Development, Validation and Testing of Effectivity of Online Learning Questionnaire (KEPO) in Pharmacy Students of Public Universities in Central Java Province, Indonesia

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Development, Validation and Testing of Effectivity of Online Learning Questionnaire (KEPO) in Pharmacy Students of Public Universities in Central Java Province, Indonesia

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Abstract

Objectives: To develop a valid and reliable questionnaire for assessing effectiveness of online learning in pharmacy students, and to determine the effectiveness and differences of online learning in pharmacy students of three public universities in Central Java.

Methods: Development and validation of KEPO were consisting of identifying dimension, item development, preliminary pilot testing, then validation and reliability testing. The research on determining effectivity and differences was using descriptive analytic methods. KEPO was administered by Google form to pharmacy students in three public universities in Central Java Province. Data were analyzed descriptively to determine the effectivity score and category then tested using Kruskal Wallis test.

Results: Final questionnaire consists of 14 items using Likert-style scores. All items were valid (r>0,321) and reliable (cronbach alpha 0,805) tested in 40 respondents as pilot testing. Average effectivity score of online learning in 478 pharmacy students of three public universities in Central Java was (37,88 +/- SD 4,9). There were no significant differences of online learning effectivity among pharmacy students in Diponegoro University, Sebelas Maret University, and Jenderal Soedirman University (p>0,05).

Conclusions: KEPO is a valid and reliabel questionnaire used for assessing effectivity of online learning in pharmacy students.

Keywords: *online learning, effectivity questionnaire, KEPO, pharmacy students*

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INTRODUCTION

COVID-19 pandemic was making the Indonesian Ministry of Education released a goverment's appeal to shifting traditional learning into online learning (1). Not only schools but also universities followed the appeal. In Central Java Province known that three public universities which having pharmacy major also made policies for the implementation of online learning, they were Jenderal Soedirman University (UNSOED), Sebelas Maret University (UNS) and Diponegoro University (UNDIP). Online learning is defined as any teaching and/or learning activity where most or all of the content is delivered online (approx 80-100%) and typically has no face-to-face meetings (2). This method has a very big opportunity to be applied today because study found that access to computers and internets among students are high, and the utilization of information and communication technology in learning is also increased (3).

Some reviews from the researches have been found that online learning is as effective as traditional face to face meeting (4)(5). Supporting factors of online learning effectiveness identified by the previous study were online learning is time-saving, allowed self-paced learning, and could improving students' confidence level(6). Effectiveness of online learning can be measured by achievement of the benefits of this method i.e. improving access to education, improving quality of education, and decreasing the cost (2). In pharmacy education, online learning was commonly used for delivering various topics as a complementary method (7).

Various questionnaire were developed to assess motivation of students (8), acceptance (9), attitude and barriers of students in online learning (10). In some researches, effectivity of online learning was assessed by pre and or post test of content delivered, or retention test (11). Conducting more research in finding effectiveness of online learning is needed, especially focused in factors that have been observed having impact ini online learning effectiveness (4). In Indonesia, there was no questionnaire developed for assessing effectiveness of online learning in undergraduate pharmacy students yet. The aim of this study were To develop a valid and reliable questionnaire for assessing effectiveness of online learning in pharmacy students, and to determine the effectiveness and differences of online learning in pharmacy students of three public universities in Central Java.

METHODS

This study was using an observational analytic design that was conducted from March to August 2020. Questionnaire developing steps was done by literatur search and validation process. Validation process divided into 2 steps, i.e. content validation, construct validation, and reliability testing. Content validation were done by professional judgement panel consist of 5 lecturer in pharmacy and calculation of content validity ratio (CVR) (12,13). Quesionnaire item categoried as valid if the calculated CVR of the item is more than 0,99. Formula to calculate CVR was based on Lawse method as seen in Figure 1 (14). After the content of the questionnaire was valid, the questionnaire was testes its construct validity and reliability to 40 students of Apotechary program in UNSOED. Construct validity were done by calculating predictive validity using correlation analysis (15). Pearson product moment was used to test the item correlation, and the item which had r more than r table for Df=38 (0,312) stated to be valid. Reliability was tested using internal consistency method by Cronbach Alpha score. Questionnaire was stated to be reliable if the score is more than 0,7(16).

$$CVR = \frac{n_e - N_2}{N_2}$$

CVR = content validity ratio
N_e = number of panelis indicating "essential"
N_2 = ½ x total number of panelis

Figure 1. Formula of CVR

Testing of questionnaire was done by online survey to all pharmacy students in three public universities in Central Java Province i.e. UNSOED, UNS, and UNDIP. Total population of the study according to PDDIKTI was 913 students of undergraduate degree of pharmacy major in UNSOED, UNDIP, and UNS (447, 254, 212 respectively) (17) . Minimum sample size calculation was following sample size for cross sectional study as seen in Figure 2 (18), where Z score used was 1.96 and d was 0,05 (95%). Proportion score was calculated by comparing total students included in online learning at the even semester of 2019/2020 and the total active students from PDDIKTI data. The proportion was 0,7.Sampling technique using stratified random sampling, where was calculated by minimum sample per university must be taken, and they were 139, 111, and 71 for UNSOED, UNDIP, and UNS respectively.

$$n = \frac{Z^2 P(1-P)}{d^2}$$

Figure 2. Sample Size Formula

The questionnaire was distibuted into all students by Google Form platform during May to July 2020. All data from the form who met the inclusion criteria were taken into sample. The inclusion criteria were (a) active students of undergraduate degree in pharmacy major of UNS, UNSOED, or UNDIP; (b) undergo online learning in compulsory course; (c) agree to participate in the study by clicking YES in agreement section after reading informed consent in the google form link. Data analysis consist of effectiveness of online learning by descriptive analysis from the total score of the questionnaire, and difference of online learning effectivity among 3 universities using Kruskal Wallis test. The study protocol was approved by Research Ethic Committee of Faculty of Health Sciences UNSOED in ethic approval No.092/EC/KEPK/V/2020.

RESULTS

DEVELOPING KEPO INSTRUMENT

The development of KEPO questionnaire consisty of 3 steps, i.e. (1) identifying dimensions; (2) developing items and format; and (3) determining the score. The process of identifying dimensions was done by reviewing the literatures, and the dimension used for evaluating effectiveness was based on the three keys benefits of online learning as stated in "The Efficacy (and Inevitability) of Online Learning in Higher Education" by Rickard (2) which were access, quality, and cost. Every dimension then breakdowned into items by reviewing literatures. Dimension of access were developed into 3 items based on three indicators of reaction and fungsion of online learning effectivity by Salter et.al (19) which were time, easy of use, and technology. The dimension of quality was developed into 5 items based on indicator of reaction and benefit of online learning by Salter et.al (19) which were knowledge, confidence, flexibility, interest, and availability of online discussion. The dimension of cost was developed into 3 items based on barriers of online learning by Childs et.al (20) which were hardware, software, and internet access.

After item development process, the items were developed into sentences and reviewed by the review panel. In this review found that the item technology in the dimension of access was need to be specified. The item then was breakdowned into 4 items based on supporting technology in online learning by Gamage et.al (21) which were hardware support, software support, media of delivery, and mode of delivery. This panel also determined the type of the sentences uses, positive or negative. All the items in dimension of access and quality were developed into positive sentences, while items in dimension of cost were developed into negative sentences. This was to uniform the answers in the scoring process after. The question then sorted based on items topics and made into a sequence of 14 questions. Final questionnaire of KEPO was delivered in Bahasa Indonesia as seen in Table 1.

Table 1. KEPO questionnaire

Dimension	Items	Questions (English Translation)	Question in Bahasa Indonesia	Number of Question
Access	Time	Online learning is carried out in effective time	Pembelajaran online dilakukan pada waktu yang efektif	1
	Easy of use	Online learning is easy to do everywhere, including location where i stay	Pembelajaran online mudah dilakukan dimana saja (termasuk lokasi yang saya tinggali)	3
	Technologi (hardware support)	Online learning allows me to use tools that I already had (handphone, laptop, PC)	Pembelajaran online memungkinkan saya menggunakan peralatan yang sudah saya miliki sebelumnya (HP, laptop, PC)	5
	Technology (software support)	Online learning using software and applications that are easily available	Pembelajaran online menggunakan software dan aplikasi yang mudah didapatkan	7
	Technology (media of delivery)	I am familiar with the online learning media used	Saya familiar dengan media pembelajaran online yang digunakan	9
	Technology (mode of delivery)	The online learning model used is effective for studying lecture material	Model pembelajaran online yang digunakan efektif untuk mempelajari materi perkuliahan	11
Quality	Knowledge	I get the maximum knowledge from the online learning process	Saya mendapatkan pengetahuan yang maksimal dari proses pembelajaran online	10
	Confidence	I am more confident to be involved (ask, discuss) in learning if it is carried out online	Saya lebih percaya diri untuk terlibat (bertanya, berdiskusi) dalam pembelajaran jika dilaksanakan secara online	12
	Flexibility	Online learning allows me to flexibly manage my learning time	Pembelajaran online memungkinkan saya mengatur waktu pembelajaran secara fleksibel	2
	Interest	Online learning increased my interest in lecture materials	Pembelajaran online meningkatkan ketertarikan saya terhadap materi perkuliahan	13
	Avalailability of online discussion	There is always a discussion room/time with the lecturer for every online class I participate in	Selalu tersedia ruang diskusi dengan dosen untuk setiap kelas online yang saya ikuti	14
Cost	Hardware	The additional cost that I spend to buy the equipment (hardware) used in online learning is burdensome for me	Biaya tambahan yang saya keluarkan untuk membeli peralatan (*hardware)* yang digunakan dalam pembelajaran online memberatkan bagi saya	6
	software	The extra costs I spend on buying software (licenses, applications, etc.) used in online learning are burdensome for me	Biaya tambahan yang saya keluarkan untuk membeli software (lisensi, aplikasi, dll) yang digunakan dalam pembelajaran online memberatkan bagi saya	8
	Internet access	The costs that I pay to access the internet are burdensome for me	Biaya yang saya keluarkan untuk mengakses internet memberatkan bagi saya	4

Scoring process of the questionnaire was done by discussion of review panel. The questionnaire then using likert-style score consist of answer Strongly Agree (score 3), Agree (score 2), Disagree (score 1), Strongly Disagree (score 0). This 4 scale used for preventing respondents choose the neutral answer, which usually make a questionnaire hardly measure the real effectiveness. Form total 14 questions the total score is 42, and then the total score was calculated its interval to determine the interpretation of effectiveness. Final interpretation of effectiveness of online learning measured by KEPO questionnaire are strongly effective (score 29-42), fairly effective (14-28), and less effective (0-13).

VALIDATION AND RELIABILITY TESTING OF KEPO QUESTIONNAIRE

Validation process of KEPO were divided into 2 steps, they were content validity and construct validity. From the initial questionnaire consist of 11 items, one item is deleted because the CVR less than 1, and changed into 4 items. Final questionnaire consist of 14 items were all having CVR 1. This means that all items in final questionnaire were fulfilled cosntent validity requirement. Construct validity and reliability were tested in 40 respondents. Item

correlation resulted in r of the items were ranged from 0,316 to 0,711, and all the items were categorized as valid because above the r table of 40 respondents (df 38) which was 0,312 (95% CI, 2 tailed). Cronbach alpha score of the questionnaire was 0,805, and it means that the questionnaire is reliable.

EFFECTIVENESS OF ONLINE LEARNING IN PHARMACY OF PUBLIC UNIVERSITIES IN CENTRAL JAVA

From 484 data collected in google form, 6 of them were excluded because the respondents disagree to participate in the study, so the final samples were 478 students. Characteristics of samples is shown in Table 2. Distribution of sample age was almost evenly among adolescent and adult. The average age of students was 19,58 years old, with the range of age vary from 17 years old to 25 years old. The majority of students in pharmacy is women. Distribution of university origin from the samples were matched to calculation of stratified sampling technique used, which UNSOED having the largest proportion and UNS having the least proportion. Most of samples were entering the university in year of academic of 2017 until 2019. Some samples with year of academic 2016 or less showed that the students were taking repeat course in compulsory subject.

Table 2. Characteristics of Samples

Characteristics	Total (n = 478)	Percentage
Age		
Adolescent (≤ 19th)	248	51,88%
Adult (> 19 th)	230	48,12%
Gender		
Women	419	87,66%
Men	59	12,34%
University Origin		
UNSOED	175	36,61%
UNDIP	167	34,94%
UNS	136	28,45%
Year of Entry		
2019	215	44,98%
2018	101	21,13%
2017	129	26,99%
2016	29	6,07%
<2016	4	0,83%

Media and methods used in online learning also asked in the characteristic section in the questionnaire. This data will show which media and methods have been used by students and which media and methods are considered the most effective. Based on students experience, the most effective media were moodle and microsoft teams, while the most offective media of learning were powerpint with audio recorded and video conference. Complete data of media and methods were shown in Table 3 and Table 4.

Table 3. Platform Media Used and Effectiveness in Online Learning of Samples

Platform Media	Students' Experience number and percentage	Effectiveness (students' preferences) number and percentage
Moodle	430 (90%)	168 (35%)
Whatsapp Group	352 (74%)	38 (8%)
Zoom	287 (60%)	2 (0%)
Google Classroom	257 (54%)	9 (2%)
Google Meeting	247 (52%)	76 (16%)
Youtube	233 (49%)	61 (13%)
Facebook group	130 (27%)	3 (1%)
Microsoft teams	126 (26%)	119 (25%)
Spotify	15 (3%)	1 (0%)
Others (Skype, edmondo, telegram)	14 (3%)	1 (0%)

Table 4. Methods Used for Delivering Course and Effectiveness in Online Learning of Samples

Methods Used for Delivering Course	Students' Experience number and percentage	Effectiveness (students' preferences) number and percentage
Discussion chat in social media platform	452 (95%)	11 (2%)
Video conference	378 (79%)	152 (32%)
Powerpoint slide	377 (79%)	2 (0%)
Voice notes	362 (76%)	12 (3%)
Video	341 (71%)	56 (12%)
Powerpoint with audio recorded	340 (71%)	219 (46%)
Lecture material chat in social media platform	289 (60%)	21 (4%)
Paper published/references	194 (41%)	0 (0%)
Pictures/infographic	136 (28%)	0 (0%)
Podcast	133 (28%)	4 (1%)
Books	77 (16%)	0 (0%)

Effectiveness of online learning measured using KEPO resulted in average score of 37,88 which was categorized as strongly effective. Average score per items were vary from 1,9 (question 4) to 3,5 (question 5). Average score per dimension were 2,96 for dimension of access, 2,54 for dimension of quality, and 2,47 for dimension of cost. Distribution of effectiveness is shown in table 5.

Table 5. Distribution of effectiveness of online learning response

Category of Effectiveness	Number of samples and percentage	Average score
Strongly effective	467 (97,69%)	38,17
Fairly effective	11 (2,31%)	25,36

Effectiveness of online learning in pharmacy also tested its differences between universities. After scores grouped into university of origin, they were tested their normality using kolmogorov-smirnov test. The result showed that the data of UNS group was not distributed normally, so the test used for differensial statistic test was Kruskal Wallis. From the test resulted p score 0,361 or p>0,05. It means that there was no significant differences of effectivity score between universities.

DISCUSSION

Developing a questionnaire is consists of many stages. One of the most critical stage is to identify the dimension, because many constructs are multidimensional or composed of several related components (22). The dimension used in this study was based on online learning benefits, i.e. access, quality, and cost (19). Item development after selecting dimension was consisting of generating sentences, determining sequences, and type of sentences. The type of question, language used and order of items may cause bias response. A mixture of positively and negatively sentences may minimize the danger of acquiescent response bias (23). The use of Likert scale in the scoring system was because this scale is widely used in psychometrics especially in social sciences and educational research. Symmetric Likert scale, no neutrality choice between two extremes choices, provides independence to participants to choose any response in a balanced and symmetric way in either direction (24).

Validating and reliability testing of a questionnaire are important steps in designing a questionnaire. A valid questionnaire will determine whether the aim of measuring the question has achieved or not. While reliability will show that repeated tests will having the same probability of results or consistency (25). Content validity refers to the extent to which a tool represents all aspects of a given social concept, and can be measured by expert judgment. While construct validity refers to the extent to which a new questionnaire conforms to existing ideas or hypotheses

concerning the concepts or constructs that are being measured (26). Reliability testing can be implemented in two ways, test-retest, and internal consistency. The internal consistency test for assessing reliability can be done by one measurement because this test using statistical estimation, Cronbach alpha, to know how well the items that reflect the same construct yield similar results (27).

The use of online learning in undergraduate study of pharmacy majors was known to be higher than other degrees (7). Moodle is one of the learning platforms that mostly used in this study (90%). Moodle also has been implemented in many universities in another country because having various possibilities for implementing asynchronous e-learning web-based modules (8). This media also can be used synchronously using video conferencing support (28). Moodle found to be a great way for teachers or tutors to monitor the achievements of students in courses (28,29). In this study, WhatsApp, zoom, and google classroom/meeting also being a popular students' experience media used in online learning (50-70%). This is along with another study in Surabaya, East Java-Indonesia, which showed that zoom and WhatsApp were being a media of choice for online learning (30). Powerpoint with audio (recorded narrative in slides) was the most effective method in online learning by students' perspective (46%). Powerpoint in traditional face-to-face teaching is one of the proven effective and easy methods to increase interactivity in class and to transfer lecture-style into the student-centered classrooms (31). Incorporating multimedia such as audio and video in PowerPoint can increase student performance in class engagement and overall course grade in learning outcome compared to video-only (32). Students found to be better grasping the content if the materials of the course can be read while watching and listening to lecturer (33). Besides PowerPoint with audio, students' experience of learning methods in online learning was varied, from texts, chats, video conferences, video, slides, to textbooks. Texts, videos, and discussion forums were the top three methods used for online learning in pharmacy (7).

Online learning is well known as flexible and having wide availability of course and content. But some students may have technical difficulties related to access to technology and digital service, and time management (34). In this study, we found that dimension of cost, particularly item 4 about internet cost was being the uneffective item in online learning. In Central Java province the accessibility of the internet is categorized as average compared to all provinces in Indonesia (35), but the disparities of internet access of students may still happen if students doing online learning from outside Central Java province. Internet costs may be a challenge to be solved as this may affect the acceptability of online courses in Indonesia (36). In contrast to internet cost, the dimension of access especially in question 5 about technology (hardware) support was being the most effective item in online learning. Many students have already had PC, laptops or handphones which could be used in the online learning method. This finding is along to another study in Surakarta, Central Java, where almost all students having hardware support (48,4% cellular phone, 11,6% PC/tablet/laptop, 33,1% all devices) to access the internet (37).

Most of the published papers on online learning in pharmacy were from the USA, and some of them were from Europe, New Zealand, Australia, Canada and South Africa (7). In the southeast asia region, one of the published papers about the effectiveness of online learning in pharmacy was found in Malaysia. The majority (90%) of students in Malaysia agree that online learning in Pharmacy could improve their understanding of new topics. The benefits of online learning were time-saving, allowed self-paced learning, and could improve students' confidence level (6). Some universities in Indonesia have been equipped with an online learning management system (38), and UNS, UNSOED, UNDIP were using the same media, moodle, to built an online learning system for students. The effectiveness of online learning between these three universities in Central Java was not different, which means that there is no gap between online learning in the pharmacy of universities in Central Java province.

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