Moreover, all students have high score level at posttest after application of educational program to them, which reflect the curiosity of nursing students to study and apply the new modalities in the field of nursing. This finding is additionally comparable to the results extracted by **Frost, Delaney, & Fitzgerald, (2020)** who conducted a study on second year students enrolled in a 3 year Bachelor of Nursing programme to invistigate the contemporary application, inclusive of advantages and challenges, of virtual reality innovation in the education of nursing students and expressed that, 100% of the students stated that the experience assisted them in their learning.

In relation to a study done by Al-**Mugheed., et al, (2022)** among 126 nursing students' from the third and fourth nursing levels to decide the impact of online education and game-based virtual reality phone applications related to standard precautions, the results showed significant enhancement of students by application of both educational approaches; the online education and game-based virtual reality phone applications compared with conventional education and traditionally-lab class. Which is congruous with this study results that, appeared rise of nursing students total knowledge score after introduction to educational program.

Conventional education is seen as monotonous and focuses on appraisal paradigms that advance educators' capacity to repeat facts with-out really understanding the content. Educators may feel more comfortable utilizing Conventional teaching. However, educational strategies ought to be improved in parallel with new modern innovation to extend the effectiveness of nursing education, and encourage viable learning and enhance students' professional knowledge and skills **(Al-Mugheed., et al, 2022).**

Conclusion

In conclusion, the application of XR is an emerging trend within the field of education. Educational innovation is an indispensable component of sustainable development of education in the future. Students who experience more simulation training report a significant increase in their professional certainty immediately following training. The effect is students reporting twice as much confidence after using technology as compared to using non-technical innovation. Simulation training has a significant positive effect on the proficient certainty of nursing students and it moreover appears to have a positive impact on the acquisition of nursing knowledge **(Fuglsang et al, 2022).** Based on the outcomes of this study which uncovered the effect of educational program on changing nursing students' knowledge to higher score level, we can emphasize the significance to begin integrating EX at nursing education in the future **(Guo, Guo, & Liu, 2021).**

Recommendations

Based on the findings of the current study, the following suggestions are proposed;

1- Design specialized health education sessions by integration with Faculty of Computer and Artificial Intelligence to upgrades nursing students' knowledge with EX applications.

2- Conducting more studies on EX practices by nursing students in different branches.

3- Set standardized programs to be applied on virtual reality labs by nursing students in the future to enhance their knowledge and practice in the actual field.

Limitations of the study

1. The restricted quantity of pupils who consented to take part in the research; Since the study was conducted during the school year, the majority of them declined to take part because they were too busy studying.

References

Souza-Nykänen, M., & Semenchenko, N. (2020). Perspectives of extended reality in nursing.

Chen, F.Q.; Leng, Y.F.; Ge, J.F.; Wang, D.W.; Li, C.; Chen, B.; Sun, Z.L.(2020). Effectiveness of Virtual Reality in Nursing Education: Meta-Analysis. J. Med. Internet Res. 22, e18290.

Shin, S.; Park, J.H.; Kim, J.H. (2015). Effectiveness of patient simulation in nursing education: Meta-analysis. Nurse Educ. 35, 176–182.

Curran, V. R., Xu, X., Aydin, M. Y., & Meruvia-Pastor, O. (2022). Use of Extended Reality in Medical Education: An Integrative Review. Medical Science Educator, 1-12.

Silveira MDS, Cogo ALP (2017). The contributions of

digital technologies in the teaching of nursing skills: an integrative review. Revista gaucha de enfermagem. 38 (2). DOI: 10.1590/1983-1447.2017.02.66204.

Kardong-Edgren S, Breitkreuz K, Werb M, Foreman S, Ellertson A. (2019). Evaluating the usability of a second-generation virtual reality game for refreshing sterile urinary catheterization skills. Nurse educator. 44(3):137-141. DOI: 10.1097/NNE.0000000000 0570.

Bayram, S. B., & Caliskan, N. (2020). The use of virtual reality simulations in nursing education, and patient safety. In Contemporary Topics in Patient Safety-Volume 1. IntechOpen.

Mendez, K. J., Piasecki, R. J., Hudson, K., Renda, S.,

Mollenkopf, N., Nettles, B. S., & Han, H. R. (2020). Virtual and augmented reality: Implications for the future of nursing education. Nurse Education Today, 93, 104531-104531.

Kim M.K., Kim S.H., Lee W.S. (2019). Effects of a Virtual Reality Simulation and a Blended Simulation of Care for Pediatric Patient with Asthma. Child Health Nurs. Res. 25: 496–506. doi: 10.4094/chnr.2019.25.4.4 96.

Kim, K. J., Choi, M. J., & Kim, K. J. (2021). Effects of nursing simulation using mixed reality: a scoping review. In Healthcare (Vol. 9, No. 08, p. 947). MDPI.

Syed-Abdul, S., Malwade, S., Nursetyo, A. A., Sood, M., Bhatia, M., Barsasella, D., Liu, M. F., Chang, C. C.,

Srinivasan, K., M, R., & Li, Y. J. (2019). Virtual reality among the elderly: a usefulness and acceptance study from Taiwan. BMC geriatrics, 19(1), 223. https://doi.org/10.1186/s1287 7-019-1218-8.

Ruthberg JS, Tingle G, Tan L, Ulrey L, Simonson-Shick S, Enterline R, et al.(2020). Mixed reality as a time-efficient alternative to cadaveric dissection. Med Teach. 42:896–901. doi: 10.1080/0142159X.2020.1762 032.

Guo, X., Guo, Y., & Liu, Y. (2021). The development of extended reality in education: Inspiration from the research literature. Sustainability, 13(2 4), 13776.

Frost, J., Delaney, L., & Fitzgerald, R. (2020). Exploring the application of

mixed reality in nurse education. BMJ Simulation and Technology Enhanced Learning.: 6 (4): 214-219.

Al-Mugheed, K., Bayraktar, N., Al-Bsheish, M., AlSyouf, A., Aldhmadi, B. K., Jarrar, M. T., & Alkhazali, M. (2022). Effectiveness of game-based virtual reality phone application and online education on knowledge, attitude and compliance of standard precautions among nursing students. Plos one, 17(11), e0275130.

Rai, N., & Thapa, B. (2015). A study on purposive sampling method in research. Kathmandu: Kathmandu School of Law, 5. Types of samples, available athttp://psc.dss.ucdavis.edu/fa culty_sites//sommerb/sommer demo/sampling/types.htm. Accessed on June 16,