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Effectiveness of Online Learning viewed from Students' Online Interaction

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ABSTRACT

Online learning was expected to remain as effective as face-to-face learning. One of the essential factors used to measure learning effectiveness is students' online interaction with their peers, teachers, and learning content. Therefore, this study aims to determine the effectiveness of online learning viewed from online interactions in SMK Negeri 3 Salatiga. This descriptive quantitative research used questionnaires distributed to 306 students as a data collection technique. The results showed that online learning in SMK Negeri 3 was effective, viewed from the online interactions, namely the student-student exchange had an average score of 3.87 (high), students-teacher interaction had an average of 4.14 (high), and students-learning content interaction had an average of 3.89 (high). The findings are expected to be considered in designing effective online learning based on the students' online interaction. Besides, the teachers will understand more about their students and their development in the learning process.

1. INTRODUCTION

Digital technology in online learning can facilitate knowledge transfer [1]. Flexibility can be achieved using technology [2]. It is necessary to make innovations in Information Technology for education [3]. One of them is online learning. Online learning is believed to provide convenience and accessibility. Online learning can also train students to learn independently through online media and increase students' activeness in terms of online communication. In addition, online learning can improve students' learning motivation [4].

Although online learning has many advantages, there are still obstacles or challenges, such as obstacles in conducting online assessments. The main obstacle is access to technology because if there is no technology, we can't run this online learning [5].

Another obstacle that often occurs is in terms of time management. Online learning can't meet the length of time designed before. Usually, online learning takes a shorter time. Therefore, some students cannot follow the learning due to the shorter time [6].

Despite its strengths and weaknesses, online learning is believed to be the only learning solution, particularly during the pandemic, as it has been there for the last two years [7]. Moreover, online learning is a form of learning innovation in this 4.0 education era that cannot be avoided [8]. However, it is expected that online learning conducted must remain as effective as face-to-face learning [9]. Therefore, it is necessary to know how effective online learning is to improve all parties' learning quality.

The effectiveness of online learning can be seen from the students' perceptions of the benefits, limitations, and recommendations of the implementation of online learning [10][11]. In addition, the ability to use online tools, access to online learning and how teachers present materials while using media in online learning are also determinants of the effectiveness of online learning [12][13][14]. Apart from being highlighted from the teachers' aspect, the aspect of students who have high activity and enthusiasm for the lesson can also be used as a determinant of the effectiveness of learning [15][15].

There are previous studies related to the effectiveness of online learning. One of them is Satyawan et al., who researched the effectiveness of online learning seen from the concentration of students in their attentiveness to the teacher's explanations, student motivation in participating in online learning and learning outcomes, in which the results were effective [16]. The following research mentioned the effectiveness of online learning, which can be seen from student's and lecturers' participation [17]. On the other hand, Tsang et al. also showed that students' interactions with other students, teachers, and students with learning content could be predictors of online learning effectiveness [18]. While the previous studies talked about the predictors or determinants of effective learning, this study uses those determinants to determine the effectiveness of online learning.

In line with Tsang et al., Swan stated that the online environment strongly supports learning outcomes that are equivalent to face-to-face learning and can be viewed from an online interaction so that there is no difference between the process of online interaction and direct interaction [9]. This means that interaction is believed to be one of the determinants of effectiveness in terms of learning. This statement is strengthened by the opinion that interaction is a factor considered important in measuring the effectiveness of online learning [19]. The interactions existing in online learning, of course, become online interactions. Online interaction here is divided into 3 aspects: student interaction with other students, student interaction with teachers, and student interaction with learning content [20]. This study uses the three student interactions as predictors of the effectiveness of online learning.

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Student interaction with other students is crucial to increase student involvement in online learning. It can also prevent students from feeling bored and isolated in online learning. When students connect, this will create a dynamic online learning community [11]. The interaction between students and teachers is also crucial in increasing student engagement. Teachers should pay special attention to this because it will impact student learning outcomes [21]. No less important than the two previous forms of interaction, Moore in Martin and Bolliger stated that student interaction with learning content is also believed to be able to change students' understanding and perspective [11]. To increase students' interaction with learning content, teachers must provide sufficient time to search for literature/reading and interactive teaching materials and make assessments with careful planning [22][23].

Furthermore, online interaction can occur through the use of several online media. One of them is an online discussion forum. Online discussion forums allow students to interact with learning content, teachers and colleagues [24]. Through online discussion forums, teachers can integrate with group work activities, which is believed to be a way to encourage student interaction in their academics [25]. Revere and Kovach suggest using online technologies such as discussion forums, chat sessions, blogs, wikis, group tasks, Twitter, Skype, YouTube, and Ning networks to increase student interaction [26]. A similar study investigating the engagement between students by focusing on how students confirmed the lectures with their lectures online showed students' attention has contributed to the quality improvement of their learning [27].

SMK Negeri 3, one of the Vocational Schools in Salatiga, has also been undergoing online learning for approximately two years. Online learning is very new for this school. This is related to the COVID-19 pandemic, where schools must conduct online learning to ensure continuity of learning [19]. However, the school hasn't known how effective the implementation of online learning is. Therefore, this study aims to determine the effectiveness of online learning seen from students' online interactions. This study will answer several questions regarding how students interact with their friends, with their teachers and with learning content in the implementation of online learning at SMK Negeri 3 Salatiga and how effective the execution of online learning is. The effectiveness can be seen from online interactions. Knowing the point of online learning, as seen from student interaction, can provide considerations for designing effective online learning by paying attention to student interactions. Furthermore, these considerations can be used in developing learning models, methods, or media. In addition, teachers can better understand students and their development in learning activities.

2. RESEARCH METHOD

This study uses a quantitative descriptive method to determine the effectiveness of online learning seen from online interactions between students - students, teachers, and students - content. The population of this study was all students at SMK Negeri 3 Salatiga totalling 1424 students consisting of 6 majors, such as Welding, Geomatics, ATPH, TBSM, Mechatronics, and Autotronics. Sampling used a random sampling technique based on the Krejcie table with an error rate of 10%. From 1424 students, a sample of 302 students was obtained. However, during the data collection process, 306 questionnaires were collected. The questionnaires were distributed in a google form, and the google form link was distributed through the homeroom teacher at SMKN 3 Salatiga for further distribution to students.

In this study, quantitative data collection was obtained through a questionnaire that had been developed based on the research of Bernard and Hrastinski [28][29]. Their study identified three types of communication in synchronous and asynchronous learning. It focused on the interaction made through students' communication in the following area;content-related, planning of tasks and social support. Besides, it describes that the continuum of students' cognitive and personal dimensions of learning spanned both ends; cognitive participation and personal participation through synchronous and asynchronous learning. The questionnaire was made using a yes/no question model and a Likert scale measurement. The Likert scale used is 5 points with the following conditions: 5 (Strongly Agree), 4 (Agree), 3 (Neutral), 2 (Disagree), and 1 (Disagree). The categorization to determine its effectiveness is presented in Table 1.

Table 1. Categorization of Online Learning Effectiveness

No	Online Interaction Score	Online Learning Effectiveness
1	X < 1.8 (very low)	Not effective
2	1.8 < X < 2.6 (low)	Less Effective
3	2.6 < X < 3.4 (medium)	Quite Effective
4	3.4 < X < 4.2 (high)	Effective
5	4.2 > X (very high)	Very Effective

It can be interpreted that the higher the average result of the online interaction is, the higher the learning effectiveness. On the contrary, the lower the average results of online interactions, the lower the effectiveness is.

To determine the accuracy and reliability of the questionnaire, validity and reliability tests were carried out [30] on each item of the questionnaire using the IBM SPSS v.25 application. After testing the validity, it was found that the output results of several questions for 306 respondents showed (r count = 0.636) and can be said to be valid because the significant value is greater than the r table (0.133). In the reliability test, Cornbach's

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Alpha = 0.750 was obtained, so it can be said that the questionnaire is reliable because Cornbach's Alpha value is more significant than the r table = 0.113. Therefore, it can be said that the research instrument is valid and reliable, so it is feasible to use in this study.

The data analysis technique used is a measure of concentration (tendency central) by calculating the average value (mean) and the size of the distribution (dispersed) with variance and standard deviation. These results can be used to describe the study's results and answer the research objectives.

3. RESULTS AND DISCUSSION

From the results of obtaining a questionnaire of 306 samples via Google Form, it can be seen that the number of respondents who dominate is male, 82%, while women are obtained as much as 12%. These results can be seen in Figure 1.

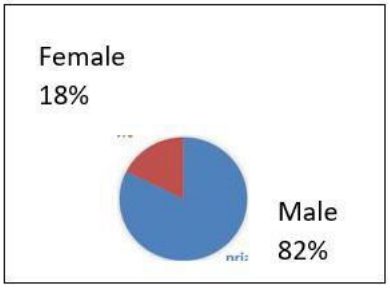

Figure 1. Gender Distribution

Besides being dominated by the male gender, the sample is also dominated by 33% of welding majors. The rest consist of Geomatics majors 12%, ATPH 11%, TBSM 15%, Mechatronics 12%, and Autotronics as much as 17%. The distribution of respondents by major is presented in Figure 2.

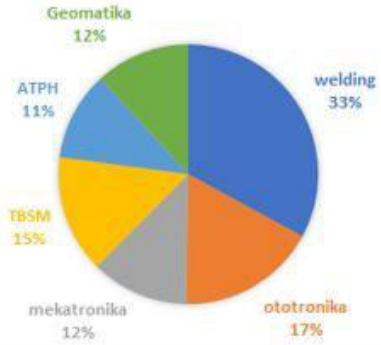

Figure 2. Distribution of respondents by major

. From the various majors, the respondents were divided into 3 classes, such as class X, class XI, and class XII. The percentage results for class X are 46% students, class XI is 17% students, and class XII are 37% students from the total 206 students as respondents, and the results are presented in Figure 3.

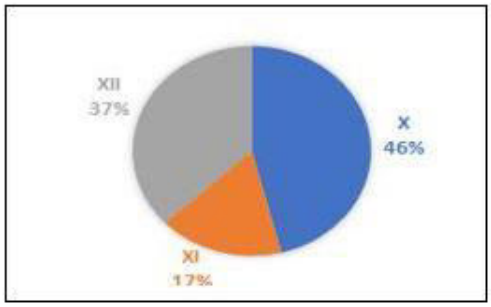

Figure 3. Percentage of The Respondents based on Class

The results of the research on Online Interaction consisting of student interactions with their friends, students with teachers and students with learning content were obtained from questionnaires distributed to 306 respondents.

3.1. Student Interaction with Friends

Most of SMKN 3's students interact with their friends synchronously; the data is presented in Figure 4.

Figure 4. Online interactions that students do with other students directly/synchronously

From Figure 4, it can be seen that the online interaction process between one student and another student directly/synchronously is obtained by 96% of the 306 students who answered "Yes" to synchronous interaction. 4% of the students responded "No" to interacting with friends synchronously. This can mean that they only interact with the teacher or do not take part in the online, face-to-face learning held by the teacher.

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Although it was found that most students (96%) had interacted with their friends, about 4% of students did not. This should be followed up by the teacher immediately, considering the importance of student interaction with their peers for the success of online learning. When students connect, this will create a dynamic online learning community [11]. The online and synchronous interactions between students and other students are carried out using several media, as presented in Figure 5.

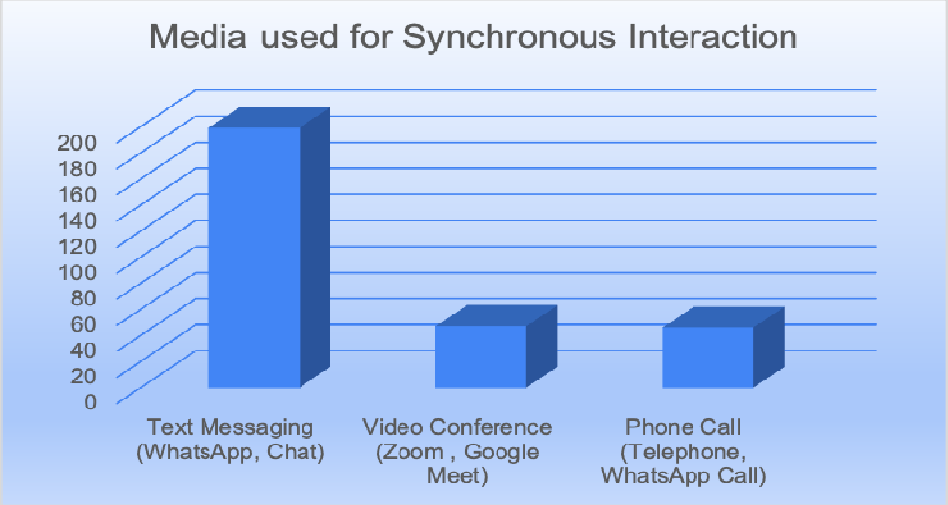

Figure 5. Media used by students to have online interaction with other students directly/synchronously

Most of the students (96%) who stated that they have online interactions with their colleagues answered that they used text/chat conversations to interact with each other synchronously or directly. In addition, video conferencing, such as zoom, and telephone and video calls are also used for synchronous interaction. This allows students to communicate as if they were face-to-face. The technology used for peer-to-peer synchronous interaction seems quite varied, as stated by Revere and Kovach [26].

In addition to direct or synchronous interactions, students interact asynchronously or indirectly with their friends during online learning. It is presented in Figure 6.

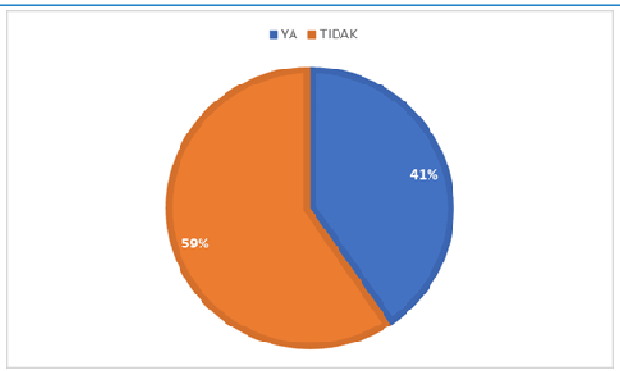

Figure 6. Indirect/asynchronous online interactions between students and other students

On the interaction process between one student and another student indirectly/asynchronously, 41% of 360 students stated "yes". They interact asynchronously. The media used can be seen in Figure 7.

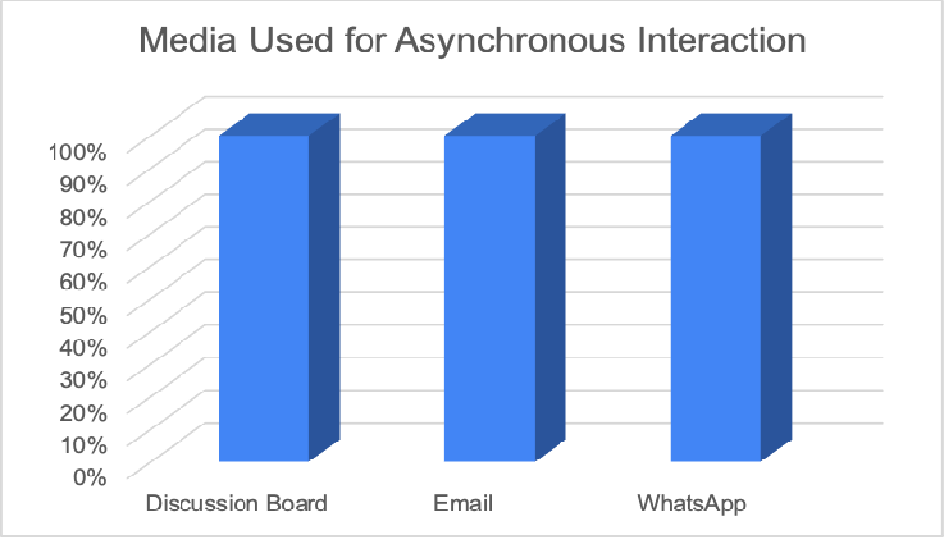

Figure 7. Media used by students to interact online with other students indirectly / asynchronously

From 41% of the students who answered yes to the asynchronous interaction with their peers, they mostly use discussion forum media (Digital School Applications) to interact asynchronously with their friends. This is because all teachers are required to use the Digital School application, and one of the application's features is a discussion forum.

Furthermore, the questionnaire results regarding students' interactions with their peers are presented in Table 2.

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Table 2. Questionnaire results regarding students' interactions with their peers

No	Question	Mean	SD	Category
3	I have a question and answer with friends related to the learning material	3.92	0.75	High
4	I share information with friends related to the learning process	3.72	0.78	High
5	I express ideas/opinions to friends	3.98	0.85	High
6	My friends and I show each other's existence as friends who struggle to learning	3.89	0.83	High
7	My friends and I motivate each other to learning	3.80	0.85	High
8	My friends and I support each other when we have learning difficulties / technical difficulties	3.98	0.89	High
9	I and my friends talk about things outside of learning	3.78	0.94	High
	Mean	3.87	0.84	High

It can be seen in Table 2 that students interact with each other when they carry out online learning. This can be seen from the acquisition of the questionnaire count, which shows the average in the "High" category. The highest value is expressing ideas or opinions and providing support when friends experience difficulties or technical problems. The lowest value is in sharing information related to the learning process. They have direct and indirect online interactions. Therefore, it can be concluded that students and other students are active and enthusiastic at interacting, particularly in the discussion process. This is in line with research from J. H. Prijanto [15] and supports the statement about the importance of student interaction with peers [11]. Furthermore, the second form of interaction that is no less important than the interaction of students and their peers is the interaction of students and teachers.

3.2. Student Interaction with Teachers

Regarding the interaction of students with teachers, it was found that 100% of the 306 students participated, which means that all students carry out a synchronous process of interaction with the teacher. The media used to interact synchronously is presented in Figure 8.

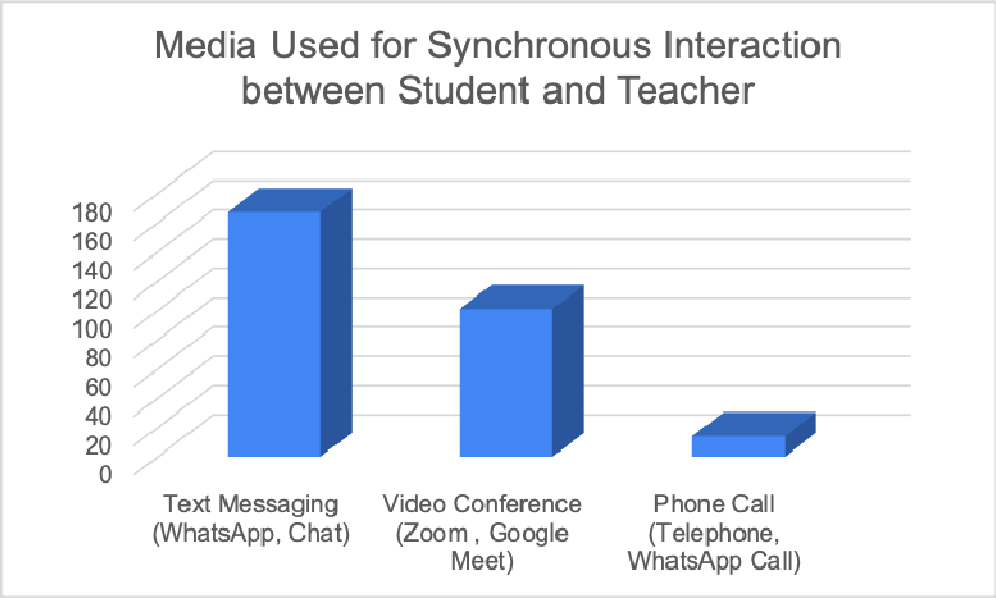
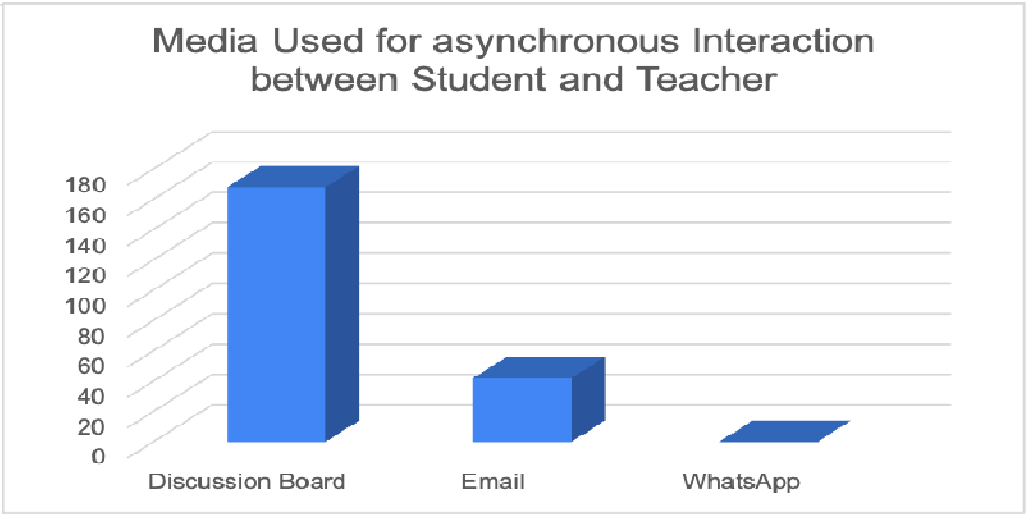


Figure 8. Media used by students to interact online with teachers directly/synchronously

Text conversations and video conferencing are the most widely used media in synchronous interaction with the teacher. This is because the media is quite familiar to students. In contrast, video conferencing allows interaction similar to face-to-face. Technology can support the interaction between students and teachers smoothly [26].

From the questionnaire results, it is also known that all students interact synchronously with the teacher and asynchronously/directly. The media used to interact asynchronously with the teacher is presented in Figure 9.



. Figure 9. Media used by students to interact online with teachers indirectly/asynchronously.

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All students who answered "Yes" used discussion forum media (digital school applications) to interact asynchronously with their teachers. This is due to the data collected that students use discussion forums most widely to interact with teachers. This is because teachers are required to use the Digital School LMS to carry out online learning, and one of the features of the LMS is an online discussion forum. Furthermore, the results of the questionnaire calculation regarding the online interaction process between students and teachers are presented in Table 3.

Table 3. Questionnaire results regarding student and teacher interactions

No	Question	Mean	SD	Category
1	Teachers motivate students to learn	4.35	0.66	Very high
2	Teachers draw the students' interest in the learning process	4.06	0.86	high
3	Teachers provide support when students have difficulties	4.24	0.78	Very high
4	Teachers provide feedback on student performance (assignments/activities carried out by students)	3.95	0.74	high
5	Teachers help students to better understand the material	4.14	0.80	high
6	Teachers monitor student learning progress	4.07	0.76	high
	Mean	4.14	0.77	high

It can be seen in Table 3 that the interaction of students with teachers is in the high category. The most increased activity of student interaction with the teacher is when the teacher motivates students to learn. Meanwhile, the lowest activity is providing feedback on student performance in the form of assignments and tests. This is probably due to the limited time that the teacher has. Providing feedback to the students takes more time to do. However, this still needs to be considered, as giving feedback is one of the aspects of student-teacher interaction, and student-teacher interaction will significantly affect student-learning outcomes [21]. The last interaction, as essential as those previous interactions, is the interaction of students with learning content.

3.3. Student Interaction with the Learning Content

The questionnaire results regarding online interactions between students and learning content are presented in table 4.

Table 4. Questionnaire results regarding student interactions with learning content

No	Questions	Mean	SD	Category
1	I use the material provided for more meaningful learning	4.13	0.78	high
2	I can relate learning content to each other's knowledge	3.84	0.81	high
3	I apply the learning content I get for problem solving	3.87	0.81	high
5	I make notes/summaries/important points about the content studied	3.72	0.83	high
6	The learning content presented can improve students' understanding	3.87	0.84	high
7	The learning content presented can change the student's perspective on the material/subject taught	3.89	0.82	high
8	The learning content presentation makes it easier for students to take part in learning	3.89	0.86	high
	Mean	3.89	0.82	high

In Table 4, it can be seen that students also interact with learning content. This can be seen from the average score of 3,89 in the "High" category. The highest score was found in utilizing the material for meaningful learning and the lowest was in making summaries/notes/essential points regarding the learning content. The high value of student interaction with learning content can be influenced by how the teacher presents the material and uses the media to convey it for effective learning. This is in line with the research conducted by Hikmat et al. [13].

4. CONCLUSION

Based on the results and discussion, it can be concluded that online learning at SMK Negeri 3 Salatiga is included in the effective category. It is seen from students' online interactions, which consist of student interactions with peers, student interaction with teachers and student interaction with learning content. Seeing the effectiveness of online learning from student interaction can provide considerations for designing effective online learning by paying attention to student interactions. In addition, teachers can better understand students and their development in learning activities. Those three interactions should be enhanced in the learning process equally. However, it depends on how the teacher designs the learning process so that all the interactions can happen to make the learning more effective. This study uses a quantitative descriptive method, in which online interactions are obtained in a less in-depth calculation of numbers. Therefore, the recommendation for further research is to use qualitative research methods with data

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collection techniques in the form of interviews and observations so that the data obtained regarding the online interaction process can be more in-depth.

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