

Optometry Educators' Teaching Experiences and Opportunities Pre-, During, and Post-COVID-19 in South Africa

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Aim: The COVID-19 pandemic has impacted the higher education sector worldwide, and South Africa has faced unique challenges that continue to influence teaching beyond the pandemic.

Purpose: The study investigated the South African optometry educators' teaching experiences and opportunities pre-, during, and post-COVID-19.

Methods: The proposed study design was explorative and quantitative. Convenience sampling was used in recruiting participants. Optometry educators from four (4) universities training optometrists in South Africa were invited to participate in the study. An anonymous online questionnaire designed by the researchers was sent to participants to ensure that it captured relevant data. The questionnaire was sent electronically to the participants and SPSS was used to analyze collected data.

Results: Face-to-face (F2F) teaching was found to be the preferred method pre-COVID-19 by all participants. During the COVID-19 pandemic, the F2F was not the teaching method of choice due to safety measures put in place by the government. Online learning (OL) was preferred by 80% (n=4), and blended methods by 100%, due to flexibility in terms of lecture time allocation and digital device infrastructure. A statistically significant satisfaction was indicated by the academics before and post-COVID-19 pandemic with $p=0.04$ and $p=0.02$ respectively. The dissatisfaction related to online and blended methods of teaching used during the COVID-19 pandemic could be attributed to a lack of preparedness and digital device infrastructure. Beyond the COVID-19 pandemic participants raised concerns related to the lack of personal interaction and challenges of self-discipline required for online learning including face-to-face lectures.

Conclusion: Post the COVID-19 pandemic, there remains a need to address challenges related to the training of optometry educators in using online (OL) and blended methods (BM) of teaching, especially for those with more than 20 years of teaching experience. Whilst OL and BMs are beneficial, F2F teaching should not be neglected as it remains the cornerstone of effective education in optometry, especially in clinical training.

Keywords: optometry education, teaching methods, blended learning, hybrid teaching, online teaching

Introduction

The COVID-19 pandemic has impacted the higher education sector worldwide, including South Africa and Sub-Saharan Africa.¹ Alternative teaching methods, such as online learning (OL), were implemented during the pandemic to mitigate the health risks and disruptions in learning. Optometry teaching in South Africa involves didactic, practical skills, and clinical training, thus teaching was negatively impacted by the COVID-19 pandemic. OL was also found to have impacted negatively on other health professions education, such as medicine and nursing, where, for decades, students also trained by observing and learning from experienced clinical practitioners through work-integrated learning.^{2,3} During the COVID-19 pandemic, challenges such as limited internet access, poor digital device infrastructure, and the unpreparedness of educators to use online teaching methods were encountered.^{1,4,5}

Lecture-based presentations (F2F) used before the COVID-19 pandemic were traditional methods that have been studied extensively.^{6,7} The success rates using traditional methods were also monitored by different teaching institutions, ensuring that educators implemented effective teaching methods.⁷ Evidence that the F2F teaching method can result in long-term retention compared to any other teaching method throughout history was found to be unavailable.⁸ In addition, students were found to prefer the F2F teaching method due to direct communication with the teaching staff members and receiving immediate feedback when clarification is required. Contrary to findings of another study, which concluded that the traditional (F2F) teaching methods were not that effective in students' learning, especially for those with subjects such as Mathematics.⁹ Thus, providing evidence that while OL and BM offer flexibility, F2F teaching remains crucial for effective education, particularly in disciplines like optometry, where direct interaction and real-time feedback are essential for learning complex concepts and practical skills.

Students' views on OL teaching in higher education courses using a Web-based instrument were investigated.¹⁰ Students commented that effective teachers are visible and actively involved in learning. Furthermore, it allows teachers to work harder towards establishing trusting relationships by providing structured yet flexible classroom environments. Their description of effective teaching appears to apply to both OL and F2F requirements for constructive teaching and learning. OL teaching during the pandemic was largely used for teaching due to its flexibility of lecture attendance regarding location, time, and adherence to the social distance COVID-19 protocol. Furthermore, the OL teaching method also allowed students in remote locations to attend lectures and participate in the learning process. A literature review of studies exploring the acceptance of OL teaching methods among academics concluded that this methodology came with its challenges. Studies in this review revealed concerns among academics on barriers perceived towards success rates in OL classes. Their concerns included a lack of confidence in their persona as OL instructors and the availability of technical support, including a yearning for a reasonable and manageable workload for class enrollments.^{11,12}

The introduction of BM teaching during the COVID-19 pandemic was due to the computer-savvy generation type of learners. This caliber of learners was found to prefer digital interactions due to its speed of receipt of information, allowance of multi-tasking and OL access to information, low tolerance for lectures, preference for active rather than passive learning, heavy reliance on communication technologies to access information and carrying out social and professional interactions.¹³ The BM is referred to as a systematic teaching method, combining aspects of traditional F2F teaching and OL interactions.¹⁴ This method was found to embrace diverse learning styles, with learning materials made available using OL platforms and maximum flexibility for learners. In addition, the F2F sessions focused on improving learners' higher-order thinking. Integration of the OL and F2F sessions was found to provide better learning opportunities.

After the COVID-19 pandemic, institutions of higher learning also considered the hybrid method (HM) of teaching using simultaneous attendance of F2F and virtual lectures from home. However, the HM was found to require a transition to bimodal teaching, requiring intensive training from highly experienced educators.¹⁴ Even though the introduction of the HM method provided a positive experience for the educators, no significant differences between HM and OL teaching were reported. Therefore, it was concluded that even though the BM is regarded as a useful solution for teaching, it is important that proper equipment and networks are guaranteed, including training in digital teaching competence.¹⁴

Methods

Prior to the commencement of the study, ethical clearance was obtained from the Faculty of Health Sciences Research Ethics Committee (REC) of the University of Johannesburg (REC NO: 1714–2022). Purposive sampling was used in this study by inviting participants with in-depth experience and exposure to optometry teaching in South Africa beyond COVID-19. The sample size was determined by the number of optometry academics employed per institution, and approximately forty-four (44) optometry teachers were invited. The Google Form questionnaire was used to collect data and probed the effectiveness of different teaching methods, namely the OL, F2F, BM, and HM. The structured questionnaire used to collect data was adapted from the "International Association of Universities (IAU) global survey on the impact of COVID-19 on Higher Education" (https://iau-aiu.net/IMG/pdf/questionnaire_second_edition_impact_covid-19_final.pdf) and included "open-ended" questions. The questionnaire consisted of demographic questions on their experience of different teaching methods, pre-, during, and post-COVID-19. The study participants were invited to

participate in this study via email. The invitation was sent together with the information letter, informed consent form, and the link to the questionnaire. Informed consent was obtained from all the participants. Participation was voluntary, anonymity and confidentiality were maintained throughout the study.

All respondents' data were exported from the Google Forms website in Excel. The mean scores for satisfaction, confidence, concern, ease of relationship, and level of engagement were all measured on a four-point scale, representing extremely confident, moderately confident, and not confident. The satisfaction scores were compared pre-, post, and during COVID-19. The paired sample *t*-tests were used to analyse the significance of the collected data related to the preferred teaching methods pre-, during and post-COVID-19.

Results

Forty-four (44) optometry teachers were recruited from the four universities offering optometric training in South Africa, and only 10 participants completed all the questions. Most participants were females (80%; $n = 8$) and males (20%; $n = 2$) average age of 45.3 ± 9.47 years. Optometry educators completed the OL questionnaire. Participants indicated years of teaching ranging from <4 to >20 years. (Figure 1) Majority (40%) of participants indicated that they had ≤ 20 years of teaching experience; 30% were those with >20 years of teaching, and 30% had ≤ 8 years of teaching. This indicates that the majority (70%) of participants were mainly those with more years of experience teaching at the tertiary level ($>20 - \leq 20$ years). Of the ten (10) Optometry educators who completed the OL questionnaire on the level of studies they were teaching, 60% indicated that they were teaching at the 4th-year level of studies. Some were also involved in teaching additional levels of studies such as 1st, 2nd, and 3rd years.

F2F teaching was found to be the preferred method pre-COVID-19 since 60% ($n=6$) of participants indicated that they used it. The BM was used by 40% ($n=4$) of the participants. All participants using the F2F method indicated the advantage of immediate feedback on learning, with 67% ($n=4$) indicating that the method allows flexibility in lectures, time allocation, and infrastructure, including the allowance of students' long-term retention. In addition, 50% ($n=3$) of participants agreed that the F2F method of teaching required less preparation time; interestingly, 33% ($n=2$) of the educators indicated that F2F provided a high pass rate.

Of the forty percent (40%; $n=4$) participants indicating a preference for the BM of teaching, 75% ($n=3$) indicated advantages of the method as allowing flexibility in terms of lecture time allocation and infrastructure, encouraging active learning, providing immediate feedback to students, and requiring less preparation time. Only 25% ($n=1$) indicated the advantage of a high pass rate and less preparation time as advantages of using this method. 60% of participants who preferred the F2F teaching method gave their reasons for not using the BM pre-COVID-19. Interestingly, 50% ($n=3$) indicated that the disadvantage of not using the BM was that it was time-consuming to prepare lectures. Thirty-three percent (33%; $n=2$) indicated that the BM discouraged active learning and did not allow long-term retention. Only 17% ($n=1$) cited inflexibility in terms of lecture time allocation and infrastructure, including difficulty in determining the rapid improvement of students' learning. Another reason given by those not preferring the BM method was that student

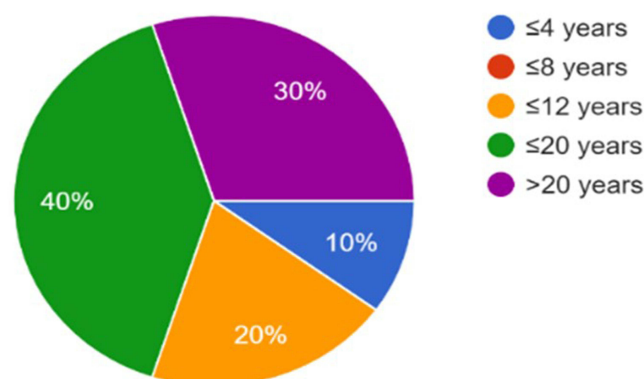


Figure 1 Distribution of years of teaching of Optometry Educators. The teaching experiences pre-COVID-19.

participation in learning is mainly dependent on their self-discipline. None of those who preferred the traditional method indicated that BM contributes towards a low pass rate.

The Teaching Experiences During the COVID-19 Pandemic

OL (50%; (n=5) and BM (40%; n=4) were indicated as preferred teaching methods during-COVID-19, with 10% (n=1) indicating usage of the F2F method. Of those who used the OL method during COVID-19, 80% (n=4) indicated that they preferred this method because it allows flexibility in the lecture time allocation and infrastructure, and 100% of participants using the BM and F2F indicated the same advantage. In addition, one of the participants indicated that during the COVID-19 pandemic, there was no choice but to use the OL method due to safety regulations put in place by the South African government. Interestingly, of the preferred methods during the COVID-19 pandemic, none of the participants indicated that any of the three methods allowed long-term retention. Participants using the BM and F2F methods of teaching during COVID-19 did not select advantages such as a high pass rate and less preparation time required. Most participants (90%) selected using the OL and BM teaching methods. However, one of the participants indicated that the disadvantage of both the OL and BM teaching methods was the lack of student-lecturer and student-peer interactions.

The Teaching Experiences Post COVID-19

The teaching methods indicated to be used post-COVID-19 included the OL, BM, F2F, and hybrid. Of the 10 participants, F2F was indicated to be used by 20% (n=2), BM by 30% (n=3), hybrid by 30% (n=3), both BM and hybrid by 10% (n=1), and all three methods by 10% (n=1). The majority of participants (80%) stated that the chosen methods provided them with immediate feedback on learning, 70% stated that their method encouraged active learning, and 60% stated that their preferred method allowed flexibility of time allocation for lectures and infrastructure. Forty percent of participants (n=4) indicated that the teaching methods were not allowing long-term retention, with 30% indicating a lack of inflexibility of time allocation for lectures and infrastructure. Twenty percent of the participants (n=2) stated difficulty in determining improvement in students learning, and 20% gave no other reasons since all the different methods of teaching were preferred.

Satisfaction Concerns, Ease of Relationship, and Level of Engagement of Students Beyond the COVID-19 Pandemic

The responses of participants pre-COVID-19 related to their satisfaction with the teaching methods used varied from being satisfied, moderately, and extremely satisfied to 30% (n=3), 50% (n=5), and 20% (n=2), respectively. During COVID-19, 20% (n=2) of participants were extremely not satisfied, with 20% (n=2) extremely satisfied and 60% (n=6) moderately satisfied with the teaching methods used. Post-COVID-19, 20% (n=2) were extremely satisfied, 20% (n=2) were moderately satisfied, and 60% (n=6) were satisfied. In determining the mean differences in the level of satisfaction pre- and during COVID-19, the mean values were found to be 0.7 ± 0.9 significant with $p=0.04$. Comparing the level of satisfaction pre-COVID-19 to post-COVID-19, the mean value of -0.1 ± 0.9 was found to be not significant with $p=0.73$. The mean differences between during and post-COVID-19 of -0.8 ± 0.9 were found to be significant ($p=0.02$) (Table 1).

How Concerned are You About Students' Academic Growth Beyond the COVID-19 Pandemic?

Participants were further asked how concerned they were about the student's academic growth post-COVID-19. The majority of participants (60%; n=6) indicated that they were concerned, 20% (n=2) were extremely concerned, and 20% (n=2) indicated they were not concerned. The mean on concerns related to teaching methods used post-COVID-19 was determined based on the ages of the participants below and above 45 years old. For those in the age groups of ≤ 45 years, the mean value of their concerns was found to be 3.4 ± 0.5 , and for those ≥ 45 years old was 2.6 ± 0.6 . This indicates that participants in the age group ≤ 45 years were more concerned with the teaching methods beyond COVID-19. However, their concerns were not statistically significant ($p=0.57$).

Table 1 Mean Score Comparisons on the Satisfaction of the Preferred Teaching Methods for Pre- During and Post-COVID19

		Paired Differences					t-test	Degrees of Freedom (df)	Sig. (2-Tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Satisfaction pre COVID-19 - Satisfaction during COVID-19	0,7	0,9	0,3	0,0	1,4	2,33	9	0,04
Pair 2	Satisfaction pre COVID-19 - Satisfaction post COVID-19	-0,1	0,9	0,3	-0,7	0,5	-0,36	9	0,73
Pair 3	Satisfaction during COVID-19 - Satisfaction post COVID-19	-0,8	0,9	0,3	-1,5	-0,1	-2,75	9	0,02

Participation in Lectures Post the COVID-19 Pandemic

In investigating the approximate percentage of students regularly participating in lectures to seek clarification on learning activities post-COVID-19, 80% (n=8) indicated that <50%; 10% (n=1) indicated >80%, and 10% (n=1) indicated >60. Even though the majority (80%) of participants indicated <50%, for the age group ≤ 45 years old, the mean of their responses was found to be 2.3 ± 0.6 , higher than that of those ≥ 45 years old (1.7 ± 0.6). However, these findings were regarded as not significant ($p = 0.23$).

Satisfaction of Effective Teaching with the Preferred Methods Beyond the COVID-19 Pandemic

On the question of how satisfied the participants were that they could provide effective teaching with the preferred method of teaching pre-, during, and post-COVID-19, no statistical significance was found for the different age groups. The above also applied to responses related to the ease of relationship with students. The mean of 2.3 ± 0.6 and 1.7 ± 0.6 for participants ≤ 45 and ≥ 45 years old, respectively, was found ($p=0.23$). Similarly, for the F2F engagements of students post-COVID-19, the mean values were 3.4 ± 0.5 and 3.2 ± 0.4 ($p=0.45$). Even though the mean values for the age groups ≤ 45 years were above those ≥ 45 years, no significant relationships were found since the p-values were found to be above 0.05.

In terms of years of experience in teaching optometry students on how satisfied participants were in the provision of effective teaching with their preferred methods of teaching, the mean of 3.3 ± 0.5 and 2.3 ± 0.03 for participants with years of experience ≤ 20 and ≥ 20 , respectively were found to be statistically significant ($p=0.03$). It was further noted that participants with fewer years of teaching (≤ 20 years) were more satisfied with their preferred teaching methods than those who taught for more than 20 years. In terms of gender (males=2; females=8) related to the question of how satisfied the participants were in providing effective teaching with the preferred method of teaching pre-, during, and post-COVID-19, no statistical significance was found for the groups since the p-value was found to be above 0.05.

Ease of Relationship with Students Beyond the COVID-19 Pandemic

Inquiry on the requested lecture content revision sessions to be held virtually by students resulted in 60% (n=6) of participants indicating that the request was made, 10% (n=1) indicated that the students never requested them, and 30% (n=3) did not respond to the question. In furnishing reasons for optometry students not engaging lecturers, 40% (n=4) indicated that sometimes students engage them, 10% (n=1) indicated that the students engaged them sometimes and rarely, with the other participants, 50% (n=5) having not responded to the question. The easiness of the relationship with the students was confirmed by 40% (n=4), with 30% (n=3) indicating that it was moderately easy and 30% (n=3) indicating that it was very difficult for students to have a good working relationship with the academics beyond the

COVID-19 pandemic. Reasons for students not engaging the optometry educators were not given since all participants (n=10) did not respond to the question.

Several statements were made by participants on optometry teaching beyond the COVID-19 pandemic, such as; “teaching facilitation is now broad and enabling lectures to be conducted at any time”; “The experience during COVID-19 allowed more academics to improve their teaching methods on virtual learning”; “it is good for content delivery and retention of knowledge but not for skills training”; and “that the students who started their first and second year during COVID are not coping with the current demands of writing tests and being back on campus full time”. Additional suggestions for improving the teaching and training of optometry students were given by only 60% of the participants. The suggestions were the promotion of critical thinking and reasoning, enforcement of collaborative learning, and instillation of lifelong learning; exploration of using non-conventional and multiple teaching methods; removal of provision of practical and clinical training OL since it is not effective; more opportunities for stimulating earlier practical exposure will be good for learning.

Discussion

The face-to-face (F2F) teaching method was the most preferred teaching method in the current study pre-COVID-19 pandemic. In agreement with other studies that found the F2F method to be an effective method of teaching.¹⁵ Due to participants not being ready for the BM, 60% (n=6) indicated that they preferred the traditional F2F method of teaching pre-COVID, and 40% (n=4) preferred the BM. However, some studies conducted in health professions education found the F2F method to be time-consuming, with a lack of full understanding of all the content conveyed, or poor retention, with students uncomfortable asking questions in class.¹⁶ Therefore, despite the initial reluctance to use OL teaching, universities globally encouraged the implementation of BM which all academic institutions were forced to implement during the COVID-19 pandemic.¹⁵ Participants in this study alluded to the fact students appreciated the flexibility and accessibility of online components, but many were concerned about the lack of personal interaction and the challenges of self-discipline required for online learning. Consistent with the findings of this study, 80% (n=8) of our participants indicated a lack of students’ active participation post the COVID-19 pandemic. However, 20% (n=2) of participants responded to good student engagement in lectures to seek clarification on learning activities post the COVID-19 pandemic. However, F2F methods of teaching were found to foster better student engagement and participation.¹⁷

Most of this study participants (90%, n=9) preferred the blended methods of teaching post-COVID-19 pandemic and indicated advantages of the method as allowing flexibility of lecture timetable and infrastructure, encouraging active learning, enabling immediate feedback to students, and requiring less preparation time. Only 25% (n=1) indicated the advantages of a high pass rate and less preparation time, consistent with the findings of other studies, which found that the BM was more suitable for students’ involvement and satisfaction.^{13,17} On the other hand, the Ugandan study demonstrated that BM could enhance knowledge retention if well-structured.¹⁷ The combination of online resources and traditional lectures was found to support continuous learning and better accommodate different learning styles. Thus, a statistically significant ($p<0.05$) satisfaction of the preferred methods before ($p=0.04$) and after ($p=0.02$) the COVID-19 pandemic compared to during the pandemic. However, one of the participants on the question of the preferred methods of teaching during COVID-19 stated that “they had no choice but to use the BM” for continuity of optometry education programs while adhering to the COVID-19 protocol requirements of social distancing.

One significant barrier to the effective implementation of BM in Africa during the COVID-19 pandemic was the lack of digital infrastructure. Studies highlighted issues related to limited internet access, insufficient digital literacy among students and faculty, and the high cost of digital devices.^{1,5} Furthermore, the high dissatisfaction among the participants during COVID-19 was consistent with the uncertainty related to the academic’s unpreparedness regarding the usage of technology, concerns with their persona as OL instructors, and challenges with the availability of technical support, consistent with the findings of the other studies.^{10,17,18}

The COVID-19 pandemic forced a rapid shift to online and blended learning including hybrid methods of teaching across African universities. Post-COVID-19 pandemic teaching methods preferences showed increased acceptance of BM. For instance, a survey by the Association of African Universities (AAU) in 2021 found that 80% of students experienced decreased active participation in online components compared to F2F sessions.¹⁹ Consistent with our study

findings, participants expressed that there was minimal student engagement on the online teaching platform. Thus, highlighting the need for strategies to enhance interaction and support in online environments.

The satisfaction of participants with their preferred methods of teaching post-COVID-19 was also found to be significant ($p=0.03$) based on the years of experience ≤ 20 and ≥ 20 . Participants with <20 years of teaching were found to be more satisfied with the online and blended teaching methods compared to those who taught for more than ≥ 20 years. This demonstrates that the traditional methods of teaching could still be used by those academics with >20 years of experience. Institutional resources should be available for academics with long service (>20 years) of teaching.

Conclusion

The satisfaction of participants with their preferred methods of teaching, both pre-and post-COVID-19, highlights the initial unpreparedness of optometry educators to adopt blended methods (BMs) and OL during the pandemic. Despite the availability of various teaching methods, including full and partial F2F sessions beyond COVID-19, the overall satisfaction of optometry academics was evident. However, the adherence to traditional F2F teaching methods during the pandemic can be attributed to several factors, such as the effectiveness of clinical training and the necessity to ensure that optometry students develop the clinical skills required to manage and treat visual anomalies effectively. Consequently, it is crucial for universities to consistently monitor and encourage educators, particularly those in the system for over 20 years, to stay updated with the evolving educational landscape. This will help prepare learners for the future by ensuring that teaching methods remain relevant and effective.

Limitations of the Study

Of the 44 optometry educators invited twice from four universities, only 10 participants responded. This resulted in the study's limitations due to the participants' low uptake. High samples are important in contributing to providing a better generalization of research results. Large sample sizes can further reduce variance and increase power in statistical analyses while providing more flexibility when violating assumptions in parametric tests. In addition, larger samples could provide accurate information about effect sizes.

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Disclosure

The authors report no conflicts of interest in this work.

References

1. Du Plessis M, Jansen van Vuuren C, Simons A, Frantz J, Roman N, Andipatin M. South African higher education institutions at the beginning of the Covid-19 pandemic: sense making and lessons learnt. *Front Edu.* 2022;6. doi:10.3389/educ.2021.740016
2. Bleakley A. Pre-registration house officers and ward-based learning: a 'new apprenticeship' model. *Med Edu.* 2002;36(1):9–15. doi:10.1046/j.1365-2923.2002.01128.x
3. Alsoufi A, Alsuyihili A, Msherghi A, et al. Impact of the COVID-19 pandemic on medical education: medical students' knowledge, attitudes, and practices regarding electronic learning. *PLoS One.* 2020;15(11):e0242905. doi:10.1371/journal.pone.0242905
4. Gourdazi E, Hasanvand S, Raoufi S, Amini M. The sudden transition to online learning: teachers' experiences of teaching during the COVID-19 pandemic. *PLoS One.* 2023;18(11). doi:10.1371/journal.pone.0265782
5. Reddy Moonasamy A, Naidoo GM. Digital learning: challenges experienced by South African university students' during the COVID-19 pandemic. *The Indep J Teach Learn.* 2022;17(2):76–90.
6. Katwibun H. Using an interactive whiteboard in vocabulary teaching. *Procedia - Soc Behav Sci.* 2014;116:674–678. doi:10.1016/j.sbspro.2014.01.278
7. Brown JC, Park H-S. Comparing student research competencies in online and traditional face-to-face learning environments. *The Online J Dist Edu e-Learn.* 2015;3(1):1.
8. Tularam G, Machisella P. Traditional vs non-traditional teaching and learning strategies-the case of E-learning! *Int J Math Teaching Learn.* 2018;19(1):129–158. doi:10.4256/ijmtl.v19i1.21
9. Soffer T, Nachmias R. Effectiveness of learning in online academic courses compared with face-to-face courses in higher education. *J Comput Assist Learn.* 2018;34:534–543. doi:10.1111/jcal.12258
10. Wingo NP, Ivankova NV, Moss JA. Faculty perceptions about teaching online: exploring the literature using the technology acceptance model as an organizing framework. *Online Learn.* 2017;21(1). doi:10.24059/olj.v21i1.761

11. Al-Balas M, Al-Balas HI, Jaber HM, et al. Distance learning in clinical medical education amid COVID-19 pandemic in Jordan: current situation, challenges, and perspectives. *BMC Med Edu.* 2020;20(1):1–7.
12. Okaz AA. Integrating blended learning in higher education. *Procedia - Soc Behav Sci.* 2015;186:600–603. doi:10.1016/j.sbspro.2015.04.086
13. Indrapangastuti D, Surjono HD, Yanto BE, Yanto BE. Effectiveness of the blended learning model to improve students achievement of mathematical concepts. *J Edu e-Learn Res.* 2021;8(4):423–430. doi:10.20448/journal.509.2021.84.423.430
14. Martín-Núñez JL, Bravo-Ramos JL, Sastre-Merino S, Pablo-Lerchundi I, Redondo AC, Núñez-Del-río C. Teaching in secondary education teacher training with a hybrid model: students. *Perceptions Sustain.* 2022;14(6):3272.
15. Woods C, Naroo S, Zeri F, et al. Evidence for commonly used teaching, learning and assessment methods in contact lens clinical skills education. *Contact Lens Ant Eye.* 2023;46(2):101821. doi:10.1016/j.clae.2023.101821
16. Masoudi R, Soleimani MA, Yaghoobzadeh A, Baraz S, Hakim A, Chan YH. Effect of face-to-face education, problem-based learning, Goldstein systematic training model on quality of life and fatigue among caregivers of patients with diabetes. *Iranian J Nurs Midwifery Res.* 2017;22:208–214. doi:10.4103/1735-9066.208169
17. Kintu MJ, Zhu C, Kagambe E. Blended learning effectiveness: the relationship between student characteristics, design features and outcomes. *Int J Edu Tech High Edu.* 2017;14(7). doi:10.1186/s41239-017-0043-4
18. Dayal S. Online education and its effect on teachers during COVID-19—A case study from India. *PLoS One.* 2023;18(3):e0282287. doi:10.1371/journal.pone.0282287
19. Universities AoA. Covid-19. Available from: <https://aau.org/covid-19/2021>. Accessed July 07, 2024.

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