ORIGINAL RESEARCH article

Evaluation of student's perception and attitudes towards switching from in-class to online teaching in the era of COVID-19

Suleiman I. Sharif [1] [*] ✉ iD , **Rubian S. Sharif** [1] ✉ iD , **Roula A. Jabri** [2] ✉
Rand A. Shriki [2] ✉ and **Abduelmula R. Abduelkarem** [2] ✉ iD

[1] Department of Pharmacy Practice, Faculty of Pharmacy, Libyan International Medical University, Benghazi, Libya
[2] Department of Pharmacy Practice, College of Pharmacy, University of Sharjah, Sharjah, United Arab Emirates
[*] Author to whom correspondence should be addressed

Keywords: COVID-19 pandemic, hybrid learning, in-class learning, online learning, university students

Abstract: Worldwide, the focus on online learning during the era of the COVID-19 pandemic faced many challenges. The present study aimed to evaluate the preferences, perceptions, and attitudes of university students toward various strategies of learning. A pre-piloted cross-sectional survey was posted on the internet in Arabic and English language. Questions covered the demographical characteristics of the participants and their preferences and perceptions of various learning strategies. We received 270 questionnaires from various countries. The majority (n=199, 73.7%) of respondents were from the University of Sharjah, United Arab Emirates, with n=125 (46.3%) participants from the College of Pharmacy. The majority (n=198, 73.0%) of respondents were females, Arabs (n=262, 97.0%), living with their families (n=208, 77.0%), and with only the father working (n=174, 64.0%). Preference was, for online learning (n=145, 53.7%) as compared to in-class learning (n=119, 44.1%). More students (n=110, 40.7%) claimed improvement in their grades with online learning but 62 of students (23.0%) stated that their grades were worsened. Student's performance in online exams was similar to that in paper exams. The majority (n=168, 62.2%) of students claimed that their overall expectations of online learning were not the same as those for in-class learning. 50.0%-60.0% of respondents believed that in-class learning allows them to learn more effectively, and achieve the best work preparation, best exam performance, and best education value, and they were more likely to recommend it. Despite the disadvantages of online learning, it remains the future strategy for higher education. Appropriate planning of courses, and helping students by reducing digital inequity, if any, would certainly prove satisfactory for the millennial generation of students.

Introduction

The COVID-19 pandemic influenced many sectors such as the economy, politics, and education [1]. It has a great impact on higher education as universities closed their buildings and countries shut their boundaries to limit the rapid spread of the virus. This crisis changed the value offered by an institution that consists of networking, social opportunities, and educational content. Universities established new learning strategies to

enhance digitalization and to complement student-teacher, academic advisor-advisee, and supervisor-student relationships and replaced in-class lectures with online teaching which has positively influenced both learning and examinations [2]. According to UNESCO, 1.3 billion students in the world are suffering because of the closures in most countries [3]. In Bangladesh, the JAAGO Foundation which is a civil society organization established in April 2007 and based in Bangladesh, discovered an advancing approach by their "Tel-Ed" inventiveness, they started carrying out classes through the voice call service and short messaging facility [4]. Qualified instructors supervise the delivery of the messages to each student individually depending on their needs. This communication education program can support the student's mental health and improve their academic performance. JAAGO has also conducted special parent-tutor advice to get them on board, and its goal was to support them to continue their children's learning, and in addition, provide food and other necessities as needed [4].

The complete lockdown disrupted the students and influenced their academic performance as well as their productivity, and skills with detrimental effects on their physical and mental health [1, 5, 6]. Learning loss with the consequent productivity-skill loss could reduce gross domestic product (GDP) by 01.5% for the rest of this century, a lowering that may not be feasible now but would become clear in the future [7]. Estimates for the United States indicate that if the student cohorts in school during the 2020 closures recorded a corona-induced loss of skills of one-tenth of a standard deviation in students and if all cohorts, thereafter, return to previous levels, the 01.5% loss of future GDP would be equivalent to a total economic loss of USD 15.3 trillion [8]. Moreover, students who lack access to good internet and digital devices are facing difficulties in adapting to the new lifestyle and routines with the stress of trying to complete their college degree [8]. A positive impact of the crisis is the enhanced awareness of the problems encountered in several countries due to digital inequities illustrated by the lack of proper digital devices, the internet, and the skill to operate various digital applications required to indulge in adequate online learning.

The United Arab Emirates applied distance learning for all students to ensure their compliance with the educational institutes' standards and systems. The Ministry of Education (MoE) began cooperating with Al Yah Satellite Communications Company (Yahsat) to offer high-speed digital to students and tutors at numerous locations where broadband services are unavailable, and free internet packages are offered for families who cannot afford it [9]. Moreover, MoE launched Duroosi (my lessons) which is a YouTube channel containing 600 tutorials, with many different topics depending on the national curriculum and it aims to assist people to reduce the fee of the private tuition. MoE also established the Diwan eBook reader that simplifies the uploading of books and online platforms enabling educators and learners to cooperate with the learning program electronically [10]. Universities faced many challenges including, but not limited to, financial strains, safety, and education. Financially, the loss of international students and tuition fees increased the financial burden on universities. The safety issue and its requirements added a financial strain and led universities to close down, and established strategies to shift from in-class to online courses. There is a shortage of studies in the United Arab Emirates on the impact of the COVID-19 pandemic on education. It is worth noting that despite the several advantages e-learning may provide, shifting from in-class to online teaching/learning is not without limitations at least from the point of view of the learner. Therefore, it is of utmost importance to explore the views of students on online teaching/learning as compared to face-to-face in-class teaching/learning. This study was taken to evaluate the impact of the COVID-19 pandemic on education by analyzing the preferences, perceptions, and attitudes of university students towards various learning strategies.

Materials and methods

Study design: A cross-sectional study was conducted from September 2020 to January 2021 to collect data on the impact of COVID-19 on the education of university students. A web-based survey posted on the internet

covering questions dealing with students' preferences, perceptions, and attitudes regarding various teaching/learning strategies.

Study population, validation, and link: The survey was prepared in Arabic and English language using a survey tool provided by Google forms. The survey was validated by distributing it to six students and two faculties and their recommendations and comments were considered in the final version of the survey. We provided participants with an information sheet explaining the nature and purpose of the study and considered their voluntary participation by willingly filling out the survey as informed consent. Only responses from university students were included in the study. Exclusion criteria included responses from non-university and school students, and other sectors of the public. The links for the Arabic and English versions of the survey were respectively made available at:

https://docs.google.com/forms/d/e/1FAIpQLSfG5BZ536ZOYBkwCojTC8gwe9BJ_5O8lyzw5N9RKw6xlBu Lw/viewform?vc=0&c=0&w=1&flr=0 and
https://docs.google.com/ forms/d/e/1FAIpQLSfVeX7UIZ z82gx 9cN4ewGIjYmtk6G9WtqEfMXQ7R f9ZBlxC7w/viewform?vc=0&c=0&w=1&flr=0

Ethical approval: Ethical approval was obtained from the Ethical Committee of the University of Sharjah, Sharjah, United Arab Emirates under the reference number of REC-20-09-04-01-S.

The questionnaire: The questionnaire consisted of 24 questions and was divided into three sections. The first section consisted of 10 questions covering the demographic characteristics of the participants including age, gender, ethnicity, level of education, number of family members learning online working parents, and living status. Questions in the second section focused on exploring student's preferences for methods of learning, and whether the shift from in-class to online teaching/learning influenced their learning. The questions included what teaching/learning strategy do you prefer?, compare your grades after online teaching to previous in-class grades, are you confident of online teaching?", which teaching strategy do you prefer if COVID-19 is completely cleared?, was your learning affected by other family members at home running online teaching?. The third section of the questionnaire covered the behavioral practices of the participants toward COVID-19, and the benefits as well as difficulties of online teaching. The questions covered students' performance in online exams as compared to paper exams, students' performance in online exams in class compared to that in distant online exams, were their overall expectations in terms of time and work were the same as in-class learning?, whether COVID-19 affected their study habits?. Other questions dealt with students' perception of the quality and value of online and in-class education, and the advantages and disadvantages of each of in-class, online, and hybrid strategies of learning. The estimated average time to complete the survey was 15-20 minutes.

Statistical analysis: We encoded the participants' responses and analyzed the data using Statistical Package for Social Sciences (IBM SPSS statistics for Windows, version 20, IBM Corp., Armonk, NY, USA). We adopted descriptive analysis to calculate the response proportion of each group of respondents for each item in the questionnaire. We expressed the results as frequency and percentage and calculated the 95.0% confidence interval for single-proportion questions.

Results

Demographic characteristics: We received 270 complete responses. The majority of participants were Arabs (n=262, 97.0%), females (n=198, 73.3%), living with their families (n=208, 77.0%), and with only the father working (n=174, 64.0%) (**Table 1**).

Table 1: Demographic characteristics of the participants

Characteristic	Frequency (%), n=270
Gender	
• Male	72 (26.7%)
• Female	198 (73.3%)
Age range 17-23 years	270 (100%)
Ethnicity	
• Arabs	262 (97.0%)
• Non-Arabs	08 (03.0%)
Accommodation	
• Family Home	208 (77.0%)
• Student's dorms	56 (20.7%)
• Other	06 (02.2%)
Average number of other School/University students at home. 2-3	270 (100%)
Working status of parents	
• Mother	20 (07.4%)
• Father	174 (64.4%)
• Both	76 (28.1%)
Expected year of graduation	
• 2020	19 (07.0%)
• 2021	79 (29.3%)
• 2022	82 (30.4%)
• 2023	43 (15.9%)
• I don't know	47 (17.4%)

Colleges, universities, and countries of participants: Students participating in the survey were from various study specialties with the majority (n=125, 46.3%) from the College of Pharmacy, followed by Colleges of Engineering (n=34, 12.6%), and Nursing (n=28, 10.4%). The participants were from local, regional, and international universities in various countries with the majority of students (n=199, 73.7%) being from the University of Sharjah, United Arab Emirates.

Student's preference for teaching/learning strategy: In general, a large number of students (n=119, 44.1%) preferred in-class teaching, and the same preference was selected (n=145, 53.7%) if the COVID-19 pandemic was completely cleared. On the other hand, in case of incomplete clearance of the pandemic, the preference (n=116, 43.0%) is for online teaching **(Table 2)**.

Table 2: Student's preference for teaching/learning strategy

Question	Frequency (%), n=270			95% CI for single proportion "Online"
	Online	In-Class	Hybrid	
What teaching/learning strategy do you prefer?	61 (22.6%)	119 (44.1%)	90 (33.3%)	17.6- 27.5
What teaching strategy is preferred if COVID-19 is completely cleared?	42 (15.6%)	145 (53.7)	83 (30.7)	47.8- 59.6
What teaching strategy is preferred if COVID-19 is not completely cleared	116 (43%)	53 (19.6%)	101 (37.4)	14.9- 24.3

Influence of shifting to online study on student's learning and performance. **Table 3** shows that 121 students (44.8%) were not sure of their confidence in online learning, and slightly more than half of the participants (n=143, 53.0%) claimed that their learning was affected by other members of the family running online learning. More students (n=110, 40.7%) claimed improvement in their grades with online teaching but 62 of

students (23.0%) stated that their grades were worsened. Again 112, (41.5%) students stated that their performance in online exams was similar to that in paper exams. About half (n=141, 52.2%) the respondents claimed no difference in their performance in online distance and in-class exams (**Table 3**). The majority of students (n=168, 62.2%) claimed that their overall expectation of online teaching in terms of time and work was not the same as those for in-class teaching. In addition, the majority of students (n=223, 82.6%) stated that the COVID-19 pandemic had affected their study habits.

Table 3: Influence changing to online study on student's learning and performance

Question/statement	Frequency (%) n=270	95% CI for a single proportion "confident", "severely affected", "improved", and "yes"
Are you confident of online teaching? Confident Not confident Not sure	89 (33.0%) 60 (22.2%) 121 (44.8%)	27.4-38.5
Did other family members running online teaching affects your learning? Severely Somewhat Not at all	42 (15.5%) 143 (53.0%) 85 (31.5%)	11.2-19.8
Compare your grades after online teaching to previous in-class grades. Improved Worsened No change	110 (40.7%) 62 (23.0%) 98 (36.3%)	34.9-46.5
How do you rate your performance in online exams as compared to paper exams? Improved Worsened No change	86 (31.9%) 72 (26.7%) 112 (41.5%)	26.3-37.4
How do you rate your performance in online exams in class to distant online exams? Improved Worsened No change	64 (23.7%) 65 (24.1%) 141 (52.2%)	18.6-28.7
In terms of time and work, are your overall expectations of online learning the same as in class? Yes No	102 (37.8%) 168 (62.2%)	32.1-43.5
Has COVID-19 affected your study habits? Yes No	223 (82.6%) 47 (17.4%)	78.1-87.1

Quality and value of various teaching/learning strategies: **Table 4** shows that between 50.0-60.0% of participants believed that in-class learning allows them to learn more effectively, the best work preparation, exam performance, and education value and it is more likely to be recommended by them. However, less than 50.0% of students claimed that working at their own pace is the value of online learning.

Sharif et al. (2024) Mediterr J Pharm Pharm Sci. 4 (1): 12-21.

Volume 4: Issue 1: Page 16

Table 4: Student's perception of the quality and value of various teaching/learning methods

Perception	Frequency (%), n=270			95% CI for single proportion "Online"
	Online	In-Class	Hybrid	
Learn more effectively	51 (18.9%)	156 (57.8%)	63 (23.3%)	14.2-23.5
Best work preparation	60 (22.2%)	165 (61.0%)	45 (16.7%)	17.3-27.2
Best exam performance	86 (31.9%)	136 (50.4%)	48 (17.8%)	26.3-37.4
Best education value	41 (15.2%)	161 (59.6%)	68 (25.2%)	10.9-19.4
Work at my own pace	132 (48.9%)	96 (35.6%)	42 (15.6%)	42.9-54.8
Likely to recommend	47 (17.4%)	138 (51.1%)	85 (31.5%)	12.9-21.9

Higher percentages of students selected online learning to be more convenient, of low tuition fees, provides flexibility in the time of the study, easy access to resources, provides recorded lectures, provides an opportunity for fast and easy sharing of resources, and helps in attaining better learning skills (**Table 5**). However, about 50.0% of students stated that in-class learning is more responsible and self-disciplined.

Table 5: Responses of students on the advantages offered by each of the educational strategies

Advantages	Frequency (%) n=270			95% CI for single proportion "Online"
	Online	In-Class	Hybrid	
More convenience	112 (41.5%)	103 (38.1%)	55 (20.4%)	35.6-47.3
Low tuition fees	179 (66.3%)	54 (20.0%)	37 (37.7%)	60.7-71.9
Flexible time of study	151 (55.9%)	71 (26.3%)	48 (17.8%)	50.1-61.8
Responsibility and self-discipline	85 (31.5%)	134 (49.6%)	51 (18.9%)	25.9-36.9
Easy access to resources	112 (41.5%)	107 (39.6%)	51 (18.9%)	35.6-47.3
Recorded lectures are clearer	163 (60.4%)	64 (23.7%)	43 (15.9%)	54.5-66.2
Fast and easy sharing of resources	137 (50.7%)	79 (29.3%)	54 (20.0%)	44.8-56.6
Better learning skills	102 (37.8%)	94 (34.8%)	74 (27.4%)	32.1-43.6

Disadvantages of various teaching/learning strategies: Higher percentages of students (60.0-81.0%) reported online learning to lack; direct contact among students, personal contact with teachers, and hands-on practice in labs. Moreover, it reduces chances of competition, provides more chances of cheating in examinations, and of non-authentic reports besides being harmful due to long hours in front of the screen, and brings a sense of isolation with no student facilities (**Table 6**).

Sharif et al. (2024) Mediterr J Pharm Pharm Sci. 4 (1): 12-21.

Volume 4: Issue 1: Page 17

Table 6: Disadvantages of the educational strategies according to respondents

Question	Frequency (%), n=270			95% CI for single proportion "Online"
	Online	**In-Class**	**Hybrid**	
Lack of direct contact among students	219 (81.1%)	29 (10.7%)	22 (08.1%)	76.5-85.7
Lack of personal contact with teachers	220 (81.5%)	34 (12.6%)	16 (05.9%)	76.8-86.1
Lack of hands-on practice in labs	216 (80.0%)	32 (11.9%)	22 (08.1%)	75.3-84.7
Reduced chances of competition	192 (71.1%)	45 (16.7%)	33 (12.2%)	65.7-76.5
More chances of cheating in exams	187 (69.3%)	52 (19.3%)	31 (11.5%)	63.7-74.7
More chances of non-authentic reports	180 (66.7%)	50 (18.5%)	40 (14.8%)	61.1-72.3
Harmful to too much time in front of a screen	215 (79.6%)	34 (12.6%)	21 (07.8%)	74.8-84.4
Sense of isolation	203 (75.2%)	41 (15.2%)	26 (09.6%)	70.1-80.3
No student facilities	208 (77.0%)	33 (12.2%)	29 (10.7%)	72.1-82.1

Discussion

The purpose of this study was to assess the impact of COVID-19 on university students' education and performance. The closures within and between countries as a measure to reduce the spread of the virus influenced several aspects of daily life including education in schools and universities across the globe. The shift from in-class to online learning was a necessity implemented by most educational authorities. Most universities across the globe have canceled all campus events and activities such as in-class teaching, workshops, and conferences, and higher education systems shifted to E-learning [1, 11]. E-learning is defined as the delivery of learning through technology and the internet [12]. Online teaching/learning is becoming rather common, widely followed, and most likely to be the landmark of future learning. However, there is a need to explore the perception and attitudes of students towards E-learning particularly when a shift in teaching/learning strategy is considered. Moreover, teachers must be aware that there are generational differences between them and their millennial students in teaching and learning [13]. Millennial students prefer working in groups, actively engaging in learning, and utilizing the technology, which they master. Respondents in the present study preferred in-class teaching if the pandemic is cleared and only go online in case of incomplete eradication of the pandemic. The majority of students were living with their family and about two-thirds had only their father working and have other members of the family studying online at home. Probably when more family members are simultaneously engaged in online learning, the parents are troubled with expenses to provide digital devices and internet services especially when only one of the parents is working, subjected to salary cuts, or complete work redundancy. In addition, the overlap and disturbance experienced when more people are working on the internet in a small-spaced accommodation worsen the situation even further. In the present study, the majority of respondents were females and from the College of Pharmacy. In UAE this is a common trend that the proportion of females is much more than males, particularly in colleges of health sciences. It is worth noting that in Malaysia, female university students focus more on the E-learning portal as compared to male students [14].

Sharif et al. (2024) Mediterr J Pharm Pharm Sci. 4 (1): 12-21.

Volume 4: Issue 1: Page 18

Even though 45.0% of students were not sure of their confidence in online learning, more students stated that their grades improved as compared to those during in-class teaching. In addition, a similar number of students found no change in their performance between online and in-class paper examinations, while more than 50.0% of participants experienced no change in their performance between distant and in-class online examinations. In this respect, the present results are similar to those reported for Indian students [15, 16]. Improvement in student's grades may not be a true reflection of the actual level of students as homework, assignments, and exams can be the subjects of unethical behavior including cheating despite the efforts to prevent this trend by universities. Almost 40.0% of respondents claimed that their grades improved with online teaching, but their performance in online exams was not different from that in paper examinations. Our results on the improvement of grades are similar to those reported for Spanish students [17] but contrast with those German students who reported that the online system of education has directly affected their grades and they were not up to their expectations [18]. Also, slightly more than 50.0% of respondents observed no change in their performance for distant and in-class online examinations.

Worrying about attracting the infection, the feeling of isolation, and the new experience of online teaching may all be stress-inducing factors that would influence the performance of low-achieving students. School closures have been reported to induce a sharp decline in the support of trained educators who are the most important school input factor to produce educational achievement [18]. The pandemic influenced the unique ecosystem of higher education. It canceled the face-to-face interaction with teachers, and student colleagues, experiential training, and reduced the extent of proper teamwork. For the majority of students, the COVID-19 pandemic had changed their habits of study and for about two-thirds of respondents, their overall expectations in time and work were not the same as when they were in class. This is most likely because of the flexible mode of learning offered by the online method [19]. Challenges to online learning are numerous including network issues, poor signal, noises, lack of access to a laptop or computer, poor accommodation and living environment, and socio-cultural background [20]. High percentages (range 50.0%-61.0%) of students regarded in-class learning to offer more effective learning, best work preparation, best exam performance, and best education value and they were more likely to recommend it. These results are in good agreement with the results of the Pakistan study where 77.0% of the medical students surveyed have negative perceptions towards e-learning [21], although out of those students, 86.0% students felt that e-learning has little impact on their learning. In valuing online learning they stated that it offers the opportunity to work at their pace. A common reason for the use of digital devices such as mobile phones in online learning is that learning can take place anytime and anywhere [22]. Again, participants selected the flexible time of the study, lower tuition fees, responsibility, and self-discipline, accessibility to clear-recorded lectures, and fast and easy sharing of resources as advantages for online learning over in-class or hybrid methods. These results add further support to the previously discussed views of students on online learning. However, students stated that online and in-class learning is more convenient and offers easy access to resources than hybrid methods [23]. In discussing the disadvantages of various methods, participants stressed deficiencies in online learning such as lack of direct contact with their teachers and other students and the lack of hands-on practice in labs. In addition, online learning offers reduced chances of competition, more chances of cheating in examinations, more chances of non-authentic reports, more harm of a long time spent in front of screens of the device used, a sense of isolation, and no student facilities [24]. Despite posting the survey on the internet, the majority of participants were from local universities in particular the University of Sharjah and were mostly female students. In this university, it is a common trend to have a higher ratio of female to male students, particularly in health sciences colleges. Moreover, the full online strategy of teaching/learning is a new experience for most of the students who are accustomed to in-class teaching using didactic lectures, and problem-based teaching.

Sharif et al. (2024) Mediterr J Pharm Pharm Sci. 4 (1): 12-21.

Volume 4: Issue 1: Page 19

Conclusion: The COVID-19 pandemic has been a challenge for higher education institutions across the globe regarding their level of suppleness and flexibility, and students' acceptance of such a shift in the strategy of teaching from in-class to complete online learning. Despite the challenges facing online learning, it remains the essence of future strategies for higher education. Appropriate planning of courses, and helping students by reducing digital inequality, if any, would certainly prove satisfactory for the millennial generation of students.

References

1. Hamrouni AM, Sharif RS, Sharif SI, Hassanein M, Abduelkarem A (2022) Impacts of COVID-19 on geopolitics, health, economics, education, and sociocultural events. Risk Management and Healthcare Policy. 15: 935-943. doi: 10.2147/RMHP.S362337
2. Schleicher A (2020) The impact of COVID-19 on education insights from education at a glance 2020. http://hdl.voced.edu.au/10707/550385.
3. UNESCO (2023) 1.3 billion learners are still affected by school or university closures, as educational institutions start reopening around the world.
4. JAAGO (2020) Tel-Ed: A Tele Education Initiative of JAAGO Foundation. https://jaago.com.bd/jaago-foundations-education-response-to-covid-19-in-bangladesh.
5. Saha B, Atiqul Haq SM, Ahmed KJ (2023) How does the COVID-19 pandemic influence students' academic activities? An explorative study in a public university in Bangladesh. Humanities and Social Sciences Communications. 10: 602. doi: 10.1057/s41599-023-02094-y
6. Li F (2022) Impact of COVID-19 on the lives and mental health of children and adolescents. Frontiers in Public Health. 10: 925213. doi: 10.3389/fpubh.2022.925213
7. Hanushek EA, Woessmann L (2020) The economic impacts of learning losses. Organization for Economic Co-operation and Development. Media Link/s OECD brochure.
8. McKeever V (2020) U.S. economy faces $15 trillion hit as a result of school closures, OECD says. Published Tue, Sep 8 2020, 9: 29 am, updated Tue, Sep 8 20209:59 am.
9. UAE e Government (2020) Distance learning in times of COVID-19, URL: https://u.ae/en/information-and-services/education/distance-learning-in-times-of-covid-19 (Accessed 09/10/2022).
10. UAE eGovernment (2020) eLearning, mLearning and distance learning, URL: https://u.ae/en/information-and-services/education/elearning-mlearning-and-distant-learning (Accessed 09/10/2022).
11. Affum MQ (2022) The effect of internet on students studies: a review. Library Philosophy and Practice (e-journal). 6932. https://digitalcommons.unl.edu/libphilprac/6932
12. Leal Filho W, Lange Salvia A, Abubakar IR, Mifsud M, Azadi H, Sharifi A, LeVasseur T, Luetz JM, Velazquez L, Singh P, Pretorius R, Akib NAM, Savelyeva T, Brandli L, Muthu N, Lombardi P (2022) Impacts of the COVID-19 pandemic on routines of higher education institutions: a global perspective. Sustainability. 14 (21): 14105. doi. 10.3390/su142114105
13. Bashir A, Bashir S, Rana K, Lambert P, Vernallis A (2021) Post-COVID-19 adaptations; the Shifts towards online learning, hybrid course delivery and the implications for biosciences courses in the higher education setting. Frontiers in Education. 6: 711619. doi: 10.3389/feduc.2021.711619
14. Tamm S (2023) What is the definition of e-learning? Defining what is e-learning is not as easy as it might first appear. e-Student. Org E-LEARNING, 2023 https://e-student.org/what-is-e-learning/
15. Black A, Gen Y (2010) Who they are and how they learn. Educational HORIZON. Winter. https://files.eric.ed.gov/fulltext/EJ872487.pdf
16. Shahzad A, Hassan R, Aremu AY, Hussain A (2021) Effects of COVID-19 in E-learning on higher education institution students: the group comparison between male and female. Quality and Quantity. 55 (2). doi: 10.1007/s11135-020-01028-z
17. Still ML, Still JD (2015) Contrasting traditional in-class exams with frequent online testing. Journal of Teaching and Learning with Technology. 4 (2): 30. doi: 10.14434/jotlt.v4n2.13481
18. Chung E, Subramaniam G, Dass LC (2020) Online learning readiness among university students in Malaysia Amidst COVID-19. Asian Journal of University Education. 16 (2): 46-58. doi. 10.24191/ ajue.v16i2.10294
19. Gonzalez T, de la Rubia MA, Hincz KP, Comas-Lopez M, Subirats L, Fort S, Sacha GM (2020) Influence of COVID-19 confinement on students' performance in higher education. PLoS ONE. 15 (10): e0239490. doi. 10.1371/ journal.pone.0239490

Sharif et al. (2024) Mediterr J Pharm Pharm Sci. 4 (1): 12-21.

Volume 4: Issue 1: Page 20

20. Grewenig,E, Lergetporer P, Werner K, Woessmann L, Zierow IL (2020) COVID-19 and educational inequality: how school closures affect low- and high-achieving students. IZA Institute of Labor Economics. Available at: http://ftp.iza.org/dp13820.pdf (Accessed 5/11/2020).

21. Kim K-J, Shijuan K, Bonk KL (2005) Online MBA students' perceptions of online learning: benefits, challenges, and suggestions. Internet and Higher Education. 8 (4): 335-344. doi: 10.1016/j.iheduc.2005.09.005

22. Kapasia N, Paul P, Roy A, Saha J, Zaveri A, Mallick R, Barman B, Das P, Chouhan P (2020) Impact of lockdown on learning status of undergraduate and postgraduate students during COVID-19 pandemic in West Bengal, India. Children and Youth Services Review. 116: 105194. 1-5. doi: 10.1016/j.childyouth.2020.105194

23. Abbasi S, Ayoob T, Malik A, Memon SI (2020) Perceptions of students regarding E-learning during Covid-19 at a private medical college. Pakistan Journal of Medical Sciences. 36 (COVID19-S4): S57-S61. doi: 10.12669/pjms.36.COVID19-S4.2766

24. Murphy A, Farley H, Lane M, Hafeez-Baig A, Carter B (2014) Mobile learning anytime, anywhere: What are our students doing?. Australasian Journal of Information Systems. 18 (3). doi: 10.3127/ajis.v18i3.1098

25. Means B, Toyama Y, Murphy R, Bakia M, Jones K (2010) Evaluation of evidence-based practices in online learning: a meta-analysis and review of online learning studies. US Department of Education. https://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf

26. Noorbehbahani F, Mohammadi A, Aminazadeh M (2022) A systematic review of research on cheating in online exams from 2010 to 2021. Education and Information Technologies. 27: 8413-8460. doi: 10.1007/ s10639-022-10927-7