

IMPLEMENTATION OF ONLINE LEARNING AND ITS IMPACT ON STUDENT SCIENCE COMPETENCY

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Abstract: Student science learning outcomes in the first year of online learning are good. However, this is in the Basic Science course, whose learning objectives do not cover all science topics and are at the basic science level. Continuous monitoring of student performance during online learning is also a necessity. This study analyzes student science learning outcomes in Science Education courses in the second year of online learning implementation. This research is a type of descriptive research that uses qualitative methods. The sample consists of 147 Elementary School Teacher Department (PGSD) FKIP students at the University of Mataram who had taken Science Education courses. The learning outcomes data collected are final grades in qualitative – A, B+, B, C+, C, D+, D, or E. This data is collected using a closed questionnaire instrument via google forms. The data were analyzed quantitatively using descriptive statistics. The study results provide information that students can be grouped into three based on their scientific competence. This group is students with excellent, good, and sufficient competence. Most of them (98.6%) have competence in the good and very good category.

Keywords: *Science Learning Outcome, Students, Science Education*

INTRODUCTION

In Higher Education (PT), science learning outcomes can be called a reflection of student competence towards learning objectives of science courses. In study programs or non-science majors, this can be observed from the final grades of the IKD courses. The Elementary School Teacher Education (PGSD) study program is an exception because, apart from the IKD, students are also provided with certain science courses to make them professionals in teaching science in elementary schools. In the PGSD study program, FKIP Mataram University, the name of this course is Science Education [1]. The final score itself is obtained from the results of the analysis of three types of exams (U), namely: (1) assignments, activities, attendance, and others become U₁), (2) midterm exams become U₂ scores, and (3) the end-semester U value₃ [2]. If there is a practicum, then the value goes into U₁.

Science learning outcomes that are expressed from the combination of U₁, U₂, and U₃ are influenced by several factors. Variables *independent* can come from within the students themselves personally and from their environment. Internal factors include intelligence, motivation, independent learning, physical and mental conditions [3-5]. The external factors include the lecturers' learning strategies, the lecturers, the *style* of the lecturers in giving lectures, association with school friends and places of residence, and attention from parents [6]. In today's digital era, environmental factors that become *independent* can even come from the surrounding environment and the environment far from

them. They can access it through various online and non-online electronic media.

Since the implementation of online learning due to the pandemic, the *independent* that can affect student science learning outcomes have increased. Good network quality is not evenly distributed throughout the region, causing learning facilities not to be perceived optimally by all students [7]. It is especially true when face-to-face lectures are held via video *conferencing*. Because of this factor, not a few PGSD FKIP students at the University of Mataram often suddenly leave the *meeting room*. They revealed it through WAG. Although not too many, some students confirmed that they could not attend online lectures because they did not have a quota. It, of course, is not found in face-to-face learning in class. Another obstacle arises because there is still a low digital literacy phenomenon [8]. It is a phenomenon where students are not ready to study online.

PGSD students have good readiness to implement online learning. It can be observed from the facilities and infrastructure they have, sufficient digital literacy to operate various media, and the anticipation of multiple obstacles that arise during the implementation of online learning [9]. However, their response at the implementation level tends to be negative. Students feel the lack of positive interaction with fellow students and lecturers and the limitations of network quality and internet costs [10-11]. When given a choice between learning online, face-to-face in class, or a mix of the two, most prefer

face-to-face learning. However, over time, they can do good habituation to master a large number of expected scientific competencies.

Based on the previous assessment results, students' science learning outcomes were in a good category [12]. However, this is the result of learning science in the IKD course. Not all science topics are taught to students. That is, (1) the learning outcomes do not cover all the science competencies required by PGSD students, and (2) the scientific competencies from the IKD learning outcomes have not been fully reflected. In this study, we observed students' science learning outcomes in the Science Education course, which facilitated students to learn all the science topics they needed to become professional elementary school teachers. The purpose of this research is to analyze student science learning outcomes. The results of this study itself can be used for (1) reflection material to design better science learning, (2) reference sources for further research, and (3) mapping of student science competencies to teach science in elementary schools.

RESEARCH METHODS

This exploratory, descriptive study used a qualitative approach. The sample consisted of 147 students who were determined by *purposive sampling*. The number consists of n male students and m female students. Based on regional origin, they are distributed in West Lombok, Mataram, Central Lombok, East Lombok, North Lombok, West Sumbawa, Sumbawa Besar, Dompu, Bima and Bali. They are third-year students in the odd semester of the 2021/2022 academic year, namely semester 5. They have also taken science education courses and have been facilitated by online learning through various platforms for these two years. These platforms include zoom, google meet, google classroom, Mataram University's Online Learning System (SPADA Unram), and various social media such as Whatsapp group (WAG).

The data that we collect is learning outcomes data. This data is qualitative, namely A, B+, B, C+, C, D+, D, and E. This form of value results from converting the final value in the form of numbers. The final score in the form of a number comes from the analysis results of three test scores - U_1 , U_2 , and U_3 . The qualitative value A is obtained from the conversion of the final value above or equal to eighty (≥ 80), $72 < B+ < 80$, $65 < B < 72$, $60 < C+ < 65$, $56 < C < 60$, $50 < D+ < 56$, $46 < D < 50$, and $E < 46$). A's interpretation is very good, B+ and B are good, C+ and C are adequate, D+ and D are poor, and E is very poor [2].

We also collect other supporting data, namely student knowledge regarding indicators from attitudes, process skills, and science products. The indicator of science attitude – scientific attitude - refers to [13], and the indicator of science process skills refers to Martin

[14]. As a detractor, some terms that are not indicators of this aspect of science are also a question in the questionnaire, are they an aspect of science or not? The scientific product indicators refer to [15]. Learning outcomes and supporting data were collected using a questionnaire or closed questionnaire instrument. This instrument is packaged in the form of a google form. The link is inserted into the Unram SPADA, which students can access for 24 hours. The collected data was then analyzed quantitatively using descriptive statistics.

RESULTS AND DISCUSSION

Science Learning Outcomes

23.8% of the students got an A grade. Most of them got a B+ score, which was 43.5%. Meanwhile, 31.3% earned a B grade. The remaining 1.4% of them got C+ and C grades (Figure 1). It means that 23.8% of students have scientific competence in the very good category. More than half (74.8%) have science competence in the good category. The remaining small part can only master science learning objectives with sufficient categories. This result is encouraging because 98.6% of students who are facilitated through online learning can master most of the learning objectives to have good to very good competencies. In addition, there are no students with science competence under the category of enough – less and very less.

This encouraging science learning result indicates that their readiness to implement online learning during the pandemic plays an important role. This readiness includes the availability of facilities and infrastructure that are needed for online learning, good literacy to use them, and anticipation of some obstacles that will arise [9]. The advantages possessed by PGSD students at FKIP Mataram University are a good and appropriate solution to avoid the negative impact of one of the obstacles to implementing online learning. The obstacle in question is the low digital literacy of students in utilizing various applications and online learning media [8]. However, the presence of a small percentage of students (1.4%) who were only able to achieve scientific competence with a sufficient category indicates that these advantages did not run smoothly for all students.

In addition to the readiness factor, the independent learning variable possessed by students is also the key to the success of almost all students in mastering various science learning objectives. Based on the results of previous studies, it is known that PGSD students have a good level of learning independence [4]. It has been trained from the family environment. Most of the students come from families of farmers, laborers, fishermen, and

entrepreneurs. They do not have enough time and low awareness to motivate their college students to study and help them complete college assignments. The thing that is most focused on is how to meet the needs of the family, including their children's tuition fees. On-

campus, they have also been accustomed to being independent in finding various learning resources. Students are increasingly trained to learn independently by utilizing various resources [10].

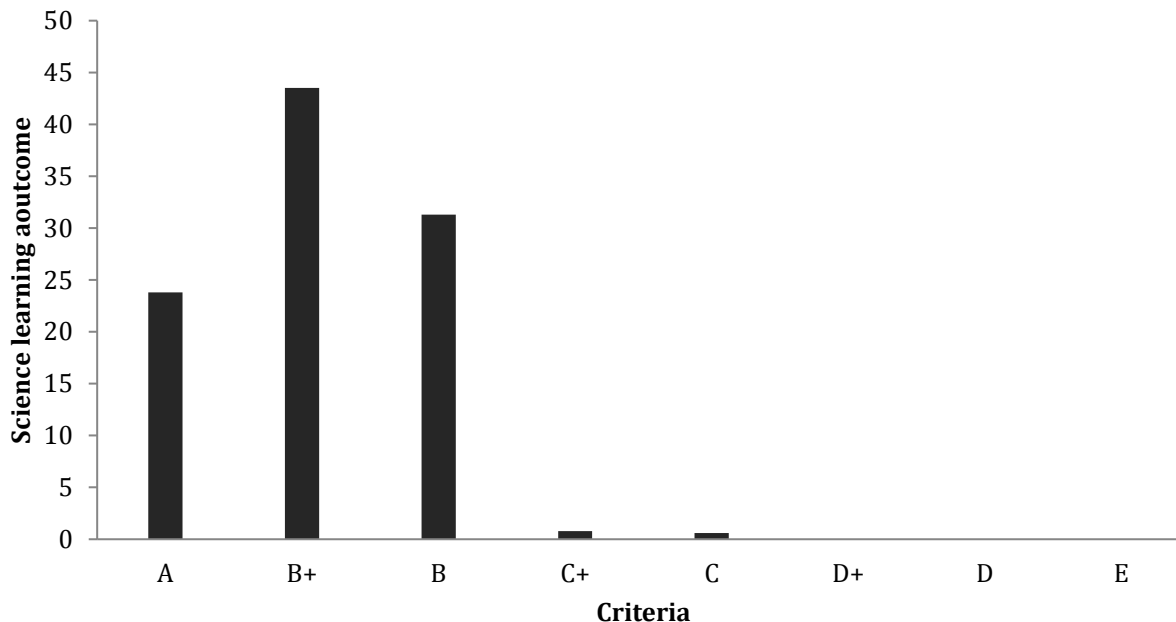


Figure 1. The distribution of the proportion of student scores in the Science Education course

Another variable that has a positive impact on students' good science competence is habituation, acclimatization, and adaptation. Although students first responded negatively to the implementation of online learning [11], this negative response was continuously eroded over time. Two years is not a small amount of time on the undergraduate level's normal lecture scale, which is normally completed in four years. It can be proven from the student responses that most of them feel comfortable learning online. As many as 90% of them even stated that they could understand the learning objectives well because they can easily find various learning resources and concentrate during the learning process [16].

From the aspect of the lecturer, the scientific competence reflected in the learning outcomes in the Science Education course means that the learning facilities used are appropriate. It is like what happened to science learning outcomes in the IKD course [12]. This positive trend certainly needs to be maintained and continuously improved going forward. The learning facilities provided to students during science learning during this pandemic are divided into three groups. First, for video conferencing as a substitute for face-to-face learning in class, platforms such as zoom and google meet are used. Second, students are facilitated with the Mataram University Online Learning System LMS

(SPADA Unram) and via email for the collection of assignments. This media is also used to upload media and teaching materials that students can access for 24 hours. Third, SPADA Unram and WAG social media were used for the discussion process.

Knowledge related to Science Aspect

Internal factors, namely readiness to carry out online learning and good learning independence, have been shown to play an important role in student success in achieving an *excellent*. Observing the survey results indicates that other internal factors also play a role in helping students achieve these competencies. The competencies referred to are their initial knowledge of indicators from aspects of science – attitudes, skills, processes, and science products. The function of this good prior knowledge is to be "capital or ticket", which can help students in the learning process. Some researchers call this concept the term initial ability. Learners with better initial abilities have science competencies which tend to be better at the end of learning [17]. It is because the initial ability helps them in the learning process.

This good initial ability is reflected in a good knowledge of the indicators of scientific

aspects. It means that students have good knowledge about the things studied and mastered to become competent in science. In the aspect of scientific attitude with indicators including honesty, responsibility, curiosity, thoroughness, diligent critical thinking, and cooperation [13], the proportion of students with good prior knowledge is very high. The percentage ranges

from 87.1% to 98%. The average is 91.7%. Those who answered not ranged from 1.4% to 7.5%, and the average was 5.64%. The proportion of students who answered they did not know had a smaller percentage. The values range from 0.7% to 8.1%, which is 3.3%. Complete data is presented in Table 1 below.

Table 1. Distribution of the proportion of student competencies in the scientific attitude aspect

No	Scientific Attitude Indicator	The proportion of Student Answers (%)		
		Yes	Not	Don't Know
1	Honest	90.5	6.8	2.7
2	Responsible	90.5	6.8	2.7
3	Curiosity	98	1.4	0.7
4	Thorough	93.2	4.1	2.7
5	Diligent	89.1	6.1	4.8
6	Critical thinking	87.1	6.8	8.1
7	Cooperation	91.2	7.5	1.4
Average		91.37	5.64	3.3

Regarding science process skills with indicators from Martin [14], the proportion of students who have good abilities ranges from 63.9% of the indicators to modeling or making models. 95.3% on the observing indicator. The average proportion of students who know well the indicators of science process skills is 81.88%. It means that there are still 18.12% of students who do not know these indicators well. The number of

these students was divided into two groups, namely (1) the group that answered "no", and (2) the group that answered "don't know". The range of the proportions is in the value of 2.7% to 18.4% in group 1 and 2% to 17.7% in group 2. The average proportions in group 1 and group 2 are 8.85% and 9.27%, respectively. Complete information is presented in Table 3 below.

Table 2. Distribution of the proportion of student competencies in the aspect of science process skills

No	Indicator of Science Process Skills	The proportion of Student Answers (%)		
		Yes	Not	Don't Know
1	Observing	95.3	2.7	2
2	Measuring	82.3	8.2	9.5
3	Predicting	80.3	10.2	9.5
4	Conclusion	92.5	6.1	1.4
5	Classifying	89.8	4.1	6.1
6	Communicating	83.7	10.9	5.4
7	Controlling variables	70.1	13.6	16.3
8	Operationally defining	75.5	8.2	16.3
9	Formulating hypotheses	84.4	6.8	8.8
10	Interpreting data	77.6	9.5	12.9
11	Experimenting	87.1	7.5	5.4
12	Modeling	63.9	18.4	17.7
Average		81.88	8.85	9.27

On aspect science products, which consist of facts, concepts, theories, principles, and laws [15], the average proportion of students with good knowledge is 79.34%. The proportion range for all indicators is 55.8%

on the legal indicator to 94.6% on the scientific fact indicator. It means that there is still a proportion of 20.66% of students who do not have good knowledge regarding indicators from science

products. This proportion is divided into 10.74% of students who answered "no" and 9.92% who answered "don't know". Sequentially, the range of the proportion

of students who answered "no and don't know" was 2% to 23.8% and 3.4% to 20.4%. Complete information is presented in Table 3 below.

Table 3. Distribution of the proportion of student competencies in the aspect of science products

No	Indicators of Science Products	The Proportion of Student Answers (%)		
		Yes	Not Do	n't Know
1	Fact	94.6	2	3.4
2	Concepts	85	8.2	6.8
3	Theories	84.4	9.5	6.1
4	Principles	76.9	10.2	12.9
5	Law	55.8	23.8	20.4
Average		79.34	10.74	9.92

Recommendations

Internal and external factors include: (1) readiness in online learning, (2) independent learning, (3) habituation, acclimatization, and adaptation abilities, (4) learning facilities from lecturers who have appropriate, and (5) good initial ability in science aspects has been proven to help students achieve good science competence. However, this still needs to be improved continuously according to the characteristics of students, characteristics of science topics, and supporting conditions, both physical and social. There are still a small number of students who have competence in the sufficient category. The competencies are in a good category, which can still be improved to a very good level, and the proportion of 23.8% of students with very good competence has not yet achieved a perfect final score – a score of 100. The 80s still dominate their final score. The minimum threshold can be categorized at a very good level.

The scientific competence that has not been maximized can be observed in most students' low science process skills. From the evaluation results in the even semester of 2020, it is known that the average science process skills are in the very poor category. The highest competency that students can achieve is in a good category, where the proportion only ranges from 2.86% to 11.43% from the two measurements. However, by implementing learning in the environment around students as natural laboratories, they can improve their science process skills. On average, the level of student competence increased to a good category. The proportion of students with good and very good categories increased to 34.29% and 28.57%, respectively. Even though they are non-science students, PGSD students still need good science process skills to solve problems in everyday life [18].

Based on these facts, we recommend using a combination of media during online learning. The combination of these tools is SPADA Unram, Whatsapp, and google meet (Figure 2). SPADA Unram serves as a medium for (1) online discussion forums that can be accessed 24 hours a day and seven days a week, (2) quizzes, (3) assignment collection, UTS, and UAS. SPADA Unram can also convey information related to lectures to students. Lecturers can upload various student needs during lessons, such as e-books, PPT, worksheets, and other learning media. Whatsapp is a WhatsApp group (WAG) and a private WA line between students and lecturers. The function of using this media is as a discussion forum in short messages. According to the lecture schedule, the google meet functioned as a face-to-face learning media online (*video conference*). Online face-to-face lectures were used zoom media.

We also recommend a learning strategy by utilizing the environment around students as a natural laboratory. This strategy is effective for (1) reducing the cost of online learning, primarily face-to-face online learning using google meeting media or zoom meetings, (2) facilitating students distributed in various districts/cities in NTB or other areas to learn directly in nature, (3) train science process skills [15], and (4) train students to discover and reconstruct their knowledge through direct observation in nature. In addition, this can also minimize to eliminate student boredom due to the implementation of prolonged online learning. In the learning process, the existence of variations or learning that is not monotonous is responded to positively by students because it can reduce or eliminate boredom.

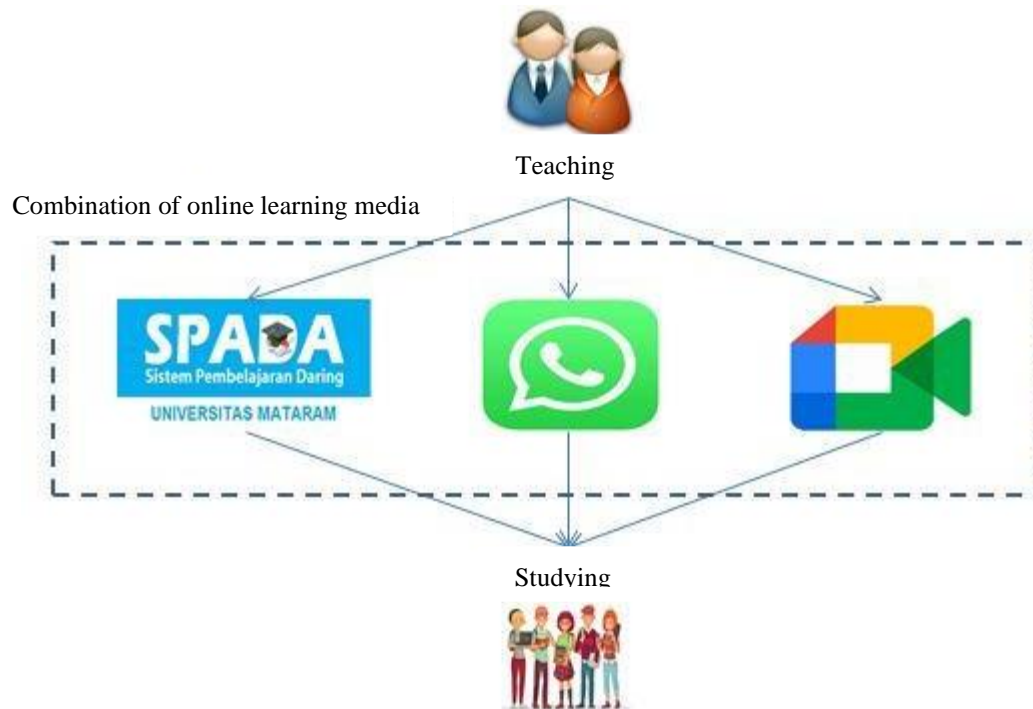


Figure 2. Recommendations for a combination of online learning media at PGSD FKIP Mataram University

CONCLUSION

Student competencies are divided into three categories good, good, and sufficient. The proportion of students who have competence towards science with a good category is dominant (74.80%). The proportion of students in the very good and sufficient categories was 23.80% and 1.40%, respectively. This level of scientific competence indicates that the learning facilities provided during online learning are appropriate. Therefore, it is recommended that a combination of online learning media be used, namely SPADA Unram, WA, and Google Meet. Another option instead of Google Meet is Zoom.

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