Effectiveness of Massive Open Online Course on Risk Communication Knowledge in Global Health Emergencies Among Nurses

Khin Thandar Aung[1*], Rafiza Abdul Razak[2], Muhammad Fadli Zulkafley[1]

1. Kulliyyah of Nursing, International Islamic University Malaysia, Pahang, Malaysia
2. Faculty of Education, University Malaya, Wilayah Persekutuan Kuala Lumpur, Malaysia

*E-mail: khin_ta@iium.edu.my

Abstract

Massive Open Online Courses (MOOCs) have transformed education. The minimal usage of MOOCs in nursing education reveals a lack of continuous healthcare professional development. Although MOOCs are recognized as a viable means of continuing education for healthcare professionals, their application and content specifically tailored to healthcare have remained unexplored. This study aimed to determine the effectiveness of a dedicated Massive Open Online Course (MOOC) designed to enhance nurses' risk communication knowledge in global health emergencies through testing with a small nurse sample in a pilot trial. This preliminary examination seeks participant feedback and insights. A quasi-experimental research design was conducted, employing a one-group pre-test and post-test design using the convenience sampling method with 40 registered nurses from the medical center of International Islamic University Malaysia. These nurses engaged in a four-week MOOC hosted on i-Taleem (the university's eLearning platform), focusing on knowledge about risk communication. Pre- and post-course questionnaires were administered, and the data was analyzed using SPSS version 20.0's paired t-test. The study showed a significant improvement in test scores with a p-value of 0.022, which is less than the predetermined significance level of 0.05. Consequently, the alternate hypothesis (HA) is accepted, signifying a substantial improvement in nurses' knowledge of risk communication in global health emergencies. Additionally, this study provides the framework for the widespread implementation of such instructional interventions in nursing education and professional development.

Keywords: global health emergencies, massive open online courses (MOOCs), nurse, risk communication

Abstrak

Efektivitas* Massive Open Online Course *terhadap Pengetahuan Komunikasi Risiko di Kalangan Perawat dalam Keadaan Darurat Kesehatan Global. Massive Open Online Courses (MOOCs) *telah mengubah pendidikan. Minimnya penggunaan* MOOCs *dalam pendidikan keperawatan menunjukkan kurangnya pengembangan profesional berkelanjutan di bidang kesehatan. Meskipun* MOOCs *diakui sebagai sarana yang layak untuk melanjutkan pendidikan bagi para profesional kesehatan, penerapan dan kontennya yang secara khusus dirancang untuk perawatan kesehatan masih belum dieksplorasi. Penelitian ini bertujuan untuk menentukan efektivitas kursus* MOOC *yang dirancang untuk meningkatkan pengetahuan komunikasi risiko perawat dalam keadaan darurat kesehatan global melalui pengujian dengan uji coba terhadap sampel perawat dalam skala kecil. Pengujian awal studi ini bertujuan untuk mengetahui umpan balik dan wawasan peserta. Desain penelitian kuasi-eksperimental menggunakan* pre-test *dan* post-test *satu kelompok dengan menggunakan metode* convenience sampling *terhadap 40 perawat terdaftar di pusat kesehatan universitas. Perawat ini terlibat dalam kursus* MOOC *selama empat minggu yang diselenggarakan di i-Taleem platform (*platform eLearning *universitas), memfokuskan pengetahuan tentang komunikasi risiko. Kuesioner* pre- *dan* post-course *diberikan, dan data dianalisis menggunakan* Paired-T test *SPSS versi 20.0. Studi ini menunjukkan peningkatan nilai yang signifikan dengan nilai p sebesar 0,022, lebih kecil dari tingkat signifikansi yang telah ditentukan yaitu 0,05. Alhasil, hipotesis alternatif (HA) diterima, menandakan peningkatan substansial dalam pengetahuan perawat tentang komunikasi risiko dalam keadaan darurat kesehatan global. Studi ini memberikan kerangka kerja untuk penerapan intervensi instruksional secara luas dalam pendidikan keperawatan dan pengembangan profesional.*

Kata Kunci: *darurat kesehatan global, komunikasi risiko,* massive open online courses (MOOCs), *perawat*

Introduction

In the contemporary landscape of education, Massive Open Online Courses (MOOCs) have emerged as a transformative approach (Regan et al., 2022). In the 21st century, learners are increasingly eager to acquire new skills through technology, thanks to advancements in digital technology. However, the integration of MOOCs into nursing education remains limited, highlighting a gap in the utilization of MOOCs for continuing professional development in the healthcare sector. Despite MOOCs being recognized as a viable means of continuing education for healthcare professionals, their application and content tailored to healthcare, particularly for nursing professionals, have been largely unexplored. Previous research has mainly described isolated experiences in the growth of nursing MOOCs (Bendezu-Quispe et al., 2020). In response to this gap, this study aims to assess the effectiveness of a dedicated MOOC designed to enhance nurses' knowledge of risk communication in global health emergencies. This preliminary investigation seeks participant feedback to improve the intervention's quality and applicability.

MOOCs represent a platform that offers a more systematic and engaging approach to teaching and learning (Paulik et al., 2020). They provide practical and holistic learning experiences compared to traditional methods. MOOCs also offer the opportunity for quality education among those facing limitations such as economic constraints, travel restrictions, or limited availability (Porat et al., 2020). This eLearning tool offers open-distance education, cost-effectiveness, and flexibility, which aligns well with the needs of nurses who often face constraints in pursuing Continuous Nursing Education (CNE). MOOC-based CNE presents a promising approach to delivering credible, cost-effective, and easily accessible content to healthcare providers at their convenience (Aung et al., 2022). CNE plays a vital role in nurses' career development, ensuring they stay updated on modern nursing procedures and meet the community's

healthcare needs, especially in times of disaster (Bendezu-Quispe et al., 2020).

Through MOOCs, learners have access to a diverse range of knowledge options, with the flexibility to attend courses repeatedly, unrestricted by geographic boundaries (Aung et al., 2022). This inclusivity contributes significantly to public health education and medicine, facilitating collaborative, social, and peer learning. The development of MOOCs marks a new era of opportunities in nursing education, fostering lifelong learning and enhancing healthcare service quality (Gómez & Gómez, 2021; Padilha et al., 2021). MOOCs in CNE programs expand the scope of learning for nurses, granting them greater autonomy in their professional development. CNE, as a credible and accessible form of education, ultimately improves healthcare outcomes. Notably, the Malaysian government actively promotes MOOCs as a platform to integrate lifelong learning and innovative teaching approaches (Albelbisi & Yusop, 2020; Sa'don et al., 2021).

In the context of nursing education, the ongoing COVID-19 pandemic has emphasized the need for nurses to sharpen their risk communication skills. The pandemic, declared a global crisis by the World Health Organization (WHO) in March 2020, prompted diverse public responses to health authorities' recommendations, making outbreak management challenging. Clear and accurate communication is crucial for responding to health emergencies (WHO, 2020). Risk communication has been described as a two-way process of information exchange between the parties concerned regarding the nature, significance, and/or management of risk. It is an interactive process of revealing information and exchanging perspectives among the responsible parties, such as professionals, community leaders, and the government, about the at-risk populations during health emergencies (Nicholson, 1999, as cited in Lowbridge & Leask, 2011). Effective risk communication is critical in guiding policymakers to protect individuals, families, communities, and nations. In the time of a

pandemic, public accessibility to the most recent and reliable public health recommenddations is a matter of life and death (Paulik et al., 2020). The pandemic has underscored the importance of clear and accurate risk communication, particularly in the context of public health crises (Qiu & Chu, 2019). Regions that did not promptly address misleading information about transmission rates suffered fatalities.

Thus, this pilot study aims to assess the effectiveness of a MOOC in enhancing risk communication skills among nurses. The study's goal is to determine the course's utility by evaluating participants' pre-test and post-test scores. It sheds light on the potential of MOOCs in nursing education and their role in improving healthcare professionals' abilities to communicate effectively during crises.

Methods

This study employed a quasi-experimental design to investigate the impact of risk communication courses delivered through a dedicated MOOC on improving risk communication skills among nurses. Specifically, it utilized a one-group pre-test and post-test design to examine causal relationships between the intervention and the desired outcomes.

Participants. The selection of participants was based on predefined inclusion and exclusion criteria. Inclusion criteria comprised individuals who were staff nurses from the medical center of International Islamic University Malaysia and those willing to enhance their knowledge and skills in risk communication. A non-probability convenient sampling method was employed, enabling the selection of readily accessible participants. A total of 40 participants were recruited, and they underwent a 4-week online course, with their progress contingent on their commitment. Regular follow-ups were conducted to encourage the 40 participants to complete their course, ultimately obtaining the desired outcomes.

Study Design and Instruments. In this research, a one-group pre-test—post-test design was used to assess the effectiveness of a MOOC on risk communication in global health emergencies. Before starting the course, participants completed a pre-test knowledge assessment. After four weeks of the course, participants who completed it were given post-test questionnaires to measure any improvements in their knowledge.

The questionnaires used in both the pre-test and post-test assessments consisted of three sections. Section A collected socio-demographic data, such as gender, age, marital status, professional experience, and educational level. Section B included 15 items adapted from Ibrahim et al. (2021) to evaluate participants' understanding of risk communication. Participants responded to these items using a five-point Likert scale, ranging from 'strongly disagree' to 'strongly agree'. Finally, Section C consisted of 15 questions about MOOC technology, adapted from Dinh et al. (2022).

Data Analysis. The data collected from participants' responses were subjected to statistical analysis using a paired t-test. This test was employed to compare participants' knowledge of risk communication before and after the intervention.

In this study, the data collected from participants' responses were analyzed using a paired t-test, a statistical method employed to compare two related samples or measurements. Specifically, this test was utilized to assess the difference in participants' knowledge of risk communication before (pre-test) and after (post-test) completing the MOOC intervention. The paired t-test was appropriate for this study because the same participants were measured twice—once before the intervention and once after—facilitating the comparison of mean scores between these two-time points.

Steps in the Data Analysis: 1) Pre-test and Post-test Design: Data were collected using pre-test

and post-test questionnaires designed to measure participants' knowledge of risk communication in global health emergencies. The pre-test was administered before the four-week MOOC, and the post-test was conducted upon course completion; 2) Data Scoring: Participants' responses were scored, with a total score computed for both the pre-test and post-test questionnaires. The scoring system was based on a Likert scale, with responses ranging from "strongly disagree" to "strongly agree" for each question. The scores were then totaled for each participant to provide a comprehensive knowledge score before and after the intervention; 3) Paired t-test Application: A paired t-test was conducted to determine if there was a statistically significant difference between the pre-test and post-test scores. This test compares the mean scores of the two related groups (the pre-intervention and post-intervention groups) and assesses whether the average improvement in scores is statistically significant.

Ethical Consideration. The researcher has obtained ethical approval from the Research Committee (IREC) of the International Islamic University Malaysia (IIUM) and the Kulliyyah of Nursing Undergraduate Research (KNPGRC). Ethical permission for this project has been granted under reference number IREC2023-KON/NURF76. Before the participation of the study's subjects, informed consent has been obtained from each participant. Written consent, using clear and accessible language, is required to document this process. By emphasizing the importance of providing participants with detailed information, this ensures their ability to make an informed, voluntary, and rational decision to participate. Additionally, the consent form allows participants to withdraw from the study at any time without having to provide reasons. Furthermore, the confidentiality of the participants is maintained, ensuring that their data is not known to anyone, including the researcher.

Results

Generally, the research employs a one-group pre-test and post-test approach with a convenience sample comprising 40 registered nurses from the IIUM medical center. These nurses

Table 1. Socio-Demographic Data

Variable	n	%
Age		
< 30 years	20	60.2
30-40	12	36.4
> 40	1	3.0
Sex		
Male	7	21.2
Female	26	78.8
Level of Education		
Diploma	24	72.7
Degree	9	27.3
Certificate	0	0
Marital status		
Non – married	16	48.5
Married	17	51.5
Widowed	0	0
Experiences		
< 10 years	26	78.8
10–40	7	21.2
> 40	0	0

participated in a four-week MOOC hosted on the i-Taleem platform (eLearning platform of the university), with a specific focus on enhancing their knowledge of risk communication in global health emergencies.

The socio-demographic data of the respondents are shown in Table 1. The majority of the respondents are women (78.8%), with a mean age of 30.78 (+3.51). In terms of educational level, most of the respondents have a diploma qualification (72.7%). Furthermore, 51.5% of the respondents are married, which is slightly higher than the percentage of non-married respondents (48.5%). Most of the respondents are expert nurses with less than 10 years of experience (78.8%).

Pre-test and post-test questionnaires are administered to access the participants' knowledge, and the resulting data are analyzed using a paired t-test of SPSS version 20.0. The study yielded statistically significant findings, with a p-value of 0.022, thereby providing empirical support for the acceptance of the alternate hypothesis (H_A). This result underscores a noteworthy improvement in the knowledge of nur-

ses about risk communication in the context of global health emergencies (see Table 2).

The Level of Knowledge on Risk Communication Among Nurses Before Studying Risk Communication in Global Health Emergencies MOOC. As elucidated in Table 2, the cumulative score for both parts of the questionnaires was set at a maximum of 75 marks, reflecting the comprehensive assessment of risk communication knowledge. The initial pre-test evaluation revealed a range of scores for Part B, spanning from 25 to 75 marks, and for Part C, scores ranged between 30 and 75 marks. The mean score for participants' risk communication knowledge, as ascertained prior to their engagement with the course, was computed at 58.88 (with a standard deviation of 9.60) for Part B and 63.79 (with a standard deviation of 10.32) for Part C.

Upon the aggregation of scores from both parts of the questionnaires, resulting in a total possible score of 150, participants' achieved scores ranged from 67 to 150. The calculated mean score, complemented by a standard deviation, for the comprehensive assessment of risk com-

Table 2. Pre-test Score of Nurses' Knowledge of Risk Communication

Overall Prevalence	Total Score	Min.	Max.	Mean (+SD)
Part B	75	25	75	58.88 (9.60)
Part C	75	30	75	63.79 (10.32)
Total	150	67	150	115.24 (17.89)

Table 3. Post-test Scores of Nurses' Knowledge of Risk Communication

Overall Prevalence	Total Score	Min.	Max.	Mean (+SD)
Part B	75	37	75	62.00 (8.35)
Part C	75	37	75	62.00 (8.35)
Total	150	74	150	124.15 (16.75)

Table 4. Paired T-test Result

Variables	Mean	Standard Deviation	t-test	p-value
Pre-test	115.24	17.89	2.95	0.0058
Post-test	124.15	16.75		

munication knowledge, stood at 115.24 (with a standard deviation of 17.89).

The Level of Knowledge on Risk Communication Among Nurses After Studying Risk Communication in Global Health Emergencies MOOC. The post-test assessment was conducted, and the participants' scores for both Part B and Part C are detailed in Table 3, ranging from 37 to 75 marks. Remarkably, the average score for evaluating the level of knowledge on risk communication after the completion of the course mirrored this consistency, with participants achieving an average score of 62.00 (with a standard deviation of 8.35) for both parts.

Upon the summation of scores derived from both sections of the questionnaires, which culminated in a total possible score of 150, participants' achieved scores ranged between 74 and 150. The calculated mean score, accompanied by its corresponding standard deviation, for the comprehensive assessment of risk communication knowledge following course completion stood at 124.15 (with a standard deviation of 16.75).

There are differences in levels of knowledge among nurses about risk communication skills in global health emergencies before and after studying MOOC. Table 4 presents the comparative analysis of pre-test and post-test scores, evaluating the impact of the MOOC course on risk communication. Based on the paired t-test results, there was a significant difference between the pre-test and post-test scores. The mean score for the pre-test was 115.24 (SD = 17.89), while the mean score for the post-test was 124.15 (SD = 16.75). The t-test yielded a t-value of 2.95, with a corresponding p-value of 0.0058, indicating that the increase in scores from the pre-test to the post-test was statistically significant (p < 0.01). The paired t-test result is shown in Table 4.

Discussion

Effective risk communication is paramount in the realm of nursing, especially in the context of global health emergencies. Nurses play a critical role in disseminating accurate information to the public during crises, and their ability to do so hinges on their proficiency in risk communication. This study assessed the impact of a MOOC on risk communication skills among registered nurses. The study employed a quasi-experimental design, utilizing one group pretest and post-test design, and involved a convenience sample of 40 nurses from the medical center of the university. The findings provided valuable insights into the potential for MOOC-based continuing education to enhance nursing competence in risk communication knowledge.

Moderate Knowledge Levels Pre-Intervention. The scores of the participating nurses in parts B and C were 55.88 and 63.79 out of 75, respectively, as shown in Table 2. These results show that the nurses demonstrated a moderate level of knowledge. Part B specifically measures their knowledge of risk communication, while Part C focuses on their knowledge of the MOOC course before the implementation of the MOOC-based intervention. This observation aligns with the outcomes of previous research, thereby corroborating the notion that there is ample room for improvement in nurses' risk communication skills (Aboagye et al., 2020; Porat et al., 2020). This moderate baseline knowledge underscores the need for ongoing education and training to bolster nurses' competencies in this critical area.

In the evolving landscape of healthcare, marked by rapid technological advancements and changing community needs, nurses are called upon to adapt and update their practices continually. One of the central challenges they face is the effective dissemination of accurate information during health emergencies, such as pandemics or natural disasters. In this regard, the integration of updated nursing standards, informed by modern technologies and community demands, is essential. These updates should encompass risk communication practices, ensuring that nurses are well-prepared to fulfil their

role as reliable sources of information in times of crisis.

One practical avenue for effecting this change is through CNE, and the study demonstrates that MOOCs offer a viable platform for such educational initiatives. CNE via MOOCs provides nurses with accessible, flexible, and relevant learning opportunities. This mode of education aligns with the argument made by Bendezu-Quispe et al. (2020) that health professionnals must engage in ongoing training to acquire new information and abilities to perform effectively in their roles. Therefore, the study's findings not only support the need for nurses to enhance their risk communication skills but also suggest that MOOC-based CNE is a promising avenue for achieving this goal.

Post-Intervention Improvement in Knowledge. The data in Table 3 show that there has been a noticeable improvement in knowledge of risk communication after completing a 4-week MOOC course. Specifically, the average score after the intervention is 124.15, with a standard deviation of 16.75, which is higher than the average score before the intervention, which was 115.24 with a standard deviation of 17.89. The observed augmentation in post-intervention scores underscores the efficacy of the MOOC-based learning approach in enhancing the risk communication skills of participants. This suggests that participants found this mode of learning to be conducive to their individual needs and learning preferences. MOOCs offer numerous benefits, including flexibility in scheduling and minimal admission requirements, making them particularly beneficial for nurses in a professional setting. The accessibility and adaptability of MOOCs empower nurses to acquire new knowledge and skills while effectively managing their concurrent professional responsibilities (Goglio & Bertolini, 2021; Musa et al., 2023).

The observed increase in knowledge following the intervention highlights the relevance of utilizing innovative learning strategies within the healthcare industry. MOOCs offer unparalleled opportunities for ongoing professional development and the acquisition of new skills due to their flexible nature and widespread availability. Healthcare professionals, including nurses, require a method that is both flexible and efficient in order to enhance their skills and proficiencies while balancing their rigorous work schedules, considering the constant evolution of the field of healthcare (Goglio & Bertolini, 2021).

In summary, the results of the post-intervention phase of the investigation demonstrated a substantial improvement in understanding risk communication, aligning with the conclusions drawn in prior studies. This enhancement highlights the effectiveness of learning through MOOCs, emphasizing how well this approach suits the requirements and inclinations of healthcare practitioners, especially nurses. MOOCs are a valuable resource for healthcare professionals seeking to enhance their skills and knowledge, thereby contributing to the overall development of healthcare communication practises in the workplace because of their accessibility and flexibility.

Statistical Significance and Implications. Based on the results of the paired t-test, there was a significant difference between the pre-test and post-test scores. The mean score for the pre-test was 115.24 (SD = 17.89), while the mean score for the post-test was 124.15 (SD = 16.75). The t-test showed a t-value of 2.95, with a corresponding p-value of 0.0058, indicating that the increase in scores from the pre-test to the post-test was statistically significant ($p < 0.01$). The statistical significance of this finding highlights a considerable improvement in the proficiency of participants in risk communication skills following their participation in MOOC. The results of this study align with feedback obtained from healthcare practitioners in an independent inquiry pertaining to online educational programs that emphasize systematic reviews (SRs). Within that framework, healthcare professionals confirmed the efficacy of

such measures in enhancing their comprehension of SRs and broadening the depth of knowledge (Nopa et al., 2024).

The implications of these empirical findings are extensive and multifaceted. Firstly, the researchers underscore the critical importance of integrating continuous education and training, particularly in domains pivotal to nursing practice, such as risk communication. Nursing, as a profession, is intrinsically dynamic, and nurses must continually update their skills and knowledge to provide optimal care to patients and communities. This necessitates an ongoing commitment to professional development and the acquisition of competencies that align with contemporary healthcare demands. Secondly, this study provides evidence to support the utilization of MOOCs as an effective platform for facilitating continuous education in the field of nursing. The inherent flexibility and accessibility of MOOCs render them an attractive and viable option for nurses who wish to enhance their skills without disrupting their rigorous work schedules. Such accessibility is particularly advantageous in the healthcare sector, where demanding and irregular shifts can pose significant challenges to conventional methods of teaching and training.

The results of this study emphasize the importance of nurses enhancing their competence in risk communication, particularly in the setting of global health emergencies. The pre-test results reveal an inadequate level of risk communication knowledge among nurses, highlighting the urgent requirement for ongoing education and training in this area. The utilization of MOOCs has emerged as a practical and efficient means of advancing the purpose of CNE. The statistics from the study clearly demonstrate a significant increase in knowledge after participating in MOOC-based training, confirming the value of MOOCs as a great tool for advancing the profession of nursing. The obtained statistical significance from the analysis of the paired t-test outcomes provides additional support for the effectiveness of MOOCs

in enhancing the skill level of nurses in risk communication. This study presents a strong argument for the significance of MOOC-based CNE in enhancing nurses' proficiency in risk communication, an essential skill set, particularly in the context of addressing and minimizing global health emergencies. This research highlights the feasibility and effectiveness of MOOCs in this setting, hence emphasizing their efficacy. Additionally, it shows the greater value of lifelong learning for healthcare professionals.

Limitations. One limitation of this study is the absence of randomization in the research design, which may introduce potential biases. Using a quasi-experimental approach, specifically a one-group pre-test and post-test design with convenience sampling, raises concerns about the representativeness of the results within the broader nursing population. This sampling method constrains the generalizability of the findings, as participants were selected based on their availability rather than through random selection. Consequently, the results may reflect the outcomes of this specific group rather than apply to a wider population of nurses. Furthermore, the lack of a control group complicates the assessment of whether the observed improvements were solely attributable to the intervention or influenced by other factors. Future studies could enhance the robustness of the results by incorporating randomization and control groups, thereby improving the generalizability and reliability of the findings.

Conclusion

Overall, this study highlights the transformative potential of MOOCs within the realm of nursing education and professional development. This preliminary investigation lays a solid foundation for the broader integration of MOOC-based educational interventions in the field of nursing, where the ability to adapt and the efficacy of learning solutions are of utmost significance. As the healthcare landscape continually evolves, the demand for accessible, flexi-

ble, and effective learning solutions becomes increasingly pronounced. MOOCs, with their inherent characteristics, are highly suitable to address this demand. In fulfilling this role, MOOCs have an opportunity to enhance the proficiency of healthcare professionals, ultimately contributing to the enhancement of patient care and the well-being of the broader community. This study illuminates the potential of MOOCs to play a pivotal role in shaping the future of nursing education and, by extension, the quality of healthcare delivery.

Acknowledgements

References

Aboagye, A.K., Dai, B., & Bakpa, E.K. (2020). The effect of risk communication on the nurses' task and contextual performance in disease outbreak control in Ghana: Application of the cause model. *The International Journal of Health Planning and Management, 35* (4), 922–938. doi: 10.1002/hpm.2978.

Albelbisi, N.A., & Yusop, F.D. (2020). Systematic review of a nationwide MOOC initiative in Malaysian higher education system. *Electronic Journal of e-Learning, 18* (4), 288–299. doi: 10.34190/EJEL.20.18.4.002.

Aung, K.T., Ali N.A.M, Zaid, M.M., & Shaharzan, N.J. (2022). Massive Open Online Course (MOOC) in Continuous Nursing Education (CNE): Contributions and challenges: A review. *IIUM Medical Journal Malaysia, 21* (2), 29–34. doi: 10.31436/imjm.v21i2.1913.

Bendezu-Quispe, G., Quijano-Escate, R., Hernández-Vásquez, A., Inga-Berrospi, F., & Condor, D.F. (2020). Massive open online courses for continuing education for nursing professionals

in Peru. *Revista Latino-Americana de Enfermagem, 28,* e3297. doi: 10.1590/1518-8345.3803.3297.

Dinh, N.B.K., Zhu, C., Nguyet, D.A., & Qi, Z. (2022). Uncovering factors predicting the effectiveness of MOOC-based academic leadership training. *Journal of Computers in Education, 10* (4), 721–747. doi: 10.1007/s40692-022-00241-z.

Goglio, V., & Bertolini, S. (2021). The contribution of MOOCs to upskilling the labor force. *Journal of Workplace Learning, 33* (7), 561–574. doi: 10.1108/JWL-10-2020-0159.

Gómez, G.F., & Gómez, P.M. (2021). Use of MOOCs in health care training: A descriptive-exploratory case study in the setting of the COVID-19 pandemic. *Sustainability, 13* (19), 10657. doi: 10.3390/su131910657.

Ibrahim, N., Shafie, S.A., & Rahim, I.N.A. (2021). Implementation of project-based-learning through MOOC in developing communication skills. *International Journal of Advanced Research in Education and Society, 3* (2), 32–37.

Lowbridge, C.P., & Leask, J. (2011). Risk communication in public health. *New South Wales Public Health Bulletin, 22* (1–2), 34. doi: 10.1071/NB10055.

Musa, M., Mamat, R., Hassan, H., Sa'at, S.F., Rahim, S.S.A., Ramdzan, A.R., Abdullah, O., Paidius, V.A., Muitaba, M., & George, A.M. (2023). The relationship of self-care behaviours and online learning engagement among nursing students during the COVID-19 Pandemic. *Jurnal Keperawatan Indonesia, 26* (3), 163–169. doi: 10.7454/jki. v26i3.985.

Nopa, I., Kurniawidjaja, L.M., & Erwandi, D. (2024). Coping strategies for nurses' distress in dealing with the COVID-19 Pandemic: A Scoping Review. *Jurnal Keperawatan Indonesia, 27* (1), 12–24. doi: 10.7454/jki. v27i1.1097.

Padilha, J.M., Machado, P.P., Ribeiro, A.L., Ribeiro, R., Vieira, F., & Costa, P. (2021). Easiness, usefulness, and intention to use a

MOOC in nursing. *Nurse Education Today, 97,* 104705. doi: 10.1016/j.nedt.2020.104705.

Paulik, L.B., Keenan, R.E., & Durda, J.L. (2020). The case for effective risk communication: Lessons from a global pandemic. *Integrated Environmental Assessment and Management, 16* (5), 552–554. doi: 10.1002/ieam. 4312.

Porat, T., Nyrup, R., Calvo, R.A., Paudyal, P., & Ford, E. (2020). Public health and risk communication during COVID-19 enhancing psychological needs to promote sustainable behavior change. *Frontiers in Public Health, 8,* 573397. doi: 10.3389/fpubh.2020.573397.

Qiu, W., & Chu, C. (2019). Clarification of the concept of risk communication and its role in public health crisis management in China. *Disaster Medicine and Public Health Preparedness, 13* (5–6), 834–836. doi: 10. 1017/dmp.2019.10.

Regan, E.A., Agha, A.M., & Brookshire, R.G. (2022). Digital learning in healthcare: Where we are and where we are going. In M. Malloch, L. Cairns, K. Evans & B.N. O'Connor (Eds.), *The SAGE handbook of learning and work* (pp. 311–318). SAGE Publications Ltd.

Sa'don, N.F., Alias, R.A., & Nakanishi, H. (2021). Massive open online course for teacher professional development in Malaysia: A multi-stakeholder's perspective. In M.K. Kabilan, R.M.R.A. Aziz & J-A. Netto-Shek (Eds.), *Teaching and learning of english in the 21st Century: Perspectives and practices from South East Asia* (pp. 266–280). Penerbit Universiti Sains Malaysia.

World Health Organization (WHO). (2020). *The COVID-19 risk communication package for healthcare facilities.* Retrievd from: https://www.who.int/publications/i/item/WPR-DSE-2020-013