Mohammed Abdullah Alamri et al. Saudi J Er Med. 2024;5(2):095-100
DOI: 10.24911/SJEMed.72-1700724233

ORIGINAL ARTICLE

The digital pulse of preparedness: staff perceptions on learning management systems in health emergency operations

Mohammed Abdullah Alamri[1,2]*, Hisham Hassan Ali Dinar[3], Sualiman Sultan Alasmari[2]

ABSTRACT

Background: Learning management systems (LMSs) are online platforms that are used to conduct and support teaching and training at various institutions worldwide. Therefore, this study aimed to assess the perception toward the use of Moodle and Google Classrooms LMS tools in the training among the National Health Emergency Operation Center (NHEOC) staff and compare their perceptions.

Methods: This was a cross-sectional study with a post-test design conducted at NHEOC in Saudi Arabia in 2023. A training program regarding crises and disaster situations was delivered via Moodle and Google Classrooms. At the end of each session, participants were invited to fill out a questionnaire regarding their perception toward these tools.

Results: A total of 72 and 65 individuals responded to the questionnaire after the end of Moodle class and Google Classrooms, respectively. There were no statistically significant differences in the mean perception scores between Moodle and Google Classrooms by; the easy access to the browser (4.18 ± 1.24 *vs.* 4.14 ± 1.09, *p*-value = 0.692), the easy access to the app (4.02 ± 1.31 *vs.* 4.11 ± 1.08, *p*-value = 0.658), the ease of browsing the educational content (4.17 ± 1.13 *vs.* 4.14 ± 1.06, *p*-value = 0.872), and the ease of dealing with the system functions (4.08 ± 1.14 *vs.* 4.09 ± 1.16, *p*-value = 0.889).

Conclusion: Participants reported similar perceptions toward the use of Moodle and Google Classrooms in training programs. Meanwhile, the majority reported that they preferred Moodle to Google Classrooms.

Keywords: Evaluation, staff perceptions, learning management systems, NHEOC, Saudi Arabia.

Introduction

Healthcare workers must have appropriate knowledge, skills, and self-assessment that can be achieved through training and educational programs. The lack of training might lead to poor health and safety outcomes and thus, adversely affect public health concerns. Scaling up training for emergency services (EMSs) personnel plays a significant role in improving knowledge, skills, and competencies capacities to respond to the evolving healthcare needs of the population.

E-learning has been proven to be one of the most effective training approaches to enhance healthcare workers' knowledge and skills. Furthermore, it has been considered a cost-effective strategy for training a wider range of healthcare professionals. It allows healthcare workers to join training programs and browse training and educational materials at their own pace and time [1,2].

Accordingly, several learning management systems (LMSs) have been developed and emerged since the last decade including Zoom, Moodle, Google Classrooms, Blackboard, and others to deliver e-lectures and online training programs and allow the customization of e-learning interventions with the incorporation of various interactive features such as chats, forums, videos, and

Correspondence to: Mohammed Abdullah Alamri
*Director, The National Health Emergency Operations Center, Deputyship of Curative Services, Ministry of Health, Riyadh, Saudi Arabia.
Email: Malamri57@moh.gov.sa
Full list of author information is available at the end of the article.
Received: 23 November 2023 | **Accepted:** 12 December2023

progress trackers. Recent research now recognizes e-learning as a promising approach to increasing the capacity of the healthcare workforce due to the great scalability and cost-effectiveness of e-learning interventions in healthcare settings [1,3-8].

Knowledge and perceptions of using LMS tools have been researched worldwide and mainly focused on university teaching from the students' and instructors' points of view. Various studies have been conducted to investigate students' and teachers' perceptions of LMS applications including Moodle and Google Classrooms [5,7,9-16]. The results of various research indicated positive perceptions and attitudes toward the use of LMS in e-learning [17,18]. However, little is known regarding healthcare professionals' perceptions toward LMS tools.

As far as Saudi Arabia is concerned, the government has adopted a set of goals to improve Saudi recruitment, training, and development policies of instructors, an employment-oriented curriculum, learning with creativity and innovation, and designing student's education according to the need of the national's growth as part of the sustainable development plan, namely Saudi Vision 2030 [19-22]. Thus, using e-learning LMS tools could contribute to significant improvement in the recruitment process and enhance the workforce in different fields including capacity building of the emergency operation centers [23].

The main purpose of this research was to evaluate the perceptions toward the use of LMS tools in delivering training programs implemented by the National Health Emergency Operation Center (NHEOC) among the NHEOC staff and assess their preferences for which LMS tool should be used.

Materials and Methods

The design of the current study was quasi-experiment cross-sectional, which adopted post-test outcomes only. The current study was conducted at NHEOC in Saudi Arabia, in 2023, from April 9 to May 2, 2023.

The NHEOC adopted a strategic plan for basic requirements strategies that ensures effectiveness in dealing with events, emergencies, disasters, and crises. In particular, this plan was supposed to improve NHEOC staff's capacity building through implementing training and educational programs for its employees over the period from 2022 to 2024, which was delivered via LMS tools.

The study population consisted of all NHEOC staff who were willing to participate in the training program. Convenience sampling was used to recruit study participants. The total number of participants in the Moodle lecture was 77, while after the completion of the lecture using Google Classrooms, the sample size was reduced to 65 participants.

The content of the training course was related to disaster and crisis communication and was delivered using both Google Classrooms and Moodle. All participants of this course were invited via a WhatsApp link that contained login details to either Google Classroom or Moodle. The training course was divided into two parts such that the first part was implemented via Google Classrooms and the second part was continued via Moodle on separate days. At the end of each section, a questionnaire on their perceptions about each platform was distributed to the participants.

A questionnaire was developed and designed to assess participants' perceptions toward the use of the LMS tool and was managed via Google Forms. The questionnaire was validated for its content by a panel of four experts in disaster management and was tested for its reliability using a pilot study. The questionnaire showed high internal consistency and reliability measures whereby Cronbach's alpha was 0.920. The item to total correlation all exceeded 0.70 showing high construct validity.

All data analyses were conducted using the Statistical Package for Social Sciences version 26.0. Descriptive statistics of the study variables included mean and standard deviations for continuous variables and counts and percentages for categorical variables. A paired sample *t*-test was executed to examine the differences in perceptions toward the use of Google Classrooms and Moodle LMS tools. Statistical significance was sought at values lower than 0.05.

Results

A total of 72 participants were enrolled in the training program, whereby all of them responded questionnaire at the end of the Moodle class while only 65 responded to the questionnaire at the end of the Google Classroom. The participants' perceptions toward easy access to the browser showed that more than one-half of the participants reported higher perceptions toward Moodle (n = 43, 59.7%) (Table 1).

The perceptions of participants regarding easy access to the related application software (app) show that 52.8% of participants had higher perceptions of the easy access to the Moodle application (n = 38) (Table 2).

As for participants' perceptions about the ease of browsing the educational subjects, the results indicated that 52.8% of them reported higher perceptions toward Moodle (Table 3).

The results also revealed that less than one-half of respondents exhibited higher perceptions regarding the ease of dealing with system functions in Moodle (n = 35, 48.6%) (Table 4).

The results also showed that the majority of participants reported that they preferred Moodle (n = 43, 66.2%) in comparison to Google Classrooms (n = 22, 33.8%).

Table 1. *Participants' perceptions toward easy access to the browser.*

Rating	Moodle (n = 72)		Google Classroom (n = 65)	
	n	%	*n*	%
1	6	8.3	3	4.6
2	2	2.8	2	3.1
3	9	12.5	10	15.4
4	12	16.7	18	27.7
5	43	59.7	32	49.2

Table 2. *Participants' perceptions toward easy access to the app.*

Rating	Moodle (*n* = 72)		Google Classroom (*n* = 65)	
	n	%	*n*	%
1	6	8.3	3	4.6
2	3	4.2	1	1.5
3	11	15.3	13	20.0
4	14	19.4	17	26.2
5	38	52.8	31	47.7

Table 3. *Participants' perceptions toward the ease of browsing educational subjects.*

Rating	Moodle (*n* = 72)		Google Classroom (*n* = 65)	
	n	%	*n*	%
1	4	5.8	3	4.6
2	2	2.6	1	1.5
3	10	13.9	11	16.9
4	18	25.0	19	29.2
5	38	52.8	31	47.7

Table 4. *Participants' perceptions toward the ease of dealing with the system functions.*

Rating	Moodle (*n* = 72)		Google Classroom (*n* = 65)	
	n	%	*n*	%
1	4	5.6	4	6.2
2	2	2.8	2	3.1
3	13	18.1	10	15.4
4	18	25.0	17	26.2
5	35	48.6	32	49.2

Furthermore, it was found that 77.8% of participants had no previous experience in Moodle (n = 56) while 53.8% had previous experience in Google Classroom (n = 35) (Figure 1).

Before comparing the average perception scores, this study executed the normality test of each outcome variable using the Kolmogorov-Smirnov normality test. The results of this test revealed that none of the outcome variables (i.e., easy access to the browser, easy access to the app, the ease of browsing the educational contents, and the ease of dealing with the system functions) followed the normality distribution because all p-values were less than 0.05. Therefore, the current study compared the mean perceptions scores between Moodle and Google Classrooms using the Wilcoxon singed-ranks; a nonparametric test used to examine the differences in mean outcome scores between two-related samples (Table 5).

The current study compares participants' perceptions toward easy access to the browser between Moodle and Google Classrooms. The results revealed that the mean perception score toward the ease of access to the Moodle browser was 4.18 ± 1.24 points compared to the mean perception score toward the ease of access to the Google Classroom browser which was 4.14 ± 1.09 points. Nevertheless, the findings of the Wilcoxon singed-ranks test showed that there were no

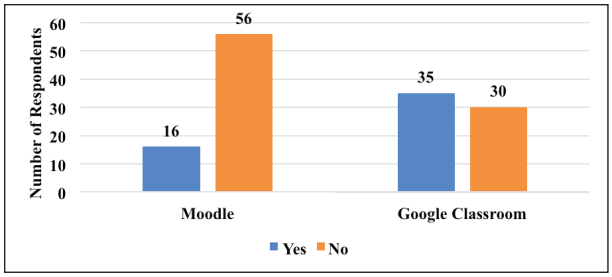

Figure 1. *Previous experience of using Moodle and Google Classroom.*

statistically significant differences in the mean perception score toward the ease of access to the browser between Moodle and Google Classrooms (μd = 0.04 ± 1.67, p-value = 0.692). This indicated that participants exhibited similar perceptions toward the ease of access to the browsers of both LMSs, Moodle, and Google Classrooms. This study also compared participants' perceptions about the easy access to the app between Moodle and Google Classrooms. The results showed that the mean perception difference between Moodle and Google Classrooms was –0.09 ± 1.73 points indicating that participants exhibited slightly higher perceptions toward the easy access to the app for Google Classrooms than that for Moodle. The present study also compared participants' perceptions concerning the ease of exploring the educational contents between Moodle and Classrooms. The findings suggested that participants shared similar perceptions toward the ease of exploring the educational contents in both LMSs. Furthermore, this study also compared perceptions toward the ease of dealing with the system functions between Moodle and Google Classrooms. It was found that participants had reported similar perceptions toward the ease of dealing with the system functions in both Moodle and Google Classrooms (Table 6).

Discussion

The findings of this study revealed that most participants exhibited higher perceptions toward the use of both LMSs with no significant differences. That is, participants of this study reported high or positive and similar perceptions related to easy access to the browser and app, browsing the educational contents, and dealing with the system functions in both Moodle and Google Classrooms. The findings of this study are congruent with various previous studies.

For example, a study by Diantari et al. [24], indicated that Indonesian students had positive perceptions toward the use of Google Classrooms in terms of ease of access, sense of usefulness, communications and interactions, presentations of instructional materials, and satisfaction but they reported that Google Classrooms was highly preferred only for sharing learning materials and management of assignments rather than delivering lectures as compared to a face-to-face learning module.

Moreover, a study by Zakaria et al. [25], indicated that medical students in Saudi Arabia showed great interest in adopting different LMS tools to boost their learning and gained more knowledge via familiarity with the LMS

Table 5. *Tests of normality for each outcome variable using* **Kolmogorov-Smirnov** *normality test.*

Outcome variables	Kolmogorov-Smirnov[a]		
	Statistic	df	Sig
Easy access to the browser (Moodle)	0.345	65	0.000
Easy access to the browser (Google Classrooms)	0.278	65	0.000
Easy access to the app (Moodle)	0.298	65	0.000
Easy access to the app (Google Classrooms)	0.273	65	0.000
The ease of browsing the educational content (Moodle)	0.293	65	0.000
The ease of browsing the educational content (Google Classrooms)	0.269	65	0.000
The ease of dealing with the system functions (Moodle)	0.269	65	0.000
The ease of dealing with the system functions (Google Classrooms)	0.276	65	0.000

[a]Lilliefors significance correction.

Table 6. *Differences of mean perceptions scores between Moodle and Google Classrooms.*

Outcome variables		Mean	Std. deviation	Mean difference (μd)	Std. deviation of μd	*p*-value
Easy access to the browser	Moodle	4.18	1.24	0.04	1.67	0.692
	Google Classrooms	4.14	1.09			
Easy access to the app	Moodle	4.02	1.31	-0.09	1.73	0.658
	Google Classrooms	4.11	1.08			
The ease of browsing the educational contents	Moodle	4.17	1.13	0.03	1.50	0.872
	Google Classrooms	4.14	1.06			
The ease of dealing with the system functions	Moodle	4.08	1.14	-0.01	1.59	0.889
	Google Classrooms	4.09	1.16			

tools. However, evidence from Indian and Iraqi students indicated that most teachers and students had reported increased complications with LMS mainly due to various challenges that stem from the available technologies, bad internet connections, and perceived fatigue resulting from listening to online classes [26,27].

Moreover, Memon et al. [7], reported that the highest perceptions were figured out to Moodle in terms of easy to use, integrity, and graphical user interface as compared to Google Classrooms as well as indicated that most participants were not aware of online LMS tools, which is not consistent our reported results.

The findings of this study also showed that the proportion of participants who had previous exposure to Google Classrooms was higher than exposure to Moodle, which is congruent with some previous findings. For instance, a study by Buthelezi and Van Wyk [18], indicated that 70% of students had no previous experience to use Moodle among postgraduate nursing students in South Africa.

The findings of this study also indicated that participants preferred Moodle on Google Classrooms as per the delivered lecture on EMS training. A study in Pakistan indicated that Moodle was more frequently used and more effective in terms of memory, integrity, user experience, and other features as compared to Google Classrooms [7], which is confirmed by our findings.

The current study has some potential limitations. First, the study tool did not account for some sociodemographic characteristics such as age, sex, educational levels, and so on, which limited the current study's attempt to assess differences in perception levels controlling for such variables. Second, the design of this study was quasi-experimental whereby randomization was not used, thus, limiting the attempts to assess the causal associations between intervention and outcome. Third, this study has a somewhat low sample size which limited the external validity of the study tool, which might be attributed to approaching respondents using convenience sampling. Finally, this study only assessed the perceptions of participants toward LMS tools but it did not evaluate the training program outcomes delivered through this intervention.

Conclusion

Participants of this study reported similar perceptions toward the use of Moodle and Google Classrooms LMS in training programs on disaster and crisis communications at NHEOC in terms of easy access to browsers and apps, easy exploring of the educational content, and easy use of the system functions. The findings of this study showed that the majority of participants reported that they preferred the use of Moodle in e-learning training programs as compared to Google Classrooms. The findings of this study would inform policy interventions and measures regarding training programs conducted at NHEOC using LMS tools. However, future studies are required to account for sex, age group, or educational

differences in perception levels toward the use of Moodle and Google Classrooms with a higher sample size of participants. In addition, mentoring and evaluation of training programs conducted through LMS tools are necessary to improve training outcomes. Indeed, comparing the effectiveness and impact of these two common LMS tools can provide valuable insights for NHEOC and trainers such as comparing outcomes, user experience, and user satisfaction when using Moodle and Google Classrooms.

Acknowledgment
This research article could not have been completed without the invaluable contributions of the NHEOC staff members who participated in the study. Authors extend their sincere appreciation and gratitude to the NHEOC staff for their dedication, professionalism, and commitment to advancing knowledge in this field. Their participation has played a vital role in shaping the outcomes of this research.

List of Abbreviations

EMSs	Emergency Services
LMSs	Learning management systems
NHEOC	National Health Emergency Operation Center

Conflict of interest
The authors declare no conflicts of interest in the publication of this study.

Funding
None.

Consent to participate
Informed consent was obtained from all participants.

Ethical approval
Ethical approval was obtained from the Research Ethics Committee of the Ministry of Health and from the NHEOC Research Ethics Committee with the IRB Log number (23-22M). Dated: 14/02/2023.

Author contributions
All authors equally contributed to designing the study, analyzing the data, preparing the manuscript, and also in approval of the final manuscript.

Author details
Mohammed Abdullah Alamri[1,2], Hisham Hassan Ali Dinar[3], Sualiman Sultan Alasmari[2]

1. Director, The National Health Emergency Operations Center, Deputyship of Curative Services, Ministry of Health, Riyadh, Saudi Arabia
2. Head of Training, Education and Research Department, The General Directorate of Emergencies, Disasters and Medical Transportation, Deputyship of Curative Services, Ministry of Health, Riyadh, Saudi Arabia
3. Advisor, The General Directorate of Emergencies, Disasters and Medical Transportation, Deputyship of Curative Services, Ministry of Health, Riyadh, Saudi Arabia

References

1. Barteit S, Jahn A, Banda SS, Bärnighausen T, Bowa A, Chileshe G, et al. E-learning for medical education in Sub-Saharan Africa and low-resource settings. J Med Intern Res. 2019;21(1):e12449. https://doi.org/10.2196/12449
2. Mullan F, Frehywot S, Omaswa F, Buch E, Chen C, Greysen SR, et al. Medical schools in sub-Saharan Africa. Lancet. 2011;377(9771):1113–21. https://doi.org/10.1016/S0140-6736(10)61961-7
3. Safie N, Aljunid S. E-learning initiative capacity building for healthcare workforce of developing countries. J Comput Sci. 2013;9(5):583. https://doi.org/10.3844/jcssp.2013.583.591
4. World Health Organization. Transforming and scaling up health professionals' education and training: World Health Organization guidelines 2013. Geneva, Switzerland: World Health Organization; 2013.
5. Holmes K, Prieto-Rodriguez E. Student and staff perceptions of a learning management system for blended learning in teacher education. Aust J Teach Educ. 2018;43(3):21–34. https://doi.org/10.14221/ajte.2018v43n3.2
6. Murray DE, McPherson P. Using the web to support language learning. Sydney, Australia: National Centre for English Language Teaching and Research; 2004. pp 88–95.
7. Memon WA, Miran AA, Memon MS, Sodhar IN. Comparative study of online learning management systems: a survey in Pakistan. Inf Sci Lett. 2019;8(3):111–20. https://doi.org/10.18576/isl/080304
8. Taufiqurrochman R, Muslimin I, Rofiki I, Abah JA. Students' perceptions on learning management systems of Arabic learning through blended learning model. J Al Bayan J Jurusan Pendidikan Bahasa Arab. 2020;12(1):22–36. https://doi.org/10.24042/albayan.v12i1.5276
9. Alanazi AA, Alshaalan ZM. Views of faculty members on the use of e-learning in Saudi medical and health colleges during COVID-19 pandemic. J Nat Sci Med. 2020;3(4):308–17.
10. Albarrak AI, Zakaria N, Almulhem J, Khan SA, Karim NA. Modified team-based and blended learning perception: a cohort study among medical students at King Saud University. BMC Med Educ. 2021;21:1–8. https://doi.org/10.1186/s12909-021-02639-2
11. Alkinani EA. Saudi Arabian undergraduate students' perceptions of e-learning quality during COVID19 pandemic. Int J Comput Sci Netw Secur. 2021;21(2):66–76.
12. Dhika H, Destiawati F, Sonny M, Jaya M. Comparison of learning management system Moodle, Edmodo and Jejak Bali. In International Conference on Progressive Education (ICOPE 2019), 2020, pp 90–4. https://doi.org/10.2991/assehr.k.200323.097
13. Prasetya RE. Perception and challenges integrating teaching English based on LMS Moodle during COVID-19 pandemic. Elite J. 2021;3(1):31–50.
14. Sayfouri N. Evaluation of the learning management system using students' perceptions. Med J Islamic Repub Iran. 2016;30:460.
15. Shahzadi A, Ijaz MM, Yousaf A, Khan FU, Jabeen N. Perceptions of students regarding changes in LMS of AIOU, Islamabad, Pakistan. J Posit School Psychol. 2022;6(8):9509–17.
16. Shin WS, Kang M. The use of a mobile learning management system at an online university and its effect on learning satisfaction and achievement. Int Rev Res Open Distributed Learn. 2015;16(3):110–30. https://doi.org/10.19173/irrodl.v16i3.1984
17. Alvarez MC. Evaluating the user experience of Moodle among healthcare professionals in Sub-Saharan Africa.

2022 [cited 2023 Aug 10]. Available from: https://healthefoundation.eu/wp-content/uploads/2022/01/Research-Report-Camila-for-HeF-website.pdf

18. Buthelezi LI, Van Wyk JM. The use of an online learning management system by postgraduate nursing students at a selected higher educational institution in KwaZulu-Natal, South Africa. Afr J Health Prof Educ. 2020;12(4):211–4. https://doi.org/10.7196/AJHPE.2020.v12i4.1391
19. Alshuwaikhat HM, Mohammed I. Sustainability matters in national development visions - evidence from Saudi Arabia's Vision for 2030. Sustainability. 2017;9(3):408. https://doi.org/10.3390/su9030408
20. Mitchell B, Alfuraih A. The Kingdom of Saudi Arabia: achieving the aspirations of the National Transformation Program 2020 and Saudi vision 2030 through education. J Educ Dev. 2018;2(3):36. https://doi.org/10.20849/jed.v2i3.526
21. Patalong F. Vision 2030 and the transformation of education in Saudi Arabia. Riyadh, Saudi Arabia: Al Tamimi & Company; 2016 [cited 2023 Nov 9]. Available from: https://www.tamimi.com/law-update-articles/vision-2030-and-the-transformation-of-education-in-saudi-arabia/
22. Singh A, Singh HP, Alam F, Agrawal V. Role of education, training, and E-learning in sustainable employment generation and social empowerment in Saudi Arabia. Sustainability. 2022;14(14):8822. https://doi.org/10.3390/su14148822
23. Dele-Olowu S, Ogunrinu T, Chukwu D, Mbogu A, Mohammed A, Wiwa O. Leveraging e-learning to train health workers during the COVID-19 pandemic in Nigeria. Abuja, Nigeria: Clinton Health Access Initiative (CHAI); 2020 [cited 2023 Nov 10]. Available from: https://www.clintonhealthaccess.org/blog/leveraging-e-learning-to-train-health-workers-during-the-covid-19-pandemic-in-nigeria/
24. Diantari AM, Artini LP, Dewi KS. Students' perception on the use of Google Classroom in the online and onsite learning mode. J Educ Study. 2023;3(1):32–50. https://doi.org/10.36663/joes.v3i1.471
25. Zakaria N, Jamal A, Bisht S, Koppel C. Embedding a learning management system into an undergraduate medical informatics course in Saudi Arabia: lessons learned. Med 2.0. 2013;2(2):e13. https://doi.org/10.2196/med20.2735
26. Tuma F, Nassar AK, Kamel MK, Knowlton LM, Jawad NK. Students and faculty perception of distance medical education outcomes in resource-constrained system during COVID-19 pandemic. A cross-sectional study. Ann Med Surg. 2021;62:377–82. https://doi.org/10.1016/j.amsu.2021.01.073
27. Kulal A, Nayak A. A study on perception of teachers and students toward online classes in Dakshina Kannada and Udupi District. Asian Assoc Open Univ J. 2020;15(3):285–96. https://doi.org/10.1108/AAOUJ-07-2020-0047