

# Nursing education institutions' readiness to use online objective structured clinical examination scoring management system



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## ABSTRACT

**Introduction:** The Objective Structured Clinical Examination (OSCE) is an acceptable measure to assess nursing students' skill competencies. To date, rapid changes in the education system, technology information, and pandemic enforced the need to develop and implement an online OSCE scoring management system, an online system to score the student during the OSCE. Although the satisfaction of the online OSCE scoring management system has been studied, the study to assess readiness to implement the online OSCE scoring management system is still lacking. This study aimed to identify the nursing education institution readiness level in implementing an online OSCE scoring management system named ON-OSCE.

**Methods:** The online survey involved 144 nursing lecturers across Indonesia. The survey consisted of 30 questions with a 5-point Likert scale that entails technology, innovation, people, and self-development dimensions. Each dimension was constructed by the questions related to resources, skills, and attitudes. The readiness levels were categorized into not ready (average score of 1-3.39) and ready (average score of 3.40-5.00).

**Results:** Mostly, the participants worked at a private institution (93%) with an accreditation level of B level (75.5%) and implemented an e-Learning system (85.4%). However, the common OSCE scoring management system was paper-based/hardcopy (73.2%). About two third of participants (67.4%) were ready to implement an online OSCE scoring management system (Mean = 3.57, SD = 0.57).

**Conclusion:** Most participants perceived that their institution was ready to implement an online OSCE scoring management system. Further study is needed to pilot an online OSCE scoring management system in a nursing education institution and explore the student and examiner's satisfaction before implementing an online OSCE scoring management system.

**Keywords:** online, OSCE, scoring management system, nursing, education, institution.

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## INTRODUCTION

The Objective Structured Clinical Examination (OSCE) has been implemented globally among health care provider students<sup>1</sup>, not only among medical students but also among dentistry<sup>2</sup> and nursing students.<sup>3</sup> School of Nursing, Faculty of Medicine and Health Sciences, Universitas Muhammadiyah Yogyakarta (SON FMHS UMY) has implemented OSCE since 2001 to assess nursing student's competence in nursing skill laboratory because it is considered as the most appropriate way to assess student's ability to perform nursing skills and procedures. While paper-based scoring systems were used since 2001, the SON FMHS UMY has moved from a paper-based scoring system to an online-based scoring system by implementing an online

OSCE scoring management system named ON-OSCE.<sup>4</sup> This ON-OSCE scoring management system has been copyrighted in Indonesia (No. 000149008).

Further study has been conducted to analyse the student satisfaction after the implementation of the ON-OSCE scoring management system in the SON FMHS UMY. Through the surveys of 480 nursing students in the SON FMHS UMY, 76% of the students were satisfied with the time to get the OSCE results and almost 60% were satisfied with the score accuracy.<sup>5</sup>

Within the last 3 years, the ON-OSCE scoring management system has been implemented in the son fmhs amy.<sup>4</sup> The utilisation of this application provides benefits not only to the examiners and students but also to the efficiency of resources such as less paper utilisation,

time efficiency, and especially during covid-19 pandemic in Indonesia, which also impact the nursing education, ON-OSCE scoring management system provides alternatives to conduct distance assessment with efficient, effective and can be accessed without time and place limitation as long as the internet connection is available.<sup>4</sup>

OSCE is a method of assessing a student's clinical competence which is objective rather than subjective and in which the areas tested are carefully planned by the examiners.<sup>6</sup> The clinical competence to be tested consists of several skills. During the OSCE, the students rotate around several stations, spending a specified time at each station. The time allowed is the same for all the stations, and the stations must be designed with this in mind. Scoring the

student's competence at OSCE station is conducted using a checklist. The checklists are the marking or scoring guidelines containing information, points, items, or tasks expected to be performed by the examinee when they are observed by the examiner.<sup>1</sup>

The OSCE scoring process is carried out using various methods, either paper-based scoring system or an electronic/online-based scoring system. The paper-based OSCE scoring system has several drawbacks, including (1) results are not immediately available; (2) delay in providing scores and feedback; (3) time pressure for academic staff; (4) low ability to moderate and audit examination results; (5) high production costs; (6) pressure on the appraisal administration staff (3). The results of a study in the SON FHMS AMY also supported the Jansiraninatarajan and Thomas's study.<sup>3</sup> Paper-based OSCE scoring management system required a huge amount of paper which eventually contributed to increasing number of paper waste, it was costly, and several difficulties were found, such as in the preparation and calculation process. It was also less efficient in terms of resources, time, and management.<sup>4</sup>

the advancement of technology influences the OSCE scoring process. several studies showed that an electronic-based scoring system has been developed. an electronic OSCE software (online OSCE management information system) has been designed for the management of four OSCE stations assessment with a cohort of first-year undergraduate nursing students delivered over two consecutive years in one higher education institution in Ireland.<sup>7</sup> They found that the electronic software enabled the storage and analysis of overall group and individual results that offer considerable time-saving. The system only allowed the completed marked form to be submitted electronically prevents the potential missing data. Additionally, the feedback facility allowed the student to receive an evaluation on their performance in a timely manner and use the feedback to benchmark and improve their performance.<sup>7</sup>

Currently, the COVID-19 pandemic has become a global health problem

and influences all aspects of human life, including education. While nursing education is a discipline based on both theoretical knowledge and practical skills and primarily conducted in face-to-face meetings, the importance of e-learning was overlooked.<sup>8</sup> Indeed, online learning offers an opportunity to increase problem-solving and critical thinking skills, improve learning in theoretical and practical topics, and engage more with the scientific topics.<sup>9</sup>

Online OSCE has been implemented in various forms. A study in the United States of America used tele-OSCE through the zoom platform for conducting summative paediatric OSCE and found that using tele-OSCE was comparable with the live OSCE, and there was no difference in mean score or failure rate between those who participated in tele-OSCE or live osce.<sup>10</sup> another study has been conducted at a university in United Arab Emirates to evaluate the feasibility and effectiveness of e-OSCE in the covid-19 era for medical students in surgery, medicine, and family medicine.<sup>11</sup> the study has found that both students and examiners are satisfied with the e-OSCE. Those two studies showed the possibility of distance or remote OSCE. However, those two studies did not report the scoring or management system to score the skill during online or remote OSCE.

Online OSCE scoring management system (ON-OSCE) in the SON FHMS UMY was developed before the COVID-19 pandemic. The lesson learned of the utilisation of this ON-OSCE scoring management system has been published<sup>4</sup>, and some revisions of the on- OSCE have been done to accommodate the examiner's/ users' feedback. During this covid-19, the on- OSCE scoring management system is very useful to accommodate several restrictions of face-to-face and limitations of the hardcopy based OSCE scoring management system. However, a study which investigates the readiness of nursing education institution to implement online OSCE scoring management system is not known yet. This study aimed to identify the readiness level of nursing education institutions in implementing an online OSCE scoring management system.

## METHODS

### Study design

This was a descriptive study with the cross sectional approach. An online survey was sent through social media such as WhatsApp and Facebook to involve potential participants around Indonesia as many as possible.

### Sample selection

This study involved nursing lecturers from all nursing education institutions in Indonesia. The inclusion criteria of the participants were: (1) Lecturer who works in the nursing institution in Indonesia, (2) Has experience as an examiner in OSCE, (3) Has to experience in using paper-based OSCE scoring management system, (4) Agree to participate in the study. The exclusion criteria are those who are unable to complete the survey. Convenience sampling was used in this study.

### Data Collection

Potential participants were invited to complete a self-administered survey through google Forms which enable the researcher to identify the readiness to use ON-OSCE scoring management system and the expression of interest of potential participants to be involved in further research in the implementation and evaluation of ON-OSCE.

### Instruments

The survey used in this study consisted of two questionnaires: (1) demographic characteristics, which was developed by the research team, and (2) readiness to implement online OSCE scoring management system, which was modified from previous studies.<sup>12,13</sup>

The readiness to implement online OSCE management system questionnaire consists of 30-item questions with a 5-point Likert scale (strongly disagree to agree strongly).<sup>13</sup> It was originally to measure the readiness to implement online learning system<sup>13</sup> and has been used in the Indonesian context.<sup>12</sup> The readiness questionnaire consist of four dimensions, including people (6 questions), self-development (9 questions), technology (11 questions), and innovation (4

questions). The validity test of the readiness questionnaire was done through expert validity and field test to determine the content and construct validity and has been found to be valid.<sup>13</sup> The reliability test using Cronbach's alpha for the total score was 0.92, where the reliability for people was 0.79, self-development was 0.84, technology was 0.89, and innovation was 0.45.<sup>13</sup> Further, this instrument was modified to the readiness in implementing online OSCE management system in this study by the research team. The readiness level was categorized into ready (average score of 3.40-5) and not ready (average score of 1-3.39).<sup>13</sup>

This questionnaire was originally developed in the English language and has been translated using a forward translation process where the original survey form was translated to Indonesian by two bilingual experts. The two Indonesian versions were compared to find any discrepancies in the research team. There were no discrepancies between the two Indonesian versions. Therefore the Indonesian version was used in this study.

### Statistical analysis

The data were analyzed using the SPSS V25.0. The demographic characteristics of the survey were analyzed using descriptive statistics, including frequency and percentage, mean, and standard deviation. The readiness levels were reported in frequency and percentage.

## RESULTS

### Characteristic Demography of Participants

A total of 144 participants were involved in this study. Most of the participants were female (71.5%) with an average age of 36.8 years old. The majority of the participants (81.3%) graduated with master's degree level with an average of 9.6 years of experience as a nursing lecturer and 6.6 years of experience as OSCE examiner. Mostly the participants worked at private institutions (93%) with an accreditation level of B level (75.5%) and have implemented e-Learning system, although the common OSCE management system was paper-based/hardcopy (73.2%). Mainly the participants utilise a computer for their daily activities (98.6%). The

**Table 1. Characteristics of Participants (N= 144)**

| Characteristics  | Values*     |
|--|-------------|
| <b>Gender</b>  |             |
| Male   | 40 (27.8%)  |
| Female   | 103 (71.5%) |
| Prefer not to mention                                    | 1 (0.7%)    |
| <b>Age (years)</b>                                       | 36.8 ± 5.8  |
| <b>Education levels</b>                                  |             |
| Bachelor degree  | 2 (1.4%)    |
| Master Degree  | 117 (81.3%) |
| Master degree with specialist                            | 16 (11.1%)  |
| PhD  | 9 (6.3%)    |
| <b>Lecturer's homebased</b>                              |             |
| Diploma 3  | 16 (32.7%)  |
| Bachelor Degree  | 32 (65.3%)  |
| Nursing Profession                                       | 1 (2%)      |
| <b>Working duration as lecturer (years)</b>              | 9.6 ± 5.3   |
| <b>Experience as OSCE examiner (years)</b>               | 6.6 ± 4.5   |
| <b>Institution accreditation levels</b>                  |             |
| A  | 24 (16.8%)  |
| B  | 108 (75.5%) |
| C  | 10 (7%)     |
| Not accredited   | 1 (0.7%)    |
| <b>Institution status</b>                                |             |
| Private  | 133 (93%)   |
| State  | 10 (7%)     |
| <b>Lecturer's role</b>                                   |             |
| Lecturer   | 96 (66.7%)  |
| Lecturer with managerial roles                           | 48 (33.3%)  |
| <b>Frequency in utilising computer</b>                   |             |
| Almost daily every week                                  | 142 (98.6%) |
| Less than 3 days in a week                               | 2 (1.4%)    |
| <b>OSCE management system in institution</b>             |             |
| Paper-based/ hardcopy                                    | 104 (73.2%) |
| Online/ website based                                    | 29 (20.4%)  |
| Don't know   | 9 (6.3%)    |
| <b>Platform e-Learning in institution</b>                |             |
| Yes  | 123 (85.4%) |
| No   | 21 (14.6%)  |
| <b>Average lecturer's education level in institution</b> |             |
| Bachelor degree  | 1 (0.7%)    |
| Master Degree  | 132 (91.7%) |
| Master degree with specialist                            | 10 (6.9%)   |
| PhD  | 1 (0.7%)    |

details of the participants and institution characteristics are available in [table 1](#).

### Readiness in Implementing Online OSCE Scoring Management System

The average readiness total score of the participants was 3.6, which indicated that the institutions were ready to implement online OSCE management system (Mean 3.57 ± 0.57) ([Table 2](#)). Based on the readiness level, two third of participating

institution ready to implement online OSCE management system. Out of the four dimensions of readiness in implementing online OSCE management system, the people dimension has the lowest score (mean 2.75 ± 0.73), while technology has the highest score (mean 4.04 ± 0.64).

[Table 3](#) shows the average score based on each item question of readiness in implementing online OSCE scoring management system and its level. In the

**Table 2. Readiness Score based on Four Dimensions of Readiness (N= 144)**

| Dimensions       | Mean | SD   | Readiness Level | Frequency | Percentage |
|------------------|------|------|-----------------|-----------|------------|
| People           | 2.75 | 0.73 | Not Ready       | 120       | 83.3       |
|                  |      |      | Ready           | 24        | 16.7       |
| Self-development | 3.56 | 0.70 | Not Ready       | 57        | 39.6       |
|                  |      |      | Ready           | 87        | 60.4       |
| Technology       | 4.04 | 0.64 | Not Ready       | 20        | 13.9       |
|                  |      |      | Ready           | 124       | 86.1       |
| Innovation       | 3.50 | 0.76 | Not Ready       | 59        | 41.0       |
|                  |      |      | Ready           | 85        | 59.0       |
| Total Readiness  | 3.57 | 0.57 | Not Ready       | 47        | 32.6       |
|                  |      |      | Ready           | 97        | 67.4       |

**Table 3. Readiness Score of Participants (N=144)**

| Dimension               | No | Item  | Mean | SD   | Readiness Level |
|-------------------------|----|---|------|------|-----------------|
| <b>People</b>           | 1  | Average employee's education level  | 2.80 | 1.41 | Not ready       |
|                         | 2  | Availability of training department to facilitate career development  | 2.40 | 1.05 | Not ready       |
|                         | 3  | Availability of e-Learning champion   | 2.57 | 1.10 | Not ready       |
|                         | 4  | Employee's experience in technology-based training  | 3.26 | 1.24 | Not ready       |
|                         | 5  | Human resources department's experience in technology-based training  | 2.60 | 1.07 | Not ready       |
|                         | 6  | The availability of professional and expert personnel to facilitate the implementation of online OSCE scoring management system | 2.88 | 1.05 | Not ready       |
| <b>Self-Development</b> | 7  | Employees' participation in training  | 3.98 | 0.85 | Ready           |
|                         | 8  | Employees' ability to spend time to participate in training   | 3.85 | 0.83 | Ready           |
|                         | 9  | High and mid-level manager's belief that employees' self-development may strengthen the institution position                    | 3.85 | 0.98 | Ready           |
|                         | 10 | Possibility to arrange budget to implement online OSCE scoring management system  | 3.20 | 0.95 | Not ready       |
|                         | 11 | Discussing about utilisation and budget arrangement to initiate online OSCE scoring management system                           | 2.92 | 1.20 | Not ready       |
|                         | 12 | Appropriateness of institution in using online OSCE scoring management system   | 3.42 | 1.08 | Ready           |
|                         | 13 | Human resources departments belief that training may strengthen the institution position  | 3.78 | 0.96 | Ready           |
|                         | 14 | Institution readiness in using online OSCE scoring management system  | 3.53 | 1.02 | Ready           |
|                         | 15 | Perception about employee's readiness for online OSCE scoring management system   | 3.52 | 0.87 | Ready           |
| <b>Technology</b>       | 16 | Employees' access to individual computer at work  | 3.99 | 1.26 | Ready           |
|                         | 17 | Employees' access to internet and/or intranet at work   | 4.52 | 0.85 | Ready           |
|                         | 18 | Employees' ability to access internet outside the institution   | 3.99 | 1.13 | Ready           |
|                         | 19 | Employees' basic computer skills ability  | 4.51 | 0.71 | Ready           |
|                         | 20 | Employees' basic internet skills ability  | 4.53 | 0.71 | Ready           |
|                         | 21 | Employee's ability to accomplish task using computer  | 4.39 | 0.71 | Ready           |
|                         | 22 | Employee's willingness to use technology (computer)   | 3.83 | 0.89 | Ready           |
|                         | 23 | Employee's acceptance in using technology innovation  | 3.79 | 0.88 | Ready           |
|                         | 24 | High and mid-level manager perspective in technology interventions  | 3.74 | 0.94 | Ready           |
|                         | 25 | High and mid-level manager's acceptance in using technology   | 3.93 | 0.89 | Ready           |
| <b>Innovation</b>       | 26 | The institution history in investing technology   | 3.44 | 1.02 | Ready           |
|                         | 27 | Employees' acceptance for changing daily tasks  | 3.73 | 0.92 | Ready           |
|                         | 28 | High and mid-level managers' acceptance in organisational changing  | 3.70 | 0.94 | Ready           |
|                         | 29 | The experience of human resources department to adapt with previous change  | 3.76 | 0.99 | Ready           |
|                         | 30 | Internal or external barriers to adopt innovation   | 2.96 | 1.00 | Not ready       |

people dimension, the average score for all six-item questions were below the cut-off point of ready levels, ranging from 2.40 – 3.26. In the self-development dimension, the results showed that the institutions were not ready to arrange a budget to initiate and implement online OSCE scoring management system, mean of 2.95 ( $\pm 1.20$ ) and a mean of 3.20 ( $\pm 0.95$ ), respectively. In the innovation dimension, the participants noted the presence of internal and external barriers in implementing e-learning with a mean of 2.96 ( $\pm 1$ ).

## DISCUSSION

This study found that based on the lecturer perception, most nursing education institutions are ready to implement an online OSCE scoring management system. This might be influenced by the characteristics of participating institutions in this study where the majority of them were accredited at level B and has implemented an e-Learning system. At level B accreditation, it is assumed that the institution has good human resources, curriculum and education process as well as facilities to achieve learning outcomes, although it is not focused on e-Learning or online learning system. A study in a university in the Philippines found that the accreditation level is significantly associated with technology access and technology skills which is subsequently associated with the institution readiness to implement e-learning.<sup>14</sup>

The experience of utilizing e-learning in the institution may also influence the readiness of the institution in implementing an online OSCE management system because they have been exposed to the technology, computer utilization, and adequate facilities such as internet connection, computer hardware and software. It is argued that experience is imperative in the implementation and acceptance of e-learning.<sup>15</sup> Thus, this is assumed that those with experience in using e-learning is more ready to implement online OSCE scoring management system in their institution.

This study revealed that out of four dimensions of readiness level in implementing online OSCE scoring management system, the highest average

score was in the technology dimension. The technology dimension entails the access and ability to use computers and the internet and positive attitude towards the use of technology.<sup>13</sup> technology readiness is an essential aspect in the successful implementation of online-based learning or technology innovation,<sup>16</sup> which in this study context is online OSCE scoring management system.

Although the majority of participants were ready to implement online OSCE scoring management system, several aspects need to be improved. The results confirmed that all item questions of people dimension has low average scores. It indicated that the institutions have average employees' education levels below the expectation. The results also showed that institutions do not have enough employees and personnel/professionals who are experienced in providing, supporting, and facilitating the implementation of online OSCE management system. They also have scarce e-learning champions, an influential person in adapting, spreading, and continuously facilitating e-learning in all aspects of the education process, including online OSCE scoring management system. These results are similar to the study in Turkey, where the human resources were the factor that needed to be improved the most.<sup>13</sup> Experienced personnel/professionals are those who have experience in providing IT support and maintenance. They have important roles in problem-solving for hardware and software issues, overcoming challenges and barriers for students and staff, and fostering the adoption of e-learning.<sup>17</sup>

OSCE system is one of the accepted methods in assessing nursing students' skill competencies.<sup>18</sup> Technology advancement and innovation development in education in the form of e-learning or online learning have contributed to the development online OSCE system and its scoring management system. Studies have reported that the effectiveness of e-learning or online learning system has been found to be effective in achieving education outcomes similar to conventional learning mode<sup>19</sup> and nursing education institutions has been ready to implement e-learning.<sup>20,21</sup> Online OSCE

scoring management system is considered as part of e-learning or online learning. Several studies in assessing satisfaction in using online OSCE scoring management system have been studied and found high satisfaction level in overseas<sup>11,22,23</sup> an Indonesian context.<sup>5</sup> It indicated that the utilization of such a scoring system is well accepted among the users. Indeed, it is strongly suggested to assess the readiness of the online OSCE management system before it is implemented.<sup>24</sup>

## CONCLUSION

Most nursing education institutions in Indonesia are ready to implement an online OSCE management system. Although the readiness means the score was slightly above the cut-off point readiness, it indicated the feasibility of implementing such a system. To increase the readiness in implementing online OSCE scoring management system, the most improvement related to people dimension should be made. This may include improving employees' education level, training or hiring experienced IT specialist department, establishing e-learning or online OSCE scoring management system champion, scaling up the skills and ability to learn with or via technology, and hiring external parties or vendors to develop the online OSCE scoring management system as needed. In the self-development dimension, nursing education institutions can initiate discussion and arrange the budget necessary to support the development and implementation of an online OSCE management system. Additionally, continuous evaluation of barriers and facilitators of online OSCE scoring management system can be conducted to ensure continuous improvement in the implementation process. Further research is needed to pilot test the implementation of the online OSCE management system and evaluate the examiner and student's perception of the pilot before widely implementing the online OSCE management system in the institution.

## CONFLICT OF INTEREST

No conflict of interest.

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## ETHICS APPROVAL

Ethical approval from the Faculty of Medicine and Health Sciences, Universitas Muhammadiyah Yogyakarta, Indonesia has been granted prior to the commencement of the study (No 127/EC-KEPK FKIK UMY/IV/2022). Participants were asked for their agreement to participate in the study. When the survey has been submitted, there was no way to withdraw the data because no personal data were collected. Those who want to express their interest to participate in the study could opt in on a separate link that was provided in the end of the survey, and this data would not be linked anyway with the response in the survey. The survey in this study was coded using a unique identifier known only to the researcher for data analysis purposes. De-identified data might be used for data analysis or data sharing in the future study.

## AUTHOR CONTRIBUTION

All authors contributed in the development of the research proposal, designs, data collection, and manuscript review. All authors approved the manuscript draft prior to the submission. Corresponding author responsible for doing data analysis, manuscript preparation and editing.

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## REFERENCES

- Onwudiegwu. OSCE Design, Development and Deployment. *J West African Coll Surg.* 2018;8(1):1–22.
- Majid I, Alikutty F, Rahaman S. Introduction of Objective Structured Clinical Examination, an assessment method for undergraduate students in a dental school. *J Contemp Med Educ.* 2017;5(1):1. Available from: <http://dx.doi.org/10.5455/jcme.20170216062547>
- Natarajan J, Thomas DS. Integrative Review Literature on Objective Structured Clinical Examination and its implications in Nursing Education. *IOSR J Nurs Heal Sci.* 2014;3(4):23–30. Available from: <http://dx.doi.org/10.9790/1959-03412330>
- Primanda Y, Sutrisno R, Haris F. The Development of Online OSCE Prototype for OSCE in School of Nursing: Lesson Learned [Internet]. Proceedings of the Third International Conference on Sustainable Innovation 2019 – Health Science and Nursing (IcoSIHSN 2019). Atlantis Press; 2019. Available from: <http://dx.doi.org/10.2991/icosihsn-19.2019.47>
- Sutrisno RY, Primanda Y, Haris F. Student's Satisfaction on Online Nursing OSCE (ON-OSCE) Assessment Application. *IJNP (Indonesian J Nurs Pract.* 2020;4(2):70–6. Available from: <http://dx.doi.org/10.18196/ijnp.v4i2.10142>
- HARDEN RM, GLEESON FA. Assessment of clinical competence using an objective structured clinical examination (OSCE). *Med Educ.* 1979;13(1):39–54. Available from: <http://dx.doi.org/10.1111/j.1365-2923.1979.tb00918.x>
- Meskell P, Burke E, Koopmans TJB, Byrne E, Setyonugroho W, Kennedy KM. Back to the future: An online OSCE Management Information System for nursing OSCEs. *Nurse Educ Today.* 2015;35(11):1091–6. Available from: <http://dx.doi.org/10.1016/j.nedt.2015.06.010>
- Güven Özdemiş N, Sonmez M. The relationship between nursing students' technology addiction levels and attitudes toward e-learning during the COVID-19 pandemic: A cross-sectional study. *Perspect Psychiatr Care.* 2020;57(3):1442–8. Available from: <http://dx.doi.org/10.1111/ppc.12710>
- Javadi-Pashaki N, Ghazanfari MJ, Karkhah S. COVID-19 pandemic: An opportunity to promote e-learning in the nursing profession. *J Clin Nurs.* 2021;10.1111/jocn.16057. Available from: <https://pubmed.ncbi.nlm.nih.gov/34561926>
- Lara S, Foster CW, Hawks M, Montgomery M. Remote Assessment of Clinical Skills During COVID-19: A Virtual, High-Stakes, Summative Pediatric Objective Structured Clinical Examination. *Acad Pediatr.* 2020;06/05. 2020;20(6):760–1. Available from: <https://pubmed.ncbi.nlm.nih.gov/32505690>
- Shorbagi S, Sulaiman N, Hassan A, Kaouas M, Al-Dijani MM, El-Hussein RA, et al. Evaluating the feasibility and effectiveness of e- OSCE in the COVID- 19 era [Internet]. Research Square Platform LLC; 2021. Available from: <http://dx.doi.org/10.21203/rs.3.rs-506145/v1>
- Saintika Y, Astiti S, Kusuma DJA, Muhammad AW. Analysis of e-learning readiness level of public and private universities in Central Java, Indonesia. *Regist J Ilm Teknol Sist Inf.* 2021;7(1):16. Available from: <http://dx.doi.org/10.26594/register.v7i1.2042>
- Ayudin CH, Tasci D. Measuring readiness for e-learning: Reflections from an emerging country. *Educ Technol Soc.* 2005;8(4):244–57.
- D. Doculan JA. E-Learning Readiness Assessment Tool for Philippine Higher Education Institutions. *Int J Integr Technol Educ.* 2016;5(2):33–43. Available from: <http://dx.doi.org/10.5121/ijite.2016.5203>
- Rohayani AHH, Kurniabudi, Sharipuddin. A Literature Review: Readiness Factors to Measuring e-Learning Readiness in Higher Education. *Procedia Comput Sci.* 2015;59:230–4. Available from: <http://dx.doi.org/10.1016/j.procs.2015.07.564>
- Mosa AA, Naz'ri bin Mahrin M, Ibrahim R. Technological Aspects of E-Learning Readiness in Higher Education: A Review of the Literature. *Comput Inf Sci.* 2016;9(1):113. Available from: <http://dx.doi.org/10.5539/cis.v9n1p113>
- Al-araibi AAM, Naz'ri bin Mahrin M, Yusoff RCM, Chuprat SB. A model for technological aspect of e-learning readiness in higher education. *Educ Inf Technol.* 2018;24(2):1395–431. Available from: <http://dx.doi.org/10.1007/s10639-018-9837-9>
- Solà-Pola M, Morin-Fraile V, Fabrellas-Padrés N, Raurell-Torreda M, Guanter-Peris L, Guix-Comellas E, et al. The usefulness and acceptance of the OSCE in nursing schools. *Nurse Educ Pract.* 2020;43:102736. Available from: <http://dx.doi.org/10.1016/j.nepr.2020.102736>
- Voutilainen A, Saaranen T, Sormunen M. Conventional vs. e-learning in nursing education: A systematic review and meta-analysis. *Nurse Educ Today.* 2017;50:97–103. Available from: <http://dx.doi.org/10.1016/j.nedt.2016.12.020>
- Contreras JO, Hilles SMS. Assessment in E-Learning Environment Readiness of Teaching Staff , Administrators , and Students of Faculty of Nursing-Benghazi University. *Int J Comput Internet Manag.* 2015;23(1):53–8.
- Coopasami M, Knight S, Pete M. e-Learning readiness amongst nursing students at the Durban University of Technology. *Heal SA Gesondheid.* 2017;22:300–6. Available from: <http://dx.doi.org/10.1016/j.hsag.2017.04.003>
- Shorbagi S, Sulaiman N, Hassan A, Kaouas M, Al-Dijani MM, El-Hussein RA, et al. Assessing the utility and efficacy of e-OSCE among undergraduate medical students during the COVID-19 pandemic. *BMC Med Educ.* 2022;22(1):156. Available from: <https://pubmed.ncbi.nlm.nih.gov/35260144>
- Ali M. What now and what next? The new era of OSCE. *Pharm Educ.* 2020;20(2):56–8. Available from: <http://dx.doi.org/10.46542/pe.2020.202.5658>
- Boardman C, Knight EP, Gavilanes JS, MacMillan C, Chatelain T, Vick E, et al. Disseminated Tele-OSCE During a Pandemic: One University's Experience. *J Nurs Educ.* 2022;61(2):107–10. Available from: <http://dx.doi.org/10.3928/01484834-20211128-01>



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