The Effect of Edmodo in Science Learning on Students' Learning Outcomes and Critical Thinking

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Abstrak
This study examines the effect of using Edmodo in science learning on student learning outcomes and critical thinking in learning organizational life systems. The type of research used is a quasi-experimental design with a posttest-only control group design. Determination of the sample using the purposive sampling method. The research population includes all seventh-grade students of SMP Negeri 1 Glenmore Banyuwangi. The samples used were students of class VII A as the experimental class and class VII B as the control class. Methods of data collection using tests. The data analysis technique used an independent-sample t-test. The independent sample t-test on learning outcomes obtained a significance value of 0.047 less than 0.05, which means that there are differences in learning outcomes between the experimental class and the control class. The independent sample t-test of students' critical thinking skills obtained a significance of 0.013 less than 0.05, which means that there is a significant difference in critical thinking skills between the experimental class and the experimental class. Edmodo can be used as an alternative media for online learning during the pandemic and classroom learning. In its implementation, teachers must have good classroom management skills so that learning can take place and provide good learning outcomes.
Kata Kunci: Edmodo, critical thinking, learning outcome, science learning

Pengaruh Edmodo dalam Pembelajaran IPA terhadap Hasil Belajar dan Berpikir Kritis Siswa

Abstract
Penelitian ini bertujuan untuk mengkaji pengaruh penggunaan Edmodo dalam pembelajaran IPA terhadap hasil belajar dan berpikir kritis siswa dalam pembelajaran IPA pada materi sistem organisasi kehidupan. Jenis penelitian digunakan adalah kuasi eksperimen dengan posttest only control group design. Penentuan sampel menggunakan metode purposive sampling. Populasi penelitian meliputi seluruh siswa kelas VII SMP Negeri 1 Glenmore Banyuwangi. Sampel yang digunakan adalah siswa kelas VII A sebagai kelas eksperimen dan siswa kelas VII B sebagai kelas kontrol. Metode pengumpulan data menggunakan tes. Teknik analisisa data menggunakan uji independent sample t-test. Hasil uji independent sample t-test pada hasil belajar diperoleh nilai signifikansi sebesar 0,047 lebih kecil dari 0,05 yang berarti terdapat perbedaan hasil belajar antara kelas eksperimen dengan kelas kontrol. Hasil uji independent sample t-test kemampuan berpikir kritis siswa diperoleh signifikansi 0,013 lebih kecil dari 0,05 yang berarti bahwa terdapat perbedaan signifikan kemampuan berpikir kritis antara kelas eksperimen dengan kelas eksperimen. Edmodo bisa dijadikan alternatif media dalam pembelajaran online selama masa pandemi maupun pembelajaran di kelas. Dalam implementasinya, guru harus memiliki kemampuan mengelola kelas yang baik agar pembelajaran dapat berlangsung dan memberikan hasil belajar luaran yang baik.
Keywords: Edmodo, berpikir kritis, hasil belajar, pembelajaran IPA

INTRODUCTION

Coronavirus Diseases Pandemic 2019 changed people's living order, including in the field of education (Rahmawati & Wahyuni, 2017). Learning that is usually done face-to-face in class, now learning must be done online or in distance learning. Distance learning has been applied where students follow learning from home, including the teaching of natural sciences subjects in junior high school. Science learning is essential so that students can follow the development of science and technology so that students can keep up with the times (Rosyada et al., 2021).

Science learning not only contains formulas or calculations, but it has meaningful essences that become the basis of learning science. The nature of science learning consists of scientific attitudes, scientific processes, and scientific products. The existence of these three essences indicates that science is an active process in using the mind to study natural phenomena, not only containing a collection of memorized knowledge (Budi Utami, 2017). So that by studying science, students can apply the theory that has been obtained to the surrounding environment. Science learning has a very complex character that requires critical thinking to analyze problems (Rahayuni, 2016). Through critical thinking, students think more logically and do not readily believe in the information obtained (Bektiarso, 2018). So that if the student has a high level of critical thinking, students will be accessible in understanding the concept of the material and sensitive to problems.

Critical thinking skills are not obtained easily but instead require a long time. In addition, students must continue to be trained to get good results. Stated that efforts to improve student's critical thinking skills take a long time to months (Fariska & Erman, 2017). Stated that students' critical thinking skills could be built with learning activities (Supeno et al, 2019). Learning activities that can improve critical thinking are with student-focused learning so that students are actively involved in the learning process. The low involvement of students in learning can lead to the low achievement of learning outcomes, difficulties in applying science in everyday life, and inhibiting students' thinking skills. Online learning activities conducted by SMP Negeri 1 Glenmore school in science subjects using WhatsApp Group. Learning activities contain materials and assignments, and students are not actively involved during the learning activities. When learning, only a few students reply to the teacher's message students do not give questions or input during the learning, so students tend to follow the learning passively. Critical thinking also relates to the student's ability to think and ask (Aprilia, 2021). Learning activities implemented in schools have not been able to improve students' critical thinking skills. Students cannot meet learning objectives without thinking skills (Hyytinen et al., 2018). Therefore, it is necessary to improve the quality of the student's learning process.

Students think that science is a boring subject, and many students think science to be an elusive subject. Difficulty in learning science because students are less involved in the learning process, so that they have difficulty understanding the materials and learning outcomes achieved less optimally. One of the science materials that students find difficult is the organization of the life system (Pertiwi et al., 2017). The material of the organizational system of life includes cells, tissues, organs, and organ systems. This material is abstract and challenging for students to understand because the subject matter cannot be seen directly. Students learn the material of the life organizing system using a package book whose explanation is still lacking so that students have difficulty understanding the material. Therefore, it is necessary to select teaching media that can visualize abstract material and teaching media that can facilitate students to interact and discuss so that students can more easily understand the material.

The selection of teaching media in the current era can take advantage of technological developments. One of the teaching media that uses the development of technology is e-learning. E-learning with easy use is Edmodo. The use of Edmodo can use applications or websites; accessing Edmodo can use a smartphone or computer. Edmodo looks like Facebook, which students often use not to have difficulty using Edmodo. In addition, using Edmodo makes it easier for students and teachers to discuss and exchange information and materials to be used as an alternative to online learning (Fitriza

et al., 2018).

Based on the background above, Edmodo is a medium that allows teaching the material of the organizational system of life classified as an abstract and challenging material. It is hoped that Edmodo can be a solution that teachers and students can use in learning activities and improve critical thinking skills and student learning outcomes. Therefore, this study aims to examine the influence of the use of Edmodo in science learning on student learning outcomes in the teaching of life organization systems and to examine the impact of the use of Edmodo in science learning on students' critical thinking skills in understanding the organizational system of life.

METHOD

This type of research is quasi-experimental research. Quasi-experimental is research in which the placement of samples is carried out non-random assignment (Hastjarjo, 2019). The research design used is a posttest-only control group design. This design only uses the final test to be analyzed to find out the research results that have been done (Payadnya dan Jayantika, 2018). The study used control groups and experimental groups whose selections were not randomly selected (Yandari dan Kuswaty, 2017). The research was conducted in the even semester of the 2020/2021 school year. The population of this study included all grade VII students of Glenmore Junior High School. The sample was selected by taking two classes consisting of experimental class and control class. The determination of research samples is conducted by purposive sampling based on students who already use mobile phones or computers and a good internet network. Experimental classes are given learning using Edmodo, while control classes use media commonly used in schools, namely using Whatsapp Group. Determination of samples based on the advice of science teachers grade VII. The research design scheme is shown in Table 1.

Table 1. *Posttest-only Control Group Design*

Group	Treatment	Posttest
E	X	O_1
C	-	O_2

Note:
E: Experimental class
C: Control class
X: Treatment (learning using Edmodo)
O_1: Posttest experimental class
O_2: Posttest control class

The research was conducted within four weeks, with one meeting each week with a predetermined schedule of schools. Learning is done online, in experimental classes using Edmodo, while in control classes using WhatsApp Group. The sample data was 26 grade VII A students and 27 students from grade VII B. Some students are unable to take the learning and post-test optimally due to some obstacles.

The immediate data retrieval techniques and instruments are performed using written tests. The tests used are achievement tests and critical thinking tests. The achievement tests use a writing test in the form of multiple-choice questions as many as 13 questions, with each question consists of 4 answer options. The problem has been adjusted to basic competencies, learning objectives, and indicators contained in the syllabus. While on the test of critical thinking skills using five essay questions made based on the indicators used, namely indicators of critical thinking skills used consists of interpretation, evaluation, analysis, inference, and explanation.

$$Score: \frac{Total\ Score\ Obtained}{Max\ Score} \ x\ 100 \ \text{……………..} \ (1)$$

The calculation of test scores of learning outcomes and critical thinking skills can be known in the equation (1). Once it is known that the test scores critical thinking skills, the score is then performed on each indicator of critical thinking skills used. Scoring can be known by following the criteria in Table 2.

Table 2. *Critical Thinking Skills Criteria*

Student critical thinking score interval	Category
0-19	Very low
20-39	Low
40-59	Medium
60-79	High
80-100	Very High

Supporting data is obtained through interviews, documentation, and observations. The interview refers to the interview sheet used to determine teaching and learning activities, the obstacles experienced, and the media science teachers usually use to teach. Documentation is used to obtain student name data, lesson schedule for the 2020/2021 school year, data on previous materials, and other supporting documents. Observation using observation sheet to know the teaching and learning process takes place.

The data analysis used a normality test and an independent-sample t-test. Normality test is used as a condition in data analysis with the parametric test. Normality test using Kormogolov-Smirnov test with the help of SPSS 24. If the data is normally distributed, it is followed by a parametric test, i.e., an independent sample t-test (Saputra & Salim, 2020). The independent sample t-test is used to determine if there are differences in learning outcomes and critical thinking skills between control classes and experimental classes. If the data is not distributed normally, then continued with a nonparametric test, the Mann-Whitney test. The level of significance used is 5% with the following criteria.

a. If the p (significance) > 0.05, then the data can be said to be normally distributed, then it is done with a parametric test (independent test of t-test samples).
b. If the p (significance) < 0.05, then the data can be said to be non-redistributed normally, then it is done with nonparametric tests (Mann-Whitney test).

Normally distributed data followed by a parametric test, i.e., independent test t-test, whereas if the data is not distributed normally will be analyzed using a nonparametric test, precisely Mann-Whitney test (Sopyan et al., 2019). This different test was conducted to determine significant differences in learning outcomes and critical thinking skills after learning using Edmodo mediaInggris.

RESULT AND DISCUSSION

Results

Student learning outcomes

This study used Edmodo as a treatment to determine the influence of Edmodo use on students' learning outcomes by reviewing student learning outcomes after learning or giving tests after learning. Post-test in the form of multiple-choice of 13 questions given in the experimental class and control class at the end of the lesson. Learning in experimental classes uses Edmodo, while in control classes uses Whatsapp groups. Recapitulation of student learning results can be seen in Table 3.

Based on Table 3, it appears that the average post-test of the experiment class is higher than the control class. The experiment class had a post-test score of 56, while the control class was a 47. The average score of the two classes is different on average, whereas the control class has a higher post-test score than the control class.

The initial stage is a normality test so that it can be known that the data is normally distributed or not normally distributed. Data is normally distributed if the significance value (sig) is more than 0.05, while the data is said to be non-normally distributed when the significance value (sig) is less than 0.05. The second stage is to conduct a t-test. If normally distributed data is done with a parametric test, that is an independent sample t-test.

Table 3. *Recapitulation of Student Learning Outcome Test Data*

Component	Post-test of Experiment Class	Post-test of Control Class
Total Students	26	27
Highest Score	77	77
Lowest Score	31	23
Average	56	47
Standard deviation	14,66	15,92

Whereas if the data is known to be not normal, then continued with nonparametric tests using the Mann-Whitney test. The following is presented output test normality of learning results which can be seen in Table 4.

Table 4. *Output of The Normality Test of Student Learning Outcomes*

Class		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Learning Outcome	Experiment Class post test	0,164	26	0,07	0,915	26	0,035
	Post-test Control Class	0,151	27	0,118	0,931	27	0,072

Based on Table 4, the significance obtained in the Kolmogorov-Smirnov column is 0.070 and 0.118 and can be said to be greater than 0.05 so that the data obtained is normally distributed. Furthermore, an independent sample t-test is conducted. Before the test is conducted, there needs to be a hypothesis determination to get conclusions. The statistical hypothesis is used as follows.

1). H_0: there was no difference in the average post-test results in the experiment class and control class.
2). H_1: there are average differences in post-test results in the experiment class and control class.

Based on the independent samples t-test of the learning outcome, it obtained sig scores (2-tailed) of 0.047 or 0.047 less than 0.05, which means that there are differences in learning outcomes between experimental with control classes.

Critical thinking students

The effect of Edmodo utilization on critical thinking skills can be known by reviewing students' post-test results after learning. The post-test problem is in the form of 5 essay questions that have been adapted to critical thinking skills indicators that include indicators of interpretation, analysis, evaluation, inference, and explanation given in both classes at the end of the learning. Based on the results and analysis of the data performed, the average post-test in the control class is lower than in the experimental class. The score obtained by the experiment class was 45, while the control class was 29. So, the average scores of both classes have a significant average difference. Data recapitulation of critical thinking skills in control classes and experimental classes can be found in Table 5.

Table 5. *Recapitulation of Students' Critical Thinking Skills*

Component	Post-test of Experiment Class	Post-test of Control Class
Total Students	26	27
Highest Score	100	64
Lowest Score	0	0
Average	45	29
Standard Deviation	28,03	18,28

Based on Table 5, the average score of the critical thinking skills test of both classes is shown. Experimental classes score higher on average than control classes, so it is known that Edmodo learning affects students' critical thinking skills. The data is then tested with a normality test. Distributed data is normal if the significance value (sig.) is more than 0.05, while data is not normally distributed if the

significance value (sig.) is less than 0.05. The results of the normality test showed normal distribution. Then conduct an independent test of the t-test sample. The following is an output of the normality test of students' critical thinking skills can be seen in Table 6.

Table 6. *Output Test of Normality on Students' Critical Thinking Skills*

	Class	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Critical Thinking Skills Results	Experimental Class Critical Thinking Skills	0,115	26	,200[*]	0,964	26	0,47
	Control Class Critical Thinking Skills	0,16	27	0,076	0,956	27	0,292

Based Table 6 shows that the significance value is greater than 0.05, so data is normally distributed. The data was then tested using a parametric test using an independent sample t-test. Determination of statistical hypotheses used as follows:
1). H_0: there was no difference in the average student's post-test results in control classes and experimental classes.
2). H_1: there are differences in the average student's post-test results in control classes and experimental classes.

Based on the results of an independent test sample t-test, it obtained sig. (2-tailed) of 0.013 or 0.013 less than 0.05, which means that there is an average difference in the critical thinking skills of control class students and experimental classes.

The next stage is to analyze the results of students' critical thinking skills. The following is presented the frequency distribution of the results of post-test critical thinking skills of students can be seen in Table 7.

Table 7. *Distribution of Frequency of Post-Test Critical Thinking Skills*

Score Range	Frequency of Experiment Class	Frequency of Control Class
0-19	6	8
20-39	5	11
40-59	8	6
60-79	3	2
80-100	4	0

Based on the data in Table 7 obtained post-test results data from essay questions with five questions that have matched the indicators of critical thinking skills used. The analysis data shows that the level of critical thinking that the experimental class and control class have respectively had a fairly critical and less critical category. The determination criteria can be seen in Table 2. Based on the table, the experimental class had six students have a very low category, five students have a low category, eight students in are moderately categorized, three students have a high category, and four students have a very high category. While in the control class, eight students have a very low category, eleven students are categorized as low, six students are moderately categorized, and two students are categorized very high. The results of the student's critical thinking skills scores are then analyzed for each critical thinking skill indicator. The score data per indicator in the control class and the experimental class can be seen in Table 8.

Based on the critical thinking skills score of each indicator in the experiment class and control class, the diagram can be observed in Figure 1. Based on Figure 1, it is known that the highest score in the experimental class is on the interpretation indicator of 47 with a moderate category. The evaluation indicator also has a moderate category with a percentage of 42. In comparison, the low category consists of indicators of analysis, inference, and explanation with successive scores of 35, 37, and 36. The highest score in the control class is on the analysis indicator of 31 with a low category, with a low

category on the indicators of interpretation, evaluation, and explanation with the same percentage of 27. In comparison, the inference indicator has a very low category with a score of 16.

Table 8. *Scores of The Indicators of Critical Thinking Skills in Two Classes*

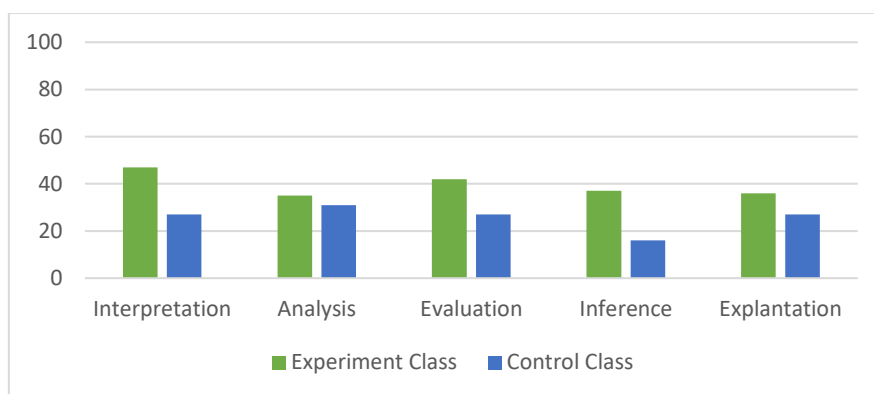| Indicators of Critical thinking skills	Experiment Class		Control Class	
	Score	Category	Score	Category
Interpretation	47	Medium	27	Low
Analysis	35	Low	31	Low
Evaluation	42	Medium	27	Low
Inference	37	Low	16	Very Low
Explantation	36	Low	27	Low

Figure 1. Critical thinking skills indicator score in experiment class and control class

Discussion

Student learning outcome

Science learning is carried out by utilizing Edmodo media as a form of treatment and reviewing students' post-test results after learning. Post-test in the form of questions as many as 18 questions that are distinguished into two, namely 13 questions to measure the results of learning in the form of multiple-choice with four choices of answers and five essay questions in accordance with critical thinking indicators. The teaching processes in experimental classes using Edmodo while in control class using media used by schools in the form of Whatsapp group. Based on the results and analysis of the data, the experimental class has a higher post-test average than the control class. The difference in scores in both classes was influenced by the use of Edmodo in learning activities.

The learning atmosphere is more conducive based on the observations during the teaching and learning activities in experimental classrooms. Students concentrate on following the learning, and students actively ask and answer questions during discussions. Students can express their opinions. There is interaction and collaboration between teachers and students so that students get more information and can solve problems through interactions that d conduct in discussions. The discussion is smooth and organized, making it easier for students to understand the material of the discussion. The existence of care, interaction, and encouragement between teachers and students can realize good academic results (Butnaru et al., 2021). While in the control class (using WhatsApp Group), the learning atmosphere created is not academic and conducive; students joke too often so can not focus on following the learning. The discussion activity went not smoothly because the students discussed things that are not related to the material, resulting in students not focusing on learning and difficulty understanding the material.

Research conducted (Sobron et al., 2019) shows that with online learning using Edmodo, students are easy to understand the material and more active than online learning that does not use Edmodo. It can happen because online learning provides a meaningful learning experience for students. In addition, Muzyanah et al. (2018) dan Nugraha et al. (2020) stated that the use of Edmodo could

improve learning outcomes because learning using Edmodo is able to create an academic and conducive learning atmosphere, students are more active, students' interest and enthusiasm in discussions are visible. The learning is centered on students so that students are able to build their curiosity and character. Therefore, learning using Edmodo can improve students' learning outcomes.

Critical thinking students

Based on the results of the analysis of critical thinking data of the experimental class, the highest critical thinking indicator is the interpretation indicator and the lowest indicator is the analysis indicator. It can be due to the difficulty of the problem. The problem in the interpretation indicator is not too high the difficulty level, while the situation on the analysis indicator includes problems with serious difficulty. It is because the interpretation indicator only observes and explains the events in the. While on the analysis, indicators are lower because it has a higher level of difficulty that requires the ability to analyze from the question to get a reason or opinion.

In the control class, the indicators that score highest and lowest are the analytical and inference indicators. Based on the observations, it was obtained that the control class students were better able to write answers on the analysis indicators but less mastered on the inference indicators. Students have difficulty in expressing the meaning of the question, so many students only answer the meaning of the picture presented without being able to make conclusions along with the logical reason of the question in question.

Teachers need to have teaching strategies combined with technology so that students can be actively involved so as to produce students who can think critically (Ismail et al., 2018). One of the uses of technology in the field of education is to use Edmodo. Research conducted (Zainudin & Pambudi, 2019) said that the use of Edmodo improves students' critical thinking skills. Based on the observations made, learning activities using Edmodo make students active in following the learning. Learning begins with the provision of materials and then continues the discussion and assignment sessions. Learning using Edmodo makes the learning atmosphere academic. Students are facilitated to discuss. Critical thinking students are trained with students given a problem, and then students can solve problems independently or discuss with other students through a discussion forum. In addition, some features can help improve students' critical thinking skills, including file and link features, assignments, and quizzes where they were used in this study. During the learning activities, students have no difficulty in using edmodo.

Students use the file and link feature to ask questions in the form of images and writing. To discuss, students can discuss each question or statement on the teacher's or other student's post by commenting on the post. Discussions are conducted so that students get a lot of information by exchanging ideas with other students. When learning, students dare to ask and answer questions so that there is the interaction between students. Students can follow the learning actively, giving and responding to questions asked by teachers and other students. Discussions make learning no longer teacher-centered but student-centered learning. With discussion activities, the material discussion becomes faster and more efficient. Students are easier to relearn materials and can solve problems. These results are supported by research (Pambudi & Zainudin, 2018) that proves that Edmodo can improve students' critical thinking skills. It is due to the process of discussion and brainstorming between students so as to solve problems. Assignments using the assignment feature in the form of worksheet help students apply information obtained during discussions. Students can upload their answers on the group homepage via the teacher's post through the assignment tool. In addition to assisting students in writing down the information obtained, assignments using worksheets can also train students' thinking skills through problems contained in the worksheet. Research conducted (Kustandi, 2017) proves that Edmodo in experimental classrooms can improve students' critical thinking skills because of student-centered learning as the primary goal. In addition, students can explore their knowledge by using the features available. It is because students are trained to think critically, actively think, and argue. After the teaching is complete, a post-test is conducted using the quizzes feature. Learning using Edmodo is student-centered so that students actively participate and can build their curiosity. In addition, according to (Sobron et al., 2019), in his research, online learning using Edmodo makes students easy to understand the material and more active than online learning that does not use Edmodo. It is because online learning provides a meaningful learning experience for

students. Learning in control classes (using WhatsApp Group) is treated the same but uses different LMS. The learning atmosphere created in control classes is less academic and not conducive. Students joke too often that they can't focus on learning.

Based on the observations, some students do not follow the learning and do not follow the post-test because there are obstacles such as broken mobile phones, the absence of internet quota, and the unstable internet network. According to (Roman dan Plopeanu, 2021), an unstable internet connection makes students less likely to be effective in following online learning. The problem can be addressed by the way students can review learning on eLearning (Edmodo) for experimental classes. In contrast, in control classes, students can review learning on the class group WhatsApp. The eLearning can be used to keep students learning so that students are not left behind (Aldiab et al., 2017). Another obstacle that occurs is that the response given by students in both classes is often slow, thus affecting learning activities. To overcome these obstacles, teachers can ask questions that students must answer. In the experimental class, the teacher can coordinate with students using the WhatsApp group before learning is carried out.

CONCLUSION

The results showed that the use of Edmodo had a significant influence on students' learning outcomes and critical thinking skills. Based on the data analysis that has been done, the experimental class has a higher average value than the control class. In addition, during the learning process, using Edmodo learning is more optimal. Students actively follow the teaching so that the use of Edmodo can improve the quality of learning and affect both the learning outcomes and critical thinking of students. Based on the research, it is expected that Edmodo can be used as a reference as a support for science learning. But it is necessary to ensure that teachers can control factors that can affect online learning, such as signal and availability of internet quota. For subsequent researchers, it is recommended that Edmodo be tested for its impact on different variables and materials. During the implementation of the learning, the teacher must be able to manage the class well and ensure that students actively participate during the learning process.

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