Does on-line learning affect to achieve the minimal competencies of entry level pharmacists in Indonesia?

Agung Endro Nugroho[1], Dyah Aryani Perwitasari[2*], Umi Athiyah[3], Daryono Hadi Tjahjono[4], Ajeng Diantini[5], Yandi Syukri[6], Shirly Kumala[7], Dwi Sulisworo[8]

[1]Department of Pharmacology, Faculty of Pharmacy, Universitas Gadjah Mada, Yogyakarta, Indonesia. [2]Department of Pharmacology, Clinical Pharmacy and Community Pharmacy, Faculty of Pharmacy, Universitas Ahmad Dahlan, Yogyakarta, Indonesia. [3]Department of Community Pharmacy, Faculty of Pharmacy, Universitas Airlangga, Surabaya, Indonesia. [4]Department of Medicinal Chemistry, School of Pharmacy, Institut Teknologi Bandung, Bandung, Indonesia. [5]Department of Pharmacology and Clinical Pharmacy, Faculty of Pharmacy, Universitas Padjadjaran, Bandung, Indonesia. [6]Department of Pharmacy, Faculty of Science, Universitas Islam Indonesia, Yogyakarta, Indonesia. [7]Faculty of Pharmacy, Universitas Pancasila, Jakarta, Indonesia. [8]Department of Physics Education, Faculty of Teacher Training and Education, Universitas Ahmad Dahlan, Yogyakarta, Indonesia.

Correspondence: Dyah Aryani Perwitasari, Department of Pharmacology, Clinical Pharmacy and Community Pharmacy, Faculty of Pharmacy, Universitas Ahmad Dahlan, Yogyakarta, Indonesia. dyah.perwitasari@pharm.uad.ac.id

ABSTRACT

The closure of educational institutions to reduce the impact of the spread of COVID-19 has brought about a change in the education administration. Shifting the face-to-face learning process to an online learning system is one method to overcome this impact. The present study aims to assess the relationship between the online learning process and the achievement of graduate competence. The study was conducted by sharing the Constructive Online Learning Environment Survey (COLLES) questionnaire, which involved 626 responses from 49 schools of pharmacy in Indonesia to the graduates and re-taker of the Pharmacy Profession Program. This questionnaire has 24 items with six domains: relevance, reflection, interactivity, tutor support, peer support, and interpretation. The data were descriptively analyzed, and to find the correlation, the Student-T test was applied. This study showed that the highest score of the Constructive Online Learning Environment Survey (COLLES) domain is relevance (4.01). The lowest score can be seen in interactivity and teacher support. There are no significant differences in COLLES domains between graduates and re-taker groups. These findings also showed that the graduates' GPA significantly influences the student study success. It can be concluded that online learning during the pandemic did not influence pharmacists' achievement of minimum competency in Indonesia.

Keywords: Minimal competency, Pharmacy, Online learning, Indonesia

Introduction

The COVID-19 pandemic affects many aspects of human life, including the learning process. Mid-March 2020, the Indonesian government issued a policy that works from home and teaches and learning from home for physical and social distancing. Since

then, most teaching and learning activities have implemented an online learning system. However, two years earlier, in 2018, the ministry of research, technology, and higher education encouraged universities to implement online and hybrid or blended learning as a challenge in the era of the industrial revolution 4.0. The ministry also supported to university in conducting curriculum reorientation by paying attention to new literature, extracurricular activities, especially leadership and teamwork skills, and entrepreneurship and internship. Online learning in pharmacy higher education, which happened during the 2019 pandemic era, became a challenge for pharmacy teachers and students. In Indonesia and other countries in Asia, the infrastructure facilities were not equally distributed throughout all Indonesia areas [1, 2].

As a part of health study programs, competency is an important parameter to be measured and standardized before the graduates enter professional practice. Thus, many skills in the pharmacy curricula must be measured as part of pharmacy competency [3]. The previous study mentioned that students' stress correlates with particular domains of education, like financial support and successful experimental learning. In the previous study, the Accreditation Council for Pharmacy Education in the United States also asked the pharmacy school to monitor the students' stress due to online learning [4]. A study found a novel learning method for pharmacy students that can be applied and accepted: interactive flipped e-learning (iFEEL) [5]. This acceptance may decrease the students' stress during the learning process.

The competent graduates were defined from the curriculum and educational outcomes. The learning process must be translated from curriculum and education outcomes [6]. Thus, it is important to design the appropriate learning process, to reach the minimal competency of the graduates. Our study aims to define the correlation between online learning and the minimal competency outcomes of graduates during a pandemic.

Materials and Methods

We conducted the cross-sectional study by sharing the Constructive Online Learning Environment Survey (COLLES) questionnaire with all of the (pharmacist) graduates and retakers of the Pharmacy Profession Program in Indonesia. The inclusion criteria were graduates and retakers of the Pharmacy Profession Program in Indonesia. The graduates' group was the students who -have passed the National Competency Examination with Computer-Based Test (NCE-CBT), while the retakers group was the students who have not passed the NCE-CBT. We also collected some data related to the score of NCE-CBT, try out of NCE-CBT, and respondents' characteristics. We ask for the student's consent before recruiting procedures as the participants

COLLES is a questionnaire designed to assess how online learning enriches students' knowledge. This questionnaire can be used by university teachers and researchers interested in evaluating the teaching process. This questionnaire has 24 items with six domains: relevance, reflection, interactivity, tutor support, peer support, and interpretation. Each domain has four questions. The relevance defines the relevance of online learning with professional practices. The reflection makes sure that online education will stimulate the students. In interactivity, the educative dialogue between teacher and students is explored. In tutor support, the tutor's role in supporting the participation of the students is explored. Peer support ensures fellow students' support, and the interpretations define a good sense of communication during the online process [7]. This questionnaire has a 5 Likert scale, namely, Rarely (1), Seldom (2), Sometimes (3), Often (4), and Almost Always (5).

Data was descriptive and analyzed, and we used the student-T Test to find the correlation.

Results and Discussion

In the present study, 626 responses were collected from 49 schools of pharmacy, both private and public universities. The proportion of female graduates and retakers is higher than that of male ones (79.7% and 20.3%, respectively). The grade point average (GPA) of the students of bachelor's degree, the first semester of the pharmacy profession program, and the pharmacy profession program were 3.21 (SD: 0.32), 3.12 (SD: 1.18), and 3.38 (SD: 1.01), respectively. The mean NCE-CBT Score and the try-out of NCE-CBT score are 54.8 (SD: 19.00) and 42.2 (SD: 27.41), respectively. The scores of the COLLES domain can be seen in **Figure 1**. Furthermore, the results of the analysis of the differences between the COLLES-score of NCE CBT can be seen in **Table 1**. The differences in GPA between the graduates and retakers groups are shown in **Table 2**.
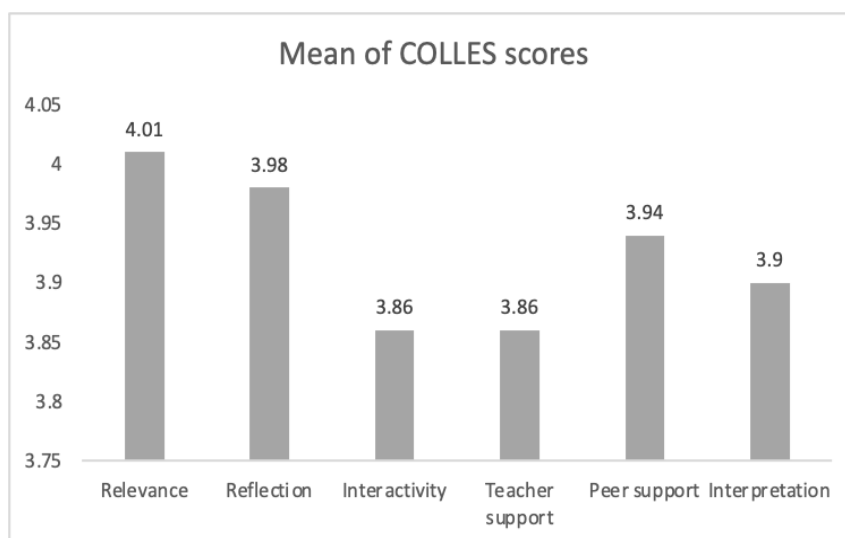
Figure 1. The mean score of COLLES domains

Table 1. Differences in COLLES domains between graduates and retakers

COLLES domain	Graduates Mean ± SD	Retakers Mean ± SD	P value
Relevance	4.00 ± 0.76	3.92 ± 0.63	0.134
Reflection	3.97 ± 0.75	3.97 ± 0.65	0.451
Interactivity	3.87 ± 0.79	3.82 ± 0.73	0.511
Teacher support	3.87 ± 0.79	3.82 ± 0.73	0.511
Peer support	3.90 ± 0.77	3.84 ± 0.72	0.345
Interpretation	3.86 ± 0.75	3.85 ± 0.71	0.861

Table 2. Differences of GPA between graduates and retakers

GPA	Graduates Mean ± SD	Retakers Mean ± SD	P value
Bachelor degree	3.30 ± 3.01	3.08 ± 3.04	< 0.05*
The first semester of the Pharmacy Profession	3.21 ± 1.21	2.99 ± 1.13	< 0.05*
Pharmacist degree	3.55 ± 0.71	2.96 ± 1.33	< 0.05*

*Significant difference; NCE: National Competency Examination; CBT; Computer Based Test

We have now reached the fourth industrial revolution, or the era of technological disruption, which is based on the use of the cyber-physical system, a combination of digital, physical, and biological domains. This period is distinguished by rapid technological advancements that have led to changes in many parts of life, including education (Education 4.0), in which digital technology is completely employed. In the Industrial Revolution Era 4.0, there are three new literacies such as humanity, technology; and big data. In 2018, the Ministry of Research, Technology, and Higher Education in the Republic of Indonesia issued a policy to encourage universities in Indonesia to reorient the curriculum to accommodate this literacy and implement online/hybrid/blended learning in academic activities.

The world encountered the COVID-19 pandemic in 2020, which caused significant changes in the education system. The majority of educational activities are conducted online using digital technologies. There was a transition from face-to-face learning to an online learning system. Synchronous (Webex, Zoom, Microsoft Teams, Skype, GoogleMeet, etc.) and/or asynchronous learning methods (Learning Management Systems) are used. Internships for pharmacy professional students in Indonesia were conducted online, offline, and/or in combination under tight guidelines. Furthermore, learning at the pharmacist professional education used content sharing methods such as learning videos and presentation slides, online group sharing with field supervisors, preceptors or practitioners, and students, and online learning by practitioners/preceptors.

In Indonesian pharmacy education, to become a pharmacist, a candidate should take a bachelor program in pharmacy (four years) and a pharmacy professional program (one year, in which the student conducts a clerkship or internship). At the end of the professional program, the student must pass an NCE-CBT.

The highest score in the COLLES domain can be seen in relevance (4.01). The students perceived the relevance between the topics in online learning and professional practice. Other parameters that exhibited scores near 4.00 were reflection (3.98), peer support (3.94), and interpretation (3.90). Reflection refers to the ability to think critically about what is learned and ideas that arise from both themselves and other students through online learning activities. Peer support is related to support from fellow students through online learning. Sensitive and encouraging support is provided online by fellow students. Interpretation is the ability to interpret messages conveyed by both the facilitator and fellow students. In this matter, students and tutors can make good sense of each other through online communication.

However, the lowest score can be seen in interactivity and teacher support. It is logical that since the students must do the teaching online, it was challenging to find interactivity with their friends. Furthermore, teachers also had difficulties finding students who faced obstacles during online learning. In online learning, the teachers act as facilitators who can create an interactive online atmosphere and motivate the students to participate in all activities. Thus, the facilitators must provide detailed instructions on the activities so that the students understand and can comply with the rules [8]. The teacher's support, interaction, and innovation might increase students' approaches to using the learning technologies [9].

The study conducted in Thailand found that pharmacy students could accept the online learning method in Pharmacy Professional Practice in Marketing and Business. The students mentioned that they gained more knowledge and were satisfied with the online course. This study is also in line with our research that the interactivity domain had a low score. The students still hope they will get knowledge from the teacher, not from active interactions with their friends [10].

There are no significant differences in COLLES domains between graduates and retakers groups. Even though the scores are higher in the graduates' group, the p-values are more than 0.05. A study in the United States of America showed that students could complete online courses with increased awareness and interest. From the performance assessment, the curriculum outcomes and

course objectives also could be reached [11]. The different results of these studies could be caused by the pandemic that forces people to get used to online procedures.

Table 2 shows the differences in GPA between the graduates and retakers groups. In general, the graduates' GPA is significantly higher than the retakers group's. It means that the student's GPA can predict the success of NCE-CBT. The previous study on nursing students also presented that the student's GPA could be the predictor of a score of the objective structured clinical examination, as the exam measures the student's competency [12].

A systematic review, which included 20 studies in North America, also mentioned that the GPA and the curriculum outcome assessment were significant predictors of the pharmacist licensure examination [13].

Our study did not explore the correlation of other demographic characteristics of the students as potential predictors. To date, to the author's knowledge, this study is the first study conducted in Indonesia using national data. We also present in this study that the possibility of NCE-CBT success is 2.78 higher in A accreditation of schools of pharmacy than the B accreditation of schools of pharmacy (95% CI: 1.84-4.05).

We suggest that future studies include more variables, like the type of curriculum, ethnicity, gender, and area characteristics, as predictors [14].

In addition, we also received some information from the respondents including the implementation of the tryout (frequency and method of implementation), and understanding of the NCE blueprint. As many as 5.95% of respondents (242) stated that they did not take part in the tryout or the institution did not organize the try-out. The implementation of online, hybrid, and offline NCE tryouts was 50.79%, 32.32%, and 16.89%, respectively. The frequency of the tryout more than 5 times, 3-5 times and less than 3 times were 22.09%, 43.56%, and 34.34%, respectively. There are 12.30% of respondents (506) who do not know the blueprint of NCE.

Conclusion

Online learning during the pandemic did not influence pharmacists' achievement of minimal competency in Indonesia. However, a student's GPA can be used as a predictor of the success of NCE-CBT. The input, process, and output of pharmacy education must be improved to reach a better GPA and this improvement must be started at the undergraduate level. The lecturers at the undergraduate level must translate the pharmacist competency level into the curriculum, then there will be a support system to gain minimal pharmacy competence in Indonesia.

Ethics statement: This study has been approved by Association of Indonesia of Pharmacy Higher education.

References

1. Lyons KM, Christopoulos A, Brock TP. Sustainable Pharmacy Education in the Time of COVID-19. Am J Pharm Educ. 2021;84(6):ajpe8088. doi:10.5688%2Fajpe8088

2. Sergeevna SM, Efimovna LE. Improving training of pharmaceutical specialists for consultation in pharmacy organizations using interactive forms of education. Pharmacophore. 2020;11(2):7-14.

3. Muflih S, Abuhammad S, Al-Azzam S, Alzoubi KH, Muflih M, Karasneh R. Online learning for undergraduate health professional education during COVID-19: Jordanian medical students' attitudes and perceptions. Heliyon. 2021;7(9):e08031. doi:10.1016/j.heliyon.2021.e08031

4. Attarabeen OF, Gresham-Dolbym C, Broedel-Zauggm K. Pharmacy student stress with the transition to online education during the COVID-19 pandemic. Curr Pharm Teach Learn. 2021;13(8):928-34. doi:10.1016/j.cptl.2021.06.011

5. Shahba AA, Alashban Z, Sales I, Sherif AY, Yusuf O. Development and Evaluation of Interactive Flipped e-Learning (iFEEL) for Pharmacy Students during the COVID-19 Pandemic. Int J Environ Res Public Health. 2022;19(7):3902. doi:10.3390/ijerph19073902

6. Paradis E, Zhao R, Kellar J, Thompson A. How are competency frameworks perceived and taught?: An exploratory study in the context of pharmacy education. Perspect Med Educ. 2017;7(3):200-6. doi:10.1007/s40037-018-0432-y

7. Taylor P, Maor D. COLLES [Internet]. A. Herrmann and M.M. Kulski (Eds), Flexible Futures in Tertiary Teaching. 2000. Available from: https://surveylearning.moodle.com/colles/

8. Wang R, Han J, Liu C, Xu H. How Do University Students' Perceptions of the Instructor's Role Influence Their Learning Outcomes and Satisfaction in Cloud-Based Virtual Classrooms During the COVID-19 Pandemic? Front Psychol. 2021;12:627443. doi:10.3389/fpsyg.2021.627443

9. Wang R, Han J, Liu C, Wang L. Relationship between medical students' perceived instructor role and their approaches to using online learning technologies in a cloud-based virtual classroom. BMC Med Educ. 2022;22(1):560. doi:10.1186/s12909-022-03604-3

10. Sthapornnanon N, Sakulbumrungsil R, Theeraroungchaisri A, Watcharadamrongkun S. Social constructivist learning environment in an online professional practice course. Am J Pharma Educ. 2009;73(1):10. doi:10.5688%2Faj730110

11. Pate KA, Pate AN, Sampognaro LA, Brady JH, Caldwell DJ. Design, implementation, and evaluation of an online elective course on current topics in pharmacy. Curr Pharm Teach Learn. 2017;9(4):528-36. doi:10.1016/j.cptl.2017.03.008

12. Vasli P, Shahsavari A, Estebsari F, AsadiParvar-Masouleh H. The predictors of nursing students' clinical competency in the pre-internship objective structured clinical examination: The roles of exam anxiety and academic success. Nurse Educ Today. 2021;107:105148. doi:10.1016/j.nedt.2021.105148

13. Park SK, Phillips J, Pavuluri N. Systematic Review of Predictors of Success for the North American Pharmacist Licensure Examination. Am J Pharm Educ. 2021;85(10):8591. doi:10.5688/ajpe8591

14. Williams JS, Spivey CA, Hagemann TM, Phelps SJ, Chisholm-Burns M. Impact of Pharmacy School Characteristics on NAPLEX First-time Pass Rates. Am J Pharm Educ. 2019;83(6):6875. doi:10.5688/ajpe6875