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THE EFFECTIVENESS OF USING ARTIFICIAL INTELLIGENCE ON STUDENTS' LEARNING INTEREST, CRITICAL THINKING, AND CREATIVITY IN NURSING EDUCATION

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ABSTRACT

Background: AI has been initiated in clinical practice and nursing education. The integration of artificial intelligence (AI) in nursing education will benefit practice by potentially preparing nursing students for repetitive, safe, and efficient practice. Objective: To determine the effectiveness of using artificial intelligence (AI) on students' learning interest, critical thinking, and creativity in learning in nursing education. Method: This study used a quantitative method, a post-test with randomized experimental and control groups. The sample consisted of nursing students from the Mitra Adiguna Health Science Institute in Palembang. The experimental group of 89 students received an explanation of the use of Chatbot or ChatGPT, an explanation of nursing lecture material, and completed a nursing care case study using Chatbot or ChatGPT. Meanwhile, the control group of 89 students did not use Chatbot or ChatGPT. Results: The Mann-Whitney test results in this study showed an Asymp. Sig. (2-tailed) P-value of 0.000 < 0.05, meaning that the use of artificial intelligence (AI) has proven effective in increasing students' learning interest, critical thinking, and creativity in nursing education. Conclusions: The use of artificial intelligence can be one of the methods in nursing education to increase learning interest, stimulate critical thinking, and enhance student creativity.
Keywords: Artificial Intelligence, Learning Interest, Critical Thinking, Student Creativity

Introduction

Nurses and nursing students are potential users of AI-based technology and are in a critical position to shape and lead the use of AI in the field of nursing. However, recent research reports that more than 70% of nurses and nursing students do not understand AI in clinical practice. This perspective exists despite the belief that AI will revolutionize nursing and healthcare services by enhancing health promotion and disease prevention, supporting the establishment of personalized care plans, automating work, and fostering interprofessional teamwork (Kwak & Ahn, 2022).

Among the existing teaching methods, including peer role-playing, using standardized patients, bedside demonstrations, and clinical practice, clinical practice, which can provide real-life experience, is the best option for history-taking training. However, with limited clinical experience, nursing students are challenged in interviewing patients when their psychological stress is prominent in a real clinical environment. Therefore, systematic learning and continuous training are needed for history-taking training before entering a real clinical environment. It is indicated that the integration of artificial

intelligence (AI) in undergraduate nursing education will benefit practice by potentially preparing nursing students for repetitive, safe, and efficient practice (Chen et al., 2023).

Along with technological developments, such as big data, machine learning, and artificial intelligence (AI), intelligent services have also begun to be actively introduced in the field of information technology. AI has been initiated in clinical practice and nursing education due to educational restrictions caused by the coronavirus disease (COVID-19) pandemic. Moreover, conventional learning has been transformed into video lectures and non-face-to-face learning. Therefore, strategies are needed to enhance students' self-learning and efforts to encourage interaction between instructors and students. This has led to increasing interest in using chatbots in the field of education. Chatbots, also known as “talking bots,” are a type of software widely emerging in the field of information technology, capable of having spoken or written conversations with human users and answering their requests using a question-and-answer format (Han et al., 2022).

Artificial Intelligence (AI) is a new keyword in healthcare and higher education services, recognized as a strategy to solve problems affecting learners, educators, healthcare professionals, and patients. While it is easy to identify the recent popularity in introducing AI in the field of nursing, most current research focuses on nursing practice in clinical settings rather than nursing education. As an application of AI, chatbots are natural language processing systems that function as virtual conversational agents and have the potential to perform complex tasks by interacting with human users. A study using virtual chatbots in nursing education confirmed the potential effectiveness of chatbots in teaching effective nursing communication skills. Regarding history-taking skills, chatbots were suggested by students to be used in areas where they need to practice history-taking. However, there is still a lack of content and programs for teaching history-taking using chatbots. The development of such programs requires an assessment of issues in clinical practice for history-taking and identifying the needs of nursing students (Chen et al., 2023).

Chatbots also have various uses in education, as people can use them to learn without spatial and temporal limitations. This also enhances the effect of self-learning as learners experience low levels of stress when engaging in conversations with chatbots and repetitive learning. Additionally, it facilitates direct input from users through conversations during the learning process and provides tailored content based on that input. Therefore, through AI technology, chatbots can provide education to those who cannot seek help from instructors due to constraints such as cost, manpower, and the COVID-19 pandemic (Han et al., 2022).

Through a computer network with seamlessly integrated content, this results in increased student ability to expand their thinking on a deeper level. This type of learning can enhance learning in every topic and course and is highly suitable for 21st-century learners. It modernly and effectively utilizes technology for learning, including pedagogically, to encourage learners to think, reason, or find solutions to problems while learning. As a result, learners can gain deeper insights into an issue, become more willing to solve potential problems, and apply new knowledge and skills in real-life situations (Kardosod et al., 2023).

This study aims to determine the effectiveness of using artificial intelligence (AI) on students' learning interest, critical thinking, and creativity in learning in nursing education. In this study, Chatbot or ChatGPT was used as the intervention provided.

Method

This study used a quantitative method with a post-test and randomized experimental and control groups. In this design, the experimental group received the treatment while the control group did not. Both groups were not given a pre-test. Measurements were only taken after the treatment was completed. The population in this study consisted of 228 nursing students. The technique used in this study was simple random sampling. The sample was randomized and divided into two groups: intervention and control. The sample used in this study consisted of 178 nursing students from the Mitra Adiguna Health Science Institute in Palembang, with 89 students in the experimental group and 89 in the control group.

Three instruments were used in this study: a student learning interest questionnaire, a student critical thinking assessment sheet, and a student creativity assessment sheet. All instruments were created and adapted to the nursing education context and were first tested with 20 different student samples. Subsequently, validity and reliability tests were conducted on the instruments. For the student learning interest questionnaire, the results showed that the calculated r-value was greater than the r-table value.

In the Pearson Product Moment validity test for the student learning interest questionnaire, the results showed that the calculated r-value was greater than the r-table value. For the reliability test, Cronbach's Alpha was 0.959 > 0.60, indicating that the instrument was reliable.

Table 1.
Pearson Product Moment Validity Test for Student Learning Interest Questionnaire

Number of questions	Calculated r	Table r (5%, 20 sample)	Description
P1	0,862	0,444	Valid
P2	0,795	0,444	Valid
P3	0,795	0,444	Valid
P4	0,862	0,444	Valid
P5	0,795	0,444	Valid
P6	0,862	0,444	Valid
P7	0,604	0,444	Valid
P8	0,862	0,444	Valid
P9	0,795	0,444	Valid
P10	0,862	0,444	Valid
P11	0,795	0,444	Valid
P12	0,862	0,444	Valid
P13	0,795	0,444	Valid
P14	0,601	0,444	Valid
P15	0,795	0,444	Valid

In the Pearson Product Moment validity test for the student critical thinking assessment sheet, the calculated r-value was found to be greater than the critical r-value. For the reliability test, Cronbach's Alpha was 0.646 > 0.60, indicating that the instrument is reliable.

Table 2
The result of the Pearson Product Moment validity test

Number of questions	Calculated r	Table r (5%, 20 sample)	Description
P1	0,617	0,444	Valid
P2	0,614	0,444	Valid
P3	0,709	0,444	Valid
P4	0,575	0,444	Valid
P5	0,747	0,444	Valid

In the Pearson Product Moment validity test for the student creativity assessment sheet, the calculated r-value was found to be greater than the critical r-value. For the reliability test, Cronbach's Alpha was 0.810 > 0.60, indicating that the instrument is reliable.

Table 3
The result of the Pearson Product Moment validity test for the student creativity assessment sheet

Number of questions	Calculated r	Table r (5%, 20 sample)	Description
P1	0,503	0,444	Valid
P2	0,879	0,444	Valid
P3	0,861	0,444	Valid
P4	0,697	0,444	Valid
P5	0,808	0,444	Valid

The experimental group was provided with an explanation on the use of Chatbot or ChatGPT, followed by an explanation of nursing lecture material on surgical medical care using problem-based learning methods. They were given time to complete a nursing care case study and allowed to use Chatbot or ChatGPT.

In contrast, the control group received an explanation of nursing lecture material on surgical medical care using problem-based learning methods and were given time to complete a nursing care case study without access to Chatbot or ChatGPT.

These learning activities were observed during the period from March to July 2023. Subsequently, in the post-test phase, evaluation assessments were conducted on both the experimental and control groups using a student learning interest questionnaire, a student critical thinking assessment sheet, and a student creativity assessment sheet in nursing. The results were then analyzed using SPSS version 23.

Results

This research was conducted over one semester from March to July 2023, involving nursing students at Mitra Adiguna Health Sciences Institute in Palembang. The study sample consisted of 178 students divided into two groups: an experimental group of 89 respondents and a control group of 89 respondents.

In the experimental group, students were provided with an explanation of the use of Chatbot or ChatGPT, followed by an explanation of surgical medical care nursing lecture material using problem-based learning methods. They were then given time to complete a nursing care case study and allowed to utilize Chatbot or ChatGPT.

Meanwhile, the control group received an explanation of surgical medical care nursing lecture material using problem-based learning methods and were also given time to complete a nursing care case study, but without access to Chatbot or ChatGPT.

Subsequently, in the post-test phase, evaluation assessments were conducted on both the experimental and control groups using a student learning interest questionnaire, a student critical thinking assessment sheet, and a student creativity assessment sheet.

The results of the univariate analysis included the frequency distribution of learning interest in both the experimental and control groups.

Table 4.
Frequency Distribution of Student Learning Interest in the Experimental and Control Groups

Scoring Level	Experimental Group						Control Group					
	Student Learning Interest		Critical Thinking		Creativity		Student Learning Interest		Critical Thinking		Creativity	
	f	%	f	%	f	%	f	%	f	%	f	%
High	76	85,4	65	73	65	73	10	11,2	17	19,1	18	20,2
Medium	13	14,6	23	25,8	23	25, 8	74	83,1	52	58,4	58	65,2
Low	0	0	1	1,1	1	1,1	5	5,6	20	22,5	13	14,6
Total	89	100	89	100	89	100	89	100	89	100	89	100

In Table 4, the results show that in the experimental group, 76 respondents (85.4%) had high student learning interest, while in the control group, 10 respondents (11.2%) had high student learning interest. In terms of critical thinking, 65 respondents (73%) in the experimental group demonstrated high critical thinking, compared to 17 respondents (19.1%) in the control group. Regarding student creativity, 65 respondents (73%) in the experimental group exhibited high creativity, while 18 respondents (20.2%) in the control group showed high creativity.

The normality test used was the Kolmogorov-Smirnov test. The results of the normality test for the data in both groups (experimental and control) are as follows:

Tabel 5
Results of the Kolmogorov-Smirnov Normality Test for the Experimental Group and Control Group

Assessment Components	Experimental Group			Control Group		
	Statistic	df	Sig.	Statistic	df	Sig.
Student Learning	0,118	89	0,004	0,101	89	0,025
Critical Thinking	0,104	89	0,020	0,158	89	0,000
Creativity	0,183	89	0,000	0,206	89	0,000

Table 5 shows that the data are not normally distributed, as indicated by all p-values being <0.05. Therefore, the bivariate analysis used is the nonparametric test, specifically the Mann-Whitney U test.

Table 6
Mann-Whitney U Test Results for the Experimental Group and Control Group

Assessment Components	Experimental Group			Control Group			Z	Asymp. Sig. (2 tailed)
	N	Mean Rank	Sum of Ranks	N	Mean Rank	Sum of Ranks		
Student Learning	89	132,13	11760,00	89	46,87	4171,00	-11,058	0,000
Critical Thinking	89	124,87	11113,50	89	54,13	4817,50	-9,229	0,000
Creativity	89	122,06	10863,00	89	56,94	5068,00	-8,518	0,000

The Mann-Whitney U test in this study yielded an Asymp. Sig. (2-tailed) p-value of 0.000 < 0.05, indicating that there is effectiveness in using artificial intelligence (AI) in enhancing student learning interest, critical thinking, and creativity in nursing education.

Image 1.
Utilization of GPT Chatbot: Anatomy, Physiology, and Nursing Assessment

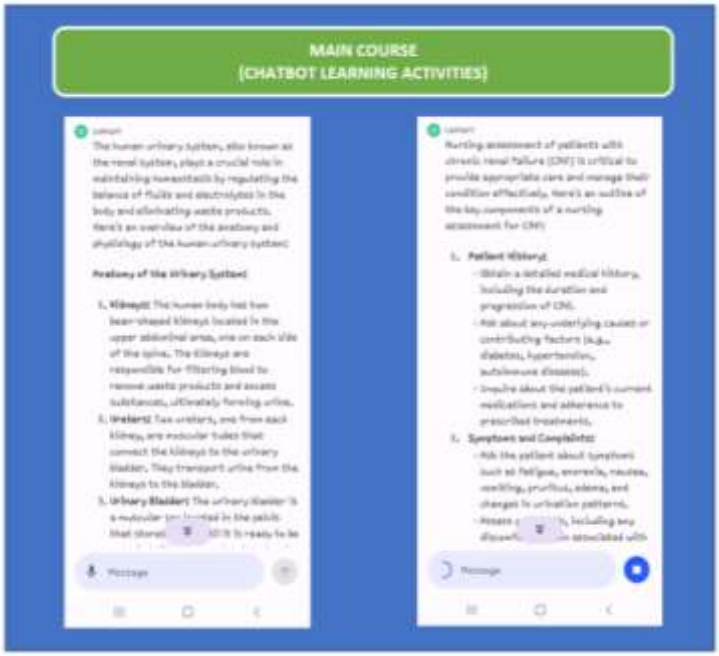


Image 2.
Use of GPT Chatbot: Nursing Analysis and Nursing Diagnosis

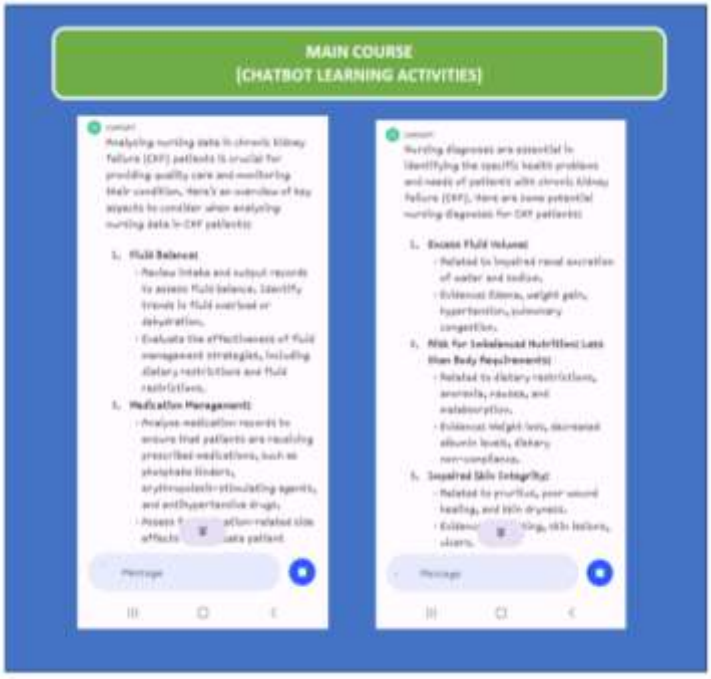


Image 3.
Use of GPT Chatbot: Nursing Interventions and Evidence-Based Nursing

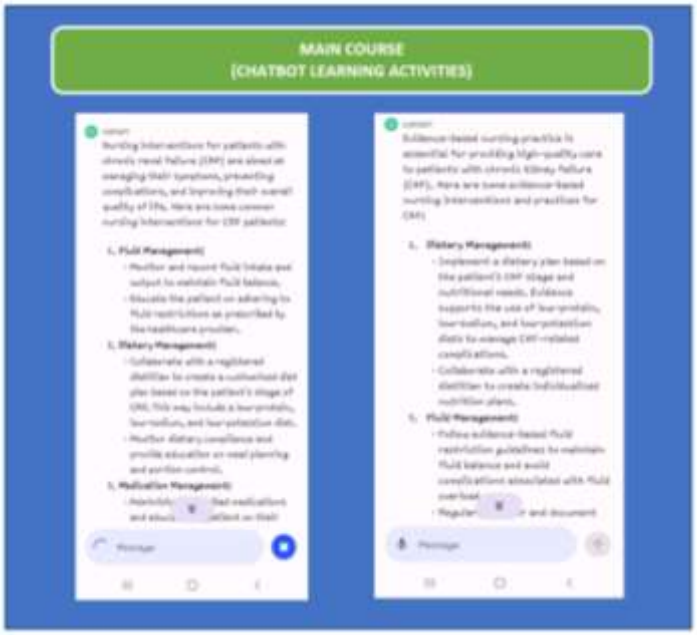
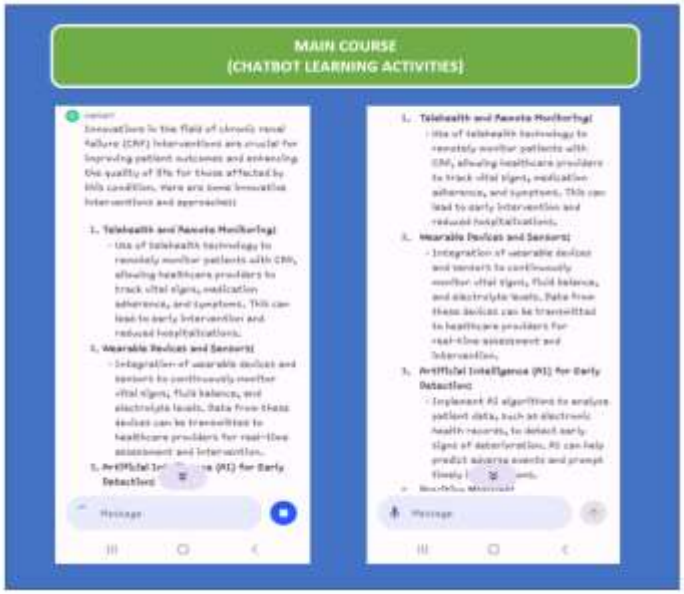


Image 4.
Use of GPT Chatbot: Nursing Innovations



Discussion

This study aims to investigate the benefits of using artificial intelligence (AI) on students' learning interest, critical thinking, and creativity in nursing education. The research employed Chatbot or ChatGPT as an intervention for the experimental group. Both groups were instructed using problem-based learning methods, where they solved cases for analysis and problem-solving solutions. All samples were observed over one semester from March to July 2023.

Table 4 results indicated high student interest in the experimental group, with 76 respondents (85.4%) showing high interest and 13 respondents (14.6%) showing moderate interest. In contrast, the control group had 10 respondents (11.2%) with high interest, 74 respondents (83.1%) with moderate interest, and 5 respondents (5.6%) with low interest in learning.

The experimental group, using AI Chatbot or ChatGPT, experienced significant positive impacts. Students were more active in group discussions, found it easier to analyze case studies, felt more confident in classroom participation, and were quicker in gathering lecture-related information. The experimental group demonstrated high learning interest throughout the use of AI Chatbot or ChatGPT, while the control group used traditional problem-based learning methods, relying on textbooks and presented materials. Students tended to be passive in the control group, becoming active only when prompted by the instructor's questions.

In terms of critical thinking, the experimental group showed broader and sharper critical thinking skills, with 65 respondents (73%) demonstrating high critical thinking, 23 respondents (25.8%) showing moderate critical thinking, and 1 respondent (1.1%) showing low critical thinking. In comparison, the control group had 17 respondents (19.1%) with high critical thinking, 52 respondents (58.4%) with moderate critical thinking, and 20 respondents (22.5%) with low critical thinking. The experimental group provided more varied and significantly directed answers when analyzing cases, whereas the control group exhibited moderate critical thinking, often relying on theory and textbooks.

Regarding creativity, the experimental group also excelled, with 65 respondents (73%) demonstrating high creativity, 23 respondents (25.8%) showing moderate creativity, and 1 respondent (1.1%) showing low creativity. In contrast, the control group had 18 respondents (20.2%) with high creativity, 58 respondents (65.2%) with moderate creativity, and 13 respondents (14.6%) with low creativity. Students in the experimental group utilized AI Chatbot or ChatGPT to develop ideas in nursing, search for accurate and quick nursing diagnoses and interventions, and explore and develop evidence-based nursing practices faster, thereby stimulating creativity.

The Mann-Whitney test results (Asymp. Sig. 2-tailed, P value $0.000 < 0.05$) indicated the effectiveness of AI in enhancing students' learning interest, critical thinking, and creativity in nursing education. The differences between the experimental and control groups were evident, especially in terms of feedback and more engaging learning methods.

The use of Artificial Intelligence (AI) technology in nursing education has the potential to enhance learning motivation and expand access to information for students in self-directed learning. However, there is a potential bias during the development of independent learning skills and when learners utilize educational technology. This underscores the responsibility to ensure the effective use of AI by learners, educators, and digital tools involved. Therefore, stronger skills are needed to maximize AI support, including effective capabilities and skilled collaboration between humans and artificial intelligence. Positive social interaction and management skills such as planning and monitoring are also key factors in the learning process (Hidayah, 2023).

Nursing education continuously undergoes innovation and change, emphasizing the importance of enhancing students' knowledge and decision-making skills in vocational education (Hwang et al., 2023). Simulation-based nursing education allows students to learn how to make accurate assessments of patient conditions and develop appropriate nursing interventions in complex situations by creating realistic clinical environments and using high-fidelity patient simulators with planned scenarios (Jeon, 2021).

Overall, mixed learning approaches in nursing education during the pandemic have become valuable tools to enhance learning outcomes and provide modern and effective means of utilizing technology for learning purposes (Kardosod et al., 2023).

AI-based training in medical and paramedical education provides opportunities for students to learn to effectively use AI tools to solve clinical problems (Mohammed et al., 2023). In nursing education, AI has opened up new possibilities with virtual avatar applications and chatbots simulating interactive clinical scenarios to enhance students' understanding of nursing concepts (Gagne, 2023).

Students' positive attitudes toward information technology (IT) reduce their anxiety toward IT, increase IT usage or interaction, and enhance confidence in problem-solving through IT. Furthermore, attitudes toward IT influence emotions, behaviors, and ideas about IT, emphasizing the importance of students' positive attitudes toward IT. Research also shows that more experience with IT, such as AI, can reduce fear and anxiety about understanding AI better. Furthermore, students familiar with AI tend to show a more optimistic and enthusiastic attitude toward AI-related work compared to their peers (Kwak & Ahn, 2022).

Given predictions that new technological advancements are expected to change aspects of nursing and its education, nurse educators need to enhance their knowledge and comfort levels with the concepts and realities that emerging AI health technologies will bring. Additionally, nurses in clinical practice require new knowledge and skills to effectively implement AI health technologies into their practice. Preparing nursing students and nurses for clinical practice in the AI era requires a balance between teaching for current needs and anticipating future demands. Over the past two decades, significant achievements in nursing informatics can be utilized to support curricular reforms for nurse educators (Buchanan et al., 2021).

The use of artificial intelligence (AI) represents a significant development in nursing education and clinical practice among nursing students. Students are equipped with good problem-solving knowledge and skills, are critical thinkers, adventurous yet controlled, possess communication skills, can empathize, and are valuable contributors to society and culture. The most important applications of AI in healthcare include health monitoring, patient data management, medical evolution, surgery, telemedicine, health statistics, individualized care, and investigative visualization (Mohammed et al., 2023).

Although AI-based tools and techniques can offer significant benefits to nursing education, it is crucial to ensure that these tools and techniques complement and enhance, rather than replace, human interaction, critical thinking, and creativity. The role of nurse educators in developing these crucial skills is vital for the development of competent and compassionate nurses. By achieving a balance between AI-supported tools and human interaction, nursing schools can provide a more holistic and effective learning experience for students. Collaborative efforts between AI researchers and nurse educators can yield comprehensive and nuanced nursing education approaches that harness the benefits of technology while maintaining the value of human interaction (Gagne, 2023).

With the rapid advancement of technology in the nursing field, the presence of artificial intelligence will not only have a positive impact on nursing education but will also have a significant impact on hospital service delivery.

Conclusions

In this study, there is a significant difference observed between the experimental and control groups regarding students' learning interest, critical thinking, and creativity, as evidenced by the Mann-Whitney test results where Asymp. Sig. (2-tailed) P value was 0.000, indicating statistical significance ($P < 0.05$). The use of artificial intelligence (AI) Chatbot or ChatGPT has shown positive impacts by enhancing student engagement in discussions, increasing learning interest, promoting critical thinking, and fostering creativity in resolving nursing cases.

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