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Critical and Creative Thinking in Malay-language Essay-writing Through an Online Authentic Learning Environment

Lim Kah Woon[1], Noor Azean Atan[2], Jamalludin Harun[3] , Mohd Fadzil Abdul Hanid[4]*

Abstract

Chinese school students' Malay-language essays are unsatisfactory as the students are rarely exposed to an authentic environment. Furthermore, there is less emphasis on learning critical and creative Malay-language essay-writing. Current web technological development enables the design of a real situational learning environment to cultivate the critical and creative use of Malay as a second language in Chinese school students' essay-writing skills. Authentic world situations can be represented by web technology. Thus, this study examined the role of an online authentic learning environment in promoting critical and creative thinking for Malay-language essay-writing among Chinese school students. In this pre-experimental study, the sample consisted of 33 government Chinese secondary school students. The Friedman and Wilcoxon signed rank test analysis results of the students' critical and creative thinking skills were both significant ($p < 0.05$). The web technology-aided authentic learning strategies improved the students' critical and creative thinking skills, which supported their achievement scores in writing critical and creative Malay-language essays.

Keywords: *Authentic Learning Strategy, Critical And Creative Thinking Skills, Web Technology*

Introduction

While many studies have integrated authentic learning environments into teaching and learning, such implementation requires structured planning to positively influence students' knowledge and skills (Chamba, Reinoso, and Rengifo 2019). The contextual approach yields positive and meaningful results for school students (Ngosman and Mahamod 2017). Nevertheless, providing real world-based learning to students is subject to constraints. Hence, the availability of web technology can aid learning activity design via real-world technological representation.

Using web technology in student learning activities can present learning opportunities by representing a real environment (Zainudin 2020;Muna 2016). Extending learning to a real environment outside school enables learning in an authentic environment, which would aid

[1] Johor State Education Department, Malaysia. E-mail: lwk8891@gmail.com
[2] Faculty of Social Science and Humanities,Universiti Teknologi Malaysia, Malaysia. E-mail: azean@utm.my
[3] Faculty of Social Science and Humanities,Universiti Teknologi Malaysia, Malaysia. E-mail: p-jamal@utm.my
[4] Faculty of Social Science and Humanities,Universiti Teknologi Malaysia, Malaysia. E-mail: mohdfadzilabdulhanid@utm.my
Corresponding author: Mohd Fadzil Abdul Hanid (mohdfadzilabdulhanid@utm.my)

effective and meaningful learning (Shadiev et al. 2018; Yasaman and Ömer 2019). Hence, the subjects taught can integrate critical and creative thinking (Bono 2018).

In addition to the communication and collaboration skills in the 21st century learning environment, students should also master creative and critical thinking (Liu et al. 2019;Hassan and Venkata 2015). Referring to the Malaysia Education Blueprint (2013–2025), students to date remain unable to use knowledge and think critically in real life. Previous studies supported the need to emphasise critical and creative thinking. Students' critical and creative thinking aspects in learning should be emphasised, specifically when presenting ideas and arguments in essays. Nonetheless, Malaysian students in Chinese schools had not mastered critical and creative Malay-language essay-writing skills as Malay is their second language (Nahar and Rahman 2018). (Nahar and Rahman 2018) reported that conventional teaching methods that do not contextualise authentic principles were unsatisfactory. Teacher-centred pedagogy resulted in moderate mastery of critical and creative writing skills as new ideas could not be broadly elaborated analytically, meaningfully, clearly, and accurately.

Essay-writing should implement the thinking skills and contextual learning component (Chamba, Reinoso, and Rengifo 2019). Therefore, critical and creative thinking skill application should be implemented clearly or consciously to enable its application by students in daily life and their learning of essay-writing (Lai Lee Chung 2017;Chew 2016). Accordingly, students should be exposed to a real world-based learning environment that supports the development of their critical and creative thinking skills to improve their learning of essay-writing. Such an environment can be represented with the aid of current web technology. Therefore, based on the requirements of the aforementioned setting and in line with the Malaysian Education Development Plan 2013–2025, this study was conducted to design and develop learning activities that support the mastery of critical and creative thinking skills in addition to Malay-language essay-writing skills among Chinese school students based on a web technology-aided authentic learning environment.

Literature Review

In this information technology age, technology has been integrated into every daily activity. Various education levels globally are presently using web technology in the learning process (Siew and Mahamod 2001), which aided students in obtaining more effective and meaningful learning results (Atan et al. 2021;Yusof et al. 2021). The varied recent technologies have increased educators' opportunities to create a student-centred learning environment to foster the development of 21st century student capabilities and skills to resolve Industrial Revolution 4.0 challenges (Mohd Idrik and Bee Piang 2022). To date, an authentic learning environment is frequently recommended as the best learning approach (Kassim 2021;Hushainiu, Osman, and Sarudin 2020).

(Ali, Mahamod, and Azlan 2021) stated that students encounter issues during essay-writing due to a lack of ideas as they are unable to relate ideas to real-life situations, which subsequently affect

essay quality. Furthermore, some language teachers require students to memorise model essays, where the teacher hopes that the memorisation can be used during essay-writing (Lai, Chin, and Chew 2017). The current learning system is mainly theoretical, which renders most students unable to understand the meaning of learning and apply what they have learned to daily life (Ali, Mahamod, and Azlan 2021; Ashrafiany et. al 2019). Furthermore, language teaching and learning methods and strategies are important when educating students on mastering essay-writing skills (Abd Wahid 2021). Similarly, Siew and Zamri Mahamod (2001) stated that there was a need to improve the learning of essay-writing through appropriate methods and approaches, which included technology use.

Implemented in schools with contextual characteristics, computer-based writing supported and improved essay-writing and language usage more generally inside or outside the classroom (Green 2019;Raja and Nagasubramani 2018). Additionally, an authentic learning environment provides a good learning experience as it aids students in making real-life connections with their learning (Prins, Bulte, and Pilot 2016;Elsworth 2019). Thus, web technology can aid learning activity design through real-world technological representation by supporting real world-based learning activity improvement (Zainudin 2020).

Problem-solving alternates between both critical and creative thinking. Practically, critical and creative thinking mainly operate together and not in isolation from each other. Previous studies demonstrated that language learning classes should implement critical and creative thinking skills to produce human capital and a workforce capable of resolving 21st century globalisation challenges. Similarly, the Curriculum and Assessment Standards Document (DSKP) states that critical and creative thinking skills are the pillar of knowledge acquisition for all subjects. Nevertheless, most teachers preferred conventional teaching approaches and model essay memorisation (Lai, Chin, and Chew 2017).

Integrating technology effectively improved language writing skills in an authentic learning environment (Nikolay 2015;Kasuma et al. 2018). Correspondingly, computer technology presented numerous opportunities to use valid materials in the classroom (Reinders and Benson, 2017) Technological use integrates language, content, and culture more comprehensively compared to conventional methods. Furthermore, it provides students with autonomous learning opportunities (Zoheb 2017). Thus, using an appropriate new technology is particularly important in foreign language education and bilingual education (Zoheb 2017). Furthermore, implementing authentic learning strategies in essay-writing learning activities would be useful for improving students' critical and creative thinking skills (Maslawati, Naiman, and Harwati 2018). Thus, students would be able to write better critical and creative essays.

Objectives of the Study

This study covers two interrelated objectives as follows:

a) To design learning activities for Malay language essay writing through online authentic learning environment to promote student's critical and creative thinking skills.

b) To identify the effect of learning activities for Malay language essay writing through online authentic learning environment to promote student's critical and creative thinking skills.

c) To identify learning activities for Malay language essay writing through online authentic learning environment to promote student's achievement.

d) To determine students' perceptions towards learning activities for Malay language essay writing through online authentic learning environment that support students' critical and creative thinking skills.

Theoretical Framework of the Study

In reference to the situational learning theory highlighted by Zainudin, (2020); Yahaya *et al*., (2017); and Baharudin, (2015); Herrington and Herrington, (2006) had introduced Authentic Learning Strategies, an exposure to real world situations in learning activities, which good effects on their achievement have been proven. The web technology can support the mastery of critical and creative thinking skills, once the students have mastered essay writing skills, as stated in previous studies (Shuib *et al*., 2018; Sasi and Chang, 2017; Huda, 2017; Ozverir *et al*., 2016); Herrington, 2015; Tan and Neo, 2015).

In this study, this highlighted authentic learning strategies by Herrington *et. al*., (2010) were used in learning Malay language essay writing besides critical and creative thinking skills which proposed by Beyer (2008). Referring to the elements of authentic learning strategies, these strategies were integrated through the Malay language essay writing learning website. Complete descriptions of the Authentic Learning environment are given as follows:

- Authentic activities must relate to the real life.
- Authentic activities are clearly defined, and the problems are subject to various interpretations and are not easily solved in the existing way.
- Authentic activities are complex, which cannot be completed in a few minutes or a few hours. Students need a long period to explore and study them.
- Authentic activities encourage students to study assignments from a variety of theoretical and practical perspectives, by using a variety of resources which require students to evaluate information critically.
- Authentic activities require cooperation or collaboration.
- Authentic activities enable students to think for themselves or reflect on learning.

- Authentic activities can be integrated and applied across different subject areas.
- Authentic activities integrate with learning assessment in an integrated way with the real world.
- Authentic activities result in products which are more valuable in their own right.
- Authentic activities enable different ways of solving and different types of outcomes or products.

Each element in the Authentic Learning environment is used in designing student learning activities, which look into meaningful contexts and realities of the real world, as stated in the study by Mohd Idrik and Bee Piang, (2022); Zainudin, (2020); Hushainiu *et al*., (2020); Herrington *et al*., (2007), and Bhagat and Huang, (2018).

This study will also look into students' mastery of critical and creative thinking skills in Malay language essay writing. Referring to Beyer, (2008) the characteristics of critical and creative thinking skills are as follows:

Characteristics of Critical Thinking

(i) Characterise: define a concept or item; identify between similar concepts or items.

(ii) Compare and Differentiate: when there are two or more features or possibilities; make a choice or decision.

(iii) Collect and Classify: when there are many items or information; unstructured items or information.

(iv) Make a Sequence: easy to understand; certain items are easy to find.

(v) Sort by Priority: to highlight important things; determine actions that need to be taken first.

(vi) Analyse: decide an opinion or statement; find implicit assumptions, elaborate them into more detailed features; rethink opinions or assumptions; make a corrected statement with factual support.

(vii) Detect bias/accuracy: when there is a statement which tends to influence someone's decision or opinion; consider the accuracy of the resource of information or statement; identify anyone's bias views.

(viii) Evaluate: choose something; accept or reject an idea.

(viii) Make Conclusions: make a decision about a study result; explain something based on investigation; predict and support statements.

Characteristics of Creative Thinking

(i) Generate ideas: find new ideas; find alternatives.

(ii) Make inferences: plan steps of actions or make choices; analyse the cause and effect of a decision or an effect.

(iii) Connect: make inferences to find patterns of relationships; predict relationship patterns; hypothesize a structure; draw conclusions; generalize.

(iv) Predict: to direct an event based on observation and experience or data; plan an event; consider options.

(v) Make a hypothesis: used in the early stages when planning to carry out an experiment, research or study.

(vi) Synthesise: conclude, generalise or prepare a title; produce forms of communication such as drawings, maps, diagrams, poems and reports.

(vii) Generalise: find patterns; organise information; predict.

(viii) Analogise: compare two things that are not the same; find similar characteristics which can be correlated; state a correlation as a metaphor.

(ix) Make a Mental Image: understand abstract concepts; remember complex concepts.

(x) Invent: produce something new; make modifications to something which already exists in the concrete or abstract forms.

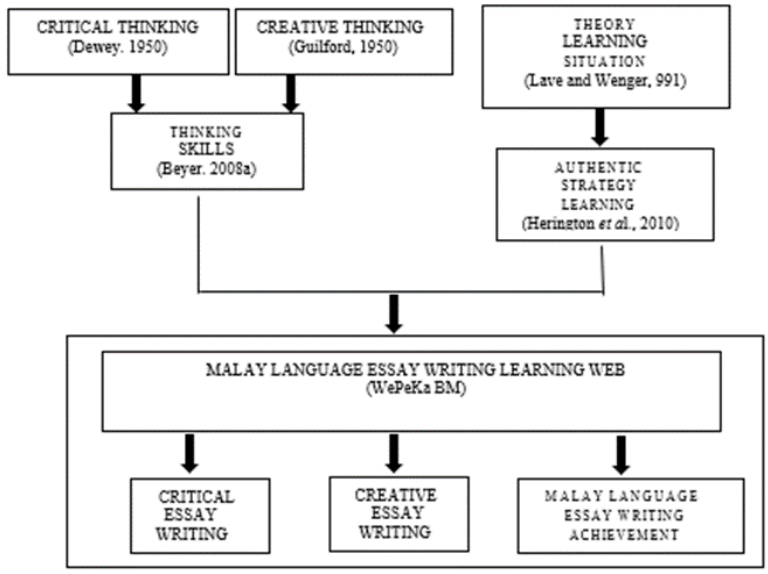

Figure 1.1 Theoretical Framework of the Study

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Methodology

The study comprised of Form 3 students in a government secondary school who will sit for a public national examination later. A total of 33 of them were randomly assigned as the study samples. The study design was a pre-experimental time series one group pre-test and post-test (Campbell and Stanley, 2015). A period of 7 weeks was allocated for this study, with an interval of few weeks between the pre-test and the post-test, as proposed by Babbie, *et.al.*, (2015) and Sani Cln, (2013) who found this to be the most ideal, because the students no longer remember the pre-test questions. For this study, data on students' critical and creative thinking skills was obtained through Pre-Activity, Post-Activity 1 and Post-Activity 2 Malay language essays based on the Critical and Creative Thinking Skills Assessment Rubric. Following this, the data was analysed using Friedman Test SPSS. Meanwhile, the achievement scores of Pre-Test and Post-Test Malay language essays writing were assessed based on the PT3 Malay language essay scoring scheme. In addition, the students' perceptions of learning activities on authentic learning environment were collected by using Likert Scale and was analysed by Descriptive Statistics.

Findings of the Study

To determine the effect of online authentic learning environment activities on students' critical and creative thinking skills, and Malay language essay writing skills, a language teacher evaluated the Malay language essays written by the students based on the rubric of critical and creative thinking skills and PT3 Malay language essay writing scoring scheme separately.

i. Mastery of Critical Thinking skills

Figure 2 and Figure 3 below shows the design of the learning process of critical thinking skills in an authentic learning environment.

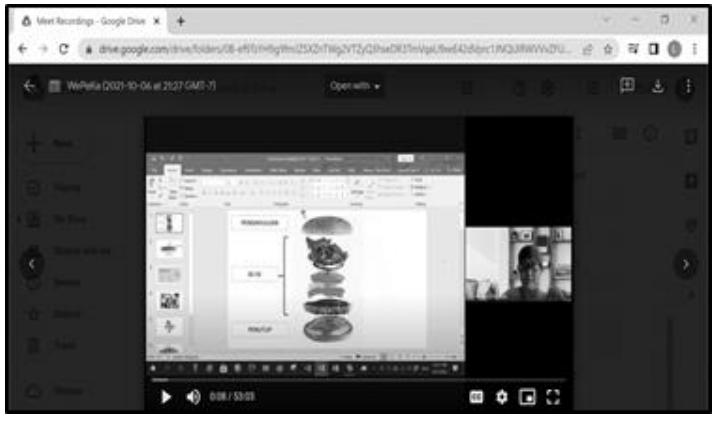

Figure 2: Learning Analyze Skill

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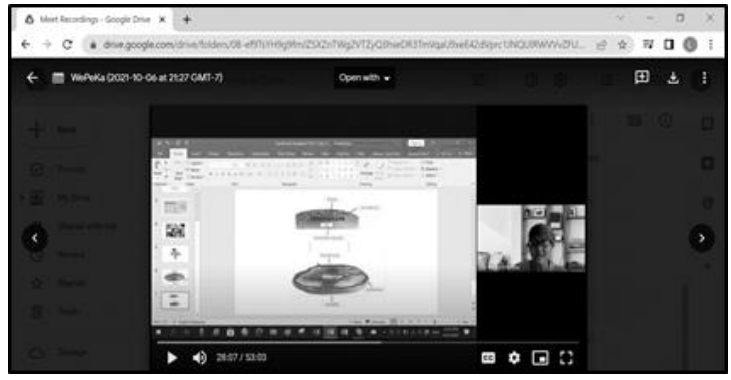

Figure 3: Learning Conclusion Skill

Table 1 below shows the mastery of critical thinking skills score through online authentic learning environment.

Table 1: Mastery of Critical Thinking Skills Pre-Activity, Post-Activity 1, Post-Activity 2

	Characterise			Differentiate			Making Accuracy			Making A Sequence			Sorting			Classify			Analyse			Evaluate			Conclutions		
	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3
P1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	1	0	1	1	0	1	1	0	1	1
P2	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1
P3	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	0	1	1	0	1	1	0	1	1
P4	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1
P5	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1
P6	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	0	1	1
P7	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	0	1	1
P8	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	0	1	1
P9	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1
P10	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	0	1	1
P11	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	0	1	1
P12	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	0	1	1
P13	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	0	1	1
P14	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	0	1	1
P15	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	0	1	1
P16	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1
P17	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1
P18	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	0	1	1	0	1	1	0	1	1
P19	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	0	1	1
P20	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	0	1	1
P21	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	0	1	1
P22	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1
P23	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	0	1	1	0	1	1	0	1	1
P24	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1
P25	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	0	0	1
P26	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	0	0	1
P27	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	0	1	1	0	0	0	0	0	1
P28	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	0	0	1
P29	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	0	1	1
P30	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	0	0	1
P31	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	0	1	1
P32	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	0	1	1	0	0	0	0	1	1
P33	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	0	1	1	0	1	1	0	1	1
	0	0	0	0	0	0	0	0	0	33	33	33	33	33	33	23	29	30	6	30	30	2	31	31	2	28	33

P = Student

T1: Pre-Activity

T2: Post-Activity 1

T3: Post-Activity 2

Refering to Table 1, the mastery of students' critical thinking characteristics can be summarized into 3 categories, namely category A, which are critical thinking characteristics that cannot be mastered after intervention learning activities that include characterizing characteristics, comparing characteristics and detecting bias/accuracy. Next, category B is the characteristics of critical thinking that are ready to be mastered before the intervention learning activity, which includes the characteristics of making a sequence and the characteristics of sorting according to priority. Lastly is Category C which covers 4 critical thinking characteristics that are successfully mastered after intervention learning activities that contain collecting and classifying characteristics, analysing characteristics, evaluating characteristics and concluding characteristics. Therefore, writing a Malay language essay requires students to classify, analyse, evaluate information, and make conclusion besides enhance different perspectives, and organize thoughts in a clear and logical way. All of these skills are important components of critical thinking.

The descriptive analysis data of each student's critical thinking mastery score during Pre-Activity, Post-Activity 1 and Post-Activity 2 can be illustrated through Table 2 below.

Table 2: Mastery of Critical Thinking Skills

Student	Pre-Activity	Post-Activity 1	Post-Activity 2
1	0	3	4
2	3	4	4
3	0	4	4
4	2	4	4
5	2	4	4
6	1	4	4
7	1	4	4
8	1	4	4
9	2	4	4
10	1	4	4
11	1	4	4
12	1	4	4
13	1	4	4
14	1	4	4

15	1	4	4
16	2	4	4
17	2	4	4
18	0	4	4
19	1	4	4
20	1	4	4
21	1	4	4
22	2	4	4
23	0	4	4
24	3	4	4
25	0	1	2
26	0	1	2
27	0	2	3
28	1	3	4
29	1	4	4
30	0	1	2
31	1	4	4
32	0	3	3
33	0	4	4

The maximum score of critical thinking characteristics mastered before intervention is 2 characteristics. While the maximum score of critical thinking characteristics mastered after tretment has increased to 4 characteristics.

Following the findings above, statistical inference anlysis with the SPSS software was carried out for the purpose of research to see if there was a significanct difference between the scores of Pre-Activity, Post Activity 1 and Post -Activity 2. The normality test was conducted first to identify the data obtained as normally distributed or non-normally distributed. This is because the type of data distribution is the selection criteria of statistical tests, whether parametric or non-parametric for subsequent analysis.

Table 3: Normality Test on Critical Thinking Skills Scores During Pre-test, Post-Activity 1 and Post-Activitiy 2

Activity	**Shapiro-Wilk**		
	Statistic	**df**	**Sig.**
Pre-activity	0.846	33	0.000 $p < 0.05$
Post-activity 1	0.508	33	0.000 $p < 0.05$
Post-activity 2	0.438	33	0.000 $p < 0.05$

As the sample size was less than 30, Shapiro-Wilk Test was performed to check the data normality, and the results obtained was 0.00 $p < 0.05$, it showed that, all the data was not normally distributed.

Therefore, the Friedman test, a non-parametric statistical test, was subsequently performed (Table 4).

Table 4: Friedman Test Analysis on Students' Critical Thinking Skills Score

	Mean Rank	**$\chi^{2\,a}$**	**df[a]**	***p*-value[a]**
Critical Pre-Activity	1.00	62.91	2	0.00 $p < 0.05$
Critical Post-Activity 1	2.41			
Critical Post-Activity 2	2.59			

a. Friedman Test

The Friedman test revealed a significant effect of authentic learning strategies on critical thinking skills was 0.00 $p < 0.05$. The median values obtained indicated, that the critical thinking score was the highest in Post-Activity 2 (Md= 2.59), followed by Post-Activity 1 (Md= 2.41) and Pre-Activity (Md=1.00) (Table 4).

Following that, the Wilcoxon Signed Rank Test was performed to compare the significant differences between the three groups of paired critical thinking skills data in order to identify the effects of learning activities.

Table 5: Change of Median Students' Critical Thinking Skills Score after Learning Activities Between Pre-Activity and Post-Activity 1 and Post-Activity 2

No.	**Activity**	**Sig.**
1.	Median Differences Between Pre-Activity with Post -Activity 1	0.00 $p < 0.05$
2.	Median Differences Between Pre-Activity with Post -Activity 2	*0.00* $p < 0.05$
3.	Median Differences Between Post -Activity 1 with Post-Activity 2	0.014 $p < 0.05$

a. Wilcoxon Signed Rank Test: The Significance Level is 0.05

Referring to Table 5, there were significant differences of median scores among all the 3 pairs of critical thinking skills, Pre-Activity with Post-Activity 1 and Pre-Activity with Post-Activity 2 were 0.00 $p < 0.05$, while Post-Activity 1 with Post-Activity 2 was 0.014 $p < 0.05$. Therefore, it can be concluded that, the intervention activities had an impact on the critical thinking skills of the respondents (Table 5).

ii. Mastery of Creative Thinking Skills

The following Table 6 showed the effect of learning activities on creative thinking skills based on authentic learning strategies, with the help of web technology,

Figure 4 and Figure 5 below shows the design of the learning process of creative thinking skills in an authentic learning environment.

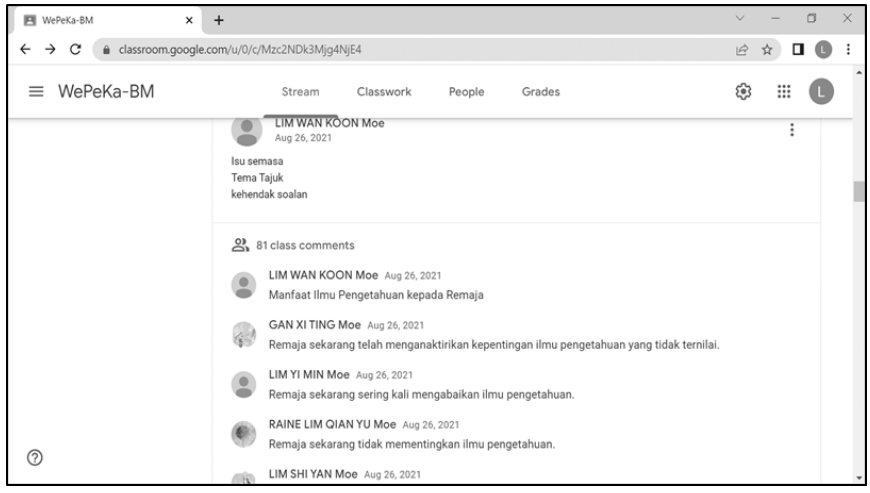

Figure 4: Learning Synthesize Skill

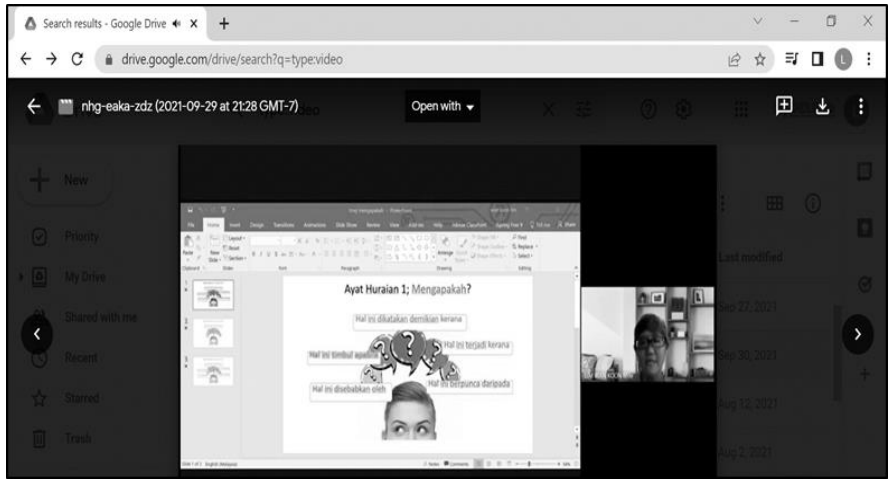

Figure 5: Learning Generate Ideas Skill

Table 6: Mastery of Creative Thinking Skills Pre-Activity, Post-Activity 1, Post-Activity 2

	Inferences			Predict			Hypothesis			Generalise			Analogise			Imagery			Generate Ideas			Connecting			Synthesis			Invent		
	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3
P1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	1	1
P2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	0	1	1
P3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	1	1
P4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	0	1	1
P5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	1	1	0	1	1
P6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	0	1	1
P7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	0	1	1
P8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	0	1	1
P9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	0	1	1
P10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	0	1	1
P11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	1	1
P12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	1	1
P13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	0	1	1
P14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	1	1	0	1	1
P15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	0	1	1
P16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	0	1	1
P17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	0	1	1
P18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	1	1	0	1	1
P19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	1	1	0	1	1
P20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	0	1	1
P21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	1	1	0	1	1
P22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1
P23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1
P24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	1
P25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1
P26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1
P27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	1	1
P28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	1	1
P29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1
P30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	1	1	0	0	1
P31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	1	1	0	0	1
P32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	1	1	0	1	1
P33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	1	1	0	1	1
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	33	33	21	24	24	0	23	23	0	27	33

P = Student

T1: Pre-Activity

T2: Post-Activity 1

T3: Post-Activity 2

The results of this evaluation can be divided into 2 categories. Category A is the category where creative thinking characteristics that cannot be mastered after intervention learning activities include inference making characteristics, predicting characteristics, hypothesis making characteristics, copying characteristics and analogizing characteristics, as well as mental image making characteristics. Next is category B, which is a category of creative thinking characteristics that are successfully mastered after intervention learning activities that include idea generating

characteristics, linking characteristics, synthesizing characteristics and creating characteristics. It was found that there were no characteristics of creative thinking that were readily mastered by the students before the intervention was given. Clearly, Malay language essay writing requires students to connect information, synthesize ideas, generate ideas and they create ways to present their thoughts in a coherent and organized manner. To do the Malay language essay writing effectively, students need to use their creative thinking skills.

The summary score of mastery of creative thinking characteristics of each student during Pre-Activity, Post-Activity 1 and Post-Activity 2 can be illustrate through Table 7 below.

Table 7: Mastery of Creative Thinking Skills

Student	Pre-Activity	Post 1-Activity	Post 2-Activity
1	0	3	3
2	2	4	4
3	1	3	3
4	2	4	4
5	1	4	4
6	2	4	4
7	2	4	4
8	2	4	4
9	2	4	4
10	2	4	4
11	1	3	3
12	1	3	3
13	2	4	4
14	1	4	4
15	2	4	4
16	2	4	4
17	2	4	4
18	1	4	4
19	1	4	4
20	2	4	4
21	1	4	4
22	0	1	2
23	0	1	2
24	1	1	2
25	0	2	2

26	0	1	2
27	1	1	2
28	0	3	3
29	0	2	2
30	0	3	4
31	0	3	4
32	0	4	4
33	1	4	4

The maximum score of creative thinking characteristics mastered before intervention is 2 characteristics. While the maximum score of creative thinking characteristics mastered after intervention has increased to 4 characteristics.

Following the findings above, statistical inference analysis with the SPSS was carried out for the purpose of research to see if there was a significant difference between the scores of Pre-Activity, Post-Activity 1 and Post-Activity 2. The normality test was conducted first to identify the data obtained as normally distributed or non-normally distributed.

Table 8: Normality Test on Creative Thinking Skills Score During Pre-Activity, Post-Activity 1 and Post-Activitiy 2

Activity	**Shapiro-Wilk**		
	Statistic	**df**	**Sig.**
Pre-Activity	0.794	33	0.000 $p < 0.05$
Post-Activity 1	0.704	33	0.000 $p < 0.05$
Post-Activity 2	0.664	33	0.000 $p < 0.05$

The results of analysis performed by using Shapiro-Wilk Test showed that, all the data of Pre-Activity, Post-Activity 1 and Post-Activity 2 was non-normally distributed because the Significan values were 0.00 $p < 0.05$ (Table 7). Therefore, the Friedman test, a non-parametric statistical test, was subsequently performed as Table 9 below.

Table 9: Friedman Test Analysis of Students' Creative Thinking Skills

Activity	**Mean Rank**	**χ^{2} [a]**	**df[a]**	***p*-value[a]**
Creative Pre-activity	1.03	60.31	2	0.00 $p < 0.05$
Creative Post-activity 1	2.36			
Creative Post-activity 2	2.61			
[a]Friedman Test				

The Friedman test revealed a significant effect of authentic learning strategies on creative thinking

skills, 0.00 $p < 0.05$. The median values obtained indicated that, the creative thinking score was the highest in Post-Activity 2 (Md = 2.61), followed by Post-Activity 1 (Md= 2.36) and Pre-Activity (Md=1.03) (Table 9). In summary, there is an increase in the scores of students' creatice thinking characteristics.

The reesults of this test also obtained an alpha value of 0.00 $p < 0.05$ which means the intervention activity is Significan in all Pre-Activity, Post-Activity 1 and Post-Activity 2 after intervention learning through the technology website. Therefore, learning through the technology website has an impact on students' creative thinking.

Subsequently, the Wilcoxon Test was performed to determine whether the pairs having significantly different median scores, to see the effects of learning activities on respondents' creative thinking skills.

Table 10: Change of Median Students' Creative Thinking Skills Score after Learning Activities Between Pre-activity and Post-activity 1 and Post-activity 2

No.	Activity	Sig.
1.	Median Differences Between Pre-Activity With Post -Activity 1	0.00 $p < 0.05$
2.	Median Differences Between Pre-Activity With Post -Activity 2	0.00 $p < 0.05$
3.	Median Differences Between Post -Activity 1 with Post-Activity 2	*0.008* $p < 0.05$

a. Wilcoxon

b. Signed Rank Test: The Significance Level is 0.05

The median scores between all the three pairs of creative thinking skills Pre-Activity with Post-Activity 1 and Pre-Activity with Post-Activity 2 were 0.00 $p < 0.05$, while Post-Activity 1 with Post-Activity 2 was 0.008 $p < 0.05$. Therefore, it can be concluded that there were significant differences and the intervention activities on creative thinking skills were effective (Table 10).

iii. Malay language Essay Writing Achievement

The effects of Malay language essay writing learning activities on students' achievement can be seen in the pre-post tests analysis, as summarised in Table 11, which revealed the pre-test and post-test scores of the Malay language essay writing for the 33 students.

Table 11: Pre-test and Post-test Malay language Essay Writing Achievements

Student	Pre	Post	Difference	Change
S1	10	14	13.3	↑

S2	29	29	0.0	↔
S3	13	18	16.7	↑
S4	27	28	3.3	↑
S5	14	18	13.3	↑
S6	15	20	16.7	↑
S7	23	25	6.7	↑
S8	15	19	13.3	↑
S9	25	27	6.7	↑
S10	25	29	13.3	↑
S11	12	15	10.0	↑
S12	13	17	13.3	↑
S13	17	20	10.0	↑
S14	11	15	13.3	↑
S15	16	19	10.0	↑
S16	17	20	10.0	↑
S17	20	24	13.3	↑
S18	15	26	36.7	↑
S19	23	25	6.7	↑
S20	15	18	10.0	↑
S21	27	29	6.7	↑
S22	10	14	13.3	↑
S23	10	16	20.0	↑
S24	12	17	16.7	↑
S25	8	12	13.3	↑
S26	9	15	20.0	↑
S27	7	14	23.3	↑
S28	10	17	23.3	↑
S29	15	19	13.3	↑
S30	12	18	20.0	↑
S31	15	19	13.3	↑
S32	10	17	23.3	↑
S33	18	23	16.7	↑

Table 12: Summary of Changes after Intervention

Change	**Number**	**Percentage**
Increased	32	96.97%

No Change	1	3.03%
Decreased	0	0%
Amount	33	100%

Table 12 above shows that, a total of 32 students (96.97%), showed improvements, while one student (3.03%), had no change and no students showed a decrease in their scores after the intervention. Thus, the Malay language essay writing learning activities, based on authentic learning strategies, through technology website with the help of the newly-designed web technology, had proven to have a positive impact on the students' Malay language essay writing skills.

The effect of Malay language essay writing learning activities on student achievement analyzed has been supported by the SPSS statistics analyzed below. The normality test was conductedd first to identify the data obtained as normally distributed or non-normally distributed.

Table 13: Normality Test on Malay Languange Malay language Essay Writing Achievement During Pre test, and Post test

Tests of Normality	**Shapiro-Wilk**		
	Statistic	**df**	**Sig.**
Pre-test	.913	33	.012
Post test	.915	33	.014

The Shapiro-Wilk test was used to test for the data normality, as the sample size was less than 50 (N=33), Dilekci and Kararay, (2023). The test results, as shown in Table 13, were 0.012 and 0.014 with $p < 0.05$, indicated that, the distribution of the sample scores for Malay language Essay Writing Achievements was not normally distributed (Field, 2016). Thus, a non-parametric analysis, Wilcoxon Signed Rank Test was conducted to determine, if there were significant score differences, between pre-test and the post-test achievements.

Table 14: Changes of Malay language Essay Writing Achievements After the Intervention

Variable	**Pre-test Median (IQR)**	**Post-test Median (IQR)**	***t* statistic**	***p* value**
Students' Achievement Score	15.00	19.00	4.966 [a]	0.00 $P < 0.05$

[a] **Wilcoxon Signed Rank Test**

As revealed, the median of score difference (between pre-test and post-test scores) was significantly different with 0.00 $p < 0.05$. The median of the post-test score was higher than that of the pre-test

score. In other words, learning activities for Malay language essays writting, based on authentic learning strategies through technology website, with the help of the newly-designed web technology, have a positive effect on students' achievement (Table 14).

iv. Students' Perceptions towards Malay language Essay Writing Activities On Online Authentic Learning Environment

Students' perceptions of Malay language essay writing activities in an authentic learning environment, through web technology, were collected through the distribution of questionaires. The results of the questionaires were interpreted based on the Likert scale (Peterson, 2003; Neo *et al.*, 2003).

Table 15: Students' Perceptions of Malay language Essay Writing Activities in an Authentic Learning Environment Through Web Technology

No	Item	Frequency (Percent)					Mean	SD	Level
		1	2	3	4	5			
1.	I can give clear arguments when using websites to find essay writing information.	0 (0%)	3 (9.1%)	18 (54.5%)	10 (30.3%)	2 (6.1%)	3.33	0.74	Moderate
2.	I can explain ideas well when getting peer feedback in Google Classroom.	0 (0%)	4 (12.1%)	18 (54.5%)	9 (27.3%)	2 (6.1%)	3.27	0.76	Moderate
3.	I can use interesting vocabulary and varied sentence structures in essays after information seeking activities.	0 (0%)	5 (15.2%)	16 (48.5%)	11 (33.3%)	1 (3.0%)	3.24	0.75	Moderate

4.	I can write essays well and organized after looking at pictures on the Power Point and discussing with friends in the Stream discussion room.	2 (6.1%)	15 (45.5%)	9 (27.3%)	7 (21.2%)	0 (0%)	2.64	0.90	Moderate
5.	I can explain the ideas supported by the description after watching the essay content video.	5 (15.2%)	13 (39.4%)	9 (27.3%)	6 (18.2%)	0 (0%)	2.48	0.97	Disagreed
6.	I can write a more structured essay after the assignment sent to Google Classroom is discussed with friends.	0 (0%)	6 (18.2%)	14 (42.4%)	11 (33.3%)	2 (6.1%)	3.27	0.84	Moderate
7.	It became easier for me to generate ideas after seeing the image	1 (3.0%)	3 (9.1%)	19 (57.6%)	10 (30.3%)	0 (0%)	3.15	0.71	Moderate

	display about the content of the essay on the website.								
8.	I can write a more creative and unique essay after studying the materials on the website.	0 (0%)	3 (9.1%)	10 (30.3%)	15 (45.5%)	5 (15.2%)	3.67	0.85	Agreed
9.	I can write better essays after receiving feedback from peers in the Stream discussion room.	0 (0%)	2 (6.1%)	11 (33.3%)	17 (51.5%)	3 (9.1%)	3.64	0.74	Agreed
10.	My writing skills improved after collaborating with friends in writing essays.	1 (3.0%)	2 (6.1%)	15 (45.5%)	10 (30.3%)	5 (15.2%)	3.48	0.94	Agreed

Referring to Table 15, there are three items which display a high mean, at 3.67, 3.64 and 3.48, indicating that the students agreed that, authentic learning activities through web technology with the help of the newly-designed web technology are able to support the critical and creative Malay language essays writing. In other words, students generally enjoy engaging in collaborating writing and learning to comment and receive feedback in a peer group. In addition, authentic materials can be one of the alternative learning tools to get writing ideas that can be related to real world life.

Discussion

This study determined that the critical thinking characteristics involved in writing a Malay-language essay are classifying, analysing, and evaluating information, and establishing a conclusion.

Furthermore, writing a Malay-language essay involves enhancing different perspectives and organising thoughts clearly and logically. This finding supported (Suteja and Setiawan 2022;Meirbekov, Maslova, and Gallyamova 2022), who reported that essay-writing is an effective means of improving students' critical thinking skills as it requires information analysis and evaluation, connecting different ideas, and developing perspectives.

This study also determined that the creative thinking skills successfully mastered after intervention learning activities are idea generation, linking, synthesising, and creating. Students should use these skills to write Malay-language essays effectively. This finding was supported by (Peze, Janssen, and Rijlaarsdam 2021), who reported that students writing an essay should collect and evaluate information, generate ideas, and connect concepts and perspectives in addition to generating innovative solutions to complex issues. Therefore, the authentic elements and characteristics of critical and creative thinking implemented in this study cultivated Chinese school students' critical and creative Malay-language essay-writing skills.

The results also proved that learning activities for Malay-language essays based on a web technology-aided authentic learning environment improved the students' Malay-language essay-writing skills. In parallel, failings in writing Malay-language essays that will affect the academic achievement of the Malay language can be addressed through such intervention activities. These findings supported (Hassan et al. 2019), who reported that learning activities for Malay-language essay writing based on an authentic learning environment via web technology aided students in mastering writing skills and improving their academic achievements. Thus, authentic materials can be an alternative learning tool to obtain real world-related writing ideas.

This study supports previous studies that also reported that teachers of second-language essay-writing should use more real and authentic writing activities that can foster the development of critical thinking skills and understanding of various contextual linguistic elements (Shemshurenko et al. 2019). In summary, the teaching strategies are important for cultivating Chinese school students' critical and creative Malay-language essay-writing skills. Educators should create innovative and creative online learning strategies to ensure that students are passionate about online learning (Purwadi et al. 2020). Lastly, teachers should design teaching and learning activities and strategies for Malay-language essay-writing through an authentic web technology-aided environment to achieve Ministry of Education objectives of producing students with critical and creative thinking skills and the ability to resolve daily-life issues.

Conclusion

This study determined that authentic learning strategies represented by newly designed web technology supported the mastery of critical and creative thinking skills. Subsequently, the strategies increased Chinese school students' Malay-language essay-writing achievement scores. Furthermore, it was confirmed that the online learning activities cultivated the students' critical and

creative thinking skills. Hence, the students' familiarity with an authentic environment is highly important and beneficial for their learning and future life. Therefore, it would be timely to integrate web technology into educators' teaching strategies.

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