The Analysis of 4-C in Moodle-Based Online Learning in Science Learning Media Courses

Desak Made Anggraeni[1*], Ferdinandus Bele Sole[2]

[1] Pendidikan Fisika, STKIP Weetebula, Tambolaka, Indonesia.
[2] PGSD, STKIP Weetebula, Tambolaka, Indonesia.

Abstract: This study aims to describe the 4-C competencies in moodle-based online learning. This type of research is descriptive qualitative research. This research was conducted at STKIP Weetebula, Southwest Sumba district. The object of this research is the students of the sixth semester of the elementary school teacher education study program (PGSD), a total of 90 people. The time of this research is from February to May 2022. The data collection technique used is a documentation study. The data analysis technique in this study uses the data analysis technique of the Miles and Huberman model, namely data analysis that is carried out directly and continuously until it is complete, so that the data is saturated. The steps in this data analysis are: Data Reduction, Data Display (data presentation) and drawing conclusions. Based on the research results, it can be concluded that online learning based on moodle can develop 21st century competencies in the form of critical thinking & problem solving; collaboration; communication; creative thinking & innovation.

Keywords: 4-C; Moodle based online learning; Science learning media courses

Introduction

Universities are institutions that play an important role in producing competent graduates in each related field. In order to produce competent graduates, the educational process in higher education must be carried out based on the demands of 21st century competence. In learning with 21st century skills, educators must motivate students to follow the learning process well. 21st century skills called 4-C are skills that must be possessed by students to prepare for the 21st century. Therefore, in the teaching and learning process, educators must communicate well with students continuously in various circumstances. The 21st century skills that are meant are (1) critical thinking skills (2) communication skills; (3) collaboration skills; and (4) creative thinking skills.

The first 21st century skill is the ability to think critically (critical thinking skills). Simanjuntak (2019) explains that critical thinking skills are the ability to think logically, reflectively, systematically, and productively which are applied in making judgments and making good decisions. Critical thinking is one of the higher order thinking skills or HOTS in addition to creative thinking, creative thinking, problem solving, and reflective thinking. Critical thinking is independent, self-disciplined, self-monitored, improving one's own thinking process. It is seen as an important standardized asset of a way of working and a way of thinking in practice. It requires effective communication and problem solving as well as a commitment to overcome innate egocentric and socio centric attitudes.

Then we look at the second 21st century skill, namely communication skills. Effective communication is communication that is able to produce attitude (Septikasari, 2018). Communicating means the development of speech and language that has emotional and social content, namely how the communication session can take place reciprocally (Van, 2011). Language literacy and digital literacy are needed for

---

* Corresponding Author: desak.madeanggraeni@gmail.com

students so that the communication process can run well.

The communication process that goes well will support collaboration skills (collaboration skills) for students. Septikasi (2018) explained that students must be taught to be able to collaborate with others. Collaborate with people who are different in their cultural background and values. In exploring information and constructing meaning, students need to be encouraged to collaborate with their classmates. In working on a product, students need to be taught how to appreciate the strengths and abilities of each person and how to take on roles and adapt appropriately to them and foster creativity.

Creativity is the ability to develop, implement, and convey new ideas to others; be open and responsive to new and different perspectives. Creativity is also defined as a person's ability to create new combinations. Creativity will greatly depend on one's creative thinking, namely the process of one's mind in creating new ideas. Creativity that can produce new discoveries is often referred to as innovation.

The demands of increasingly rapid technological developments require acceleration in the use and literacy of technology in the learning process. Entering the current era of digitalization of learning, there is a shift in the face-to-face learning process towards online learning. It is undeniable that to support the online learning process, various platforms are needed that support the online learning process. In general, there are many online learning platforms on offer. One of the online learning platforms that is widely used is the moodle-based online learning platform.

Anggraeni (2022) explains that as a learning platform, Moodle is designed to provide educators, administrators, and students with a strong, secure, and integrated system to create a personalized learning environment. As one of the online learning platforms, Moodle implements student centered learning, thus encouraging students to always actively participate in every learning activity. In addition, there are many features in Moodle that can support the online learning process and create online learning classes that can be designed to develop 4-C competencies. However, previous studies have not studied in depth the identification of 4-C competencies in moodle-based online learning. So the purpose of this research is to analysis the 4-C competencies (critical thinking skills; communication skills; collaboration skills; and creative thinking skills) in Moodle-based learning in the science learning media course.

Method

In this study, the type of research used is descriptive qualitative. This research was conducted at STKIP Weetebula, Southwest Sumba district. The object of this research is the students of the sixth semester of the elementary school teacher education study program (PGSD), totaling 90 people. The time of this research is February to May 2022. The data collection technique used is a documentation study. The data analysis technique in this study uses the data analysis technique of the Miles and Huberman model, namely data analysis that is carried out directly and continuously until it is complete, so that the data is saturated. The steps in this data analysis are: Data Reduction, Data Display (data presentation) and drawing conclusions. The method of research can be seen on Figure 1.
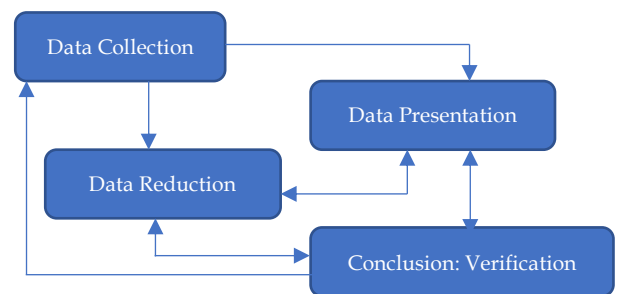

Figure 1. Step of Research

Result and Discussion

This study aims to describe the 4-C competencies in Moodle-based online learning. In this study, four 21st century competencies will be described which include critical thinking & problem solving; collaboration; communication; creative thinking & innovation. The learning carried out in this research is in the form of online learning which is carried out on the Moodle application. The following shows some pictures when carrying out research where students carry out learning using the Moodle platform.
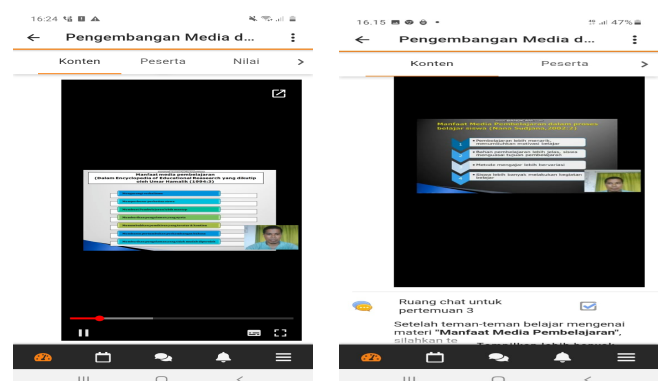

Figure 2. The Procces of Learning with Moodle

In Moodle-based online learning, the learning carried out in Moodle data is divided into 2, namely: (1) synchronous and (2) asynchronous. Synchronous means at the same time interaction occurs between lecturers

and students through the website. implementation synchronous is a virtual classroom, while asynchronous gives students the flexibility to study at any time without having to directly interact with the lecturer at the same time.methods asynchronous can be in the form of embedded learning, courses and discussion groups. As an LMS, moodle has features that support the online learning process. Moodle's features include: (*a*) *Assignment.* Assignment is used by lecturers to assign, collect assignments and assess student assignments online, accompanied by descriptions of work and clear boundaries. The assignment submission feature consists of two parts, namely online submission (typing assignments directly in the text field) and file submission (submission of task files); (*b*) *Chat.* Chat is used to send messages between lecturers and students or between students in real time (directly). The module can also be added by the lecturer at the top of the session so that students can send messages or conduct questions and answers with other lecturers or students through the chat. Availability Chat can be set to activity around the clock, or just once or it may be repeated at the same time on a daily or weekly basis; (*c*) *Discussion.* forum the forum module forum is used to carry out two-way discussions between lecturers and students or fellow students on a website page. Each student in the forum can ask questions, reply to messages, respond to, and refute a topic by typing it in a text editor column; (*d*) *Quiz.* Quiz The quiz module is used by lecturers to make quizzes with various forms of questions, save questions in the question bank, present questions to students with detailed instructions, and provide assessments and feedback to students through the e-learning. In addition, lecturers can also secure quizzes with a password, set the time available, time limit for processing, time limit for repetition and presentation of questions randomly or sequentially; (*e*) *Video conference application.* Web conference web conference module is used by lecturers to carry out face-to-face online learning using website pages and PC/Laptop cameras. The plugin used for web conferencing is Big Blue Button. The features of this plugin include voice sharing, live video, powerpoint slides, polls, emote icons (including raising your hand), chat fields (chat), and the presenter's computer desktop; (*f*) *Peer Assessment.* Peer assessment is a learning process that involves students to assess the performance of other students (the same level). You can apply this system to assess a group assignment; (*g*) *Inline Feedback.* Inline feedback is a feature found in Moodle that allows lecturers to provide corrections on student worksheets directly. In this feature, lecturers can provide highlights or special notes directly on student worksheets.

A summary description of 4C skills and activities that can be done in Moodle-based online learning can be seen in Table 1.

Table 1. 4C Activity on Moodle

4C Dimension	Activity on Moodle LMS
Critical Thinking & Problem Solving	Students access learning videos that contain problems in learning. At the end of the video contains critical questions that will be answered by students in the discussion forum feature.
Colaboration	Students work on a collaboration room in each group using the breakout room feature on google meet or zoom
Communication	Students convey the results of the discussion on the main room menu and can be responded to by students from other groups
Creative Thinking & Inovation	Students use various supporting features in the Moodle LMS to design learning media other than what has been shown or learning media based on local wisdom

In the following, the results of the 4C analysis that can be developed and implemented in online learning based on moodle are presented in the Media Development and Science Learning Aids course.

Critical Thinking & Problem Solving

Critical thinking skills are one of the components of higher order thinking that are the focus of 21st century learning. Critical thinking is an ability that goes beyond rote memorization. When students think critically, they are encouraged to question hypotheses, analyze, and synthesize events. Critical thinking makes students go further by developing new hypotheses and testing them against facts (Karacoc, 2016). Onion, (2009) said critical thinking is a way of thinking and skills carried out to obtain information consciously, systematically, and with logical consideration of deciding what to do. Critical thinking leads to valid conclusions that are resistant to criticism.

Several strategies in moodle-based online learning that can be done to develop critical thinking and problem solving are through learning videos that present problems using media in learning. At the end of the learning video, questions are displayed. lighter questions that will guide students to think about why these problems can occur and strategies for solving problems through discussion forums. Students will explain various alternative solutions that can be taken to overcome the problems shown in the learning video. Another form of activity carried out is preparing study project assignments to identify problems and root causes.

Another strategy that can be done in moodle-based online learning to develop critical thinking and problem-solving skills is by maintain the skills to be taught. Teachers can demonstrate how to use learning media such as Torso and Elementary School Science Kits which

are displayed live through additional features embedded in Moodle such as google meet or zoom cloud meeting. During virtual or virtual face-to-face learning, educators can provide opportunities for students to ask questions or statements related to the material that has been studied. This can help develop students' critical thinking skills.

Another form of activity is to provide additional learning resources that explore critical thinking skills. These additional learning resources can be in the form of textual reading materials such as modules or other reading materials or explanations in the form of learning videos from YouTube whose links have been embedded in each session.

Furthermore, at the end of the lesson, educators can carry out assessments in the form of tests of students' abilities and understanding. Educators can focus more on assessments that incorporate higher order thinking skills (HOTS) and evaluate student work based on analysis, application, and creation rather than assessments that are memory mining.

Collaborative

Learning or collaborative learning is a situation where there are two or more people learning or trying to learn something together (Dillenbourg, 1999). Collaborative learning is a solution for students in learning difficult material by utilizing the diversity contained in the learning environment, namely by sharing ideas with peers who have different views. As defined by Sato (2007), collaborative learning is a product of shared ideas, in which students propose, listen and respond to each other's ideas, then build a meaning or understanding through joint efforts in diversity or difference. Thus, collaborative learning requires students to actively participate in utilizing individual diversity.

There are several activities that can be done by students in developing collaboration skills, such as doing group assignments in the collaboration room using the breakout room feature on Google Meet or on Zoom cloud meetings whose links have been embedded in Moodle. In the breakout room, students discuss the assigned group assignments while still getting supervision and assistance from the lecturer. Discussion activities can be carried out by giving each other their opinions directly, or conveying them in the chat feature. Discussion participants can display the results of group discussions by taking advantage of the share screen feature or working on joint tasks through Google Documents where each group member can work on the document together.

Another form of activity that can foster student collaboration skills is to conduct discussions on the chat feature and discussion forums. Lecturers can provide examples of problems to be discussed in chat or in discussion forums. In addition, lecturers can also take advantage of the jamboard feature on Google Jamboard to improve student collaboration. Students can access the jamboard link embedded in the Moodle and together answer the problems given by the lecturer. Through these activities, students can train and develop collaboration skills.

Communication

In the world of education, the learning process takes place effectively if communication and interaction between teachers and students occurs intensively (Hasanah & Nasir, 2020). Communication is very important to do as well as possible in the learning process, especially between teachers as educators and students as students (Aziz, 2019). Communication is a process of interaction or reciprocal relationship between individuals with other individuals who send messages to each other and receive messages. Communication skills include verbal and written skills (Carr, 2013). Communication can be said to be effective if the communication can meet the indicators of achievement in communication skills (Handayani et al., 2021).

Communication ability is a process of interaction or reciprocal relationship between individuals with other individuals who send messages to each other and receive messages. Communication can be said to be effective if the communication can meet the indicators of achievement in communication skills. (Aw, 2011) mentions some of these indicators, namely: (1) Understanding, (2) Pleasure, (3) Influence on attitudes, (4) Good relationships, and (5) Actions.

Communication skills in moodle-based online learning can be developed through several activities, namely when students deliver or present the results of their group work in the main room at Google Meet or Zoom Cloud Meeting. When one group has finished delivering the results of the discussion, the lecturer can facilitate a question and answer session and discussion. In addition, communication skills can be developed through question and answer activities when the teacher delivers teaching materials or demonstrates the use of learning media.

Creative Thinking & Innovation

Creative thinking is one of four important competencies that must be taught to students in 21st century education. Creative thinking competencies along with critical thinking, collaboration, and communication cannot be separated in classroom learning. The creative thinking section is an important thing that must be developed by students and educators at the level of basic education, secondary education, and higher education.

According to Asiri, (2020) creative thinking has a strong relationship with individual development and

individual thinking skills. By thinking creatively, each individual has an initial sensitivity to the situation at hand, that the situation is identified as a problem that wants and must be resolved. Students in learning only focus on the ability to imitate what the teacher does, it does not have the meaning of learning, it is enough to do tasks according to abilities so that it has an impact on students' thinking abilities (Faturohman & Afriansyah, 2020). In practice, students not only learn to think creatively at school, but how to use information in everyday life (Annuuru et al., 2017).

Creative thinking skills and innovation in Moodle-based online learning can be developed through several activities, for example students use various supporting features in the Moodle LMS to design learning media other than those that have been shown or learning media based on local wisdom that are adapted to existing equipment and materials. surrounding environment.

Another form of support that can be done by lecturers in developing students' creative thinking is through quiz games. The form of support, for example providing motivation, is given a quiz game through the quizizz application which makes the thinking process higher. The learning process should provide a place for students to express and explore the potential of their brains with supporting facilities from schools (Utama et al., 2018).

The four 21st century skills known as 4Cs can be grown and developed in moodle-based online learning by using various features, support and also various activities designed by the lecturer. The results of this study prove that even if learning is carried out online, it can still be designed to grow and develop 4C skills. The results of this study are in line with research conducted by Dewi, Adnyani and Mardani on the analysis of the implementation of 4C-based Japanese language learning in SMK Negeri 1 Singaraja. To develop students' potential in accordance with changing learning models, they must apply 4 21st century learning characters in learning activities. This study discusses how to implement learning in the classroom in normal conditions (offline) and what obstacles are faced by the teacher. In 4C learning, it has been going well according to theory, but there are shortcomings in the creative thinking and collaboration aspects. Students are still unable to think creatively and the discussion often leaves the core topic. One of the other obstacles encountered was in the allocation of time.

This research is relevant with study conducted by Gunawan (2019) that the application of LMS can support the development of student creativity. The character of students in each semester can be well supported in accordance with their abilities and needs. Moodle besides being a non-paid application, also provides a variety of interesting learning experiences for students. Students are trained in creativity in every aspect of

teaching, both in online and offline learning, and the simulations and animations provided are able to support student development. Hermansyah et al., (2019); Gunawan et al., (2019); and Herayanti et al., (2018) stated that all computer simulations both online and offline have great opportunities to support the improvement of various specific abilities, such as only student creativity. Other study conducted by Wiyono (2020) find that developed e-learning using the moodle platform in the lesson of Electromagnetic Induction is valid for enhancing student's critical thinking and practical for users. Additionally, the instructional integration in learning activity shows improved terms of learner's comprehension regarding the lesson concepts.

Conclusion

Based on the analysis of research data, it can be concluded that online learning based on Moodle can develop 21st century competencies in the form of critical thinking & problem solving; collaboration; communication; creative thinking & innovation.

Acknowledgements

References

Anggraeni, D. M., & Sole, F. B. (2018). E-Learning Moodle, Media Pembelajaran Fisika Abad 21. *Jurnal Penelitian Dan Pengkajian Ilmu Pendidikan: E-Saintika*, 1(2), 57–65. https://doi.org/10.36312/e-saintika.v1i2.101

Annuuru, T. A., Johan, R. C., & Ali, M. (2017). Peningkatan Kemampuan Berpikir Tingkat Tinggi Dalam Pelajaran Ilmu Pengetahuan Alam Peserta Didik Sekolah Dasar Melalui Model Pembelajaran Treffinge. *Edutcehnologia*, 3(2), 136–144.

Asiri, A. A. (2020). The Effectiveness Of The Inquiry And Brain Storming Strategies In Developing Achievement And Creative Thinking Skills In Arabic Language Of University Students. *International Journal Of English Linguistics*, 11(1), 253. Https://Doi.Org/10.5539/Ijel.V11n1p253

Aziz, J. A. (1970). Komunikasi Interpersonal Guru Dan Minat Belajar Siswa. Iq (Ilmu Al-Qur'an): *Jurnal Pendidikan Islam*, 2(02), 149–165. Https://Doi.Org/10.37542/Iq.V2i02.30.

Carr, J. M. (2013). Using A Collaborative Critiquing Technique To Develop Chemistry Students' Technical Writing Skills. *Journal Of Chemical*

Education, 90(6), 751-754. Https://Doi.Org/10.1021/Ed2007982.

Dillenbourg, P. (1999). *Collaborative Learning: Cognitive and Computational Approaches*. Advances in Learning and Instruction Series. New York, NY: Elsevier Science, Inc.

Faturohman, I., & Afriansyah, A. E. (2020). Peningkatan Kemampuan Berpikir Kreatif Matematis Siswa Melalui Creative Problem Solving. Mosharafa: *Jurnal Pendidikan Matematika*, 9(1), 107–118. Http://Journal.Institutpendidikan.Ac.Id/Index.Php/Mosharafa

Gunawan, Sahidu, H., Susilawati, S., Harjono, A., & Herayanti, L. (2019). Learning Management System with Moodle to Enhance Creativity of Candidate Physics Teacher. *J. Phys.: Conf. Ser.* 1417 012078. https://doi.org/10.1088/1742-6596/1417/1/012078

Gunawan, G., Nisrina, N., Suranti, N.M.Y, Herayanti, L., & Rahmatiah, R. (2018). Virtual Laboratory to Improve Students' Conceptual Understanding in Physics Learning. *Journal of Physics: Conference Series* 1108 (1) 012049. https://doi.org/10.1088/1742-6596/1108/1/012049

Handayani, S., Masfuah, S., & Kironoratri, L. (2021). Analisis Kemampuan Komunikasi Siswa Dalam Pembelajaran Daring Siswa Sekolah Dasar. Edukatif : Jurnal Ilmu Pendidikan, 3(5), 2240–2246. Https://Doi.Org/10.31004/Edukatif.V3i5.770.

Hasanah, H., & Nasir, M. (2020). Blended Learning In Improving Students' Critical Thinking And Communication Skills At University. *Cypriot Journal Of Educational Sciences,* 15(5), 1295–1306. Https://Doi.Org/10.18844/Cjes.V15i5.5168.

Herayanti, L., Gummah, S., Sukroyanti, B.A., Ahzan, S. & Gunawan, G. (2018). Developing Moodle in Problem-Based Learning to Improve Student Comprehension on the Concepts of Wave. *Advances in Intelligent Systems Research (AISR)*, 157(1). 134-137

Hermansyah, H., Gunawan, G., Harjono, A., & Adawiyah, R. (2019). Guided inquiry model with virtual labs to improve students' understanding on heat concept. *Journal of Physics: Conference Series.* 1153 (1) 012116. https://doi.org/10.1088/1742-6596/1153/1/012116

Karakoç, M. (2016). The Significance Of Critical Thinking Ability In Terms Of Education. *International Journal of Humanities and Social Science*, 6(7), 81–84.

Onions, P. (2009). Thinking Critically. An Introduction, Working Paper. Retrieved from: http://www.patrickonions.org/docs/academic/2009%20Thinking%20critically.pdf.

Sato, M. (2007). *Tantangan yang Harus Dihadapi Sekolah, makalah dalam Bacaan Rujukan untuk Lesson Study-*

Berdasarkan Pengalaman Jepang dan IMSTEP. Jakarta: Sisttems.

Septikasari, R., & Frasandy, R.N. (2018). Keterampilan 4c Abad 21 Dalam Pembelajaran Pendidikan Dasar. *Jurnal Tarbiyah Al Alwad*. 8(2). https://doi.org/10.15548/alawlad.v8i2.1597

Simanjuntak, M. D. R. (2019). Membangun Ketrampilan 4C Siswa Dalam Menghadapi Revolusi Industri 4.0. *Prosiding Seminar Nasional Fakultas Ilmu Sosial Universitas Negeri Medan* Vol 3 Tahun 2019, hal 921-929. Retrieved from http://digilib.unimed.ac.id/37330

Utama, A.W., Zulela, M.S., & Solihatin, E. (2018). Penerapan Pendekatan Brain Based Learning Sebagai Upaya Meningkatkan Kreativitas Belajar Dalam Mata Pelajaran IPS Pada Siswa Kelas V. *Prosiding Seminar Dan Diskusi Nasional Pendidikan Dasar* 2018, 395–399

Van, T.J.M. (2011). *Pendidikan Anakku Terlambat Bicara*. Jakarta: Perdana.

Wiyono, K., Zulherman, Z., Saparini, S., Ariska, M., Khoirunnisa, R., & Zakiyah, S. (2020). Moodle-based E-Learning Model for Critical Thinking in the Lesson of Electromagnetic Induction. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, *6*(2), 237 - 246. https://doi.org/10.21009/1.06210