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# The Impact of Online Education of Practical Courses on Pharmacy Students Practical and Communication Skills: Students' Perceptions

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## ABSTRACT

The quarantine during the COVID-19 pandemic has forced universities to continue their education courses remotely, including practical courses. However, delivering practical laboratory courses was challenging, since all simulation laboratory courses lack real hands-on experience. The purpose of this study was to assess student's perception of the impact of online delivery of hands-onlaboratory courses, on pharmacy students' practical and communication skills. An anonymous Microsoft®Forms-based cross-sectional questionnaire was sent to potential participants at the University of Jordan Pharmacy School. Students' responses were analysed using SPSS® 23.0 software. A total of 274 online surveys were completed. About 69% of students preferred the hands-on laboratory courses and about 62% of students did not find online labs as effective as hands-on laboratory courses. About 73% of students think that online learning negatively affected their practical skills. Approximately 76% of students think that direct working in the lab improves their communication skills. Overall, Students prefer the traditional lab for practical course learning and think that learning online has negatively affected their practical and communication skills. This emphasises that pharmacy schools should consider the nature of practical courses when it comes to online educational methods inclusion into their curricula, to maximize the benefits delivered to students while matching students' needs and preferences.

**Keywords:** Pharmacy Education, Online, Laboratory, COVID-19.

## INTRODUCTION

Practical knowledge is a cornerstone in pharmacy education. For instance, Pharmacy students must learn the analytical methods used in drug analysis. Practical skills are usually delivered by conducting experiments in laboratory courses, using glassware and equipment [1,2]. However, the COVID-19 outbreak, have highlighted alternative methods for practical skills teaching [3]. Among the most used alternative methods to deliver the practical laboratories by universities around the globe were the Video-based laboratories, in which students watch a demonstration video for the experiment, and virtual laboratories, in which students conduct experiment online in a virtual environment [4,5]. Distance teaching enables students to carry out experiments without safety concerns, like chemicals hazards, compared to laboratories. Moreover, online experiments are usually less stressful and take a shorter time [4]. All those benefits which are associated with online learning encouraged many higher education institutions to adopt the blended learning approach that implements the online learning technologies with the traditional in-class learning methods. Hence, providing students with the best learning opportunities [6].

However, during online laboratory sessions students are physically unable to touch the laboratories glassware

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and equipment. This lack of the real hands-on experience, may negatively affect students' practical as well as their communication skils[4,7]. In laboratory courses, students deal directly with their colleagues and instructors, share glassware, and many times have students to work in pairs or groups. All of which, will be missed or compromised during online education[8].

By the beginning of March 2020, the school of Pharmacy at the University of Jordan, laboratory sessions were cancelled and displaced by videos, shared online with students, showing demonstrations for the experimental work. The aforementioned videos were helpful to students to learn the basic concepts of the experiments; nevertheless, pharmacy students missed the real hands-on skills. The full resumption of hands-on laboratories was not started until the first semester of 2022.

These two years of intermittent online learning affected all pharmacy school students, especially the current third-year pharmacy students who have taken most of their first and second-year practical courses via online learning. Basic pharmacy students' practical skills are usually built during the first and second years. Hence, this must have led to difficulties faced by third-year students, after resuming hands-on laboratory works, in advanced courses, while lacking the hands-on experience from their previous years. Therefore, current third-year students might be the most affected by online learning during the pandemic.

Data is lacking regarding the consequences of online learning on pharmacy students practical and communication skills. Therefore, in the present research, we aim to gain insight into pharmacy student's perception of the impact of online learning, during the COVID-19 pandemic, on their practical and communication skills. This can help in making feedback recommendations for decisions makers in pharmacy school, to compensate for the missed hands-on skills in order to achieve the intended learning outcomes of the curriculum, either by offering compensatory courses or embedding the missed skills in other related courses. That will prevent the probability of graduating some students with inadequate laboratory skills that may have a negative impact on them when they enter the work market. Further, we aim to find out students' attitudes toward online learning. Online learning has shown some advantages that can be utilized, even after the end of the pandemic. For instance, video-based experiments can be a useful resource for students to prepare before the hands-on experiment. This can help them to follow safety measures according to the level of risks associated with the experiment. Moreover, online learning for practical courses can be a possible alternative to using expensive laboratory glassware and equipment, especially for low the income countries.

## Experimental

### Data collection

Data for this study were collected using an anonymous Microsoft®Forms based cross-sectional questionnaire. The data collection tool was developed by the authors based on the authors' experience and knowledge in the field and after intensive review of the literature [9–11].The questionnaire consists of four sections. The first section composed of items related to demographics and participants characteristics including gender, residence, nationality, whether secondary school belongs to public or private sector, GPA, academic level, and the program they are enrolled in. The second section covered items related to the effect of online sessions on students' practical skills, these items asked if not practicing experiments during the online learning period has affected students' practical skills and their abilities to use glass wares, handle reagent bottles and operate laboratory equipment. The third section asked questions about the effect of online learning stage on students' skills that are being developed during hands-on practical sessions including communication skills, abilities to active listening, self-confidence, patience and active engagement with colleagues and instructors. In the fourth section, students' preferences toward learning methodology were examined. Sections two, three and four

consisted together of 21 items on 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

At the beginning of the questionnaire, a short and full description of the study scope and aims was added, in addition to that an informed consent statement to indicate participation agreement was required before the participant is allowed to answer the study questions.

Before the administration of the questionnaire, the data collection tool was assessed by expert in the field with long experience in teaching practical courses then a pilot study was conducted to test the data collection tool and 10 random responses were collected. Further evaluation of the tool was done using statistical confirmation of the tool validity and reliability. Cronbach's Alpha value of 0.702 asserts the internal consistency of the tool. Also, sample adequacy was confirmed factor analysis with Kaiser-Meyer-Olkin (KMO) value of 0.862 and a significant Bartlett's Test ($p<0.0001$).

Data collection took place from midDecember2021 till midMarch 2022. First and second year students were excluded. The tool was sent to potential participants via Microsoft Teams®, Facebook® and Emails. The questionnaire was randomly distributed to 308 students and 274 students completed with response rate of 88.9%.

To minimize social desirability bias, assurance was given to participants that the responses would be anonymized. Collected data was stored with the corresponding author and further analysis was done anonymously.

**Statistical analysis**

According to the registration department, the total number of students enrolled in 3rd, 4th, 5th and 6th year students in the School of Pharmacy at the University of Jordan is 950 - 1000 students, a sample size of 270- 278 participants was assumed to be sufficient as calculated via Raosoft® sample size calculator, using 95% confidence level and 5% margin of error [12].). Moreover, the total number of items in the questionnaire is 21 and applying the rule of the number of responses to item ratio ranges from 10:1[13], the collected responses were also sufficient.

Data analysis was conducted using SPSS® 23.0 (IBM, Armonk, NY) where data was encoded first then entered and analyzed. Responses were then presented as frequencies and percentages for categorical variables, and as means and standard deviations (or medians and inter-quartile ranges) for continuous variables. Comparisons between groups were performed using chi-square test. A *p*-value of $< 0.05$ was considered significant. All hypothesis testing was two-sided. For the purpose of comparisons, the 5-likert scale was shorten to 3-likert scale in which strongly agree and agree responses were merged and on the other side strongly disagree and disagree were merged. The two compared group were third year students (group 1) and fourth, fifth- and sixth-year students as group 2. This grouping was based on the fact that students from the third year were enrolled in the university during the COVID-19 pandemic lockdown and have no hands-on practical session's experience, while group 2 students have at least one-year experience with real face to face (F2F) practical session's experience (senior students). The study was approved Institutional Review Board (IRB) at the Deanship of Academic Research—The University of Jordan (IRB Ref. 9-2022). Besides, all methods were carried out following the national guidelines and conforming to the ethical standards of the *Declaration of Helsinki*. The questionnaire ensured the confidentiality and anonymity of study participants.

**RESULTS**

A total of 274 pharmacy students responded to this survey, of them 158 (57.7%) were third-year students and 116 (42.3%) were fourth, fifth- and sixth-year students (senior students). The majority 227 (82.8%) of the study respondent were females and Amman residents 224 (81.8%). Most of the respondents 157 (57.3%) academic performance was very good (See Table1).

**Table 1: Students demographics and characteristics, N=274**

| | | All (N=274) | Third Year Students (N=158) | Senior Students[a] (N=116) |
|---|---|---|---|---|
| | | 274 (100%) | 158 (57.7) | 116 (42.3) |
| **Gender** | Female | 227 (82.8) | 138 (87.3) | 89 (76.7) |
| | Male | 47 (17.2) | 20 (12.7) | 27 (23.3) |
| **Residence** | Amman | 224 (81.8) | 121 (76.6) | 103 (88.8) |
| | Others | 50 (18.2) | 37 (2.6) | 13 (11.2) |
| **Nationality** | local | 230 (83.9) | 134 (84.8) | 96 (82.8) |
| | Others | 44 (16.1) | 24 (15.2) | 20 (17.2) |
| **Type of Secondary School** | Governmental | 142 (51.8) | 90 (57) | 52 (44.8) |
| | Private | 132 (48.2) | 68 (43) | 64 (55.2) |
| **Program** | BSc of Pharmacy | 175 (63.9) | 86 (54.4) | 89 (76.7) |
| | PharmD | 99 (36.1) | 72 (45.6) | 27 (23.3) |
| **Academic Level** | Third year | 158 (57.7) | | |
| | Fourth year | 67 (24.5) | | |
| | Fifth year | 43 (15.7) | | |
| | Sixth year | 6 (2.2) | | |
| **GPA** | Excellent | 77 (28.1) | 48 (30.4) | 29 (25) |
| | Very good | 157 (57.3) | 93 (58.9) | 64 (55.2) |
| | Good | 37 (13.5) | 15 (9.5) | 22 (19) |
| | Fair | 3 (1.1) | 2 (1.3) | 1 (0.9) |

[a]Fourth, fifth and sixth years students

As shown in table 2, The majority of third-year students agreed that they have faced difficulties working with laboratory glassware 62 (39.2%) and operating the laboratory equipment 74 (46.8%) after resuming laboratory courses, on the contrary, the majority of senior students disagreed with having such difficulties 55 (47.4%), 53 (45.7%) for glassware's and equipment respectively), the difference was significant between the third-year students and seniors' students' responses (P=0.001 and 0.002 for glassware's and equipment respectively). On the other hand, most students didn't find difficulties in handling reagent bottles after resuming hands-on laboratory courses137 (50.4%). Most students agreed that seeing (not handling) the lab glassware's and equipment during the online labs negatively affected their practical skills 200 (73%). And when students were asked if they think that the online labs didn't affect their practical skills most students disagreed 137 (50%).

**Table 2: Effect of online delivery of practical sessions on students' practical skills**

| Statement | All N(%) (N=274) | | | Third Year Students N(%) (N=158) | | | Senior Students N(%) (N=116) | | | *p-value*[a] |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Agree** | **Neutral** | **Disagree** | **Agree** | **Neutral** | **Disagree** | **Agree** | **Neutral** | **Disagree** | |
| I think that seeing (not handeling) the lab glassware's and equipment during the online labs negatively affected my practical skills. | 200 (73) | 42 (15.3) | 32 (11.7) | 121 (76.6) | 21 (13.3) | 16 (10.1) | 79 (68.1) | 21 (18.1) | 16 (13.8) | 0.295 |
| After resuming real labs, I face difficulties working with laboratory glassware's (using a pipette for example). | 94 (34.3) | 84 (30.7) | 96 (35) | 62 (39.2) | 55 (34.8) | 41 (25.9) | 32 (27.6) | 29 (25) | 55 (47.4) | 0.001 |
| After resuming real labs, I have difficulties in operating the laboratory equipment. | 106 (38.7) | 70 (25.5) | 98 (35.8) | 74 (46.8) | 39 (24.7) | 45 (28.5) | 32 (27.6) | 31 (26.7) | 53 (45.7) | 0.002 |
| After resuming real labs, I have difficulties in handling the laboratory reagent bottles. | 51 (18.6) | 85 (31) | 138 (50.4) | 34 (21.5) | 52 (32.9) | 72 (45.6) | 17 (14.7) | 33 (28.4) | 66 (56.9) | 0.148 |
| I think that learning online didn't affect my practical skills in the lab. | 83 (30.3) | 54 (19.7) | 137 (50) | 44 (27.8) | 29 (18.4) | 85 (53.8) | 39 (33.6) | 25 (21.6) | 52 (44.8) | 0.340 |

[a] *Pearson Chi-square*

Table 3 illustrates the effect of online delivery of practical sessions on students' perception of their communications skills. Students agreed that online learning decreased their active listening skills 166 (60.6%). Regarding the self-confidence skill, there was a significant difference between third year and senior's students' responses, the majority of third-year students agreed 81 (51.3%) that online learning decreases their self-confidence, however, the majority of seniors 41 (35.3%) disagreed. Students disagreed that they tend to avoid eye contact after resuming hands-on laboratory courses 148 (54%), but the percentage of students who disagreed was higher in the senior year group 72 (62.1%) than the third-year group 76 (48.1%). Most students agreed that they feel impatient during hands-on laboratory courses sessions 137 (50%) and agreed that it was easier to communicate with the lab instructor during the hands-on laboratory courses compared to the online lab 188 (68.6%). Most students agreed that working as a group in a hands-on labs has improved their communication skills 209 (76.3%) but there was a significant difference between the students' groups (p=0.019).

**Table 3: Effect of online delivery of practical sessions on students' communication skills**

| Statement | All N(%) (N=274) | | | Third Year Students N(%) (N=158) | | | Senior Students N(%) (N=116) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Agree | Neutral | Disagree | Agree | Neutral | Disagree | Agree | Neutral | Disagree |
| I think that working in pairs/a group with my colleagues in real lab, improved my communication skills. | 209 (76.3) | 34 (12.4) | 31 (11.3) | 116 (73.4) | 17 (10.8) | 25 (15.8) | 93 (80.2) | 17 (14.7) | 6 (5.2) |
| I think that online learning decreased my active listening ability. | 166 (60.6) | 59 (21.5) | 49 (17.9) | 97 (61.4) | 31 (19.6) | 30 (19) | 69 (59.5) | 28 (24.1) | 19 (16.4) |
| I think that online learning decreased my self-confidence. | 121 (44.2) | 69 (25.2) | 84 (30.7) | 81 (51.3) | 34 (21.5) | 43 (27.2) | 40 (34.5) | 35 (30.2) | 41 (35.3) |
| After resuming real labs, When the lab instructor gives me instructions, I affirm that I understand, even if I don't entirely understand. | 109 (39.8) | 81 (29.6) | 84 (30.7) | 68 (43) | 46 (29.1) | 44 (27.8) | 41 (35.3) | 35 (30.2) | 40 (34.5) |
| After resuming direct learning, I found myself avoiding eye to eye contact with my colleagues and instructors. | 55 (20.1) | 71 (25.9) | 148 (54) | 37 (23.4) | 45 (28.5) | 76 (48.1) | 18 (15.5) | 26 (22.4) | 72 (62.1) |
| I feel impatient during the real lab sessions (for example: when you have to wait for your turn for using a certain device or equipment). | 137 (50) | 77 (28.1) | 60 (21.9) | 83 (52.5) | 44 (27.8) | 31 (19.6) | 54 (46.6) | 33 (28.4) | 29 (25) |
| During the real lab sessions, I found it easier to ask for clarification when my instructor says something I'm not sure about compared to the online lab. | 188 (68.6) | 63 (23) | 23 (8.4) | 112 (70.9) | 33 (20.9) | 13 (8.2) | 76 (65.5) | 30 (25.9) | 10 (8.6) |

[a] *Pearson Chi-square*

Table 4 demonstrates students' preferences regarding F2F and online learning methods for practical courses. More than two thirds of students felt more motivated after resuming hands-on laboratory courses199 (72.6%), with a significant difference between a third year and seniors' student's responses(p=0.003). And when students were asked if they preferred online lab sessions, most of students disagreed 189 (69%). Students disagreed that online lab delivery enabled them to continue their education like the direct lab 132 (48.2%) with a significant difference between third year and senior's students' responses (p=0.003). Students disagreed that online labs enabled them to understand the experiment without safety concerns compared to hands-on experiments 137 (50%) and the difference was significant between third year and senior's students' responses(p=0.016). Most students 132 (48.2%) felt that direct lab assessment is more stressful than online assessment. And disagreed that they feel that hands-on lab is time-consuming compared to the online lab 125 (45.6%). In addition, most students think that direct lab allows for a higher chance of COVID-19 transmission 121 (44.2%), but there was a significant difference between third and seniors' year student's responses (p=0.001).

**Table 4: Effect of online delivery of practical sessions on students' preferences**

| Statement | All N(%) (N=274) | | | Third Year Students N(%) (N=158) | | | Senior Students N(%) (N=116) | | | *p-value*[a] |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Agree** | **Neutral** | **Disagree** | **Agree** | **Neutral** | **Disagree** | **Agree** | **Neutral** | **Disagree** | |
| I feel more motivated after resuming the direct face to face laboratory work. | 199 (72.6) | 56 (20.4) | 19 (6.9) | 126 (79.7) | 21 (13.3) | 11 (7) | 73 (62.9) | 35 (30.2) | 8 (6.9) | 0.003 |
| I prefer online labs sessions compared to real lab sessions. | 40 (14.6) | 45 (16.4) | 189 (69) | 20 (12.7) | 26 (16.5) | 112 (70.9) | 20 (17.2) | 19 (16.4) | 77 (66.4) | 0.560 |
| I feel that direct lab assessment is more stressful than online assessment. | 132 (48.2) | 69 (25.2) | 73 (26.6) | 71 (44.9) | 40 (25.3) | 47 (27.7) | 61 (52.6) | 29 (25) | 26 (22.4) | 0.339 |
| I think that online delivery of lab content enables students to continue their education similar to the direct lab. | 68 (24.8) | 74 (27) | 132 (48.2) | 47 (29.7) | 31 (19.6) | 80 (50.6) | 21 (18.1) | 43 (37.1) | 52 (44.8) | 0.003 |
| I feel that online labs allow me to understand the real experiments without safety concerns compared to the real lab. | 81 (29.6) | 56 (20.4) | 137 (50) | 36 (22.8) | 36 (22.8) | 86 (54.4) | 45 (38.8) | 20 (17.2) | 51 (44) | 0.016 |
| I think that the real lab is time consuming compared to the online lab. | 88 (32.1) | 61 (22.3) | 125 (45.6) | 47 (29.7) | 37 (23.4) | 74 (46.8) | 41 (35.3) | 24 (20.7) | 51 (44) | 0.607 |

| Statement | All N(%) (N=274) | | | Third Year Students N(%) (N=158) | | | Senior Students N(%) (N=116) | | | *p-value*[a] |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Agree** | **Neutral** | **Disagree** | **Agree** | **Neutral** | **Disagree** | **Agree** | **Neutral** | **Disagree** | |
| I think that direct working in the lab allows for a higher chance for COVID-19 transmission. | 121 (44.2) | 85 (31) | 68 (24.8) | 58 (36.7) | 49 (31) | 51 (32.3) | 63 (54.3) | 36 (31) | 17 (14.7) | 0.001 |
| I think that I need extra face to face classes to compensate for what I missed during online lab learning. | 127 (46.3) | 75 (27.4) | 72 (26.3) | 87 (55.1) | 38 (24.1) | 33 (20.9) | 40 (34.5) | 37 (31.9) | 39 (33.6) | 0.003 |
| I think that online lab experience is effective as real lab experience. | 49 (17.9) | 55 (20.1) | 170 (62) | 22 (13.9) | 25 (15.8) | 111 (70.3) | 27 (23.3) | 30 (25.9) | 59 (50.9) | 0.005 |

[a] *Pearson Chi-square*

When students were asked if they think that they need extra F2F classes to compensate for what they missed during online labs, more than half of third-year students 87 (55.1%) agreed, while only 40 (34.5%) of seniors agreed, the difference was significant (p=0.003). Most students didn't agree that the online lab was effective as a hands-on lab 170 (62%), and the difference between third year and senior year students' responses was significant (p=0.005).

**DISCUSSION**

Overall, students preferred hands-on laboratory sessions and did not find online labs as effective as F2F labs in increasing their practical and communication skills. Students didn't find value in seeing laboratory glassware and equipment without the hands-on experience and think that their practical skills have been negatively affected by online learning. Working together in hands-on lab sessions, still be considered valuable by students to improve their communication skills. Students think that their ability to listen actively and their self-confidence have been decreased by online learning. Further, Students find it easier to communicate with collogues and instructors during hands-on F2F labs compared to the online labs. Interestingly, students didn't find hands-on F2F lab sessions time consuming, even though hands-on lab sessions take a longer time compared to online lab session. From another view, students think that hands-on F2F labs assessment is more stressful than the online labs. Moreover, students think that direct working in a hands-on F2F lab allows for a higher chance for COVID- 19 transmittance.

When students' responses were stratified according to school academic year, significant differences were found

when comparing third-year students to senior students (fourth, fifth and sixth years) students, with prior exposure to hands-on F2F practical sessions before the COVID-19 pandemic. Third-year students have faced difficulties using laboratory glassware and equipment, after resuming hands-on F2F labs, more than the senior students. This may be explained by the effect of previous laboratory hands-on experience which senior students have been exposed to during their early academic years. Third-year students lack this experience due to the lockdown during the COVID-19 quarantine. Therefore, third-year students think they need extra F2F classes to compensate for the missed skills and were more motivated after resuming hands-on F2F labs.

Senior students value the beneficial effects of working as groups, during hands-on F2F lab on their communication skills more than the third-year students. In addition, senior students didn't think that their self-confidence was negatively affected by online learning. On the contrary, third-year students do think that their self-confidence was negatively affected. Interestingly**,** senior students believe that working in a hands-on F2F lab allows for a higher chance for COVID-19 transmittance, more than third-year students. This again may be explained by the earlier hands-on F2F laboratory experience senior students have, which makes them more familiar with the nature of interactions during scientific F2F labs which could lead to diseases transmittance. Those differences between the third year and senior students' responses, agree with the results of studies conducted by Hamilton *et al* and Survey *et al* which show that students' attitudes and preferences can change as they advance in their academic year. Accordingly, caution must be taken when designing and reviewing curricula to take into consideration that students' academic year affects their preferences[11,14].

Previous studies have shown that online learning is effective for pharmacy education in the short term. Further, the use of online learning in pharmacy education has several benefits; it renders more convenience and time flexibility when compared to traditional learning. Moreover, the use of online learning in practical courses gets over safety and health pitfalls associated with hands-on laboratory courses. In addition, many medical schools have started to utilize online labs as a cost-effective alternative to hands-on F2F labs, due to the high cost of the lab's equipment and budget shortage. Nevertheless, the majority of studies have shown that pharmacy students preferred the blended learning approach [4,6,11,15,16].

Students in this study did not prefer the use of online learning in practical courses. The results of this study agree with a previous study conducted by Survey *et al* where students in the biology lab preferred hands-on F2F lab sections to the online lab [14] and agree with results of Ali *et al* previous study where pharmacy students preferred the hands-on F2F labs for practical courses[17]. Another study also have shown that medical students preferred F2F microbiology labs compared to online laboratory[18] In the contrary, a recent study has shown that pharmacy students at a University in Spain were satisfied with online learning of chemistry laboratory courses, implemented during the COVID-19 pandemic, where students performance was improved by online learning compared to the traditional laboratory methods[19]Another study from Thailand has shown that pharmacy students were satisfied with the learning outcomes of online learning of medicinal chemistry laboratorycourses[20]

However, Students' preferences should be taken alongside the best teaching practices, which may not be always in one line. Therefore, the use of a blended learning approach can be a suitable choice for practical courses to optimize the benefits students can gain from both the traditional learning and online learning method. Hence, The University of Jordan pharmacy school has adopted the blended learning approach for practical courses, where the theoretical component of the labs is given online to students while keeping the practical part in the F2F labs.

However, this study has some limitations; the participants in the survey were University of Jordan pharmacy students only. Therefore, generalizing those results to other students' communities must be done

carefully. Moreover, students were surveyed about online labs in general without specifying a certain lab; during pharmacy study, students encounter different labs of different nature and different degrees of hands-on skills required for students to have. Consequently, some labs can be delivered online without major effects on students' practical skills, while delivering other labs online can truly affect students' practical skills.

**CONCLUSIONS**

Overall, students did not prefer online learning for practical courses delivery and thought that online learning has a negative impact on their practical and communication skills. Therefore, consideration must be done to continue the traditional F2F learning that is merged with an online component like recorded experiments in the form of blended learning for practical courses, to satisfy students' needs and preferences while maintaining a high quality learning outcomes The negative impact of online learning was seen in third-year students more than senior students; therefore, pharmacy schools should consider the students' academic year while incorporating online courses into their educational curriculum.

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# تأثير التعلم عن بعد على إيصال المواد العملية لطلاب كلية الصيدلة:توجهات الطلاب

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## ملخص

أجبر الحجر الصحي خلال جائحة كورونا الجامعات إلى متابعة برامجها التعليمية عن بعد, بما فيها المختبرات العملية. لكن إيصال المختبرات العملية واجه العديد من التحديات نظرًالأن جميع بدائل التعلم المباشر داخل المختبرات تفتقد الخبرة العملية الحقيقية. لهذا كان الهدف من هذه الدراسة هو تقييم مدى تأثيرالتعلم الإلكتروني للمختبرات العملية على المهارات العملية ومهارات الإتصال لدى طلبة كلية الصيدلة في الجامعة الأردنية من وجهة نظر الطلاب. لتحقيق هذا الهدف تم إرسال استبيان إلكتروني لطلبة كلية الصيدلة في الجامعة الأردنيةوتحليل نتائج هذا الإستبيان عبر برمجية التحليل الإحصائي SPSS.أكمل 274 طالب الإستبيان, حوالي 69% من الطلاب فضل المختبر التقليدي وما نسبته 62% من الطلاب لم يجدو أن المختبرات المعطاة عبر الإنترنت بفعالية المختبر المختبرات التقليدية. حوالي 73% من الطلاب يعتقد أن تعلم المختبرات عبر الإنترنت أثر سلبًا على مهاراتهم العملية وحوالي 76% من الطلاب يعتقد أن المختبرات التقليدية تحسن من مهارات التواصل لديهم. بشكل عام يفضل الطلاب المختبرات المعطاة عن طريق الطرق التقليدية ويعتقد الطلاب أن المختبرات المعطاة عبر الإنترنت تئثر بشكل سلبي على مهاراتهم العملية والتواصلية.يؤكدهذاعلى أن مدارس الصيدلة يجب أن تأخذ في الإعتبار طبيعة المختبرات العملية عندمايتعلق الأمربإدراج الأساليب التعليمية عبرالإنترنت في مناهجها ،لتعظيم الفوائد المقدمة للطلاب مع مطابقة احتياجات الطلاب وتفضيلاتهم.

**الكلمات الدالة:** الصيدلة، التعليم، الإنترنت، المختبرات.

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