湖南大学学报（自然科学版）
Journal of Hunan University (Natural Sciences)

第 49 卷 第 12 期
2022 年 12 月

Available online at http://jonuns.com/index.php/journal/index

Vol. 49 No. 12
December 2022

Open Access Article

https://doi.org/10.55463/issn.1674-2974.49.12.16

Development of a Blended Learning Model Based on Case Based Learning

Eko Risdianto[1]*, Afrizal Mayub[2]

[1] Physics Education Study Program FKIP, Bengkulu University, Indonesia

[2] Graduate School of Science Education, University of Bengkulu, Indonesia

* Corresponding author: eko_risdianto@unib.ac.id

Received: August 17, 2022 / Revised: October 20, 2022 / Accepted: November 19, 2022 / Published: December 30, 2022

Abstract: This research aims to develop a case-based learning (CBL) blended learning model assisted by Massive Open Online Courses (MOOCs) for the implementation of the Free Learning-Free Campus (MBKM) curriculum in tertiary institutions. The research method used is joint research that combines qualitative and quantitative studies. The research was conducted at Bengkulu University for limited trials and several partner campuses, such as the State Institute of Islamic Religion (IAIN) Curup and Palembang Aviation Polytechnic, for broad trials. The study results show that the learning model suitable for applying the CBL method in higher education is the CBL-based blended learning model using MOOCs. The design of the Blended Learning model based on CBL includes the design of the Learning Model starting with learning objectives, subject matter, learning activities, media resources, and tools and assessment. The learning activities consist of an introduction, core learning, and closing. Core Activities use MOOCs to assist the online learning process (Blended). A Blended Learning model based on CBL using the MOOCs system has been developed and can already apply in the blended learning process in tertiary institutions in implementing and implementing the MBKM curriculum. Implementation of the model developed in trials at the University of Bengkulu, and partner (IAIN Curup Mathematics, Physics and Informatics Study Program), Palembang Aviation Polytechnic (field testing will be in October-November). The novelty of this research is the use of MOOCs as a medium for implementing blended learning models. Besides, CBL applies in the implementation of learning with a blended learning model.

Keywords: blended learning, case-based learning, Massive Open Online Courses, MBKM curriculum.

基於案例學習的混合學習模型的開發

摘要：本研究旨在開發一種由大規模開放在線課程輔助的基於案例的學習混合學習模型，以在大專院校實施免費學習自由校園課程。採用的研究方法是定性和定量研究相結合的聯合研究。 該研究在明古魯大學進行有限試驗，並在伊斯蘭宗教研究所杯子 和巨港航空理工學院等幾個合作校區進行廣泛試驗。研究結果表明，適合在高等教育中應用基於案例的學習方法的學習模式是基於基於案例的學習的海量開放在線課程秒混合學習模式。基於基於案例的學習的混合式學習模型設計包括從學習目標、主題、學習活動、媒體資源、工具和評估入手的學習模型設計。學習活動包括介紹、核心學習和結束。核心活動使用海量開放在線課程來協

助在線學習過程（混合）。基於基於案例的學習使用海量開放在線課程系統的混合學習模型已經開發出來，並且已經可以應用於大專院校實施和實施自由學習自由校園米課程的混合學習過程。在明古魯大學和合作夥伴（國家伊斯蘭宗教研究所杯子 數學、物理和信息學研究計劃）、巨港航空理工學院（實地測試將在 10 月至 11 月進行）實施試驗開發的模型。這項研究的新穎之處在於使用海量開放在線課程作為實施混合學習模型的媒介。此外，基於案例的學習適用於混合學習模型的學習實施。

关键词：混合式學習、基於案例的學習、海量开放在线课程、自由學習自由校園 課程。

1. Introduction

The Ministry of Education and Culture's policy regarding the implementation of Free Learning-Free Campus (MBKM) has now been implemented nationally at the tertiary level [1]. Note that the key to successful implementation of the MBKM policy in a tertiary institution is having the courage to change the mindset from a rigid content-based curriculum approach to an adaptive and flexible learning achievement-based curriculum to prepare students to become adults who can be independent [2].

In improving the quality of students to become adults who can be independent, education should make changes in learning that are suitable for the current situation, namely, student-centered learning. Student Centered Learning (SCL) can encourage students to develop their creativity and ability to learn independently. SCL learning that can be used to develop students' creativity, motivation, and knowledge skills in problem solving is the Case-Based Learning (CBL) method or the term currently used is the Case Method. However, the problem is that currently the teaching staff cannot implement it because they do not know how to apply the right blended learning model, how to implement it in the CBL method,

A media or online learning systems that can be used for application of the blended learning model with the CBL approach is MOOCs. MOOC (Massive Open Online Course) is an online learning systems with open registration that allow it to be accessed not only by students within the university itself but can be accessed widely [3–6]. This allows MOOCs to be applied in implementing online learning, especially in implementing the MBKM curriculum, which allows students from outside Bengkulu University to take courses. Several leading universities both inside and outside are currently using MOOCs as an alternative to online learning besides the conventional learning they do. Some examples of MOOCs in Indonesia include Indonesia X, skill academy, and several MOOCs at the University of Indonesia such as UI MOOCs (https://idols.ui.ac.id/).

Based on the results of an analysis of student needs conducted at the Physics Education Study Program at the University of Bengkulu, it is known that students need the right learning model and they state that the modelthe right learning at this time is done in a mixed way (online and offline). Online learning provides an opportunity for them to be able to learn more flexibly (anytime and anywhere). Unlike them, more than 18% of the IAIN Curup students disagree.

The right learning at this time is done in a mixed way (online and offline). Then there are more than 25% of IAIN Curup students who also disagree with the statement that online learning provides an opportunity for them to be able to learn more flexibly (anytime and anywhere).Then, the results of research on the needs of Palembang Poltekbang students showed that cadets needed a blended learning model based on MOOCs to improve their writing skills in the English Aviation course and Palembang Polytechnic students also agreed to develop the Introduction to Safety Management System learning through MOOCs to improve the mastery of aviation safety concepts.

Based on the above background, it is necessary to develop a CBL blended learning model assisted by MOOCs for the implementation of the MBKM curriculum in tertiary institutions.

2. Literature Review

2.1. Blended Learning

Blended learning (BL), or the integration of face-to-face and online instruction, is widely adopted in higher education, with some scholars calling it the "new traditional model" or the "new normal" in course delivery [7]. In this model, a lecturer can teach several sessions first in class. After students get an overview of the course, they can proceed to online learning and interaction [8]. Learning with Blended Learning provides a wider space for students to explore their abilities and independence, which so far has been centered on learning activities in the classroom [9]. Blended Learning is designed to provide learning opportunities facilitated by the internet and digital media that can present with teachers and students. In this case, digital media such as zoom, Google Meet, etc. can accommodate the presence of lecturers and

students. Thus, in distance learning, it is also possible to perform blended learning [10].

2.2. Case-Based Learning (CBL)

There is no definite definition for CBL [11]. CBL combines constructivist perspectives and experiential, professional skills that develop from such theories, such as problem solving, clinical reasoning, and knowledge transfer [12]. CBL allows students to feel more connected to reality [13]. [14] wrote that CBL can be performed through videos and approaches that use CBL with videos have been shown to foster professional vision. CBL is an effective and interesting learning approach. CBL can involve students to be active and creative in discussions about real life events. In CBL, learning scenarios or case studies are used to develop students' reasoning knowledge and skills in solving problems [15].

2.3. MOOCs

MOOC is one of the newest innovations in education and is growing rapidly. Here, through MOOC, we can expand our knowledge or learn easily because MOOC is a space for online learning, anytime and anywhere [16]–[18]. MOOCs are present online with the aim of large-scale interactive participation and open access via the websites [19–21]. In addition to traditional course materials such as videos, readings, and problem sets, MOOCs provide interactive user boards, quizzes that help form a community for students, professors, and assistants to discuss online learning content via the Internet with virtually anyone who wants to take free courses without charge and attendance limit [22–24]. Enhanced technology has led learners to participate in massive open online courses (MOOCs) through online education platforms without attending traditional face-to-face classrooms [25–27].

2.4. Merdeka Belajar Kampus Merdeka Curriculum (MBKM)

The Merdeka Belajar Kampus Merdeka Curriculum (MBKM) is a policy of the Minister of Education and Culture which is applied to higher education to improve the quality of learning and graduates [28]. MBKM is an advanced design of the implementation of a study program curriculum based on the Indonesian National Qualifications Framework (KKNI) which is oriented toward the completeness of learning competency outcomes, including elements of attitudes/values, knowledge, general skills, and specific skills [29]. The MBKM program is expected to be able to stimulate students or lecturers to have different experiences so that they can broaden their horizons, network, and character excellence [30]. It can also be said that the MBKM curriculum policy is an effort to encourage students to master various knowledge that is useful for entering the world of work or industry in the 21st century and Society 5.0 [31].

3. Research Method

This research is a type of R&D. This type of R&D is often called Research and Development (R&D). According to Borg and Gall R&D in the field of education is an industry-based development model in which the findings of the research results are used to design learning products, which are then systematically tested in the field, evaluated, and refined until a learning product meets certain standards is produced, namely effective, efficient and quality. The design of the development model in this study will use the ADDIE (Analysis, Design, Develop, Implementation, and Evaluation) steps. Data collection techniques used included non-test and test techniques. Data analysis techniques used qualitative and quantitative data analysis techniques.

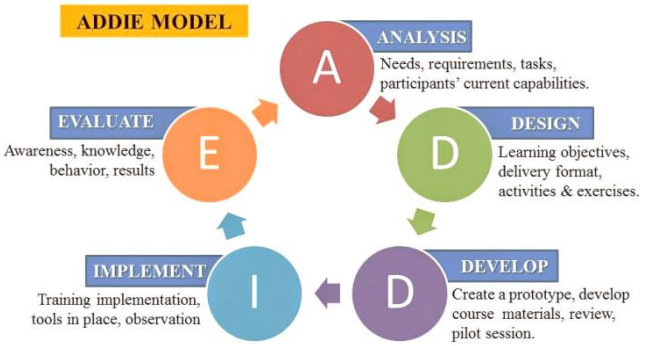

Fig. 1 ADDIE development model (https://grafispaten.wordpress.com/)

This research was conducted at Bengkulu University for limited trials and several partner campuses such as IAIN Curup and Palembang Aviation Polytechnic for wide trials.

Table 1 Unib performance targets regarding partner cooperation (UNIB performance targets, 2022)

Code	Strategic objec-tives/targets/performance indicators	2021 achievements	2022 targets
IKSS 4.1.1	Improved service and cooperation		
	Cooperation with partners		
	Percentage of diploma and undergraduate study programs (faculty)	53	100
	Number of cooperation agreements (PKS) (all work units)	408	428
IKSS 4.1.2	Service satisfaction level (all work units)		
	Percentage level of satisfaction scale 4	3.25	3.3

4. Results

4.1. Analysis

In the analysis phase, data were collected regarding the needs of Bengkulu University students, Curup IAIN students, and Palembang Polytechnic students for developing CBL-based blended learning models

assisted by MOOCs for implementing the MBKM curriculum in tertiary institutions.

The following is the result of filling out the questionnaire by Physics Education students at the University of Bengkulu.

Table 2 Results of filling out questionnaire sheets by physics education students at the University of Bengkulu (Developed by the authors)

Aspect	Item No.	Number of respondents (%)			
		SS	S	TS	STS
MBKM Curriculum	1	40	56.3	3.8	0
	2	63.7	35	1.3	0
	3	42.5	52.5	5	0
Facilities and infrastructure	1	17.5	75	7.5	0
	2	18.8	71.3	10	0
	3	10	48.8	40	1.3
	4	16.3	61.3	22.5	0
	5	57.5	40	2.5	0
	6	38.8	58.8	2.5	0
	7	25	52.5	21.3	1.13
Learning process	1	30	48.8	21.3	0
	2	35	56.3	8.8	0
	3	32.5	57.5	8.8	1.3
	4	31.3	67.5	1.3	0
	5	50	46.3	3.8	0
	6	56.3	41.3	2.5	0
	7	48.8	43.8	7.5	0
Evaluation	1	50	46.3	3.8	0
	2	43.8	46.3	8.8	1.3
	3	46.3	47.5	6.3	0
	4	47.5	51.2	1.3	0
	5	57.5	40	2.5	0

The following is the result of filling out the questionnaire by IAIN Curup students.

Table 3 Results of filling out questionnaire sheets by IAIN Curup students (Developed by the authors)

Aspect	Item No	Number of respondents (%)			
		SS	S	TS	STS
MBKM Curriculum	1	23.3	44.2	20.9	11.6
	2	37.2	53.5	7	2.3
	3	34.9	58.1	4.7	2.3
Facilities and infrastructure	1	18.6	60.5	18.6	2.3
	2	14	69.8	14	2.3
	3	20.9	37.2	25.6	16.3
	4	14	41.9	32.6	11.6
	5	62.8	34.9	2.3	0
	6	51.2	44.2	2.3	2.3
	7	27.9	44.2	20.9	7
Learning process	1	32.6	46.5	18.6	2.3
	2	27.9	46.5	25.6	0
	3	34.9	44.2	18.6	2.3
	4	34.9	60.5	4.7	0
	5	46.5	51.2	2.3	0
	6	51.2	41.9	4.7	2.3
	7	44.2	51.2	0	4.7
	8	30.2	55.8	11.6	2.3
	9	60.5	34.9	2.3	2.3
Evaluation	1	55.8	41.9	0	2.3
	2	32.6	44.2	23.3	0
	3	46.5	46.5	4.7	2.3
	4	48.8	48.8	2.3	0
	5	67.4	30.2	0	2.3

The following is the result of filling out the questionnaire by Palembang Poltekbang Cadets who took the Aviation English course.

Table 4 Results of filling in the needs questionnaire by Palembang Poltekbang cadets who take the English Aviation course (Developed by the authors)

Item Number	Number of respondents (%)			
	Strongly agree	Agree	Don't agree	Strongly disagree
1.	69.20%	28.20%	1.70%	0.90%
2.	70.10%	29.10%	0.90%	
3.	77.80%	21.40%	0.90%	
4.	74.40%	24.80%	0.90%	
5.	71.80%	27.40%	0.90%	
6.	68.40%	30.80%	0.90%	
7.	70.10%	28.20%	1.70%	
8.	69.20%	29.90%	0.90%	
9.	72.60%	26.50%	0.90%	
10.	70.90%	28.20%	0.90%	
11.	70.10%	27.40%	2.60%	
12.	68.40%	29.10%	2.60%	
13.	69.20%	25.60%	3.40%	1.70%
14.	71.80%	26.50%	0.90%	0.90%
15.	71.80%	27.40%	0.90%	
16.	71.80%	27.40%	0.90%	
17.	76.10%	23.10%	0.90%	

The following is the result of filling out the questionnaire by Palembang Poltekbang Cadets who took the Safety Management System course. Fig. 2 shows the percentage of answers for each item.

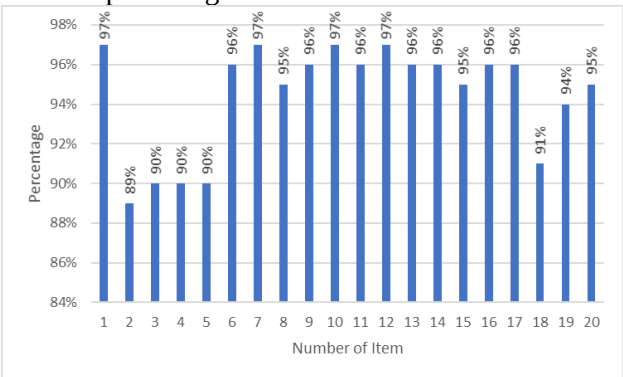

Fig. 2 Percentage of questionnaire filling results by Palembang Poltekbang cadets taking the safety management system course (Developed by the authors)

From the graph above, it can be seen that all items get a percentage from the lowest 89% and the highest 97%. So, all items are in the range of 76-100%, which means they are in the strongly agree category.

4.2. Design

The following is a draft design for developing a CBL-based blended learning model using MOOCs. Learning Model Design begins with learning objectives, subject matter, learning activities, media sources and tools and assessment. The learning activities consist of introduction, core learning and closing.

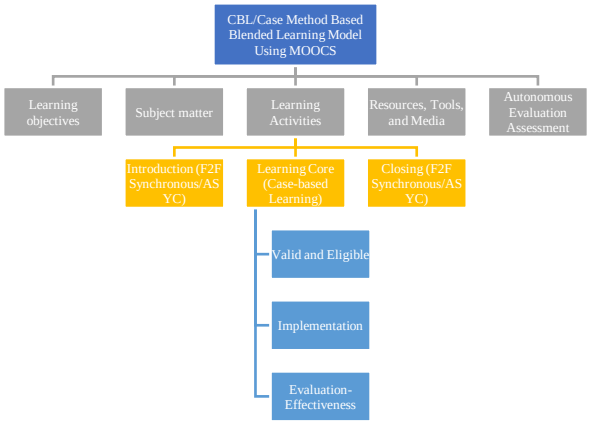

Fig. 1 CBL-based blended learning model design using MOOCs (Developed by the authors)

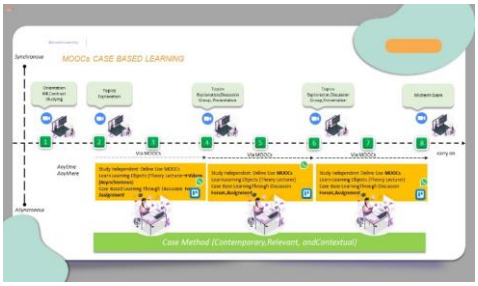

Fig. 2 MOOCs learning design (Developed by the authors)

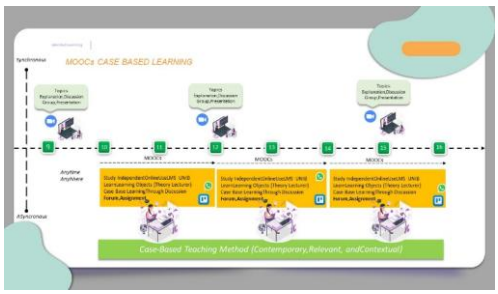

Fig. 3 MOOCs learning design (Developed by the authors)

4.3. Development

The following is the result of the development of the MOOCs system that was created and can be accessed via the link http://moocs.unib.ac.id. The MOOCs system is also an output that can support the achievement of KPI in tertiary institutions.

Fig. 6 MOOC development results (Developed by the authors)

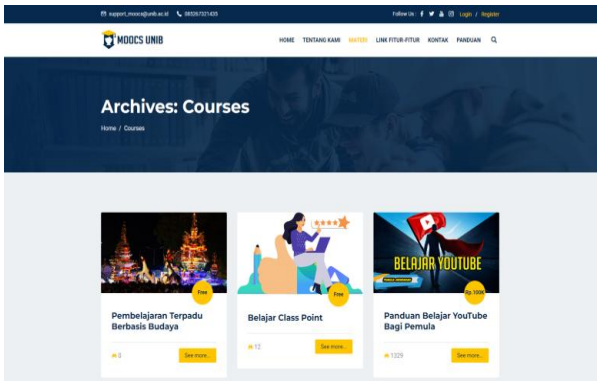

Fig. 7 MOOC development results (Developed by the authors)

Fig. 8 MOOC development results (Developed by the authors)

4.4. Implementation

At the implementation stage, a test was conducted with the aim of determining the effectiveness of MOOCs-based online training to improve the cognitive abilities of Palembang Poltekbang cadets on safety management system material. Tests on safety management system material are given to cadets at the beginning of the meeting (pretest) and at the end of the meeting (posttest). The results of the pretest and posttest were analyzed using the N-Gain Score and the Paired Sample T-Test. The following is a table of N-Gain calculation results (Table 5).

Table 5 N-Gain calculation results (Developed by the authors)

	N	Minimum	Maximum	Means
N Gains	69	0.00	1.00	0.9492
N Gain, %	69	0.00	100.00	949.247

Then, a different test was carried out on the pretest and posttest values by conducting the Paired Sample T-Test. The following are the results of the Paired Sample T-Test (Table 6).

Table 6 Paired sample T-test results (Developed by the authors)

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	SD	Std. error means	95% confidence interval of the difference Lower	Upper			
Pair 1	Pretest – Posttest	-36.854	29.333	3.109	-43.033	-30.675	-11.853	88	0.000

Additionally, at this stage, an analysis of lecturers' responses was also carried out on the application of interactive and innovative learning patterns through the PJBL/CBL method assisted by TPACK (trello)-based media to increase engagement in online learning activities. The following are the results of filling out the lecturer's response questionnaire (Table 7).

Table 7 Results of filling out questionnaires by lecturers (Developed by the authors)

Item No.	Number of respondents (%)			
	SS	S	TS	STS
1	84.6	13.5	1.9	
2	92.3	5.8	1.9	
3	88.5	9.6	1.9	
4	86.5	13.5		
5	92.3	7.7		
6	86.5	11.5		1.9
7	88.5	11.5		
8	90.4	7.7	1.9	
9	78.8	15.4	3.8	1.9
10	88.5	7.7	3.8	
11	90.4	7.7	1.9	
12	90.4	9.6		
13	82.7	17.3		
14	92.3	7.7		
15	86.5	9.6	3.8	
16	84.6	15.4		
17	92.3	7.7		
18	90.4	7.7		1.9
19	92.3	7.7		
20	86.5	11.5	1.9	
21	88.5	9.6	1.9	
22	88.5	11.5		
23	84.6	15.4		
24	78.8	21.2		
25	88.5	11.5		
26	82.7	17.3		
27	86.5	13.5		
28	90.4	7.7		1.9

4.5. Evaluation

At the evaluation stage, the researcher asked the training participants to fill out a response sheet to find the training participants' responses to the old learning methods and learning methods of MOOCs-Based Safety Management System. The results can be seen in Table 8.

Table 8 Comparison of old learning methods with MOOCs-based SMS learning methods (Developed by the authors)

Prior learning methods, %	Aspects	MOOCs based SMS learning methods, %
71	Learning innovation	86
65	Technology usage	87
69	Creativity	85
70	Cognitive ability	80
71	Learning outcomes	85

Based on the comparison table above, it can be seen that effectiveness MOOCs based SMS learning method higher than the previous learning method. The average effectiveness of the previous learning method = 69% and MOOCs based SMS learning method = 85%.

To prove the significance of the difference MOOCs based SMS learning method and previous learning methods must be tested statistically with a correlated (related) t-test.

Table 9 Paired sample statistics (Developed by the authors)

		Means	N	Std. Deviation	Std. Error Means
Pair 1	Old method	138.571	105	.97496	.09515
	New method	169.619	105	136.525	.13324

Table 10 Paired samples correlations (Developed by the authors)

		N	Correlation	Sig.
Pair 1	Old method & New method	105	003	.975

Table 11 Paired samples test (Developed by the authors)

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	SD	Std. error Means	95% confidence interval of the difference				
					Lower	Upper			
Pair 1	Old method - New method	-10.476	167.518	.16348	-342.895	-278.057	-18.992	104	0.000

From Table 11, it can be seen that the t-value = -18.992. To make a decision, whether the difference is significant or not, the t-count value is compared to the t-table with dk n-2 = 103. For the one-sided test with an error rate of 5%, the t-table value = 1.65978. That is, the t-count value falls on the acceptance area of Ha, then, Ha states that MOOCs based SMS learning method better than previous learning methods received.

5. Discussion

5.1. Analysis

Bengkulu University has implemented the MBKM Curriculum and Bengkulu University students or more precisely, students from the Physics Education Study Program already know a lot about implementing this MBKM in Higher Education. Many of the MBKM implementation programs provided by the government are to improve the quality and quality of graduates in tertiary institutions. According to the students, the implementation of MBKM also has more positive sides than negative sides.

In terms of facilities and infrastructure, Bengkulu University already has comfortable enough facilities for learning and learning classrooms already have ideal conditions for the teaching and learning process to be carried out. But unfortunately, as many as 40% of

students who filled out the questionnaire felt that the study room in their class did not yet have adequate internet connectivity, and 22.5% of students also said that the internet provider they used when internet facilities in class were less supportive also did not work well in their class. However, there are still as many as 77.6% of students still feel that the internet provider they use works well in class.

Not much different from Bengkulu University, in terms of facilities and infrastructure, 41.9% of IAIN Curup students answered that classrooms do not yet have adequate internet connectivity and 44.2% of students said that the internet provider they used did not work well in class. Even so, the largest percentage of students still stated that the study room in class already had adequate internet connectivity and the internet provider they used could work well in class.

Bengkulu University Physics Education students already use laptop/computer devices and gadgets to make it easier for them to access learning resources; they also use electronic devices more than print devices learning resources. However, even though learning resources are now easily available and accessible via their gadgets, as many as 21.3% of respondents said that their frequency of going to the library is still high.

In terms of the learning process, Bengkulu University students stated that right learning at this time is done in a mixed manner (online and offline). Online learning provides an opportunity for them to be able to learn more flexibly (anytime and anywhere). Assignments and projects provided by lecturers are easier and more efficient if the processing and collection are done online. Unlike Bengkulu University students, more than 18% of IAIN Curup students disagree that the right learning at this time is done in a mixed manner (online and offline). Then there are more than 25% of IAIN Curup students who also disagree with the statement that online learning provides an opportunity for them to be able to learn more flexibly (anytime and anywhere). Likewise, with regard to assignments and projects given by lecturers, more than 18% of respondents from IAIN Curup did not agree that projects given by lecturers were easier and more efficient if the work and submission were done online. However, they have the same answer as students from Bengkulu University, namely, agreeing that lecturers who give assignments, projects and problems based on factual conditions (which occur in everyday life) can add value to their knowledge and skills.

As generation Z (a generation that is more in touch with digital things), using technology-based devices has become commonplace for students so they want varied, interactive and innovative learning methods in every lesson they take part in. They admit that they perceive visual/video-based material faster than reading or text-based.

In terms of evaluation, students from Bengkulu University and IAIN Curuplike assignments that can be immediately given feedback or immediately know the results of the assessment and they are happy if the results of their assignments are shared. Bengkulu University students also like tests conducted online compared to manually conducted (offline). However, for IAIN students, there were as many as 23.3% of respondents from IAIN Curup who did not agree to be tested online. However, the percentage of respondents from IAIN Curup who prefer tests conducted online compared to manually (offline) is still higher. Furthermore, they want the assessment not to be limited to assignments and tests, but their activeness in class learning can be considered part of the assessment. Test results that are quickly known and rewards given to them when they can do something good, encourage them to be more enthusiastic about learning.

From the results of filling out the questionnaire on the four aspects, it can be said that students have the perception that the right learning model in implementing learning in the MBKM curriculum is a mixed learning model. This perception is based on the adequacy of facilities and infrastructure to support learning activities with a mixed model, the form of the required learning model, and the desired form of evaluation. Thus, it is necessary to develop a CBL blended learning model assisted by MOOCs for the implementation of the MBKM curriculum in tertiary institutions.

In addition to the University of Bengkulu and IAIN Curup, preliminary data collection was carried out in the form of an analysis of the needs of Palembang Poltekbang students for developing a MOOCs-based blended learning model to improve writing skills in the English Aviation course. Palembang Polytechnic students, especially those taking the Aviation English course, agree that to improve their ability to determine ideas in writing, a learning model is needed that does not only focus on learning in class but is integrated with online learning so that it is not monotonous. Additionally, to improve the ability to determine ideas in writing, learning is necessary supported by material in visual form and can be accessed online, learning supported by material that is presented in an interesting way and can be studied repeatedly, and learning that presents many learning resources. To improve the ability to organize the contents of writing, a learning model is needed that presents structured material so that students can more easily follow step by step in organizing the contents of the writing that is being or will be made. To improve the ability to use correct grammar in writing, a learning model is required that provides many types of learning resources. Apart from that, learning which is supported by material in the form of audio-visual is also very much needed to improve students' ability to use correct grammar to make a piece of writing. Meanwhile, the ability to use appropriate language structures in writing can be

improved through learning activities that present many types of learning resources. Cadets also agreed that a learning model was needed that facilitated direct and online learning processes that could help students improve their ability to use good and correct spelling and improve their ability to use grammar properly and correctly when writing.

According to the cadets, the material for writing skills in the English Aviation course is suitable for face-to-face delivery and supported by material in the form of videos that can be accessed online. Additionally, learning English Aviation is also suitable if done with a distance learning system using learning videos such as the MOOCs (Massive Open Online Course) program with side-by-side face-to-face learning. Cadets stated that they liked learning in which the material was presented online and then discussed face-to-face and liked internet-based learning coupled with conventional learning. They agreed that need a learning model that allowed them to freely study subject matter independently, needed a learning model where they could hold discussions with lecturers or other students outside face-to-face hours, and they also needed a learning model with a broad range of learning.

Then, at this analysis stage, an analysis of the needs of Palembang Poltekbang students was also carried out to develop learning Safety Management System through MOOCs to improve the mastery of aviation safety concepts. Students taking courses Safety Management System at Poltekbang Palembang stated that they liked learning using electronic devices such as computers and cellphones and internet-based. Additionally, students also agreed that they liked audio-visual-based learning such as videos and according to them, the material in the Introduction to Safety Management System course was suitable if delivered via video and suitable if carried out through a distance learning system using learning videos such as the MOOCs program online courses. They also hope that the material in the Introduction to Safety Management System course can be accessed anytime and anywhere and the material would be presented in a sequential or structured manner so that they will be more enthusiastic about learning it. Students also agreed that they preferred learning where they could monitor their own learning progress and liked learning where they could learn the material repeatedly so they could improve their mastery of flight safety concepts. In terms of needs, students agree that they need a learning system that can assist them in understanding the meaning of aviation safety scientifically both in theory and in its application in everyday life. They need a learning system that can improve their ability to construct meaning or understanding based on their initial knowledge. about flight safety they need a learning system that can improve their ability to describe a problem or object regarding aviation safety into its elements and determine how the interrelationships between these elements, they need a learning system that can improve their ability to make a judgment based on established criteria and standards. Regarding aviation safety, they need learning that can improve digital literacy skills, learning that presents material that they can learn independently, learning that material is presented in various forms such as video tutorials, animations, and audio and so on. According to them, the reason for this is because the material conveyed via video is easier to master because it is accompanied by moving images. Additionally, the material delivered via video can also save direct learning time between educators and students because students can play the material repeatedly and independently. From the characteristics of the learning system in the Introduction to safety management system course desired by the abovementioned students, it is very much in line with the characteristics of the online learning system through MOOCs. It can be concluded that students agreed to conduct the development of Introduction to Safety Management System learning through MOOCs to increase the mastery of aviation safety concepts.

5.2. Design

Learning Model Design begins with learning objectives, subject matter, learning activities, media sources and tools and assessment. The learning activities consist of introduction, core learning and closing. This design is a stage that will be carried out by each user in implementing the CBL-based Blended Learning Model Using MOOCs

5.3. Development

The resulting product is a CBL-based blended learning model using MOOCs. Various internet-connected devices can access this system anywhere and anytime. The MOOC system can be used as an alternative to online learning in the e-learning system that Bengkulu University previously had.

5.4. Implementation

At the implementation stage, a test was carried out with the aim of determining the effectiveness of MOOCs-based online training to improve the cognitive abilities of cadets at the Palembang Polytechnic on safety management system material. In Table 4, we can see in the mean column it is written that the average N-Gain value is 0.9492. In accordance with the N-Gain classification in Table 2, because the value of 0.9492 is greater than 0.7, it is in the high category. This means that MOOCs-based online training has a high level of effectiveness in improving the cognitive abilities of cadets on safety management system material. When viewed from the N-Gain value in percent, the average N-Gain result is 94.9247. In accordance with the N-Gain classification in Table 3, because the value of 94.9247% is greater than 76%, it enters the effective

category. This means, MOOCs-based online training is effective in improving the cognitive abilities of cadets on safety management system material. Then in Table 5, you can see the value of Sig. (2 tailed) of 0.000. In accordance with the guidelines, if the value of Sig. (2-tailed) <0.05 means that there is a significant difference between the results on the pretest and the results on the posttest. Therefore, Ho is rejected and Ha is accepted. This means that there are differences in the cognitive abilities of cadets in the safety management system material before MOOCs-based online training and after MOOCs-based online training. 0.05 means that there is a significant difference between the results of the pretest and the results of the posttest. Therefore, Ho is rejected and Ha is accepted. This means that there are differences in the cognitive abilities of cadets in the safety management system material before MOOCs-based online training and after MOOCs-based online training. 0.05 means that there is a significant difference between the results of the pretest and the results of the posttest. Therefore, Ho is rejected and Ha is accepted. This means that there are differences in the cognitive abilities of cadets in the safety management system material before MOOCs-based online training and after MOOCs-based online training.

At this stage, an analysis of lecturer responses was also carried out regarding the application of interactive and innovative learning patterns through the PJBL/CBL method assisted by TPACK (Trello) based media to increase engagement in online learning activities. According to the respondent (lecturer), the learning method using the Trello project management application is interesting for apply in helping deliver lecture material in class (Activity Monitoring), Project and CBL methods using Trello and several interactive applications can make them more enthusiastic about implementing PBM, so they became interested in using Trello and other interactive applications to manage the courses they teach where they work. According to respondents (lecturers), the learning process and assignments given through the learning method using Trello can make students more responsible in attending lectures. Students will work on assignments either case-based or project-based in a timely manner if the engagement process in learning occurs optimally, for example, using Trello and other interactive applications. Monitoring learning using this pattern can make lecturers and students feel closer to engagement and being interactive. Teaching and learning activities using project-based learning methods using trello can also bring up the character values of discipline (for example in submitting assignments given), honest (not cheating), other jobs, independent, appreciate achievement, creative, and hard work.

Using technology to help respondents (lecturers) monitor learning activities. They also believe that students will be motivated to follow all the material given because it is fun. They feel they can apply innovative ideas in the learning they will live later, especially in their field of knowledge. This technique can also help to evaluate the learning process in class more easily.

According to the respondents (lecturers), students will be more enthusiastic when they get a direct response from the assignments collected, the interaction and involvement carried out using the trello application is excellent and optimal, so they feel that with this learning method, involvement in the learning process will be more effective and students will be more motivated to complete their tasks. Student activities will also be more easily controlled through this learning method, especially in terms of accuracy in working on a given project to help students achieve the desired learning achievement targets. According to respondents (lecturers), this learning method led to the application of behavioristic learning theory (stimulus response), cognitive learning theory, constructivism learning theory, and humanistic learning theory. Application of interactive and innovative learning patterns through the PJBL/CBL method assisted by TPACK (trello)-based media to increase engagement in online learning activities.

5.5. Evaluation

At the evaluation stage, the researchers used a non-test measuring instrument in the form of a questionnaire. This questionnaire was developed by comparing student responses to the previous learning model with the new learning model (the model developed by the researcher). The researcher asked the training participants to fill out a response questionnaire to determine the participants' responses to the old learning method and the MOOCs-Based Safety Management System learning method. Based on the results of distributing the questionnaire to Palembang Poltekbang students who took the Safety Management System course, there is a significant difference between the effectiveness of the MOOCs-based SMS learning method and the previous learning method.

6. Conclusion

The learning model that is suitable for applying the Case Base Learning method in Higher Education is the CBL-based blended learning model using MOOCs. The design of the Blended Learning model based on CBL includes the design of the Learning Model starting with learning objectives, subject matter, learning activities, media resources and tools and assessment. The learning activities consist of introduction, core learning and closing. Core Activities use MOOCs to assist the online learning process (Blended). A Blended Learning model based on Case Based Learning using the MOOCs system has been developed and can already be used in the blended learning process in tertiary institutions in implementing and implementing the MBKM curriculum. Implementation of the model developed in

trials at the University of Bengkulu, and partners – IAIN Curup MPI study program, and Pelembang Aviation Polytechnic (field testing will be carried out in October-November). The effectiveness of the developed model will be known after all stages of model development have been completed. The novelty of this research is the use of MOOCs as a medium for implementing blended learning models. Besides, CBL is used in the implementation of learning with a blended learning model. As for limitations of the research, the selection of instruments for the evaluation stage was very limited so that the results of the evaluation do not cover broad research activities.

References

[1] SYAMSUDDIN A., TAHIR R., MUNIR A., ALI M.Y., and MADO I. Description of Participatory Collaborative Learning Program Provisioning in the MBKM Cooperation Curriculum Implementation Activities. *Journal of Teaching and Learning*, 2022, 5(1): 16-24.

[2] ENDRAWAN I.B., HARDIYONO B., SATRIA M.H., and KESUMAWATI S.A. Development of the Independent Campus Learning Curriculum (MBKM) Undergraduate Sports Education Study Program (S1) Faculty of Education and Language Science, Bina Darma University. *Journal of Community Service Bina Darma*, 2021, 1(2): 180-186.

[3] MARGARYAN A., BIANCO M., and LITTLEJOHN A. Instructional quality of Massive Open Online Courses (MOOCs). *Computers & Education*, 2015, 80: 77-83. DOI: 10.1016/j.compedu.2014.08.005.

[4] LINDSEY B.T., RHOADS R.A., and LOZANO J.B. Virtually unlimited classrooms: Pedagogical practices in massive open online courses. *The Internet and Higher Education*, 2015, 24: 1-12. DOI: 10.1016/j.iheduc.2014.07.001.

[5] BOZKURT A., AKGÜN-ÖZBEK E., and ZAWACKI-RICHTER O. Trends and patterns in massive open online courses: Review and content analysis of research on MOOCs (2008-2015). *International Review of Research in Open and Distributed Learning*, 2017, 18(5): 118-147. DOI: 10.19173/irrodl.v18i5.3080.

[6] APARICIO M., OLIVEIRA T., BACAO F., and PAINHO M. Gamification: A key determinant of massive open online course (MOOC) success. *Information & Management*, 2019, 56(1): 39-54. DOI: 10.1016/j.im.2018.06.003.

[7] DZIUBAN C., GRAHAM C.R., MOSKAL P.D., NORBERG A., and SICILIA N. Blended learning: the new normal and emerging technologies. *International Journal of Educational Technology in Higher Education*, 2018, 15(1): 1-16. DOI: 10.1186/s41239-017-0087-5.

[8] LIN Y.W., TSENG C.L., and CHIANG P.J. The effect of blended learning in mathematics course. *Eurasia Journal of Mathematics, Science and Technology Education*, 2017, 13(3): 741-770. DOI: 10.12973/eurasia.2017.00641a.

[9] RAMADHANTI D., YUSUF I., YENUSI K.A., and WIDYANINGSIH S.W. Development of Teaching Materials In A Direct Current Electric Circuit Based on The Blended Learning Model Oriented High Order Thinking Skill (HOTS). *Kasuari: Physics Education Journal*, 2020, 3(1): 18-29. DOI: 10.37891/kpej.v3i1.113.

[10] LUSA H., ADNAN A., and YURNIWATI Y. Effect of Blended Learning on Students' Learning Outcomes: A Meta-Analysis. *International Journal of Progressive Education*, 2021, 11(2): 309-325. DOI: 10.23960/jpp.v11.i2.202113.

[11] MCLEAN S.F. Case-Based Learning and its Application in Medical and Health-Care Fields: A Review of Worldwide Literature. *Journal of Medical Education and Curricular Developmen*, 2016, 3: 39-49. DOI: 10.4137/jmecd.s20377.

[12] KANTAR L.D., and MASSOUH A. Case-based learning: What traditional curricula fail to teach. *Nurse Education Today*, 2015, 35(8): 6-14. DOI: 10.1016/j.nedt.2015.03.010.

[13] RAURELL-TORREDÀ M., OLIVET-PUJOL J., ROMERO-COLLADO À., MALAGON-AGUILERA M.C., PATIÑO-MASÓ J., and BALTASAR-BAGUÉ A. Case-Based Learning and Simulation: Useful Tools to Enhance Nurses' Education? Nonrandomized Controlled Trial. *Journal of Nursing Scholarship*, 2015, 47(1): 1-9. DOI: 10.1111/jnu.12113.

[14] KRAMMER K., HUGENER I., FROMMELT M., AUF DER MAUR G.F., and BIAGGI S. Case-based learning in initial teacher education: Assessing the benefits and challenges of working with student videos and other teachers' videos. *Orbis Scholae*, 2015, 9(2): 119-137. DOI: 10.14712/23363177.2015.83.

[15] WOSPAKRIK F., SUNDARI S., and MUSHARYANTI L. The effect of applying case-based learning methods on student motivation and learning outcomes. *International Journal of Health Studies*, 2020, 4(1): 30-37. DOI: 10.31101/jhes.515.

[16] BUSRI E., ZLIRFAN Z., and FAKHRUDDIN F. The Development of MOOC Media to Increase Recall Memory Skills in Physics at Vocational High School. *Journal of Physics: Conference Series*, 2019, 1(1): 1-4. DOI: 10.1088/1742-6596/1351/1/012017.

[17] BARAK M., WATTED A., and HAICK H. Motivation to learn in massive open online courses: Examining aspects of language and social engagement. *Computers & Education*, 2016, 94: 49-60. DOI: 10.1016/j.compedu.2015.11.010.

[18] DE JONG P.G.M., PICKERING J.D., HENDRIKS R.A., SWINNERTON B.J., GOSHTASBPOUR F., and REINDERS M.E.J. Twelve tips for integrating massive open online course content into classroom teaching. *Medical Teacher*, 2020, 42(4): 393-397. DOI: 10.1080/0142159X.2019.1571569.

[19] ISMAIL M.E., UTAMI P., ISMAIL I.M., HAMZAH N., and HARUN H. Development of massive open online course (MOOC) based on ADDIE model for catering courses. *Journal of Vocational Education & Training*, 2018, 8(2): 184-192. DOI: 10.21831/jpv.v8i2.19828.

[20] AWANG A., GHANI R.A., MUHAMMUD F.S., BAKAR R.A., and SULAIMAN N.H. An Analysis of Student Acceptance of Islamic Education through Interactive MOOC Learning during Covid-19 Pandemic. *BITARA International Journal of Civilizational Studies and Human Sciences*, 2021, 4(4): 1-14.

[21] JORDAN K. Initial trends in enrollment and completion of massive open online courses Massive Open Online Courses. *International Review of Research in Open and Distributed Learning*, 2014, 15(1): 133-160.

[22] KUSEN K. Rasch Test for Digital Learning Material Development Based on MOOCS. *Tadbir: Journal of Education Management Studies*, 2022, 6(1): 33-48.

[23] CHAPMAN S.A., GOODMAN S., JAWITZ J., and DEACON A. A strategy for monitoring and evaluating massive open online courses. *Evaluation and Program*

Planning, 2016, 57: 55-63. DOI: 10.1016/j.evalprogplan.2016.04.006
[24] LIYANAGUNAWARDENA T.R., and WILLIAMS S.A. Massive open online courses on health and medicine: Review. *Journal of Medical Internet Research*, 2014, 16(8): 191. DOI: 10.2196/jmir.3439.
[25] ZHUSSUPBEKOV A. *MOOCs and Their Implications for Traditional Higher Education Institutions*. University of Southampton, UK, 2015: 29-33. https://nur.nu.edu.kz/bitstream/handle/123456789/2351/MOOCS%20and%20their%20implications.pdf?sequence=1&isAllowed=y
[26] PHAN T., MCNEIL S.G., and ROBIN B.R. Students' patterns of engagement and course performance in a Massive Open Online Course. *Computers & Education*, 2016, 95: 36-44. DOI: 10.1016/j.compedu.2015.11.015.
[27] MIN H., and NASIR M.K.M. Self-Regulated Learning in a Massive Open Online Course: A Review of Literature. *euro. European Journal of Interactive Multimedia and Education*, 2020, 1(2): 1-6. DOI: 10.30935/ejimed/8403.
[28] SUASTIKA K., SWANTI V., FERDIANI R.D., and HARIANTO W. The Impact of MBKM Curriculum Implementation: Analysis of Satisfaction and Perceptions of Lecturers and Students. *MENDIDIK: Journal of Education and Teaching Studies*, 2022, 8(1): 19-28. DOI: 10.30653/003.202281.207.
[29] SAO S., SURYANI L., MBAGHO H.M., and MEI A. Response of Students of the University of Flores Mathematics Education Study Program to the MBKM Program. *Scholar's Journal: Journal of Mathematics Education*, 2022, 6(1): 812-823. DOI: 10.31004/cendekia.v6i1.1242.
[30] WARDHANI G., SUSANTY D., OKSARI A.A., NURHAYATI L., NURANZANI A., and FARIDHA F. Implementation of the Independent Campus Learning Curriculum (MBKM) in the Chemistry Study Program at Nusa Bangsa University. *Indonesian Education University Journal of Science Learning*, 2022, 5(1): 53-59. https://ejournal.undiksha.ac.id/index.php/JPPSI/article/view/42802
[31] KHOLIK A., BISRI H., LATHIFAH Z.K., KARTAKUSUMA B., MA'UFUR M., and PRASETYO T. Implementation of the Independent Campus Learning Curriculum (MBKM) based on the Perceptions of Lecturers and Students. *Beni-Suef University Journal of Basic and Applied Sciences*, 2022, 6(1): 738-748.

参考文:

[1] SYAMSUDDIN A.、TAHIR R.、MUNIR A.、ALI M.Y. 和 MADO I. 自由學習自由校園 合作課程實施活動中參與式協作學習計劃的描述。教學雜誌，2022，5（1）：16-24。
[2] ENDRAWAN I.B.、HARDIYONO B.、SATRIA M.H. 和 KESUMAWATI S.A. 開發獨立校園學習課程本科體育教育學習計劃(小号 1)，比納達瑪大學教育和語言科學學院。 社區服務比納達瑪雜誌，2021 年，1(2)：180-186。
[3] MARGARYAN A.、BIANCO M. 和 LITTLEJOHN A. 大規模開放在線課程的教學質量。計算機與教育，2015, 80: 77-83. DOI：10.1016/j.compedu.2014.08.005。
[4] LINDSEY B.T.、RHOADS R.A. 和 LOZANO J.B. 幾乎無限的教室：大規模開放在線課程的教學實踐。互聯網與高等教育，2015, 24: 1-12. DOI：10.1016/j.iheduc.2014.07.001。
[5] BOZKURT A.、AKGÜN-ÖZBEK E. 和 ZAWACKI-RICHTER O. 大規模開放在線課程的趨勢和模式：海量開放在線課程 研究的回顧和內容分析 (2008-2015)。國際開放和分佈式學習研究評論，2017，18（5）：118-147。DOI：10.19173/irrodl.v18i5.3080。
[6] APARICIO M.、OLIVEIRA T.、BACAO F. 和 PAINHO M. 遊戲化：大規模開放在線課程成功的關鍵決定因素。信息與管理，2019, 56(1): 39-54. DOI：10.1016/j.im.2018.06.003。
[7] DZIUBAN C.、GRAHAM C.R.、MOSKAL P.D.、NORBERG A. 和 SICILIA N. 混合學習：新常態和新興技術。國際高等教育教育技術期刊, 2018, 15(1): 1-16. DOI：10.1186/s41239-017-0087-5。
[8] LIN Y.W., TSENG C.L. 和 CHIANG P.J. 混合學習在數學課程中的作用。歐亞數學科技教育學報, 2017, 13(3): 741-770. DOI：10.12973/歐亞大陸.2017.00641a。
[9] RAMADHANTI D.、YUSUF I.、YENUSI K.A. 和 WIDYANINGSIH S.W. 基於面向高階思維技能）的混合學習模型開發直流電路教材。對案件：物理教育雜誌，2020，3(1)：18-29。DOI：10.37891/kpej.v3i1.113。
[10] LUSA H.、ADNAN A. 和 YURNIWATI Y. 混合學習對學生學習成果的影響：元分析。國際進步教育雜誌, 2021, 11(2): 309-325。DOI：10.23960/jpp.v11.i2.202113。
[11] MCLEAN S.F. 基於案例的學習及其在醫療保健領域的應用：全球文獻綜述。醫學教育與課程發展雜誌, 2016, 3: 39-49. DOI：10.4137/jmecd.s20377。
[12] KANTAR L.D. 和 MASSOUH A. 基於案例的學習：傳統課程無法教授的內容。今日護士教育, 2015, 35(8): 6-14. DOI：10.1016/j.nedt.2015.03.010。
[13] RAURELL-TORREDÀ M.、OLIVET-PUJOL J.、ROMERO-COLLADO À.、MALAGON-AGUILERA M.C.、PATIÑO-MASÓ J. 和 BALTASAR-BAGUÉ A. 基於案例的學習和模擬：增強護士能力的有用工具＇教育？非隨機對照試驗。護理獎學金雜誌, 2015, 47(1): 1-9. DOI：10.1111/jnu.12113。
[14] KRAMMER K.、HUGENER I.、FROMMELT M.、AUF DER MAUR G.F. 和 BIAGGI S. 初始教師教育中基於案例的學習：評估使用學生視頻和其他教師視頻的好處和挑戰。奧比斯學院，2015, 9(2): 119-137. DOI：10.14712/23363177.2015.83。
[15] WOSPAKRIK F.、SUNDARI S. 和 MUSHARYANTI L. 應用基於案例的學習方法對學生動機和學習成果的影響。國際健康研究雜誌，2020, 4(1): 30-37. DOI：10.31101/jhes.515。
[16] BUSRI E.、ZLIRFAN Z. 和 FAKHRUDDIN F. 開發海量開放在線課程 媒體以提高職業高中物理學的回憶記憶技能。物理學雜誌：系列會議，2019 年，1(1)：1-4。DOI：10.1088/1742-6596/1351/1/012017。
[17] BARAK M.、WATTED A. 和 HAICK H. 在大規模開放在線課程中學習的動機：檢查語言和社會參與的各個方面。計算機與教育，2016, 94: 49-60. DOI：10.1016/j.compedu.2015.11.010。
[18] DE JONG P.G.M.、PICKERING J.D.、HENDRIKS R.A.、SWINNERTON B.J.、GOSHTASBPOUR F. 和 REINDERS M.E.J. 將海量在線開放課程內容融入課堂教

學的十二個技巧。醫學教師, 2020, 42(4): 393-397. DOI：10.1080/0142159X.2019.1571569。
[19] ISMAIL M.E.、UTAMI P.、ISMAIL I.M.、HAMZAH N. 和 HARUN H. 基於分析、設計、開發、實施和評估模型的餐飲課程大規模開放在線課程的開發。職業教育與培訓, 2018, 8(2): 184-192. DOI：10.21831/jpv.v8i2.19828。
[20] AWANG A.、GHANI R.A.、MUHAMMUD F.S.、BAKAR R.A. 和 SULAIMAN N.H. 在新冠肺炎大流行期間通過交互式 海量開放在線課程 學習分析學生對伊斯蘭教育的接受程度。比多拉國際文明研究與人文科學雜誌, 2021, 4(4): 1-14.
[21] JORDAN K. 大規模開放在線課程註冊和完成的初步趨勢 大規模開放在線課程。國際開放和分佈式學習研究評論，2014，15（1）：133-160。
[22] KUSEN K. 快的基於海量開放在線課程的數字學習材料開發測試。事件：教育管理研究雜誌，2022，6(1)：33-48。
[23] CHAPMAN S.A.、GOODMAN S.、JAWITZ J. 和 DEACON A. 一種監控和評估大規模開放在線課程的策略。評估和項目規劃，2016，57：55-63。DOI：10.1016/j.evalprogplan.2016.04.006
[24] LIYANAGUNAWARDENA T.R. 和 WILLIAMS S.A. 關於健康和醫學的大規模開放在線課程：回顧。醫學互聯網研究雜誌, 2014, 16(8): 191. DOI: 10.2196/jmir.3439.
[25] ZHUSSUPBEKOV A. 海量開放在線課程 及其對傳統高等教育機構的啟示。英國南安普頓大學，2015 年：29-33 。 https://nur.nu.edu.kz/bitstream/handle/123456789/2351/MOOCS%20and%20their%20implications.pdf?sequence=1&isAllowed=y
[26] PHAN T.、MCNEIL S.G. 和 ROBIN B.R. 學生在大規模開放在線課程中的參與模式和課程表現。計算機與教育, 2016, 95: 36-44. DOI：10.1016/j.compedu.2015.11.015。
[27] MIN H. 和 NASIR M.K.M. 大規模開放在線課程中的自我調節學習：文獻綜述。歐元。歐洲交互式多媒體與教育雜誌，2020，1(2)：1-6。DOI：10.30935/ejimed/8403。
[28] SUASTIKA K.、SWANTI V.、FERDIANI R.D. 和 HARIANTO W. 自由學習自由校園 課程實施的影響：講師和學生的滿意度和看法分析。教育：教育與教學研究雜誌，2022，8(1)：19-28。DOI：10.30653/003.202281.207。
[29] SAO S.、SURYANI L.、MBAGHO H.M. 和 MEI A. 弗洛勒斯大學數學教育研究項目學生對 自由學習自由校園 項目的反應。學者雜誌：數學教育雜誌，2022，6（1）：812-823。DOI：10.31004/cendekia.v6i1.1242。
[30] WARDHANI G.、SUSANTY D.、OKSARI A.A.、NURHAYATI L.、NURANZANI A. 和 FARIDHA F. 在努沙邦沙大學化學研究項目中實施獨立校園學習課程。印度尼西亞教育大學科學學習雜誌, 2022, 5(1): 53-59. https://ejournal.undiksha.ac.id/index.php/JPPSI/article/view/42802
[31] KHOLIK A.、BISRI H.、LATHIFAH Z.K.、KARTAKUSUMA B.、MA'UFUR M. 和 PRASETYO T. 基於講師和學生的看法實施獨立校園學習課程。貝尼蘇夫大學基礎與應用科學雜誌，2022，6(1)：738-748。