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ANALYSIS OF STUDENTS' CRITICAL THINKING SKILL THROUGH ONLINE LEARNING ASSISTED BY STUDENT WORKSHEETS

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Abstract: This research is motivated by the lack of teaching materials that can facilitate students' critical thinking skills in learning during the COVID-19 pandemic. Critical thinking skills are very important competencies to be trained. This ability is indispensable in everyday life. The purpose of this study was to analyze critical thinking skills through online learning assisted by student worksheets. The method used in this research is Quasi Experiment with pre-test-post-test control group design. The population in this study were students of class XI MIPA at SMA Negeri 1 Cigugur for the academic year 2020/2021. The sample used in this study consisted of 50 students, consisting of 2 classes, namely the experimental class and the control class. The sampling technique used is purposive sampling. The instruments used are critical thinking questions and student response questionnaires to the implementation of online learning assisted by student worksheets. Based on the results of analysis and calculations with hypothesis testing, the results obtained are H1 is accepted and Ho is rejected, meaning that students' critical thinking skills increase in online learning assisted by Student Worksheets. With Student Worksheets, students can construct their own knowledge so that students' critical thinking skills can be facilitated and students can play an active role in learning activities, not just doing exercises.

Keywords: *critical thinking; online learning; student worksheets (LKS).*

INTRODUCTION

Education has an important role in the learning process to make students understand all the material being taught. It is very important for educators to provide an understanding of knowledge, skills, and attitudes. According to Syarif (2012), learning is a process of interaction between teachers and students, both direct interaction such as face-to-face activities or indirectly, by using various learning media. Based on the differences in these interactions, learning activities can be carried out using various learning patterns.

In general, Indonesia uses face-to-face learning, where the teacher plays a direct role in delivering learning to students in the classroom. Aji (2020) stated that at the beginning of 2020 the Covid-19 Pandemic occurred, this incident was a heart-breaking disaster for the entire population of the world experiencing difficulties in the economic crisis, health, and in the world of education. Many countries have decided to close schools, colleges and universities, including in Indonesia. The situation during this pandemic of course has an impact on the quality of learning, students and teachers who previously interacted directly in the classroom must now interact in a limited virtual space through online learning. Teachers are required to be able to carry out learning well, so that learning objectives can be achieved (Cahyani,

Listiana, & Larasati, 2020).

According to Delen & Liew (2016), the development of online learning will greatly assist students in considering ways to use good self-learning strategies. Online learning is one of the effective ways to be applied in the world of education, because most of its implementation is at the secondary and tertiary education levels that already understand the use of technology, making online learning will greatly affect its effectiveness, in emergency conditions such as the Covid-19 pandemic.

Online learning in Indonesia also has shortcomings in its implementation, according to Pangondian, Santosa, & Nugroho (2019), the shortcomings in online learning are the lack of fast feedback during the learning process, then sometimes it makes some people feel uncomfortable using the new learning process, in remote areas it is very difficult reaching the existing internet, so that it is not optimal in the learning process. This deficiency is one of the impacts due to the lack of training in students' critical thinking skills.

According to Ariyana, Pudjiastuti, & Bestary (2018), critical thinking is a process where all knowledge and abilities are mobilized in solving problems that arise, making decisions, analysing all assumptions that arise and conducting investigations or research based on data and information that has been obtained so as to produce information or conclusions that desired.

This critical thinking skill is very important to be mastered by students (Pujianti, 2020), because through critical thinking, students will be trained to observe the situation, raise questions, formulate hypotheses, make observations, collect data, and provide conclusions. Wahyuni (2015) stated that critical thinking also trains students to think logically and not to accept things easily.

According to Ita (2014), teachers need tools in learning so that learning can run smoothly. The teacher's efforts are to make it easier for students to understand and the concepts received by students are more durable, so the teacher can develop one of the teaching materials in the form of student worksheets (LKS). The use of student worksheets (LKS) is able to assist students in facilitating knowledge and training critical thinking, in line with the opinion of Astuti, Purwoko, & Indaryanti (2017), suggesting that student worksheets can express students' ideas and opinions in criticizing the problems that exist in the LKS so that with the LKS process of training students' critical thinking will be more focused and comprehensive (Suryawati, 2017). With LKS, students can construct knowledge so that students can criticize lessons and can play an active role, not just doing exercises. Meanwhile, according to Arafah, Priyono, & Ridlo (2012), the use of LKS is used as a reference to guide the implementation of learning activities and also as a learning tool. LKS contains student activity sheets and practice questions, LKS also contains a summary of the material, then LKS is also a means to assist and facilitate teaching and learning activities.

Judging from the online learning process implemented during the current pandemic, there are not many teaching materials that can facilitate the practice of critical thinking skills (Yamin, 2020), while critical thinking skills are very important competencies to be trained. This ability is indispensable in daily life. This is supported by research that has been carried out by Khotimas (2017) which showed that based on the analysis of data obtained by students in the class who have mastered critical thinking skills after carrying out learning using worksheets. and after learning takes place post-test. This is evidenced by the average value of n-gain of 0.69. Thus, to be able to train critical thinking skills to achieve well, worksheets are given as teaching materials in facilitating students to practice critical thinking skills, especially in online learning during the pandemic

LKS is stated to be effective in improving students' critical thinking as in Islamia's research (2019) that LKS shows an average score of 89%. This is because the LKS developed has good quality as a tool in training critical thinking in learning.

The novelty value in this study is that there are not many teaching materials that can facilitate students' critical thinking skills during online learning, the use of critical thinking worksheets contains contextual problems and the questions given refer to critical thinking indicators. So that this research can be useful for teachers to make it easier for teachers to train students' critical thinking skills, especially on immune system material in the online learning process during the current Covid-19 pandemic.

Based on the background above, the researchers

are interested in conducting a research entitled "Students' Critical Thinking Skills through Online Learning Assisted by student worksheets (LKS)".

METHOD

The research method used is Quasy Experiment with a pre-test-post-test control group design research design (Sugiyono, 2017). The population in this study were students of class XI science at SMA N 1 Cigugur which consisted of 3 science classes with a total of 79 students. The sample was obtained using the purposive sampling technique, as many as two classes; class XI IPA 1 as the experimental class and XI IPA 2 as the control class. Data collection techniques used in this study were through tests and non-tests. The instrument used in this research is in the form of standardized critical thinking essay test questions, which are given during pre-test and post-test. In addition, a questionnaire was also used to reveal student responses to LKS-assisted online learning.

Table 1. *Student critical thinking skill test grid*

Material	**Aspect**	**Indicators**	**No. of question**
Immune System	Elementary Clarification	Focusing the question	**1,2**
		Analyzing arguments	**3,4**
	Basic Support	Considering the credibility of a source	**5,6**
	Inference	Making induction and considering induction results	**7,8**
	Advance clarification	Identify assumptions	**9,10**
	Strategy and tactic	Deciding an action	**11,12**
Total			**12**

Table 2. *Questionnaire sheet instrument grid*

No	**Indicators**	**Item No**
1.	The effectiveness of the implementation of online learning on the material of the immune system	1,2
2	Students' motivation and interest in learning towards online learning assisted by LKS	3,4,5,8,9
3	The role of LKS in critical thinking	10,12,13,14,15
Total		15

RESULTS AND DISCUSSION

Analysis of pre-test result

To measure students' initial critical thinking skills, students are given a pretest in the form of 12 critical thinking skills description tests that have previously been tested by instruments and contain 6 indicators of critical thinking skills. The mean value of the pretest from the control class and the experimental class can be seen in the table below:

Table 3. *Pre-test mean*

Class	N	Mean	DS
Experiment	25	36,67	5,61
Control	25	37,78	5,84

Based on the table of pre-test scores for the two classes, namely control and experiment, the results were not much different. Based on the results of the pre-test given to the experimental class and the control class, the results showed that it did not show a significant difference, meaning that students had the same initial ability, the two sample classes had relatively the same critical thinking skills. The mean overall pre-test scores of the experimental class and control class students are not much different as shown in the table, namely 36.67 in the experimental class and 37.78 in the control class.

Hypothesis test (t test)

Homogeneity of variance that was carried out previously, hypothesis testing was carried out using the t-test, because the data group was homogeneous. The results of the t-test on the pre-test data The results of the t-test on the pre-test data of the experimental class and control class are presented in the table:

Table 4. *The result of pretest data hypothesis test*

Class	tcount	Db	tTable	Conclusion
Experiment and Control	-0,69	48	2,01	Nothing is better

Because the variance of the data is homogeneous, it is continued to test the hypothesis, namely the t-test and the t-value is -0.69 and t-table is 2.01. Because the value of t-count < t-table, -0.69 which is < 2.01 then H0 is accepted and H1 is rejected, which means that the two sample groups, both the experimental class and the control class, have no significant or equivalent initial differences in critical thinking abilities.

Analysis of posttest results

The mean of posttest from the control class and the experimental class can be seen in table 5.

Table 5. *Posttest mean score*

Class	N	Mean	DS
Experiment	25	56,67	7,64
Control	25	42,78	6,36

Based on the table, the experimental class has a higher mean post-test value than the control class. The results of the post-test calculation of critical thinking skills in the control class and the experimental class. Based on the table, the mean value of the post-test obtained by the experimental class is 56.67 while the mean value of the control class is only 42.78. This shows that online learning assisted by worksheets has a positive effect on students' critical thinking skills. In other words, students' critical thinking skills can increase because it is facilitated by online learning assisted by student worksheets. Furthermore, the post-test results of the two classes were used to test the hypothesis.

Based on the homogeneity of variance test that was carried out previously, hypothesis testing was carried out using the t-test, because the data group was homogeneous. The results of the t-test on the post-test data of the experimental class and control class are presented in table 6.

Table 6. *Post-test data hypothesis test results*

Class	Tcount	Db	TTable	Conclusion
Experiment and Control	5,45	48	2,01	H0 is rejected, H1 is accepted

From the data above, it can be seen that the mean percentage of critical thinking indicators achievement after learning in the control class and experimental class results in a t-count of 5.45 and a t-table of 2.01. Because the value of t-count > t-table is 5.45 > 2.01, then H1 is accepted and H0 is rejected, meaning that there is an increase in students' critical thinking skills in online learning assisted by critical thinking worksheets. The mean learning process in the achievement of critical thinking indicators in the experimental class is greater than the control class, so when it is compared with the results of the pre-test, the experimental class and control class have increased the achievement of the critical thinking ability indicator.

The N-Gain calculation is carried out to analyze the magnitude of the increase in students' critical thinking skills, from the results of the analysis by comparing the results of the pretest and posttest experimental class and control class. The results of the calculation of the mean N-Gain can be seen in table 7:

Table 7. *Comparison of the mean value of the experimental class and the control class*

Class	Mean score			Criteria
	Pretest	Posttest	N-Gain	
Experiment	36	56	0,31	Medium
Control	37	42	0,08	Low

The results of the N-Gain analysis obtained by the experimental class and control class in table 7 show that the experimental class has improved better when compared to the control class, with the mean of N-Gain value in the experimental class 0.31 including in the medium category and for the control class 0.08 is included in the low category. This shows that there is a difference in the improvement of students' critical thinking skills between the experimental class and the control

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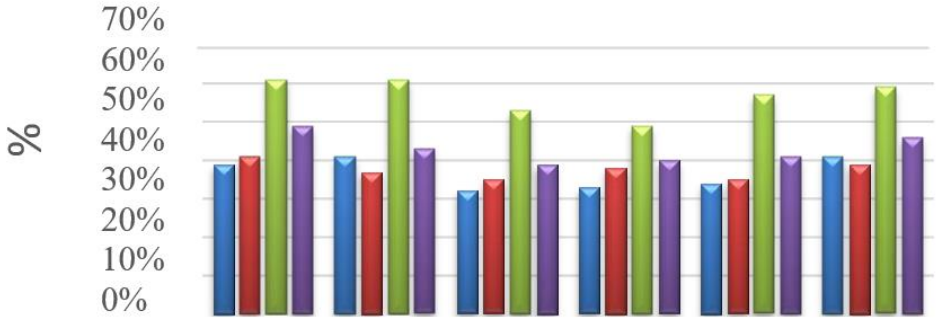
class.

The percentage value of each critical thinking indicator for the experimental class and the control class

The critical thinking ability description test sheet is made based on critical thinking ability indicators which consist of (1) focusing questions, (2) analysing arguments, (3) considering the credibility of a source, (4) making inductions and considering the results of induction, (5) identifying assumptions (6) deciding an action (Ennis, 1996). Critical thinking indicators are applied to the description test questions which was given to students at the pre-test and post-tests. The results of the recapitulation of the value of each critical thinking indicator are shown in Figure 1.



	1	2	3	4	5	6
Pretest experiment	39%	41%	32%	33%	34%	41%
Pretest control	41%	37%	35%	38%	35%	39%
Posttest experiment	61%	61%	53%	49%	57%	59%
Posttest control	49%	43%	39%	40%	41%	46%

Figure 1. *The percentage value of each critical thinking indicator*

Based on Figure 1, it shows that the pretest results in the experimental class on indicator 1 are 39%, indicator 2 is 41%, indicator 3 is 31%, indicator 4 is 33%, indicator 5 is 34%, indicator 6 is 41%. As for the control class, the pretest scores on indicator 1 are 41%, indicator 2 is 37%, indicator 3 is 35%, indicator 4 is 38%, indicator 5 is 35%, and indicator 6 is 39%.

After being given a posttest, each indicator of critical thinking increased, in the experimental class, the posttest score was 61% for indicator 1, 61% for indicator 2, 53% for indicator 3, 49% for indicator 4, 57% for indicator 5, and 59% for indicator 6. While the percentage results in the control class posttest are 49% for indicator 1, 43% for indicator 2, 39% for indicator 3, 40% for indicator 4, 41% for indicator 5, and 46% for indicator 6. In both the experimental class and the control class, the indicator that experienced the highest pattern of improvement was indicator 1, namely the indicator focusing on questions, the mean result was that the experimental class was 61% and the control class was 49% this is due to the learning process in the class. Experiments with the interaction of the question and answer process that take place in the learning process, this makes students more trained in terms of critical thinking skills, especially in focusing questions. So we can conclude that the increase in the experimental class is higher than the control class because the experimental class is facilitated by critical thinking worksheets as teaching materials.

Data analysis of questionnaire result

The questionnaire sheet instrument was used to reveal student responses to online learning assisted by critical thinking worksheets carried out in the experimental class; class XI IPA 1. The questionnaire sheet for each indicator consisted of fifteen statements from the three indicators of the student response questionnaire. The percentage of the questionnaire for each statement has a different response. The results of the calculation of the questionnaire sheet obtained a percentage that

shows the response of the experimental class during the learning process. The results of the calculation of the questionnaire sheet are adjusted to the score of each questionnaire item that is used to reveal student responses to online learning using critical thinking worksheets that take place in the experimental class.

The following is a diagram of the questionnaire percentage to reveal student responses to the implementation of online learning assisted by critical thinking worksheets.

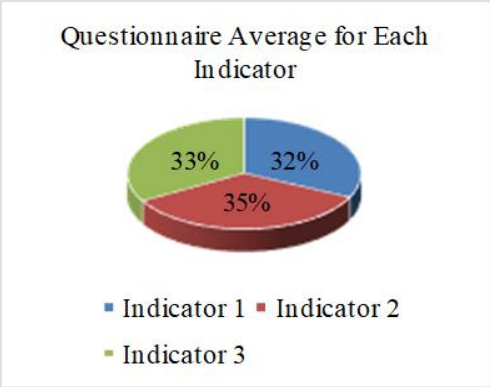


Figure 2. *Questionnaire average for each indicator*

Students' responses to the learning process using LKS critical thinking in the experimental class showed that the highest indicator is the indicator of student motivation and interest in learning which is 85%, this is evidenced at the time of learning assisted by LKS that students feel that using this LKS can help in training critical thinking skills, especially during online learning during the pandemic. Then the second highest indicator on the indicator of the role of LKS on critical thinking obtained results of 82%, this is proven when learning using LKS, students find it easier to formulate a question, analyze arguments, consider results from a source based on literature, make conclusions, can identify assumptions in circulation, and can decide what action to choose. Then the results of the third indicator on the online learning process indicator obtained results of 79% positive student responses, this is because at the time of learning, the media used was using Zoom, not just WhatsApp groups, so the interaction process between teachers and students was more visible than when learning, students find it easier to understand the material presented. Of the three indicators, they gave a high positive response to the implementation of LKS-assisted online learning towards students' critical thinking on immune system material.

Based on the results of the analysis, the posttest value of the experimental class is higher than the posttest value of the control class, this is because the worksheets given are different between the control class and the experimental class. The worksheets given for the experimental class have facilitated critical thinking skills, where the worksheets that have been presented have several special characteristics, including the problems are more contextual, making students easier in learning at school because it can be implemented in daily life, can be easily understood by students, and contextual problems will make students have high curiosity or curiosity. This is in line with the opinion of Contextual learning strategies are needed in learning biology, because biology is related to nature. So it takes direct experience through experimentation through concepts and relate them to the real world. Therefore, the use of contextual-based worksheets is expected to improve student learning outcomes, especially on the concept of the human immune system (Suryani, 2016).

Then contextual problems will make students want to continue to analyze them, because analyzing is the basis of critical thinking as Lismaya (2017) mentioned that critical thinking is the result of problem solving activities or students are accustomed to problem-based learning. Problem-based learning is not only listening, taking notes, and memorizing material, but through problem-based learning students actively think, analyze, communicate, search and process data, which ultimately students conclude.

In addition, another characteristic of LKS is that it contains discourse taken from articles containing up-to-date content so that students have scientific content that can be accounted for. For example, the problem presented is about Covid-19 so that students will be more interested in knowing the relationship between the covid-19 virus and the immune material being studied, and the problem questions given refer to critical thinking indicators, namely in the cognitive realm C4 to C6. According to Anderson & Krathwol (2010), there are 2 levels of student thinking, namely low order thinking (C1-C3) and high order thinking (C4-C6). So that the cognitive level of HOTS which

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includes the ability to analyze, evaluate, and create is an ability that must be developed by students so that they can think at higher levels or think critically (Wahyuni, 2015), so that the worksheets given to the experimental class make students more facilitated in terms of critical thinking skills. While in the control class the form of the LKS given is not contextual in nature, the questions given have a low cognitive domain, namely in CI and C2 only. This causes students to not be able to bring up their critical thinking.

Based on the results of the analysis of critical thinking skills on each indicator obtained, the first indicator is to focus on questions. The results of the analysis on this indicator show an increase in the mean pretest and posttest scores of 38.6 and 61.3. Meanwhile, in the control class, the mean pre-test and post-test scores were 41.3 and 48.6 where the indicator of focusing questions is the highest increase in the experimental class because during the online learning process between teachers and students interact with each other to ask questions, students are trained in asking questions about learning and during discussions discussing LKS so students can focus questions better. Then the LKS questions given refer to critical thinking indicators. This is in accordance with Hayati, Loka, & Anwar 's research (2019), that the ability to focus questions affects a person to be able to identify and formulate questions and criteria to consider possible answers.

The ability to focus questions is the ability of students to find / formulate problems from a given case or phenomenon. This makes students read the problem statement and find known facts from a problem to help solve the problem.

The second indicator is analyzing arguments, the results of the analysis show an increase in the average pretest and posttest scores of 41.3 and 60.6. While in the control class, the mean of pre-test and post-test scores were 37.3 and 42.6. In the problems given to the experimental class, the worksheet contains aspects of analyzing arguments related to a phenomenon/information encountered. Students relate to the analysis of their arguments scientifically in order to find out whether the arguments are proven or not by their opinion on the issue. In accordance with Hayati et al.'s research (2019) analyzing arguments are directly related to the ability to analyze a person, someone who is able to give the right reasons in answering a question can be ascertained to have high analytical skills. Analyzing problems directly can make students able to solve problems with more critical thinking.

The third indicator is the ability to consider credibility, based on the results of the analysis, it shows an increase in the mean of pre-test and post-test scores of 32.0 and 53.3. Meanwhile in the control class, the mean of pre-test and post-test scores were 35.3 and 38.6. Its activities in considering the suitability of the sources used are to find information/data, students are directed to find the right information according to the problems presented. Students can find and collect data that has been obtained and then put forward in solving the problems being faced so that they can develop their critical thinking skills. Experimental class students can find the right source according to the problem. In accordance with the research of Pujianti (2020) that basic abilities can increase significantly if a person is accustomed to finding information independently and choosing the right information to solve a problem. Students will make their own decisions about what direction to take in an investigation, what information to collect, and how to analyze and evaluate that information.

The fourth indicator is making and assessing conclusions, namely making inductions and considering the results of induction. The results of the analysis showed an increase in the mean value of the pretest and posttest that was equal to 32.6 and 48.6. Meanwhile, in the control class, the average pre-test and post-test scores were 38.0 and 40.1. Drawing conclusions based on facts is the purpose of inducing indicators and considering the results of this induction. When the data collection process has been collected, then the data processing process is carried out. In the problems that have been presented students were asked to make appropriate conclusions according to the problem. According to Nikmaturrohmah (2016), the ability to conclude is one aspect of critical thinking ability. The ability to conclude is the activity of the human mind based on the understanding or knowledge (truth), it has to achieve another new understanding or knowledge (truth).

The fifth indicator is identifying assumptions, the results of the analysis show an increase in the mean of pretest and posttest scores of 34.0 and 57.3. While in the control class, the mean of pre-test and post-test scores were 35.3 and 40.6. The

problems presented include students being able to identify the assumptions in question and providing clarity on what they have done, being able to communicate the results of their analysis with developing assumptions about responses to developing assumptions, students must look for appropriate and accurate information. statement in accordance with the information that has been obtained. According to Hayati et al. (2019), students are said to be able to keep the situation in response to questions from straying far from the topic being asked. So they talk only in the realm of material or concepts related to questions. Students are said to have the ability to conclude and identify assumptions if in answering questions students can provide answers with the right reasons for the problems presented both in general and specifically (Ernest in Hayati et al., 2019).

The sixth indicator is deciding an action, the results of the analysis show an increase in the mean of pretest and posttest scores of 41.33 and 58.66. While in the control class, the mean of pre-test and post-test scores were 39.3 and 46.0. The indicator decides an action, namely the problem presented is to decide an action on the problem presented. Students are asked to decide what action to take when faced with a problem. In this case students will be more active in finding the information needed, in deciding an appropriate action. According to Jf (2017), measuring the ability to decide students' actions on a problem that is around them by providing logical and contextual reasons (contextual teaching and learning) will contribute to the development of critical thinking skills.

As for the results of the questionnaire analysis of student responses to online learning assisted by LKS, the results showed that there was student interest in the learning process from the three calculated indicators. The percentage of the three indicators has a mean of 82%. Where both when the online learning process takes place students can better understand the material being taught, then the use of the LKS provided can motivate students to practice critical thinking skills, the use of LKS also makes it easier to understand because the LKS itself is in a contextual form where the problems intersect in daily life (Syarif, 2012). This means that the online learning process assisted by the LKS that has been carried out can help students understand the material better and develop their critical thinking skills. This is in line with the research of Suryawati (2017) which stated that student responses to LKS are in good and quite good categories. This shows that the developed worksheets have facilitated students in scientific work.

Students' critical thinking abilities were analyzed through critical thinking assessment sheets.

The use of teaching materials in the form of LKS based on critical thinking really helps students to continue to be trained in their critical thinking skills. According to Nurichah (2012), student Activity Sheets based on critical thinking skills have components that train students in interpreting, analyzing, evaluating, concluding, and explaining.

CONCLUSION

Based on the research that has been done, it can be concluded that there is an effect of applying online learning assisted by worksheets on students' critical thinking skills in class XI immune system material. This can be seen from the results of the t-test hypothesis stating that H0 is rejected and H1 is accepted because the results of t-count > t-table are 5.45 > 2.01, which means that there is an influence from the implementation of online learning assisted by LKS on students' critical thinking skills. The highest indicator is generated on the indicator focusing the question. The results of N-Gain in improving critical thinking skills there are differences between the experimental class and the control class, namely the average N-Gain result in the experimental class is 0.31 with moderate criteria, and the mean of N-Gain in the control class is 0.8 with low criteria, it can be interpreted that there is an increase in the critical thinking ability of class XI IPA 1 students, on the material of the immune system. Based on the results of the questionnaire or student responses to the online learning process assisted by LKS, the results were 82%. Students gave a positive response to the application of online learning assisted by worksheets and facilitated critical thinking skills.

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