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Students' Perception Concerning E-Learning Based on Moodle Platform: A Study of Learning Outcome

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Abstract. Online learning (e-learning) has become an alternative teaching method in higher education. Many applications were used for virtual learning; one of them is Moodle. This study aims to investigate the perception of students to carry out e-learning based on Moodle platform, especially in higher education. The study conducted a quantitative and qualitative approach with a survey method using a questionnaire among undergraduate students. The result showed that the students responded in the high category to Moodle platform as e-learning. It successfully implemented e-learning because half of the students agreed with 47 percent, strongly agreed with 6 percent, doubtful with 35 percent, and disagreed with 13 percent. The Moodle platform also increase student learning outcomes with the medium category. A positive perception of students is needed to enhance learning transformation.

Keywords: students' perception, Moodle platform, virtual classroom, and learning outcome.

INTRODUCTION

Currently, the global issues of the COVID-19 pandemic in the educational world have become a new challenge to the higher education landscape at a magnitude we have not seen since the emergence of educational technology supported and e-learning [1], [2]. On the other hand, [3], [4] have pinpointed that the COVID-19 pandemic bears social demand to change social activities, which become Work from House (WFH), specifically in the learning system in all the Indonesian campuses to conduct e-learning. Similarly, the e-learning model will run effectively if the university curriculum, teaching, learning, student engagement, and lecture can motivate their students [5], [6]. In response to its case, Indonesia's national education system went entirely on 12 March 2020.

Today, online learning (e-learning) has become an alternative method to maintain educators to enhance continuous hand hygiene teaching mainly. Factually, online teaching and learning usually use virtual classrooms with many applications such as Google Classroom, Modular Object-Oriented Dynamic Learning Environment familiar (Moodle), Edmodo, and *Ruang Guru* [7], [8]. Moreover, e-learning aims to give students the experience of completing a collaborative activity to utilize learning technology that could prepare them for the dispersed nature of the global world [9]–[11]. This research also aims to investigate learning outcomes through Moodle platform in higher education.

Early research by [12] highlighted that all was done through Blackboard Collaborate Ultra, Zoom Meeting, and Microsoft Teams. This is time for us pharmacists to be visibly present as essential during these difficult times. Their professional depends on it. This case may become a meaningful event for learning technology. In other research, [13] pinpointed 12,000 suspected cases across the country. This case will be significantly increased if the prevention measures are not taken to anticipate. The role of university librarians in this emergency included building awareness through public health education, providing support to medical staff, and researchers, and providing ongoing.

Additionally, a blended learning (campus and online) approach is designed for virtual classroom education [14]. As maintaining students have learned some courses through campus learning (online system), lecturers can improve Moodle platform (<https://moodle.org/>) to organize web-based peer assessments. These jogs increase the students cognitive Moodle, helping them build their knowledge and promoting positive attitudes to discuss and cooperate in peer teams [15]. It becomes evident when students enhance their skills to implement learning to utilize E-learning. Universitas Wiralodra is one of the Indonesia campuses which conducts virtual classroom education with Moodle type (<https://sinau.biounwir.ac.id/>).

The research focuses on the issues around teaching and learning in higher education. Every Indonesian university is conducted virtual classrooms, so our universities conduct run online learning through Moodle platform. Moodle means a dynamic place of learning using object-oriented models. Based on the research objective, the problem formulation are: (1) How does students perception about the-learning of Moodle platform? And (2) how does the impact of e-Learning on students learning outcome for university students?

This study aims to analyze student perceptions about online learning (Moodle platform). Learning of online and the presence of digital leaders are recognized to be a 21st-century challenge. As 21st-century education still needs to be traced through scientific studies to get adequate research and to encourage further research on how students have exciting experiences to conduct Moodle platform of e-learning to enhance their learning outcome (student achievement). The study used a quantitative and qualitative approach with a survey method to investigate students' perception about e-learning of the e platform. This study address concerning student perception in E-learning model to continue their learning. Positive perception of student is needed to enhance learning transformation. In the learning, lecturers as motivator and innovator model is to make students to learn through the mount of resource to utilize technology. If the students have good learning motivation, of course they will get good learning outcome.

LITERATURE REVIEW

Student Perception about e-learning

With advance of internet, online learning is increasing rapidly around the world, most of learning application are used as supplement to universities environment, so the learning process is changed from offline to online [16]. Commonly, the conducting of E-learning makes positive perception within students if it is designed professionally because it can construct their knowledge and learning experience [17], [18]. In contrary, negative perception about E-learning Moodle within students they will assume the social interaction between students and lecturer are decreased because all of communication covered by technology [19].

In our universities, the conducting E-learning is the Moodle system which constitutes itself as Virtual Learning Environment (VLE), it is evidence where the teaching and learning process completed online, existence a software open source and is destined to help a collaborative learning environment (www.moodle.org). The Moodle has been used as a LMS platform for continuing the learning system to share useful information, documentation, and knowledge management in research projects, yielding important benefits to the researchers [14], [20]. It constitutes a new learning framework, based on the constructivist pedagogy where both teaching staff and students meet, complete collaborative activities and create information. In Indonesia Moodle has been used by several schools and universities in various purposes. So that learner can learn better and construct their knowledge.

Educational system in Indonesia is established online completely. Therefor all of educator, lecturers, and administrator staff must adapt their system to continue their job desk. As researchers know that virtual learning will help students to build their knowledge. In addition, an open learning system this system will form meaningful learning. Researchers also must build positive perception about E-learning to our students.

Learning Outcome of Moodle Platform

In our institution, learning outcome (student achievement) in E-learning Moodle becomes pivotal undertaken which deliberate by some lecturers. so in our discussion, authors will explore learning outcome based on Bloom perspective [21], [22]. In cognitive domain asserted that, learning outcome through E-learning with Moodle platform will be significantly increased in utilizing technology if the lecturer guidance is existed [23]. This study will explore also about learning outcome through E-learning model.

This study contained an investigation about the essence of e-learning according to [24] also argues that a Moodle e-learning is an effective tool for teaching and learning in the occupational health and safety discipline. Especially, as [25] pointed out about teaching and learning of e-learning can cultivate four broad domains: behaviourism, cognitivism, and constructivism. In this study, lecturer role in online learning as agent of change who can motivate, encourage, and guide students to learn to develop their insight.

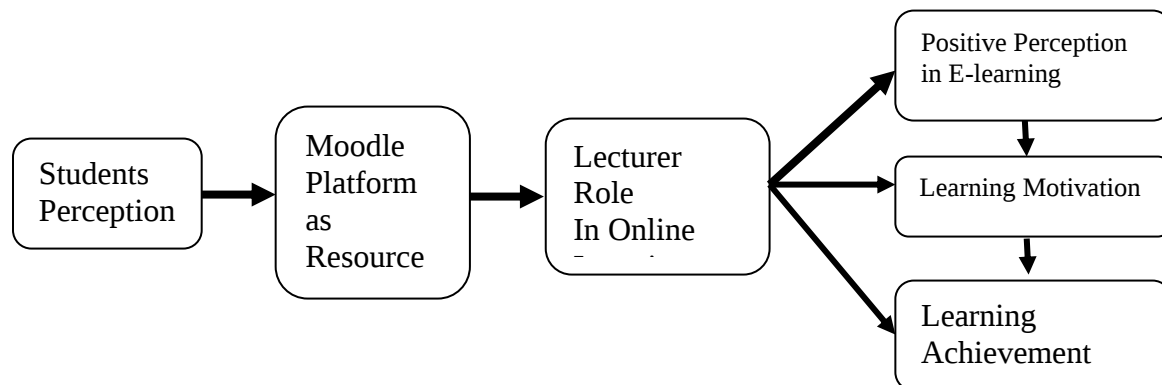


FIGURE 1. *Learning outcome of Moodle platform*

There skills that students need to improve in the 21st century, e-learning practices have shown higher levels of learner satisfaction, improvement in knowledge, self-awareness, understanding concepts, achievement of course objectives and changes in practice in both qualitative and quantitative terms to overcome social problem and social change [26], [27]. The following figure will describe the relation meaning about Moodle:

Based on several theory, authors can concluded that the offline learning (face to face) provide bigger chance in learning outcome than online learning (E-learning) in normal condition. To overcome this condition, lecturers competence is needed to design E-learning Moodle as interesting as possible to enhance learning outcome (student achievement). Academic assignment in E-learning is very useful to increase academic investigation until students can build their knowledge, because the good assignment will construct student's knowledge, students attitude, and students skill which involve academic investigation. Moodle platform is designed to encourage inquiry process and meaningful learning.

RESEARCH METHODOLOGY

Research Design

The study was experiment research. The instrument analysis conducted through the test and questionnaire consisting of Likert scale questions and open-ended questions. Quantitative data generated by the test and Likert scale questions were analyzed using descriptive statistics and frequency analysis. Qualitative data content, i.e. responses to open-ended questions, were analyzed and coded into emergent categories and sub-categories. Units of meaning for the qualitative analysis were phrases, sentences or more than one sentence indicating one category or sub-category item. Aspects of the student feedback investigated included: the general preferences of students for online learning, common student perceptions of the online lesson in terms of motivation, and common student perceptions of the online lesson in terms of interest.

Participants

The research sample were the students of biology education department from three private universities in West Java, Indonesia. The number of students in the study was 90 people. Researchers was selected random samples. Samples were collected in one experimental group with the one Group of Pre-test and Post-test design by using online learning with Moodle [28]. Students are randomized from various levels, from the first level to the final level.

Instrument

To conduct our research, researchers used three instruments that were adopted from several sources. The first was a questionnaire was used to measure students' responses to e-learning lectures with the Moodle platform. The survey was in the form of a closed questionnaire with a range of 1-5 according to a Likert scale, of which one meaning strongly disagree, and five strongly agree [29]. The questionnaire totaled 20 positive statements. The indicators used as the basis for preparing the questionnaire were adapted from [30] are described in Table 1.

TABLE 1. *Indicators of questionnaire*

No	Indicator	Statments description
1	The benefits of e-learning	1. E-learning give students fast feedback on understanding the concept of covid-19 2. E-learning help students to focus on the material provided 3. E-learning learning makes me truly understand concepts, not just answering test questions 4. E-learning helps me to apply the concept of covid-19 in my surroundings 5. E-learning learning helps me understand the misconceptions that occur 6. I prefer e-learning learning than regular learning 7. I am required to be more prepared when entering class in e-learning learning 8. E-learning learning helps me get the opportunity to study anywhere and anytime 9. E-learning learning makes me more active during the learning process
2	Material or concept	10. The material provided is easy to understand 11. The references used to compile various materials so as to add insight about Covid-19 12. The learning materials made me understand the basic concept of viruses, their structure and reproduction 13. I can explain the difference between SARS, MERS and NCoV (Covid-19) 14. I can explain to the public about the symptoms and prevention of Covid-19
3	level of Learning Success	15. I find it easier to answer quiz questions with e-learning than regular learning
4	The class assignment	16. I'm sure I can finish the quiz in this e-learning lesson well
5	Interest in e-learning	17. Assignments during learning force me to think and study more 18. Good interaction between students and lecturers makes me enthusiastic in participating in e-learning learning 19. The new things I got during e-learning made me more enthusiastic about learning 20. Activities during learning stimulate me to be even better in learning

Second was an open ended question to see students' perceptions of face-to-face learning in the classroom (regular learning) and online learning [31]. The third is a pre-test and post-test, which was used to measure students' understanding. Pre-test and post-test are standard tests with 35 multiple choice questions. The perfect score of this test is 100. The indicators about the pre-test and post-test are taken from the learning indicators.

Procedure

The E-learning about virus was carried out by the Department of Biological Education from three private university, with five sessions and 150 minutes for each session. This lecture uses Moodle application version 3.8 with various features used, such as attendance, URL links, discussion forums, chat rooms, assessments, files, quizzes, and questionnaires [32]. These features can be set according to the needs in learning, both in terms of time, appearance, additional images or voice notes, and many other options. Before starting lectures in the first session, participants filled out pre-test questions to test their initial ability about viruses. The material given during the lecture is about the basic concepts of viruses, Coronavirus, SAR-Cov2, and Coronavirus Disease. The 5th session was closed by filling out the post-test and response questionnaire by students [29]. Student activities during lectures

take place in understanding the material, in the form of power points from lecturers, links to content prepared, and videos shared by lecturers, after which students have an active discussion in the discussion room and the chat room. In the 3rd and 4th sessions, students were also given an assignment to better understand the material being studied. The class activities are visualized in Figure 2 and Figure 3.

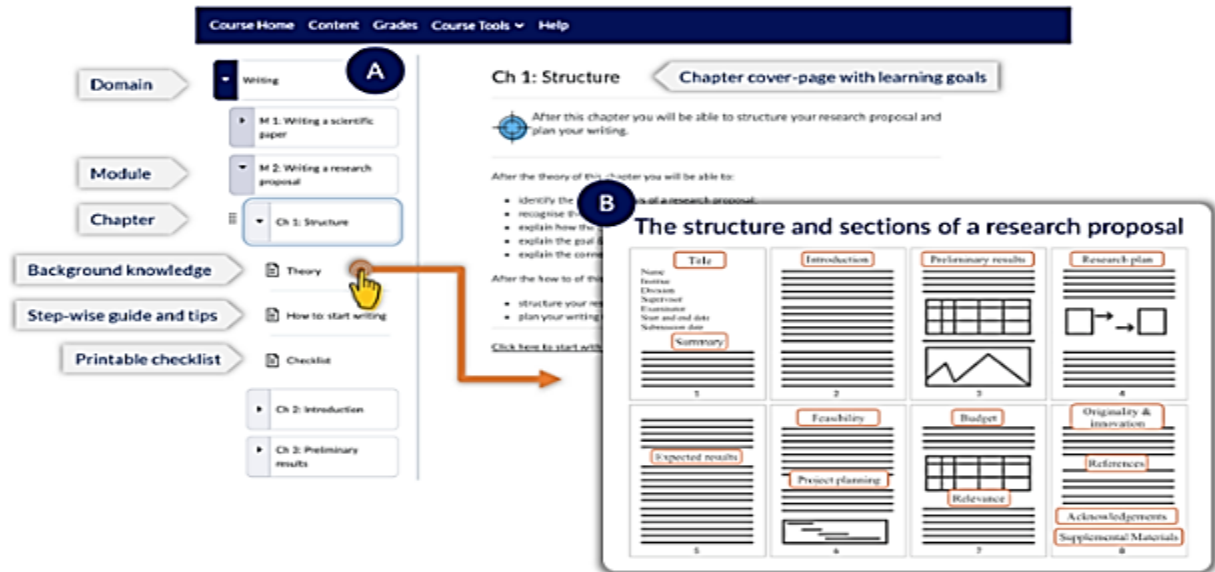


FIGURE 2. Features on Moodle in the form of attendance, URLs, chat room discussions, discussion forums, and voice notes
Source: sinau.biounwir.ac.id 2022

After the lecture is ended, it is expected that undergraduate of biology can understand about virus material and care about the surrounding environment. Then to see student perception about Moodle learning. The questionnaire were also conducted to students after carried out distance learning using Moodle applications [33].



FIGURE 3. Features in Moodle such as discussion forums, assignments and chat groups Data analysis
Source: sinau.biounwir.ac.id 2022

The results of the pre-test and post-test were analyzed using the normalized gain index formula. Then, the increase is categorized into three groups, namely high, medium, and low [34]. The results of the questionnaire from Likert scale were calculated and then presented in the form of Tables and Diagrams. While, the qualitative data in the form of open ended question with research subjects are described to strengthen the analysis of questionnaire data [35].

RESULT AND DISCUSSION

Student's perception about E-learning of Moodle platform

This section described the responses of students to e-learning utilizing the Moodle platform. The significant information on this study is majority of students give a positive response that e-learning successfully implementing.

TABLE 2 Student responses to the benefits of e-learning

Indicator	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
The benefits of e-learning (Material or concept level of Learning Success)	5.1	16.7	19.8	43.7	14.8
The class assignment	0	4.4	17.6	57	21
Interest in e-learning	0	13	34.5	46.5	6
	0	12	8	65	15
	0	6.3	17.7	57.7	18.3

The students perceived benefits of e-learning include material understanding, concept applications, loss of misconception, increasing enthusiasm, increasing learning activities, and flexibility in the learning. Table 2 showed most of students agree and strongly agree that e-learning could provide many benefits for them, including e-learning could make them to understand of concepts. [17] argues where if e-learning is designed professionally because it can construct their knowledge and learning experience. Additionally, students focus on lectures. Distance learning that is done without face to face requires students to focus more on the material presented. Their concentration is only focused on gadgets or laptops in front of him. This situation is caused by the lecturers' pedagogical ability to package material so that it is more interesting and easier to understand. [36] pinpointed that significant pedagogical transformation has been achieved throughout the institution.

Students who understood the concept would reduce their misconceptions. The students agreed to follow to reduce the misconception in their self. Based on recording discussions, it showed that there were misconceptions about viral genomes, especially RNA viruses, which were initially known as single strands; there is also a double-stranded RNA. What follows was a discussion that illustrated the reduction in misconception.

Student: After seeing an explaining video the structure of a virus, it was said that there were a lot of classification of viruses. One of the virus classifications was reviewed based on the structure of the genome; there were single-strand DNA, double-strand DNA, single-strand RNA, and double-strand RNA. What I want to ask is why in the virus, there was a single strand DNA structure and double-strand RNA, which in mammals, especially humans, were not or rarely found, even I just heard that RNA could also be in a double-strand structure, please explain.

Lecturer: viruses with a single RNA, some were single +, and some were single -. the difference is sense strand (or positive sense or positive-stranded) because the genome (RNA) acts as mRNA; the second was an antisense strand (or negative sense) because the genome serves as a template for making mRNA (+ strand). For double-strand RNA with the different DNA strands. If DNA is the double helix, only viruses need their host RNA to synthesize proteins. If double-strand RNA, the RNA acts as mRNA and tRNA, while the amino acid is taken from the host.

Student: So the point of double-strand RNA was not structured like double-helix DNA, ma'am, I thought double-strand RNA was like double helix DNA.

In fact, misconceptions could occur because of an error to understand the concept. Usually, if the students feel misconceptions they will find their difficult to reconstruct their knowledge. According to [37] that misconceptions can occur when students construct their knowledge due to interactions with sources of knowledge, while students do

not necessarily understand the purpose of the source correctly. E-learning display various sources and having a discussion room with the lecturer make students realize their misconceptions so that they can reinforce quickly their understanding.

Another benefit of learning is that students could prepare themselves before learning. The students need to conduct more preparation than regular lectures. However, in other said they did not agree because e-learning did not require them to prepare to go to campus like daily course. In addition, to prepare student activities were increased when they had to open material links on Moodle. Lecturers could supervise the student activities through the Moodle platform. Whether the given link was opened or not, whether the discussion forum was read or not, then the lecturer and notifies the student. This situation made students active in the learning. Flexibility is also one of the benefits of this e-learning. Almost all of students felt the e-learning is not limited in space and time. It means they could study anywhere, anytime, and in any condition. [4] Maintained that the discussions can also still take place in the discussion forum even though the lecture session is over. So, every learner can, at his or her own choice of time and place, access a world of multimedia material. Most of the open ended question that students agreed that flexibility is one of the advantages of E-learning. Some of them can learn by following other activities.

However, The pandemic condition in Indonesia, which caused a social distancing policy by implementing distance learning, made them never meet each other. It made them disagree that e-learning is more fun than regular learning. [19] Stated that e-learning Moodle within students they assumed the social interaction between students and lecturers are decreased because all of communication covered by technology. Also, [38] argues that e-learning Moodle will not substitute the lecturer, it has led to the fact that there are a small number of students who do not agree that e-learning provides many benefits for them. This statement is not in accordance with the previous literature which student perceived enjoyment with blog use as e-learning. Based on the open-ended question result, it showed that most of students felt a lack to interact when the learning was conducted by e-learning. They assumed that the use of e-learning is dependent on lecturers. Some of lecturers used to e-learning to share material and assignments, whereas not a few provide explanations of the content through video or voice notes.

The second indicator in Table 2 showed that the varieties of sources made the material easy to learn. More than half students agreed that the content is easy to understand, but not a few of students considered the material challenging to understand. The one of obstacle to the difficulty of understanding the material is the language used at the source in English. These conditions make students have to study more to translate first, to read subtitles, to be able to understand the material presented finally.

Student responses to the material in each lecture session also varied. It was easy to find essential concepts of the virus, virus structure, and virus replication in the first lecture session. They have learned these concepts in the microbiology course, so they are not too difficult to understand. The material in the second and third sessions discussed about coronavirus and SARS CoV-2. Only half of students answered agree and strongly agreed that the content was easy to understand. While half of it felt they didn't know (neither agree nor disagree) whether they could distinguish between the coronaviruses that cause SARS, MERS, and SARS CoV-2. The fourth material is the Coronavirus disease, which covers the transmission, symptoms, and preventive of Coronavirus disease, including how soap and hand-sanitizer work in destroy the coronavirus. The content about the Coronavirus disease pandemic is real and applicable so that students understand the material more easily. Based on factual condition, [39] stressed that providing e-learning materials are embedded due consideration of learner requirements, the benefits of using e-learning to support distance learners or distance e-learning.

The responding students to the learning achievement was the belief that they can overcome the test questions correctly (Third indicator in Table 2). The aspect could be measured to see this achievement level is when students work on posttest questions. Nearly, half of the students agreed that e-learning succeeded in making them learn so that it was easy to answer and solve questions well. Commonly, [40] express that learning outcome (student achievement) determined by lecturers competence and learning environment (learning process) as long as lecturers modeling become significant instrument. Another cause for the aspect which stated the fluency to answer the questions, more than half of the students reported agreed that they could overcome the existing problems. There were no errors or loading constraints, for example. It means that this Moodle platform can be used well in addition to learn as well as for evaluating learning outcomes. On the Moodle platform, there are various choices of questions. However, in this research, only using items in the form of multiple choice.

This study also considered students' responses to learning assignment (fourth indicator in Table 2). There were two assignments that gave to students during lectures. The first task was to make posters in groups about the origins of the coronavirus. The second task was creating an original narrative video about the Coronavirus disease pandemic, which includes transmission and prevention. The students need to understand the concept as a whole so that they could do their assignments well. Such assignments require students to think and learn in understanding the

material and presenting it. [26] cautioned that lecturers need to prepare students for the new skills to build towards creativity and innovation. Based on open ended question with students regarding the given assignments by lecturers during distance learning are that most of them are eager to do the assignments if the lecturer has previously explained the content and discussed it. It is different when the lecturer only distributes content without explanation. It is evidence to make them are no excitement in doing the assignment.

The last indicator captured through students' responses to e-learning is their interest in learning. Table 2 showed that student interest in e-learning was very high. Proven based on the response, most students agreed that learning made them interested in learning. The indicator of interest in e-learning can be seen from three aspects; namely, students' enthusiasm towards learning due to interaction, enthusiasm in learning new things, and learning activities could stimulate themselves. The students were enthusiastic about the interactions that occurred when learning took place. The existence of discussion forum and chat room columns made it easier for students to ask and or respond to answers. The lecturers could also give direction or just greet students in the group chat column. Some students who had experience technical problems and could ask private chat. E-learning about Coronavirus disease was a first-time learning technique, so the students agreed that e-learning makes them enthusiastic in learning, and the activities carried out to stimulate themselves to learn. [41] argue that the interest is a content-specific concept. It is always related to specific topics, tasks, or activities. The statement was supported by the open-ended question results which stated that some students were very enthusiastic about e-learning because it made them technologically literate. However, this situation will be hampered when there was no signal, or the quota is used up.

The Impact of E-Learning On Students Learning Outcome

The significant information in this study is also learning outcome after learning about virus using by Moodle platform. Test data used to measure the students understanding to the concepts.

TABLE 3. *Result data of students test*

Average pretest	Average posttest	N-gain	Category
41.5	77.7	0.6	Medium

Table 3 showed the differences between the results of student pretest and posttest corroborating evidence that students understood the learning concept. The average of pretest results was smaller than the posttest. The increasing in test results was medium category. It means that there were differences in students' understanding of the concept between before and after using e-learning. The form of learning outcomes using the Moodle platform can be seen from an increase in student understanding. This statement is supported by [42] in argument that learning outcome through e-learning with Moodle platform will be significantly increased in utilizing technology.

E-learning was the learning process using an electronic application (online system). This research used moodle because it has many features are used for student learning. These features are used so that students feel interested and can help students in learning to increase students' insight, likewise, with the assignments given by the lecturer to help students understand the material as [43] highlighted the conducting Moodle effectively and efficiently carry out to student achievement.

As this study focus, the learning outcome on cognitive domain of student is classified based on Bloom perspective [22]. Moreover, cognitive domain consist of: (C1) remember, (C2) understand, (C3) apply, (C4), analye, and (C5) evaluate with dimensions of factual and conceptual knowledge.

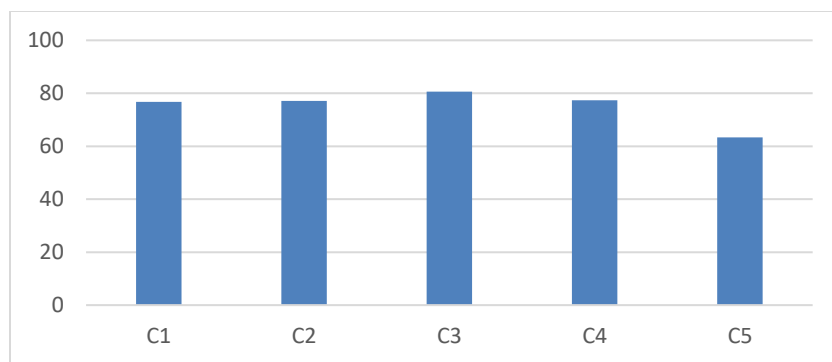


FIGURE 4. *Learning outcome-based Bloom perspective*

Figure 4 showed more than half of students could answer questions in the cognitive category C1-C5. C1 and C2 cognitive dimensions are found in questions with the material of the structure of the virus, the basic concept of the virus, and virus replication. The ability to remember and understand could be helped by the use of images or videos that are displayed on Moodle. [44] explains that remembering is exhibit memory of previously learned material while understanding is demonstrate understanding of facts and ideas through a variety of actions. Both are included in the low order thinking skills.

The ability to apply is highest aspect in cognitive domain. However, this ability becomes the highest ability that owned by almost all students. To apply is the problem-solving skill to implement the primary of material concept of the virus that has been studied in the Coronavirus disease. To implement is different from giving the solution because the best solution should only be classified to reach one of the three higher levels of analysis, synthesis, and evaluation [45].

To enter the level of higher order of thinking skills. The students who can analyze and evaluate means that they are able to remember to understand, and to apply, based on Figure 3 presentations, the number of students who have this ability is less than others. This ability is addressed when the lecturer gave the assignment in Moodle. The assignment requires students to analyze and evaluate the prevention- transmission of the Coronavirus. They must firstly understand how the virus infects, analyzes the spread of the virus, and applies the work of soap/hand-sanitizer to destroy the viruses.

CONCLUSION

Students perception about the e-learning of Moodle platforms shows that the majority of students give positive responses. Students consider that e-learning about virus used Moodle platform provides many benefits, with a variety of materials and assignments that make them interested and enthusiastic. The impact of e-Learning is an increase in learning outcomes. Thus e-learning with the Moodle platform is used successfully for distance learning in higher education.

Research Limitations

Research limitation is that not all of learning mater can deliver through E-learning of Moodle platform. For further studies will investigate the essence of E-learning of Moodle platform in higher education as pivotal model to enhance learning outcome and learning motivation.

Practical implication

This study address concerning student perception in e-learning model to continue their learning. Positive perception of student is needed to enhance learning transformation.

Social implication

This study can make the learning and interaction between students and lecturers efficiently during distance learning.

Originality/values

This research contained an investigation the pivotal point about virtual classroom and student achievement. The some methods and behaviors of online learning that enhance the student achievement. The Moodle platform as an e-learning system can used in higher education.

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