



The academic impact of online mathematics learning during COVID-19 for junior high school students

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Abstract

Until now, no research explicitly examines the academic impact on public junior high school students in Singaraja City. The actual condition of the academic impact of online mathematics learning is necessary to be revealed immediately. This information can be used as a basis for teachers designing and implementing mathematics learning to minimize or eliminate the negative impact of online learning. This study involved 507 public junior high school students distributed over four public schools in Singaraja City as the sample. This study used a questionnaire instrument consisting of 14 items, and the data were tabulated based on the responses entered on the google form. The study results showed that students experienced several academic impacts as a result of online learning of mathematics. The academic impacts that students most felt among others: the amount of mathematics material was hard to understand, students doubted the accountability of the grade obtained by their friends, decreased enthusiasm for learning, and students felt that their academic abilities were not optimal. The conclusion obtained from this study is that online mathematics learning during COVID-19 had an academic impact on public junior high school students in Singaraja City.

Keywords: academic impact; COVID-19; mathematics; online learning

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Introduction

Today COVID-19 pandemic becomes an exciting focus to discuss because of the impact in all aspects of life, including education. The significant impact of the COVID-19 pandemic is feared to have a negative effect on the education world. It is understandable because there are changes in the learning process that are usually done face-to-face in class that must be done online by utilizing network-based technology. Therefore, all components involved in the implementation of learning, from schools, teachers, and students, must adapt to the implementation of online learning. Adaptations that teachers and students must make will undoubtedly cause various problems in learning (Alomyan, 2021; Yilmaz & Kostur, 2021; Yohannes et al., 2021).

The COVID-19 pandemic is believed to have a massive impact on education. It led many studies being conducted in various countries to look at the impact of COVID-19 on learning, particularly related to online learning (Adnan, 2020; Al-Mawee et al., 2021; Chaturvedi et al., 2021; Chirinda et al., 2021; Mengistie, 2021; Mukuka et al., 2021; Noori, 2021; Uegatani et al., 2021; Upoalkpajor & Upoalkpajor, 2020; Yilmaz & Kostur, 2021). Research on the academic impact of online learning during COVID-19 has been carried out by Alomyan (2021) and Baltà-Salvador et al. (2021). Both of these studies were conducted at a university outside Indonesia.

In Indonesia, many studies have been conducted that examine the impact of online learning, especially on students. These studies did not give the same results and sometimes showed contradictory results (Baltà-Salvador et al., 2021). Several research results showed that online learning positively impacted students' motivation and learning outcomes (Hasanah et al., 2020; Khurriyati et al., 2021; Mandailina et al., 2021; Safrawita, 2021; Wasiah, 2021; Yuliana, 2021). Meanwhile, several other research results showed the opposite result; namely, online learning had a negative impact on student motivation and learning outcomes (Basa & Hudaidah, 2021; Fadilla et al., 2021; Mukuka et al., 2021; Noori, 2021; Sukma & Priatna, 2021; Utami & Cahyono, 2020; Wasiah, 2021; Yohannes et al., 2021; Yunitasari & Hanifah, 2020).

In every learning, either carried out face-to-face or online, there will always be an interaction. According to Bernard et al. (2009), there are three types of interaction in the learning process: the interaction between students and students, students with teachers, and students with the material. The change from face-to-face learning to online learning will potentially change the quality of the three types of interaction. The type of interaction that is somewhat limited is the interaction between students and students (Fauzy & Nurfauziah, 2021; Kalogeropoulos et al., 2021) and students and teachers (Thanji & Vasantha, 2018). In online learning, discussions between students are very limited (Calder et al., 2021).

Changes in the three types of interactions can undoubtedly have an impact on students' interests, motivation, learning outcomes, and perceptions of online learning (Basa & Hudaidah, 2021; Fadilla et al., 2021; Mukuka et al., 2021; Noori, 2021; Rivai et al., 2021; Sukma & Priatna, 2021; Utami & Cahyono, 2020; Wasiah, 2021; Yohannes et al., 2021; Yunitasari & Hanifah, 2020). Merrill (2013) states that learning interactions can be enhanced if guided and reinforced by effective instructional strategies. It implies that the teacher plays an important role in improving the quality of the three types of interaction. If the teacher cannot manage online learning well, the quality of the three types of interaction will be difficult to achieve

optimally. Adnan (2020) reported that 71.4% of respondents stated that online learning through virtual meetings was less motivating for learning than face-to-face learning in the classroom, 78.6% stated that face-to-face contact with the teacher was necessary for effective learning. Furthermore, the interaction change factor, Baber (2020) states, the variables of student motivation to participate in online classes, subject structure, facilitation, and teacher knowledge were significant determinants of student learning perceptions and student satisfaction with online learning.

Public Junior High School in Singaraja City also carries out online learning. Although based on research, there is a bad impact of online mathematics learning (Hasanah et al., 2020; Tyaningsih et al., 2021), but until now, there has been no research that explicitly examines the academic impact on Public Junior High School students in the city Singaraja. Currently, there is only one study conducted by Ardiyanti et al. (2020) that examines the evaluation of the online mathematics learning process during the Covid-19 period. This study did not target junior high school students but only high school students (SMA) in the city of Singaraja.

With inconsistency results of several studies (Basa & Hudaidah, 2021; Fadilla et al., 2021; Hasanah et al., 2020; Khurriyati et al., 2021; Mandailina et al., 2021; Mukuka et al., 2021; Noori, 2021; Safrawita, 2021; Sukma & Priatna, 2021; Utami & Cahyono, 2020; Wasiah, 2021; Yohannes et al., 2021; Yuliana, 2021; Yunitasari & Hanifah, 2020) take appropriate steps to ensure the quality of the process and results of mathematics learning is the online learning continue to be implemented. Therefore, the real condition of the various academic impacts of online learning on mathematics learning is important to be revealed immediately. The results of this study were expected to provide an actual illustration of the things experienced and felt by Public Junior High School students in the city of Singaraja while participating in online mathematics learning. This information can later be used as a basis for teachers designing and implementing mathematics learning to minimize or even eliminate the negative impact of online learning.

This research examines the various academic impacts felt by Public Junior High School students in Singaraja City in online mathematics learning during COVID-19. As reviewed by Alomyan (2021) and Baltà-Salvador et al. (2021), the academic impact is still very relevant to study because the impact may be felt by students at the junior high school level.

Methods

The population of this study was junior high school students of 4 public schools in Singaraja City, namely Public Junior High School 1 Singaraja, Public Junior High School 2 Singaraja, Public Junior High School 3 Singaraja, and Public Junior High School 6 Singaraja. This study involved 507 junior high school students at four public schools with the distribution: 132 students at Public Junior High School 1 Singaraja, 126 students at Public Junior High School 2 Singaraja, 125 students at Public Junior High School 6 Singaraja, and 124 students at Public Junior High School 6 Singaraja. At each school, seventh dan 8th-grade students were given a questionnaire link, and then students were asked to fill out the questionnaire. The respondent data were tabulated based on the questionnaires sent by the respondents on the google form.

Furthermore, the data were analyzed descriptively to determine the level of respondent approval of the questionnaire items based on predetermined criteria.

This study used a questionnaire instrument consisting of 14 items. The questionnaire item contains statements related to online learning. Online learning referred to in this study was in the form of comprehensive learning activity that used various digital platforms (zoom, google classroom, google meet, and others) connected to the internet (such as smartphones, laptops, and others) to communicate directly or indirectly by online (Assidiqi & Sumarni, 2020; Singh & Thurman, 2019).

The complete questionnaire items are presented in Table 5. Each item used a 4-point Likert scale whose answers were strongly agreed, agree, disagree, and strongly disagree. The gradation of hesitation was not included so that the response obtained could give a clear direction of the trend. To determine the level of approval for each item, three levels of approval were used, namely high, medium, and low, using the formula developed by Alomyan (2021) as follows:

$$\text{Scale range} = \frac{\text{maximal score} - \text{minimum score}}{\text{number of level}} \quad (1)$$

Based on the formula (1), the level of approval for each item in the questionnaire can be calculated and presented as in Table 1 below.

Table 1. Item classification of the agreement level, adapted from Alomyan (2021)

Interval	Agreement Level
1 – 1.999	Low
2 – 2.999	Medium
3 – 4	High

Before the questionnaire was used, a questionnaire review process was carried out through professional judgment to see the validity of the contents of the questionnaire. Content validity testing was done by involving an expert in mathematics education and an assessment expert. Gregory formula was used to determine the validity of the contents of the questionnaire. Furthermore, to determine the internal validity of the questionnaire, a field trial was conducted involving 95 students of Public Junior High School 8 Singaraja. Its internal validity was seen based on the value of the Pearson correlation coefficient on each item of the questionnaire.

Meanwhile, the stability of the questionnaire was seen based on the value of the Cronbach Alpha coefficient obtained. The Pearson correlation coefficient and Cronbach Alpha coefficient were calculated using the IBM SPSS Statistics Version 20. To interpret the Pearson correlation coefficient, the following Table 2 criteria were used.

Table 2. General guidelines for interpreting validity coefficients (Saad et al., 1999)

Validity Coefficients Range	Interpretation
Upper than 0.35	very beneficial
0.21 – 0.35	likely to be useful
0.11 – 0.20	depends on circumstances
Lower than 0.11	unlikely to be useful

Based on the criteria on Table 2 above, the item was considered valid and can be used if the Pearson correlation coefficient value was at least 0.21. To interpret the value of the Cronbach Alpha coefficient, the following Table 3 criteria were used.

Table 3. General guidelines for interpreting the reliability coefficient (Saad et al., 1999)

Reliability Coefficient Score	Interpretation
Upper than 0.9	excellent
0.80 – 0.89	good
0.70 – 0.79	adequate
Lower than 0.70	may have limited applicability

Based on the criteria in Table 3, the questionnaire was considered reliable and can be used if the Cronbach Alpha coefficient value was at least 0.70.

Results

From the results of the questionnaire test consisting of 14 items, the content validity coefficient value was 1.00. The internal validity of each questionnaire item is presented in Table 4 below.

Table 4. Pearson correlation value of each questionnaire

Item Number	Coefficient Correlation	Interpretation
1	0.608 *)	very beneficial
2	0.621 *)	very beneficial
3	0.499 *)	very beneficial
4	0.482 *)	very beneficial
5	0.616 *)	very beneficial
6	0.635 *)	very beneficial
7	0.547 *)	very beneficial
8	0.543 *)	very beneficial
9	0.571 *)	very beneficial
10	0.448 *)	very beneficial
11	0.368 *)	very beneficial
12	0.622 *)	very beneficial
13	0.429 *)	very beneficial
14	0.443 *)	very beneficial

Description: *) significant for $\alpha = 0.01$

From the results in Table 4, it can be concluded that the 14 items used were in a very beneficial category, so that they were suitable to be used as the instruments in this study. Meanwhile, the Cronbach Alpha Coefficient value obtained was 0.867, which was good. It indicates that the questionnaire instrument had a good level of stability, so it is suitable to be used as an instrument in this study. Student responses to each item in the questionnaire can be presented in Table 5 below.

Table 5. Mean, standard deviation, agreement level, percentage of student responses

Item Number	Statement	Mean	SD	Agreement Level	Response Percentage	
					Agree-Strongly Agree	Disagree-Strongly Disagree
1	I feel that the math scores I get during online learning do not fully reflect the real math skills	3.036	0.917	High	71.99%	28.01%
2	I prefer to get math lessons in person in class than online	3.276	0.789	High	87.97%	12.03%
3	A lot of math material that I do not understand because math lessons are done online	3.294	0.814	High	88.36%	11.64%
4	I am lazy to ask the teacher because math lessons are done online even though I do not understand the material	3.028	0.795	High	76.53%	23.47%
5	I often cannot take math lessons online properly due to internet network problems	2.477	0.844	Medium	47.53%	52.47%
6	I often cannot take math lessons online because I do not have a quota	1.730	0.662	Low	6.11%	93.89%
7	As long as mathematics learning is done online I do not believe that the math scores that my friends get are purely because of their abilities	3.118	0.715	High	82.05%	17.95%
8	I am often late in submitting assignments given by the teacher because mathematics learning is done online	2.371	0.858	Medium	44.38%	55.62%
9	Online Mathematics learning makes my enthusiasm for learning decrease	3.101	0.834	High	77.32%	22.68%
10	I hope that math learning will still be done online	1.811	0.817	Low	18.15%	81.85%
11	I often get good math scores even though the lessons are done online	1.890	0.824	Low	21.50%	78.50%

Item Number	Statement	Mean	SD	Agreement Level	Response Percentage	
					Agree-Strongly Agree	Disagree-Strongly Disagree
12	When I am given a math assignment, my parents often help me when I do the task	2.162	0.813	Medium	34.91%	65.09%
13	When given a test I often look for answers in books or the internet	3.036	0.732	High	78.90%	21.10%
14	Online learning causes my math skills to decline	3.122	0.832	High	78.30%	21.70%

Based on the results obtained in Table 5, there were eight items with high agreement levels, three items in the medium category, and three items in the low category. The items with a high and medium level of agreement were items from statements related to the negative impact of online learning. Meanwhile, the items with low agreement levels were from two items which are statements related to the positive impact of online learning, and one item is a statement related to the negative impact of online learning.

Number 3 statement, "A lot of math material that I do not understand due to online learning," had the highest mean of 3.294 with the high agreement level. When viewed from the percentage, as many as 88.36% of respondents stated they agree or strongly agree with this statement.

Number 6 statement "I cannot attend math online learning due to no data package" had the lowest mean of 1.730 with the low agreement. Viewed from the percentage, only 6.11% of respondents stated agree or strongly agreed with this statement. It means only 6.11% of students could not attend online math lessons because they did not have a data package.

Discussion

Online learning has a psychological impact on students. Many students experience boredom in answering questions, so they finish it carelessly (Basa & Hudaidah, 2021). The lack of seriousness in answering the questions is an indication that students have not used their abilities optimally in answering questions, so the results obtained do not actually show the optimal abilities of students. With this condition, students naturally feel that the math scores they achieve do not fully reflect their actual mathematical abilities.

Carrying out face-to-face mathematics learning means that they need the role of the teacher directly in learning. Mathematics learning conducted online will certainly reduce students opportunities to learn mathematics with their peers (Kalogeropoulos et al., 2021) because the interactions that occur between students are limited (Calder et al., 2021) and also the lack of interaction between students and teachers (Fauzy & Nurfauziah, 2021). Students need the direct role of the teacher in learning so that students will feel more comfortable and feel that they receive direct guidance and direction from the teacher in studying the material. It

may be why direct learning in class is more desirable for students than online learning. It is also the reason for students not expecting online mathematics learning.

Mathematics, as the subject of online learning, requires much preparation that must be done by the teacher so that the material presented can be easily understood by students (Yohannes et al., 2021). However, the effort is not enough because the decreasing pattern of interaction in online learning can make it difficult for students to understand the material (Budiman, 2021). Students can also not fully understand the material due to the limited communication that occurs with the teacher during online learning. Moreover, when mathematics learning does not require visualization, students will have difficulty understanding the material if the teacher cannot provide visualization directly (Basa & Hudaidah, 2021). In addition, the motivational factor possessed by students is one of the determining variables on students in mastering the material (Safarati, 2021). With much material that students do not master, it will certainly impact students' academic abilities. It is the reason for students disagreement with the statement, "I often get good math scores even though the lessons conducted online".

Internet connection and the quality of learning influence students' motivation or enthusiasm to take part in online learning (Yanti & Sumianto, 2021). Unstable internet connection becomes an obstacle in online learning (Amalia & Sa'adah, 2020; Fauzy & Nurfauziah, 2021; Nur, 2021). It impacts the number of students who often cannot take online math lessons well. The internet network that is often disrupted and the teacher's implementation of poorly designed learning may cause students to be less enthusiastic in participating in online learning. The results of this study are in line with the results of Adnan (2020) but contradict the results of his research by Safarati (2021), who reported that online learning caused 80.75% of students to feel enthusiastic about participating in learning. The poor quality of the internet network and the low quality of learning designed by the teacher will also have an impact on the low participation of students in participating in learning (Hutagaol, 2021) so that even though there is a material that has not been understood, students are reluctant to ask the teacher.

Related to the student delays in submitting assignments, one of the causes is internet interference. The existence of internet interference also impacts the student participation level in learning. Frequent internet interferences experienced by students will reduce interest in learning, resulting in decreased student participation in learning, for instance, the low number of student participation in collecting assignments (Budiman, 2021). The results of this study are in line with the findings of Majid et al. (2020), who reported the obstacles that are often faced during online learning, including students who are less disciplined in complying with the task collection schedule so that some students are late in collecting assignments. This result contrasts with Hidayati and Adilaturrahmah (2021), who found that 96% of students often submit the assignments on time.

The issue of academic cheating has the potential to occur during online learning. Issues of academic cheating that occur during online learning include the participation and dominance of parents doing their children assignments (Indrayani, 2021; Sapardan, 2021), children who search answers from search engines during the test (Indrayani, 2021; Sapardan, 2021; Putri et al., 2020). Another impact of online learning is piracy and plagiarism (Thanji & Vasantha,

2018). The potential for cheating can be caused by three factors: the quality of the questions or assignments, the attitude of the parents, and the students' integrity (Indrayani, 2021). Various potentials of cheating may occur during online learning will give students confidence that they lack confidence in the value of mathematics obtained by their friends purely because of their abilities. It is very natural for students to feel this way because conditions like this do not only happen to students of public junior high school in Singaraja city but can also happen in other areas or even in developed countries. Kuhfeld et al. (2020) report on the impact of COVID-19 on students in America. In almost all grades, the gains in students' math grades in fall 2020 were lower than the previous years. It can happen due to online learning that has not been able to maximize student knowledge compared to face-to-face learning (Nur, 2021) or the limited communication that occurs with teachers during online learning (Budiman, 2021).

Conclusion

This study showed several academic impacts felt by public junior high school students in Singaraja City in mathematics online learning during COVID-19. Students' academic impact is mostly felt related to their mathematical academic ability. Various potential frauds that can occur in the implementation of online mathematics learning cause students to feel their academic abilities are not optimal and doubt the academic abilities of their friends. The limitation of this study is that the conclusions obtained are very dependent on the sample responses used because each respondent subject will have different perceptions of the questionnaire items given. Based on these findings, if the learning is carried out online, it is expected that the mathematics teachers of public junior high schools in Singaraja should design and implement online learning properly that will be able to minimize and even eliminate the academic impact felt by public junior high school students in the city of Singaraja in participating in mathematics online learning.

Conflicts of Interest

The author guarantees that this article is the author's original. There is no conflict of interest in the publication of this manuscript. In addition, the author also guarantees that there are no issues that violate publication ethics such as plagiarism, misconduct, data forgery and/or tampering, and that this article has not been published or considered for publication in other places. Issues of originality and publication ethics are entirely the responsibility of the author.

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