C2. Muti'ah

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ARTICLE

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Exploration of the scientific papers and self-assessment of students using the COVID-19 case on biochemistry course

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Abstract

The coronavirus disease 2019 (COVID-19) pandemic is a case that can be used as a biochemistry learning resource in relation to the topic of viruses. Learning to use cases will be effective if students are assigned to produce reports, articles, or other scientific papers. Self-assessment can be used to assess the competencies that have been learnt in the writing process. This study aims to analyze the scientific papers and self-assessment of students using the COVID-19 pandemic case. It includes qualitative research with scientific paper and self-assessment questionnaire analyses. The research sample was chemistry education study program students ($N = 57$) following biochemistry course, out of a population of 87 students. The results show that the students have a good understanding of explaining COVID-19. Self-assessment analysis shows that 80% of the students responded positively to eight statements; those who gave positive responses to each questionnaire statement were able to produce scientific papers. Good self-assessment is in line with the ability of students to compile good scientific papers.

KEYWORDS

case-based learning, COVID-19 case, scientific paper, self-assessment, virus

1 | INTRODUCTION

World Health Organization officially declared the coronavirus disease 2019 (COVID-19) as a dangerous pandemic on March 11, 2020.[1] The virus is reported to cause acute respiratory distress and has infected millions of people, causing the death of hundreds of thousands around the world.[1,2] The condition has led to major changes in all fields, one of which is that of education.

Since the pandemic emerged, restrictions on activities have been imposed to prevent the spread of COVID-19. All schools and universities were closed, which automatically affected 862 million school-age children around the world.[3] This was done to reduce social contact between students so that the spread of the virus could be reduced.[4] The closure of schools and universities is reported to have prevented 2–4% of deaths due to COVID-19.[5] This requires a change in the education system which enables the training of students' scientific thinking habits amid a pandemic whose effects are likely to be felt for a long time.[6]

Indonesia is one of the countries that has introduced policies restricting school and university activities. Nusa Tenggara Barat (NTB), one of the provinces in the country, implemented home study on March 16, 2020 to reduce the spread of COVID-19. The province is among those with the highest number of positive COVID-19 cases in Indonesia. Learning in higher education has introduced a learning policy at home through course or assignments conducted online.

Viruses are a topic studied on biochemistry courses, with discussion centered on the type of virus, its life cycle, impact, and prevention. The COVID-19 pandemic can be a source of learning in biochemistry course.

This is expected to change students' assumptions that biochemistry is not relevant to life today.[7–10]

Using cases in the community can be a student-centered learning resource to explain concepts based on their perspectives.[11] In college, the use of cases can increase motivation and make students more independent by a more in-depth approach to concepts.[12,13] Cases in the community are reported to be effective in learning in the fields of medicine, nursing, business, engineering, and science education.[11,14,15]

Case-based learning will be effective if students are assigned to produce reports, articles, or other scientific papers. Such papers can link the theories learned with conditions actually occurring in the environment, both those experienced directly by students and those learnt about from the media.[16] Through writing, students can develop their analysis and critical thinking skills in accordance with the goals of 21st century education.[17,18]

Self-assessment is a form of assessment of the level of achievement of competencies.[19] This assessment technique can be used to assess skills that have been learn and to strengthen the learning process, including writing skills.[20,21] Self-assessment can be in the form of a questionnaire or checklist.[22,23]

This study aims to analyze the scientific papers and self-assessment of students using the current COVID-19 pandemic case in biochemistry course.

2 | METHODS

2.1 | Situation analysis

The semester courses were conducted from January 2020 through face-to-face classes and structured assignments. However, since March 16, 2020, these have been conducted online because of the order made by local governments to limit social interaction. Therefore, half of the semester's biochemistry course will have been conducted face-to-face in class and the other half course do not usually take place in class (online).

The subject of viruses was introduced at the beginning of the semester before online learning was implemented. Initial knowledge before studying viruses is that students have studied the topic of assembling proteins related to the life cycle and composition of the virus. However, assignments have been conducted online. The indicators of achievement after learning and assignments are as follows:

1. Students are able to explain the components of the virus.
2. Students are able to explain the types of viruses based on the type of genetic material and their host.
3. Students are able to explain the life cycle of a virus.
4. Students are able to analyze the role of vaccines in preventing viral infections.

2.2 | Sample

This research was conducted in Mataram, NTB Province. The research sample was chemistry education study program students ($N = 57$) following biochemistry course, out of a population of 87 students. The age of the students was between 20 and 22. Table 1 shows the demographic data of the study sample.

2.3 | Research design

The research is qualitative in nature and aims to study the scientific papers and self-assessment of students based on the COVID-19 case. It uses scientific paper analysis techniques and self-assessment questionnaires to obtain data.[24] The scientific papers produced by the students were on the theme of COVID-19. They were given the freedom to determine the title based on a predetermined theme. The papers had a systematic title, abstract, introduction, literature review, discussion, conclusion, and references. Instructions on the preparation of scientific papers can be seen in Appendix S1. Students' self-assessment was analyzed on the basis of the questionnaires completed.

2.4 | Research instruments

The study used two research instruments, namely, analysis of the scientific papers produced by the students, and

TABLE 1 Summary of sample demographics ($N = 57$)

	Subtotal	
Background	***n***	**%**
Gender		
Male	8	14
Female	49	86
Age		
20	7	12
21	44	77
22	6	11
Zone location of residence		
Red zone	30	53
Green zone	27	47

the self-assessment questionnaire. The scientific papers analysis instrument was in the form of a checklist in accordance with the categories assigned to each writing component. The self-assessment questionnaire is an effective instrument for collecting qualitative research data.[25] For this study, it was developed based on positive and negative statements related to the students' self-assessment of their work and its relationship to biochemistry learning. There were five possible responses to the statements in the questionnaire: strongly disagree, disagree, neutral, agree, and strongly agree. A total of 17 statements were compiled and assessed by the expert. The questionnaire also included free responses through which the participants could freely convey their opinions about the tasks assigned and their conditions in face of the COVID-19 pandemic. Before being used, the instrument was tested on three experts with regard to its relevance to the components being assessed. The instrument evaluation sheet was arranged with rating categories of irrelevant (1), less relevant (2), quite relevant (3), relevant (4), and very relevant (5).

The questionnaire given to the expert for approval was tabulated and calculated through the Aiken Index for each statement ***using the following formula[26]:

$$V = \frac{\sum s}{n(c-1)},$$

with V being the index of expert agreement; s is the score given by the experts minus the lowest score in the rating category used; n is the number of experts; and c is the number of evaluation categories that the experts could choose. From the calculation of index V, a statement or indicator could be categorized based on its index. If index V is less than 0.4, the validity is lower; at 0.4–0.8, it is considered that the validity is sufficient; and if greater than 0.8, validity is deemed to be high.[27] The result of the rubric V index of the scientific paper analysis was 0.865, in the high overall category, so it could be concluded that the rubric for analyzing the student papers was valid and could be used. The self-assessment questionnaire analysis obtained an average Aiken V of 0.843, also in the high overall questionnaire category, so it was also concluded that it was valid and could be used. The questionnaire declared valid was compiled as a Google form and completed by students online.

2.5 | Data analysis

The study analysis began with domain analysis to obtain a general condition of the research object. The writing component and item analysis of the self-assessment statements indicate the object of the study. The writing component and statements in the self-assessment questionnaire were described in more detail to be able to establish the student patterns in compiling papers based on COVID-19.[28]

3 | RESULTS AND DISCUSSION

3.1 | Analysis of students' scientific papers

The analysis of the scientific papers produced by the students shows the percentage of fulfillment of all the criteria for each paper component. The analysis showed that 100% of the students fulfilled the three criteria for the production of predetermined titles. The abstract component showed that 76% of students had fulfilled all the related criteria; 70% met all the preliminary criteria for the introduction; and 67% for the literature review criteria. The discussion component was that with the lowest percentage, at 47%, while the conclusion and references have percentage fulfillment criteria of 65 and 60%, respectively (Figure 1).

The criteria for the titles developed by the students in accordance with the predetermined themes were that they should be clear, and no longer than 14 words. This would show that the students had understood how to compose good titles. This component showed the highest percentage of fulfillment of the criteria. Development of a title was the component most easily understood by students in the preparation of their scientific papers[29,30] and is rarely a problem in writing student scientific papers.[31]

Analysis of the abstracts showed that the most of the students had been able to write these well and had included all the information related to the themes studied and keywords. However, some students wrote abstracts that were too long, exceeding 150 words. The drafting of

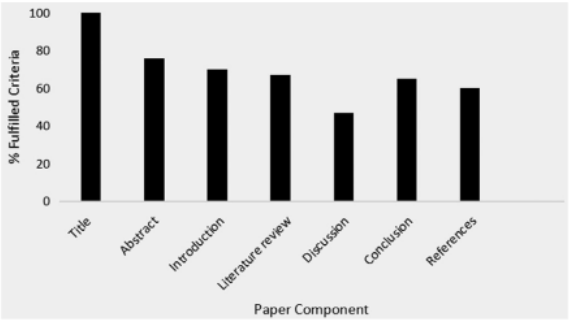

FIGURE 1 Percentage of students' paper component fulfillment criteria

abstracts is sometimes a problem in producing chemistry students' paper[32,33]; this is in contrast to the opinion of Deiner et al.,[29] who state that abstracts are the easiest component to learn in preparing scientific papers.

In the preparation of the introduction, the most of the students experienced problems in compiling arguments about the importance of writing in the introduction. This is in line with the opinion of Rosenthal,[34] who claims that argumentation is among the most important abilities that a person must possess when producing the scientific papers. The introduction is the most difficult part after the discussion, so must be emphasized to students in the preparation of scientific papers.[30,31]

The literature review in the scientific papers has used literature more than five with the sources should be 5–10 years old relevant to the title of the paper. The shortcomings shown by the students in compiling the literature review included citation of theories taken from blogs and inconsistencies in citing the sources. Consistency when quoting is one of the problems that is often encountered in reports prepared by students.[31,35]

The discussion contains the author's analysis of the problem, linking it with existing theories. This component was the most problematic for the students to master in accordance with predetermined criteria. Students had difficulties in linking their analysis with theory, and tended to rewrite the literature reviews that have been prepared. The discussion component is the most difficult in writing because it contains scientific arguments that require a higher order thinking skills.[29,31,34] A report by Greenberg[30] found that only 49.40% of students were able to structure the discussion well in their papers.

The students were able to draw conclusions well, but only a few provided recommendations after the conclusions had been made. The references were prepared in accordance with the agreed format. However, some sources do not have a reference. The students still need to be trained in format of papers.

The title of the text widely used by the students was "COVID-19 and How to Prevent It". Several other titles raised specific issues, such as "Social Distancing in Preventing the Spread of COVID-19 in My Neighborhood" and "Closing of My Home Environment Since the COVID-19 Pandemic."

The most of students began writing their abstracts by revealing facts and proceeding with outlining the purpose of the paper. However, in the first sentence of the abstract some directly expressed the purpose of writing. The keywords that always appeared were COVID-19, social distancing, and masks. Other keywords were viruses, life cycle, disinfectant, lockdown, and vaccine.

In the introduction, the students started writing by concentrating on the number of people infected with COVID-19 and the number of victims who had died. Next, they explained the symptoms of COVID-19 infection, the problem of public discipline in maintaining cleanliness, and the appeals made by the government. The problems widely described were the lack of discipline by the public in heeding government appeals, and how to prevent the spread of the virus. The sources most widely used by the students were "COVID-19: The First Documented Coronavirus Pandemic in History" by Yen-Chin Liu, Rei-Lin Kuo, and Shin-Ru Shih; Nusa Daily News; Kompas.com News; and "Corona Virus Disease (COVID-19): A Literature Review" by Yuliana.

The literature reviews by the students mostly began with a definition of a virus, as a very small microorganism composed of genetic material and capsid. Some students began with the development of the pandemic and the composition of COVID-19. Others explained the COVID-19 life cycle and its effects on health. Most students used reputable international journals in elaborating the COVID-19 theory.

The discussions developed by the students were able to connect the issues raised with the theories described. For example, they explained that the soap used when washing hands can dissolves the fat membrane in the COVID-19 capsid, so the intermediary of the virus used to enter the cell becomes absent. In addition, several explanations were given by the students that viruses are inanimate objects as they do not have metabolic devices, and become living things when they meet a host cell and are able to reproduce themselves. This contributed to their analysis of the importance of social distancing to prevent the spread of virus. Another interesting explanation is the importance of maintaining a healthy body in order to strengthen the body's immune system so that it can prevent the virus from affecting human health.

3.2 | Self-assessment analysis

Most students gave positive responses to each statement on the questionnaire (Table 2).

A total of eight statements showed positive responses above 80%, namely:

1. Since COVID-19, I have felt that the biochemistry topic is very useful for me.
2. Reading articles about COVID-19 virus has wasted my time.
3. Since the COVID-19 case, I have understood the importance of maintaining cleanliness to prevent the spread of the virus.
4. I do not understand biochemistry, so the COVID-19 case is not interesting to me.
5. The emergence of the COVID-19 cases has made me want to know more about virus.

TABLE 2 Student self-assessment based on the COVID-19 case

No.	Statement	% Response				
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	I enjoy studying the virus topic in biochemistry course	0	5.26	17.54	59.65	17.54
2	The virus topic is not interesting to learn	49.12	35.09	3.51	8.77	3.51
3	Since the COVID-19 case, I have enjoyed reading articles about virus	0	5.26	26.32	54.39	14.04
4	I am interested in reading articles about viruses since the COVID-19 case	0	5.26	22.81	49.12	22.81
5	Understanding the virus topic on biochemistry courses has made me understand the prevention of the spread of COVID-19 implemented by the government	0	7.02	35.09	31.58	26.32
6	Since the COVID-19 pandemic I have felt that the biochemistry topic is very useful for me	0	1.75	17.54	40.35	40.35
7	Reading articles about the COVID-19 virus has wasted my time.	80.70	14.04	5.26	0	0
8	Since the COVID-19 case I have understood the importance of maintaining cleanliness to prevent the spread of the virus	0	0	0	22.81	77.19
9	Understanding the virus topic on the biochemistry course has helped me explain the importance of maintaining cleanliness to the people around me	0	0	8.77	31.58	59.65
10	I do not understand biochemistry, so the COVID-19 case is not interesting to me	52.63	42.11	0	5.26	0
11	The emergence of COVID-19 cases has made me want to know more about the virus	0	0	19.3	40.35	40.35
12	The COVID-19 case has prepared me to be ready for all the changes occurring	0	8.77	19.3	31.58	40.35
13	I follow all government recommendations to prevent the spread of COVID-19	0	5.26	10.53	42.11	42.11
14	Before the COVID-19 case, my understanding of the virus was minimal	0	5.26	10.53	71.93	12.28
15	The COVID-19 case has made me find out more about the virus	0	5.26	14.04	59.65	21.05
16	I love to explain to people around me the importance of consuming nutritious foods to boost the immune system	0	3.51	19.30	45.61	31.58
17	I consume healthy food to maintain my body's immune system	0	0	14.04	31.58	54.39

6. I follow all government appeals to prevent the spread of COVID-19.
7. Before the COVID-19 case, my understanding of the virus was minimal.
8. I consume healthy food to maintain my body's immune system.

The free response data show that the students had been interested in studying the virus since the COVID-19 pandemic became a news topic. In addition, they felt that studying biochemistry made them understand the articles about COVID-19 that they read. However, some students thought there was too much content that they did not understand in the articles about the virus.

The self-assessment relationship showed that students who gave positive responses to each statement in the questionnaire were able to produce better papers than those who gave negative responses. They used more than

five references; explained clearly their relation to COVID-19 and provided a good argument in relating the theory with the problem expressed in the text.

If the zone where the students live is considered, those who live in a red zone raised more titles about the problem of indiscipline in implementing government regulations. This is based on their observations in the environment in which they live and on their personal experience. Cases in their environment can usually add to their analysis when making reports.[17]

Student papers based on the COVID-19 case made them understand the process of preventing the spread of viruses and how to deal with the changing conditions of our lives. It is hoped that this paper can teach students to take care of their health and help each other in preventing the spread of COVID-19.[36,37] In addition, assignments based on cases can help students deal with similar pandemics in the future.[36]

4 | CONCLUSION

Analysis of the papers produced by the students shows good understanding of explaining about COVID-19. This is in line with the self-assessment analysis, which shows that the COVID-19 case has made students interested in learning about viruses, and that they feel that biochemistry is a useful course for helping them understand the virus. Good self-assessment is in line with their ability to produce good writing.

4.1 | Limitations

The limitation of this research is that the discussion is only limited to the topic of viruses as part of topics discussed in biochemistry courses. We do not check plagiarism from student writing, but students must collect all articles that are used as references, including picture citation, must include references. Another reason is because student writing is not published. The use of scientific writing format is only to teach students to compile scientific writing. The appropriateness of references with student writing was examined by two reviewers.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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