Seminars in Medical Writing and Education. 2023; 2:102
doi: 10.56294/mw2023102

ORIGINAL

Investigation of Online Interactive Modules for Strengthening Emergency Preparedness in Nursing Education

Investigación de módulos interactivos en línea para fortalecer la preparación ante emergencias en la educación de enfermería

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Cite as: Tripathy P, Jayakumar SS, Kumar A. Investigation of Online Interactive Modules for Strengthening Emergency Preparedness in Nursing Education. Seminars in Medical Writing and Education. 2023; 2:102. https://doi.org/10.56294/mw2023102

Submitted: 04-09-2022 **Revised:** 16-12-2022 **Accepted:** 22-02-2023 **Published:** 23-02-2023

Editor: PhD. Prof. Estela Morales Peralta

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ABSTRACT

The effective emergency preparedness in nursing education necessitated innovative teaching strategies that strengthened both theoretical knowledge and practical skills. Traditional instruction alone failed to provide nursing students with the critical competencies required for high-pressure emergency scenarios. Research examined the role of online interactive modules in improving emergency response proficiency, focusing on Emergency and Life Support Training (ELST), a web-based multimedia simulation game designed to enhance engagement, motivation, and skill acquisition in emergency care. A controlled investigation was carried out with final-year undergraduate nursing students (N=120) to assess the efficiency of ELST in emergency guidance. The intervention group engaged with ELST before realistic training, while the control group received conventional coaching. Quantitative investigation, performed using SPSS, involved an independent t-test to evaluate group performance, a paired t-test to assess within-group development, and a Chi-square test to analyze categorical differences in competency levels. The findings proved a statistically significant enhancement ($p < 0,05$) in key emergency competencies, including equipment verification, airway assessment, safe and effective use of a defibrillator, chest compression technique, and emergency medication management. Qualitative comments underscored the profit of interactive learning, as students reported increased confidence, faster decision-making, and better retention of emergency protocols. These results highlighted the potential of integrating simulation-based modules into nursing curricula to improve engagement, reinforce practical skills, and advance preparedness for critical situations. Incorporating digital learning equipment into emergency education bridged the break between academic instruction and real-world submission, finally leading to more capable and confident nursing professionals.

Keywords: Nursing Education; Online Interactive Modules; Emergency Preparedness; Emergency and Life Support Training (ELST); Nursing Students.

RESUMEN

La preparación eficaz para emergencias en la enseñanza de la enfermería requiere estrategias docentes innovadoras que refuercen tanto los conocimientos teóricos como las habilidades prácticas. La enseñanza tradicional por sí sola no proporcionaba a los estudiantes de enfermería las competencias críticas necesarias para los escenarios de emergencia de alta presión. La investigación examinó el papel de los módulos interactivos en línea en la mejora de la competencia de respuesta a emergencias, centrándose en la

formación en emergencias y soporte vital (ELST), un juego de simulación multimedia basado en la web diseñada para mejorar el compromiso, la motivación y la adquisición de habilidades en la atención de emergencia. Se llevó a cabo una investigación controlada con estudiantes universitarios de último curso de enfermería (N=120) para evaluar la eficacia del ELST en la orientación en emergencias. El grupo de intervención se comprometió con ELST antes del entrenamiento realista, mientras que el grupo de control recibió entrenamiento convencional. La investigación cuantitativa, realizada con SPSS, incluyó una prueba t independiente para evaluar el rendimiento del grupo, una prueba t pareada para evaluar el desarrollo dentro del grupo y una prueba Chi-cuadrado para analizar las diferencias categóricas en los niveles de competencia. Los resultados demostraron una mejora estadísticamente significativa ($p < 0,05$) de las competencias clave en emergencias, incluida la verificación del equipo, la evaluación de las vías respiratorias, el uso seguro y eficaz de un desfibrilador, la técnica de compresión torácica y la gestión de la medicación de emergencia. Los comentarios cualitativos subrayaron el beneficio del aprendizaje interactivo, ya que los estudiantes manifestaron una mayor confianza en sí mismos.

Palabras clave: Educación en Enfermería; Módulos Interactivos en Línea; Preparación para Emergencias; Capacitación en Emergencias y Soporte Vital (ELST); Estudiantes de Enfermería.

INTRODUCTION

The rapid progress of technology has notably influenced nursing education, leading to a paradigm shift in the perspectives of both students and educators.[1] Online communities can make it easy for learners to change from inactive recipients of information to engaged participants, determining the evolving conversation on contemporary nursing problems.[2] Nursing educators had to adopt distant online teaching and learning (OT/L), as the only viable option, despite real education being the norm in earlier years. Teaching methods evolved to enhance student engagement in the learning process from home through worldwide OT/L system, such as Microsoft Google Classroom, Teams, Zoom, and e-learning systems.[3] The rising frequency of emergencies combined with reported low levels of preparedness among emergency nurses, is a critical issue that requires attention. The preparedness of emergency nurses is expected to play an important function in emergency reply, healing task, and patient output.[4] Conferences, seminars, meetings, and training programs on disaster nursing are essential for mitigating uncertainties, addressing deficiencies, and enhancing nurses' proficiency in disaster response. Therefore, educational programs, technological applications, and resources should be rapidly developed to equip nursing students with the essential skills react to emergencies. Among healthcare professionals worldwide, nurses constitute the biggest occupational group, and nursing students represent the major segment of healthcare students. Given their numbers and expertise, nurses have the greatest potential to play a pivotal role in disaster response in the future.[5]

A 89 nursing undergraduate students took part in all. 14 items were used to measure perceived emergency nursing knowledge, confidence, and training/response both before and after the instruction.[6] A descriptive survey questionnaire was designed, incorporating the Disaster Preparedness Evaluation Tool (DPET) in Bangla for quantitative data collection. Using a multistage sampling approach, data were gathered from 410 nurses across eight hospitals in Dhaka city.[7] The success of knowledge through the virtual social network was demonstrated by the significant rise in the knowledge mark that was noted in the control group contrasted to the intervention group. Furthermore, emergency nurses' favorable outlook on the significance of disaster preparedness was evidenced by their high attitude ratings both before and after the course.[8] An online investigation was generated from the International Council of Nurses (ICN) and World Health Organization (WHO) framework of emergency nursing skills.[9] A reaction speed of 37 %(n=657/1787) was reached. Many participants expressed a low self-esteem in value and safety methods, tools, and Quality and Safety Education for Nurses (QSEN) framework competencies. Primary level staff nurses and obstetric nurses reported feeling underprepared compared to their central and senior professionals, with a major number indicating a inactivity in risk management efforts.[10] The findings emphasized the importance of creating emergency preparedness education plans that focused on student well-being and fostered innovative collaborative partnerships between schools and clinical partners.[11]

Objective of the research

Preparedness in nursing education is essential for providing future nurses with the awareness, skills, and confidence needed to respond effectively to various healthcare challenges, including emergencies and disasters. As the demands on healthcare professionals continue to evolve, nursing programs must integrate comprehensive training that enhances clinical competence, critical thinking, and adaptability. This research employed a controlled design, dividing 120 final-year undergraduate nursing students into two groups: an

intervention group (N=60) that engaged with the ELST modules before traditional training and a control group (N=60) that received only conventional instruction.

METHOD

Research used a controlled design, with 120 final-year undergraduate nursing students separated into two groups: an intervention group (N=60) that occupied with the Emergency and Life Support Training (ELST) module before traditional exercise and a control group (N=60) that received only traditional training. Figure 1 develops the methodology flow.

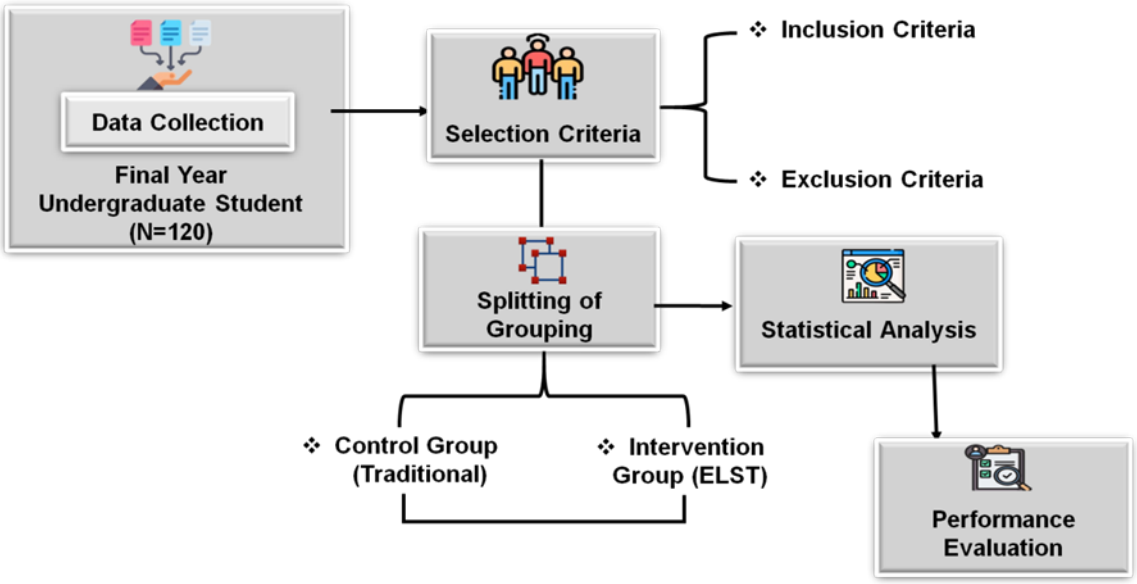

Figure 1. Methodology flow

Data collection

Final-year undergraduate nursing students (N=120) participated in the data collection process. Research were randomized into two groups: an intervention group (N=60) that received additional interactive assistance prior to training sessions and a control group (N=60) that received only traditional education. Knowledgeable approval was obtained from all involved before the research commenced. Both groups finished pre-training assessment to evaluate baseline ability stage, followed by post-training assess after their individual training sessions. Data collection included structured competency checklists measuring key emergency response skills, with scores recorded for statistical analysis. Additionally, qualitative feedback was gathered from participants to assess their learning experience, engagement, and confidence in emergency care. The structured data collection process facilitated a thorough assessment in improving emergency preparedness among nursing students. Table 1 presented the data gathered from final-year undergraduate nursing students (N=120) in this research.

Table 1. Demographic description of participants (N=120)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	90	75 %
	Female	30	25 %
Age group (year)	18-20	50	41,7 %
	21-23	40	33,3 %
	24-25	30	25 %
Previsions Emergency Training	Yes	95	79,2 %
	No	25	20,8 %
Clinical experience (year)	Less than 1	70	58,4 %
	1-2	50	41,6 %
Group assignment	Intervention (ELST)	60	50 %
	Control (Traditional)	60	50 %

https://doi.org/10.56294/mw2023102

Selection criteria

This section details the specific factors and conditions for participant inclusion in the research. It ensures that selected individuals meet the necessary requirements and helps define the population from which the sample is drawn.

Inclusion criteria

Only final-year students enrolled in the nursing program were qualified to participate in the research to certify they had foundational knowledge and realistic experience in nursing care. Participants aged 20 years or older to ensure that they were mature enough to handle the responsibilities of emergency care training. All participants were required to provide informed consent before inclusion in the research. Only students actively enrolled in the nursing program, without immediate plans for graduation, were selected to ensure their participation throughout the investigation.

Exclusion criteria

Students who had prior experience with ELST were excluded to prevent bias in the intervention group's data. Additionally, those with medical conditions that could interfere with their participation in training or assessments were excluded to prioritize participant safety. Participants who were incapable or unwilling to perform to finish the full training and assessments (e.g., due to scheduling conflicts) were excluded. A total of 400 students were initially selected for the research. However, after applying these exclusion criteria, the last sample included 120 participants.

Splitting of grouping

In this research, the 120 final-year undergraduate nursing students were divided into two groups as follows.

Control group (Traditional)

The Control Group (N=60) comprised final-year undergraduate nursing students who underwent conventional emergency care training, which included both theoretical instruction. The theoretical component covered fundamental emergency care concepts, life support protocols, medical terminology, and emergency medications. Notably, the control group did not utilize the ELST module, ensuring their learning relied entirely on traditional teaching methods.

Intervention group (Emergency and Life Support Training)

ELST is a web-based multimedia simulation game designed to improve the engagement, motivation, and practical skills of individuals in emergency care. The module integrates both academic and realistic components, reinforcing needed ideas and enhancing skill development before participants engage in conventional training. The intervention group (N=60) consisted of final-year undergraduate nursing students who mixed up with the ELST module before undergoing the traditional emergency care training period. The ELST module accepted students to practice critical emergency care skills, such as equipment checks, airway assessment, CPR, defibrillator use, and emergency medication administration in a controlled, simulated environment. Immediate feedback was provided throughout the exercise, enabling students to learn from their activities and refine their skills. Active engagement was promoted by the engaging setup, which strengthened knowledge and improved general skill development. Prior to engaging in traditional training, which sought to further develop their abilities in emergency care events, students completed the ELST module.

Statistical analysis

Statistical investigation for this research was carried out using IBM SPSS Statistics (Version 26). Independent t-tests were used to calculate the performance among the intervention group (who used the ELST module) and the control group (who received traditional training). Paired t-tests were conducted to measure within-group developments prior to and following training, while a Chi-square test examined categorical differences of observed variations in emergency care qualification between the two groups ($p<0,05$).

RESULTS

Qualitative feedback supported these findings, as students reported increased confidence, quicker decision-making, and better retention of emergency procedures. These findings demonstrate how well simulation-based learning connects theoretical learning with real-world disaster readiness.

Independent t-test

The independent t-test competency measurement displayed in table 2, the competency scores of two independent groups (control and intervention) to assess whether the variation is statistically significant. This

research examines whether students who engaged with the ELST simulation outperformed those who received only traditional instruction.

Table 2. Competency Measure

Competency Measure	Control Group			Intervention Group			t-value	p-value
	N (%)	Mean (X')	Sd	N (%)	Mean (X')	Sd		
Equipment Checks	40 (66,7 %)	0,67	0,47	52 (86,7 %)	0,87	0,34	3,92	p<0,05
Airway Assessment	34 (56,7 %)	0,57	0,50	50 (83,3 %)	0,83	0,37	4,42	p<0,05
Defibrillator Usage	32 (53,3 %)	0,53	0,51	55 (91,7 %)	0,92	0,29	5,21	p<0,05
Chest Compression Technique	36 (60,0 %)	0,60	0,49	57 (95,0 %)	0,95	0,22	5,14	p<0,05
Emergency Medication Admin	30 (50,0 %)	0,50	0,51	48(80,0 %)	0,80	0,40	4,18	p<0,05

Competency measurement variables are equipment checks, airway assessment, defibrillator usage, chest compression technique, and emergency medication admin showed notable gains, with t-values ranging from 4,52 to 5,56 and p-values less than 0,05. This represents diverse emergency reaction skills evaluated in the research. Control Group indicates the number and fraction of students in the control group who effectively demonstrated competency. The intervention Group represents the number and percentage of students in the intervention group who successfully demonstrated competency after using ELST. T-test represents a statistical measure screening the variation among the two groups. A higher t-value suggests a better difference in performance. P-value: Determines the statistical importance of the finds. A p-value of a smaller amount 0,05 ($p < 0,05$) defines that the experimental differences are statistically major and due to random possibility. The elevated percentages, t-values, and statistically significant p-values in the intervention group demonstrate that incorporating simulation-based learning effectively enhances emergency preparedness among nursing students.

Paired t-test Results

The paired t-test assesses the same group's performance in the control group and the intervention group. In this research, it determines whether nursing students exhibited significant improvements in emergency competencies following training, as shown in table 3.

Table 3. Competency Achievements

Competency Measure	Control Group			Intervention Group			t-value	p-value
	N (%)	Mean (X')	SD	N (%)	Mean (X')	SD		
Triage Decision-Making	30 (50,0 %)	0,50	0,51	48(80,0 %)	0,80	0,40	4,52	p < 0,05
Hemorrhage Control	32 (53,3 %)	0,53	0,53	49 (81,7 %)	0,82	0,39	4,81	p < 0,05
Rapid Response Coordination	29(48,3 %)	0,48	0,48	53(88,3 %)	0,88	0,33	5,38	p < 0,05
Medication Administration	35 (58,3 %)	0,58	0,58	56(93,3 %)	0,93	0,25	5,56	p < 0,05
Trauma Stabilization	29 (48,3 %)	0,48	0,48	45(75,0 %)	0,75	0,43	4,94	p < 0,05

The paired t-test findings point out a statistically significant enhancement in emergency competencies after preparation. Triage Decision-Making, Hemorrhage Control, Rapid Response Coordination, Medication Administration, and Trauma Stabilization all showed notable gains, with t-values ranging from 4,52 to 5,56 and p-values less than 0,05. These results confirm that students demonstrated improved proficiency in critical emergency skills following the training intervention, emphasizing the effectiveness of simulation-based learning improved emergency preparedness. After the evaluating paired t-test achieved a high value of the intervention group.

Chi-Square Test

The Chi-square test results specify a statistically significant development in competency stages between students who underwent the intervention. An advanced proportion of students in the intervention group achieved high competency, while fewer remained at low or medium levels compared to the control group ($p < 0,05$). As exposed in table 4, this competency levels show that simulation-based training successfully enhanced emergency readiness and skill improvement.

Table 4. Comparison of Competency Levels

Competency Level	Control Group N (%)	Intervention Group N (%)	Chi-square Value (x^2)	p-value
Low	18 (30,0 %)	4 (6,7 %)	11,92	p < 0,05
Medium	30 (50,0 %)	10 (16,7 %)	8,62	p < 0,05
High	12 (20,0 %)	46 (76,7 %)	16,23	p < 0,05
Total	60 (100 %)	60 (100 %)	36,77	p < 0,05

DISCUSSION

The findings emphasize the efficiency of integrating interactive digital learning equipment into emergency nursing education. The statistically significant development observed across enter competencies tool checks, airway assessment, defibrillator usage, chest compression technique, and emergency medication management displays the compensation of supplementing traditional training with simulation-based training. The intervention group, which engaged with the ELST module before realistic exercise, exhibited better proficiency than the control group, which relied on conventional instruction. This research was carried out with an cohort of final-year undergraduate nursing students, which can limit the applicability of the answer to other educational settings or experience levels. Overall, the research underscores the value of incorporating web-based multimedia simulation equipment into nursing curricula to develop emergency readiness. By strengthening practical skills, increasing engagement, and constructing confidence, these digital interventions can contribute to training more skilled and receptive nursing professionals.

CONCLUSION

The findings verify that the ELST imitation significantly enhanced emergency readiness in nursing education. Independent and paired t-tests focused on superior performance, while the Chi-square result exposed a higher amount of student's success in high competency stages ($p < 0.05$). Qualitative opinion highlighted better confidence, earlier decision-making, and better retention of emergency protocols. These findings highlight the effectiveness of digital simulations in linking theoretical instruction with practical purpose. Incorporating these tools into nursing curricula improves engagement and facilitates skill enhancement. Simulation-based learning equips students for real-world emergency situations and contributes to better patient output. Future research should explore the long-term effects of digital simulation training on clinical practice and patient care.

REFERENCES

1. Padilha JM, Machado PP, Ribeiro AL, Ramos JL. Clinical virtual simulation in nursing education. Clinical Simulation in Nursing. 2018 Feb 1;15:13 8. https://doi.org/10.1016/j.ecns.2017.09.005

2. Haslam MB. What might COVID-19 have taught us about the delivery of Nurse Education, in a post-COVID-19 world?. Nurse Education Today. 2021 Feb 1;97:104707. https://doi.org/10.1016/j.nedt.2020.104707

3. Suliman WA, Abu-Moghli FA, Khalaf I, Zumot AF, Nabolsi M. Experiences of nursing students under the unprecedented abrupt online learning format forced by the national curfew due to COVID-19: A qualitative research study. Nurse education today. 2021 May 1;100:104829. https://doi.org/10.1016/j.nedt.2021.104829

4. Amberson T, Wells C, Gossman S. Increasing disaster preparedness in emergency nurses: a quality improvement initiative. Journal of emergency nursing. 2020 Sep 1;46(5):654-65. https://doi.org/10.1016/j.jen.2020.05.001

5. Kalanlar B. Effects of disaster nursing education on nursing students' knowledge and preparedness for disasters. International journal of disaster risk reduction. 2018 Jun 1;28:475-80. https://doi.org/10.1016/j.ijdrr.2017.12.008

6. Levoy K, DeBastiani SD, McCabe BE. Evaluation of a novel disaster nursing education method. Disaster medicine and public health preparedness. 2018 Dec;12(6):703-10. https://doi.org/10.1017/dmp.2017.150

7. Hasan MK, Younos TB, Farid ZI. Nurses' knowledge, skills and preparedness for disaster management of a Megapolis: Implications for nursing disaster education. Nurse education today. 2021 Dec 1;107:105122. https://doi.org/10.1016/j.nedt.2021.105122

8. Ghezeljeh TN, Aliha JM, Haghani H, Javadi N. Effect of education using the virtual social network on the knowledge and attitude of emergency nurses of disaster preparedness: A quasi-experiment study. Nurse

education today. 2019 Feb 1;73:88-93. https://doi.org/10.1016/j.nedt.2018.12.001

9. Siemon M, Hackwith J, Monson K. Development of a disaster nursing competencies assessment instrument for baccalaureate nursing education. Journal of Nursing Education. 2019 Apr 1;58(4):229-33. https://doi.org/10.3928/01484834-20190321-08

10. Gallen A, Kodate N, Casey D. How do nurses and midwives perceive their preparedness for quality improvement and patient safety in practice? A cross-sectional national study in Ireland. Nurse Education Today. 2019 May 1;76:125-30. https://doi.org/10.1016/j.nedt.2019.01.025

11. Michel A, Ryan N, Mattheus D, Knopf A, Abuelezam NN, Stamp K, Branson S, Hekel B, Fontenot HB. Undergraduate nursing students' perceptions on nursing education during the 2020 COVID-19 pandemic: A national sample. Nursing Outlook. 2021 Sep 1;69(5):903-12. https://doi.org/10.1016/j.outlook.2021.05.004

FINANCING

None.

CONFLICT OF INTEREST

The authors declare that the research was conducted without any commercial or financial relationships that could be construed as a potential conflict of interest.

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