



Implementation of Social Emotional Learning to Manage Academic Stress and Its Impact on Senior High School Students' Well-Being in Coordination System Topic

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Abstract: This study aims to determine the effectiveness of Social Emotional Learning (SEL) in managing academic stress and its influence on well-being and conceptual understanding of the coordination system material. This study employs a mixed-methods embedded approach, involving pretests, posttests, and qualitative interviews. The population of this research is senior high school students in one public school in Ciamis Regency. The sample was selected using purposive sampling, in which two classes of grade XI students were chosen based on the consideration that their Biology lesson schedules were relatively similar and their average academic stress scores were nearly equal. These classes were then assigned as the experimental group and the control group. The experimental group underwent SEL intervention, while the control group followed the conventional learning process. Data collection techniques included academic stress questionnaires, conceptual understanding tests, and well-being interviews. The quantitative data were analyzed using paired t-tests and independent t-tests, while qualitative data were analyzed through thematic coding. The results revealed a significant decrease in academic stress ($p < 0.05$) and improvement in conceptual understanding in the experimental group. The qualitative findings highlighted enhanced well-being in terms of emotional regulation, self-awareness, and interpersonal skills. This study concludes that SEL can be an effective approach to reducing academic stress and fostering holistic development in high school students, and it is recommended for broader implementation in educational practices.

Keywords: Social emotional learning; biology learning; academic stress; well-being; regulation emotion

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INTRODUCTION

Education at the Senior High School (SMA) level is an important phase in the formation of an individual. However, in this educational process, students are often faced with various challenges that affect their overall learning experience. Adolescence is a period of complex change, marked by the formation of behavior and emotions (Öner et al., 2021; Eryılmaz, 2012). In changing social, cultural, and economic conditions, adolescents face issues such as body image, self-identity, independence from parents, social relationships, and academic pressure that affect their mental health (Syakarofath, 2021).

Mental health, which is an important aspect of education, is often neglected even though it has long-term impacts. Academic stress is one of the main challenges faced by high school students due to high academic expectations (Izzati et al., 2020). Academic stress can cause various negative impacts, including decreased learning motivation, procrastination, and reduced student well-being (Pascoe et al., 2020). In addition, research shows that academic stress is influenced by internal factors such as stress management skills and external factors such as academic pressure and parental expectations (Shofiyah & Chamid, 2022).

In the context of Biology learning, the lack of active involvement of students in learning activities is a major concern. Theoretical and monotonous learning often fails to stimulate students' interest, resulting in limited understanding of concepts and increased academic stress (Saputri & Sikumbang, 2019). To overcome this, the independent curriculum tries to provide space for innovation in learning by emphasizing the balance between intellectual aspects and emotional development of students (Faiz & Imas, 2020).

However, the implementation of this curriculum requires the support of strategies that involve technology and a holistic approach such as Social Emotional Learning (SEL). SEL is an approach that can improve student well-being by helping them manage their emotions, understand themselves, and establish positive relationships (Greenberg in Yuliandari & Wijaya, 2021). Previous research has shown that SEL contributes significantly to increasing student learning motivation and resilience. Social and Emotional Learning (SEL) is also needed to equip students to avoid various problems. This is in line with Kautz et al. (2021), who stated that SEL can lead to positive student outcomes, including reducing school dropout rates, deviant student behavior problems in schools, drug use, mental health problems, and criminal behavior. In line with this statement, Esen-Aygun & Sahin-Taskin (2017) explained that SEL impacts students' self-esteem and self-acceptance, improves student abilities such as communication skills and empathy, and prevents violence or bullying. Thus, SEL can address existing problems related to the student learning process. Research by Lestari & Azizah (2023) shows that SEL can shape students' responsible character and make learning enjoyable and effective through SEL.

The statement of novelty in this study lies in the application of SEL in Biology learning to improve the well-being of high school students. This study integrates emotional management and social relationship development in the context of learning, which has not been widely studied before in the context of Biology learning in Indonesia. Based on the explanation above, the problem of this study is how the application of SEL in Biology learning can reduce academic stress and improve the well-being of high school students. This study aims to evaluate the effectiveness of SEL in Biology learning as a strategy to improve students' well-being and their understanding of concepts.

METHOD

The research method used was a Quasi Experiment with a pre-test post-test design with a non-equivalent control group. According to Sugiyono (2010) in his book: This design is almost the same as the pretest-posttest control group design, only in this design the experimental group and the control group are not selected randomly. This design was chosen because it allows for comparing academic stress conditions between the experimental group that received Social Emotional Learning (SEL) intervention and the control group that did not receive the intervention (using a conceptual approach). This design includes four main stages, namely the initial data collection (pre-test) of the academic stress questionnaire, the implementation of the intervention (process), the final data collection (post-test) of the academic stress questionnaire, and the analysis and interpretation of the research results. Specifically, qualitative data collection on well-being was conducted by interviewing 10 students in each control and experimental class, representing each category of academic stress. Qualitative well-being data were used to explain the relationship between SEL and well-being and the relationship between quantitative academic stress data and qualitative well-being data.

The learning method used in the control class and in the experimental class uses the method usually used by teachers in the class, namely Discovery Learning. However, the difference is that in the experimental class, Social Emotional Learning approaches are also applied during the learning process. In the experimental class, students not only learn the coordination system material according to the learning objectives, core competencies, and basic competencies expected. But also Emotion-Related Physiological Processes, Expression of Emotion, and Strategies of Emotional Regulation as in Table 1.

Table 1. Social emotional learning approaches in coordination system topic

No	Sub-Topic	Biology Learning	SEL (Emotion Regulation)
1	Nervous System	<ol style="list-style-type: none"> 1. Identify the parts of the structure of nerve cells. 2. Describe nerve impulses, voluntary movement, and reflexes. 3. Describe the central nervous system and peripheral nervous system. 4. Present an analysis of the impact of lifestyle on the abnormalities in the structure and function of the nervous system organs in humans. <p>Summarizing Question: What is the difference between the central nervous system and the peripheral nervous system?</p>	<p>Emotion-Related Physiological Processes: Students understand how the nervous system regulates physiological responses to emotions (increased heart rate, triggering emotional reactions, or changes in breathing patterns in response to emotional situations).</p> <p>Strategies of Emotional Regulation: Understand how mindfulness practices or breathing techniques can affect autonomic nervous system activity and help regulate emotional responses.</p> <p>Summarizing Question: How do emotional situations affect heart rate and how can we manage it?</p>
2	Endocrine System	<ol style="list-style-type: none"> 1. Analyze the relationship between the structure of the tissue making up the endocrine organs in humans. <ul style="list-style-type: none"> ▪ Structure of the Hormonal System ▪ Types of Hormonal Systems ▪ Disorders in the Hormonal System 2. Present an analysis of the impact of lifestyle on disorders in the hormonal system in humans. <p>Summarizing Question: How do hormones work in the body, and what is their impact on our bodies?</p>	<p>Expression of Emotion: The topic on the endocrine system helps students understand how hormones like adrenaline and serotonin affect emotional expression.</p> <p>Emotion-Related Physiological Processes: Students can understand how hormones affect physiological processes in the body, including emotional responses (stress hormone/cortisol can affect mood).</p> <p>Strategies of Emotional Regulation: Students can learn how healthy lifestyle choices and stress management (emotional regulation strategies such as exercise, meditation, or creating a supportive mental health environment) can help manage the impact of stress and hormonal disturbances.</p> <p>Summarizing Question: How can we maintain a healthy and happy body by eating healthy and managing stress?</p>

No	Sub-Topic	Biology Learning	SEL (Emotion Regulation)
3.	Sensory System	1. Analyze the relationship between the structure of the tissue making up the sensory organs in humans. <ul style="list-style-type: none"> ▪ Structure and Types of Sensory Systems ▪ Disorders in the Sensory System 2. Present an analysis of the impact of lifestyle on disorders in the sensory system in humans. Summarizing Question: How do the eyes, ears, nose, and other senses help us perceive the world around us?	Emotion-Related Physiological Processes: Students can understand how sensory perception can trigger physiological reactions in the body, such as reflex reactions to harmful stimuli or changes in brain activity when receiving pleasant stimuli. Strategies of Emotional Regulation: Students share their experiences with classmates and discuss how sensory perception can affect their moods/emotions. This helps develop empathy for the sensory experiences of others and enhances interpersonal communication. Summarizing Question: How can we relate well to others through how we see, hear, and feel the world around us?

This strategy is based on the research by González, Hennemann, & Schlüter (2019), which states, each lesson integrated both physiological and psychological elements, combining the relevant aspects of the human body with emotional competence aspects as part of SEL.

RESULTS AND DISCUSSION

This academic stress instrument uses the Scale for Assessing Academic Stress (SAAS) which consists of 30 statement items, given to students in the experimental and control groups before (pretest) and after (posttest) the learning process. This instrument was developed based on indicators proposed by Sinha et al. (2001) which include cognitive, affective, physical, social/interpersonal, and motivational indicators.

The average academic stress score of control class students, for each questionnaire indicator can be seen in the Table 2.

Table 2. Average score of control class academic stress questionnaire on each indicator

No	Indicator	Class	Average	
			Pre-test	Post-test
1.	Cognitive	Control	105,29	103,86
		Experimental	120,14	111,29
2.	Affective	Control	111,20	108,60
		Experimental	134,80	117,80
3.	Physical	Control	89,20	85,00
		Experimental	97,40	92,60
4.	Social/interpersonal	Control	78,25	78,75
		Experimental	114,50	105,25
5.	Motivational	Control	93,57	91,86
		Experimental	127,29	107,14

Based on Table 2, the average score of the academic stress questionnaire showed a decrease in most indicators. The cognitive indicator decreased from 105.29 to 103.86, while the affective indicator decreased from 111.2 to 108.6. The physical indicator also showed a decrease from 89.2 to 85, as did the motivational indicator which decreased from 93.57 to 91.86. However, the social/interpersonal indicator experienced a slight increase from 78.25 to 78.75. Thus, the physical indicator experienced the most significant decrease in score among all indicators, followed by

the affective, cognitive, and motivational indicators. The social/interpersonal indicator increased by 0.5 (from 78.25 to 78.75).

The average academic stress score of experiment class students, for each questionnaire indicator can be seen in the Table 2, the average score of the academic stress questionnaire showed a decrease in all indicators. The cognitive indicator decreased from 120.14 to 111.29, while the affective indicator decreased from 134.8 to 117.8. The physical indicator also showed a decrease from 97.4 to 92.6, as did the motivational indicator which decreased from 127.29 to 107.14. Also, the social/interpersonal indicator decreased from 114.5 to 105.25. Thus, the motivational indicator experienced the most significant decrease in score among all indicators, followed by the affective, social/interpersonal, cognitive, and physical indicators.

Paired Sample T-Test Hypothesis Testing

The hypothesis testing was conducted using IBM SPSS 26 software. This test was carried out to determine whether there is a significant difference between the pretest and posttest scores in each class, namely the control and experimental classes. The analysis results are presented in Table 3.

Table 3. Results of paired sample t-test hypothesis testing

Class	Significance	Conclusion
Control	0.076	No significant difference
Experimental	0.000	Significant difference

From Table 3, it can be seen that the control class obtained a significance value of 0.076, which is greater than the significance level of 0.05. Therefore, it can be concluded that there is no significant difference between the pretest and posttest scores in the control class. Conversely, in the experimental class, the significance value was 0.000, which is smaller than the significance level of 0.05. Thus, it can be concluded that there is a significant difference between the pretest and posttest scores in the experimental class.

N-Gain Analysis

The N-Gain analysis was conducted using IBM SPSS 26 software. The N-Gain test was performed to examine changes in students' academic stress levels in the control and experimental classes after the intervention. This analysis was used to determine the effectiveness of the intervention in reducing students' academic stress. The results are shown in Table 4.

Table 4. N-Gain analysis results for academic stress

Class	N-Gain	N-Gain (%)	Conclusion
Control	-0.02	-1.93%	Slight decrease in academic stress
Experimental	-0.1	-10.24%	Greater decrease in academic stress compared to control class

Negative N-Gain values indicate a decrease, not an increase. However, in the context of academic stress (where a decrease is desirable), it is considered positive, albeit small. Table 4 shows that the experimental class experienced a larger decrease in academic stress compared to the control class, with a difference of 8.31%. Furthermore, the intervention in the experimental class was approximately 5.31 times more effective in reducing students' academic stress compared to the control class.

Comparison of the percentage of academic stress instrument score categories in control class can be seen in Figure 3 and Figure 4.

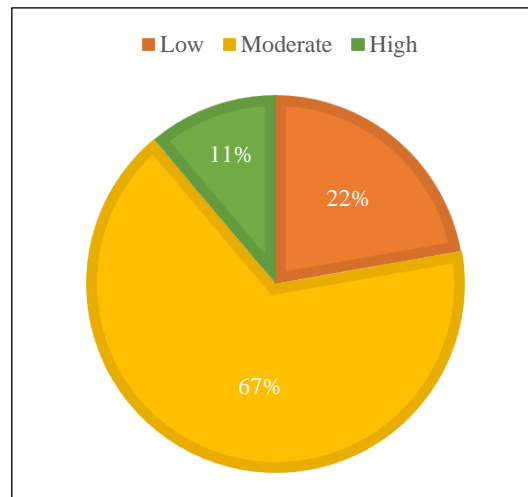


Figure 3. Percentage of academic stress questionnaire score categories of control class (pre-test)

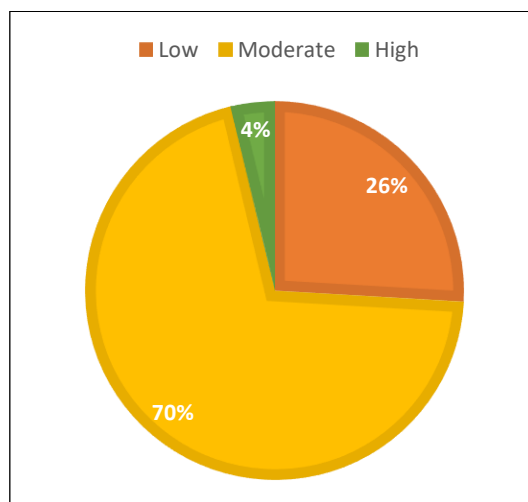


Figure 4. Percentage of academic stress questionnaire score categories of control class (post-test)

The results of the pie chart in Figure 3, the percentage change in the academic stress questionnaire score category in the control class, obtained the pretest score results of 22.222% of students in the "low" academic stress category, the majority of students, namely 66.666%, were in the "moderate" academic stress category, and as many as 11.111% of students were in the "high" academic stress category. In Figure 4 the post-test results, students in the "low" stress category increased slightly to 25.925%, the "moderate" stress category to 70.370%, and students in the "high" stress category decreased to 3.703%.

Comparison of the percentage of academic stress instrument score categories in experimental class can be seen in Figure 5 and Figure 6.

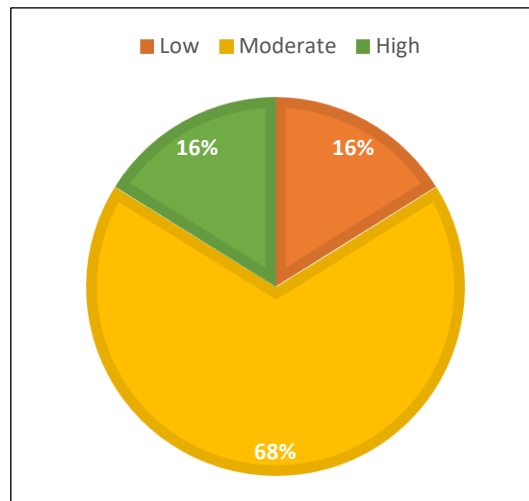


Figure 5. Percentage of academic stress questionnaire score categories of experimental class (pre-test)

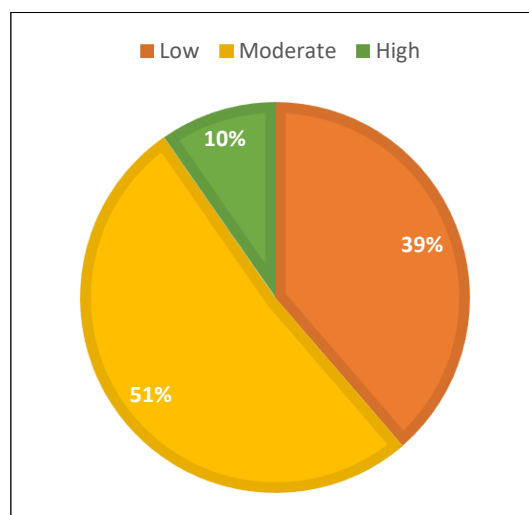


Figure 6. Percentage of academic stress questionnaire score categories of experimental class (post-test)

Meanwhile in the experimental class, the pie chart in Figure 5 shows the pretest score results of 16.129% of students in the “low” academic stress category, most students, namely 67.741%, are in the “moderate” academic stress category and as many as 16.129% of students are in the “high” academic stress category. In Figure 6 post-test results, the percentage of students in the “low” stress category increased to 38.709%, the “moderate” stress category decreased to 51.612%, and students in the “high” stress category decreased to 9.677%.

The results of this study are in line with previous studies showing that emotional management strategies, such as those expressed by Aldao et al. (2010) and Gross & Thompson (2007), are effective in reducing stress through more adaptive emotional regulation. Mindfulness, which is part of SEL interventions, has also been shown to help students reduce their perception of stress by increasing their awareness and ability to deal with academic situations more realistically (Shapiro, 2009; Tang et al., 2015). Through exercises such as breathing and visualization techniques, students learn to deal with acute stress with an accepting and non-judgmental attitude, which provides a more realistic perspective on academic challenges. This decrease in academic stress is in line with the findings in the studies of Durlak et al. (2011) and

Taylor et al. (2017) which stated that SEL contributes to the development of emotional regulation and academic motivation. This study confirms that the SEL approach allows students to deal with academic challenges constructively, thereby encouraging an increase in overall well-being. In addition, SEL increases the components of self-awareness, self-management, and relationship skills, which play an important role in reducing academic stress while increasing students' self-confidence and engagement in learning (OECD, 2019).

Description of Student Well-being Data

The scale developed was based on a review of well-being research in children conducted by Pollard and Lee (2003) and adapted to the school context referring to the psychological well-being approach of Ryff and Keyes (1995), and developed by Irine Kurniastuti and Saifuddin Azwar (2014).

A total of 10 students from each class, namely the control class and the experimental class, were selected to be interviewed regarding well-being based on their academic stress categories. In the control class, the selected students consisted of the academic stress categories of "moderate to low" (1 out of 1 person), "high to medium" (2 out of 2 people), "low remains low" (3 out of 6 people), "moderate remains moderate" (3 out of 17 people), and "high remains high" (1 out of 1 person). Meanwhile, in the experimental class, the selected students included the academic stress categories of "moderate to low" (3 out of 7 people), "high to moderate" (1 out of 4 people), "low remains low" (2 out of 5 people), "moderate remains moderate" (2 out of 12 people), "high remains high" (1 out of 1 person), and "moderate becomes high" (1 out of 2 people). Then the interview results were categorized as in Table 5.

Table 5. Student well-being interview questionnaire category results

Well-being Indicator	Experimental Class (10 Students)	Control Class (10 Students)
1. Able to Control Emotion	2 High Students 5 Moderate Students 3 Low Students	1 High Student 5 Moderate Students 4 Low Students
2. Resilient in the Face of Problems	3 Moderate Students 4 High Students	2 High Students 6 Moderate Students 2 Low Students
3. Not Feeling Inferior	3 High Students 4 Moderate Students	3 High Students 5 Moderate Students 2 Low Students
4. Having a High Curiosity	5 High Students 3 Moderate Students 2 Low Students	4 Moderate Students 3 Low Students 3 High Students
5. Participating in Learning and School Activities	6 High Students 4 Moderate Students	3 Moderate Students 3 Low Students 4 High Students
6. Persevere in the Learning Process	5 High Students 3 Moderate Students 2 Low Students	5 Moderate Students 5 Low Students
7. Able to Communicate What Students Feel and Think	4 Moderate Students 4 High Students 2 Low Students	3 Moderate Students 5 Low Students 2 High Students
8. Able to Position Themselves in Situations Experienced by Others	3 Moderate Students 4 High Students 3 Low Students	5 Moderate Students 3 Low Students 2 High Students
9. Demonstrating Confidence and Comfort in Interacting	6 High Students 4 Moderate Students	2 High Students 5 Moderate Students 3 Low Students

Table 5 presents the results of student well-being interviews based on nine indicators, focusing on the comparison between the control and experimental classes. In the control class, the majority of students were in the low to medium categories, particularly on indicators such as Able to Control Emotion (4 students in the low category), Persevere in the Learning Process (5 students in the low category), and Confidence and Comfort in Interacting (3 students in the low category). In the experimental class, most students demonstrated high well-being categories, especially on indicators such as Participating in Learning and School Activities (6 students in the high category), Having a High Curiosity (5 students in the high category), and Demonstrating Confidence and Comfort in Interacting (6 students in the high category).

Correlation Between Academic Stress Levels and Student Well-being

The analysis results indicate a negative relationship between academic stress levels and student well-being, meaning that a decrease in academic stress levels correlates with an increase in well-being. In the experimental class, the N-gain result of -0.1 indicates an average reduction in academic stress of 10.24%. This decrease aligns with an improvement in well-being categories across most indicators. For example, students in the experimental class demonstrated better emotional regulation, resilience in facing problems, and more active participation in learning and school activities.

In the control class, the decrease in academic stress levels was smaller, with an N-gain of -0.02, equivalent to an average reduction of 1.93%. This decrease was not significant and reflects stagnation in student well-being categories, which mostly remained at low to medium levels. Indicators such as the ability to regulate emotions and confidence in interactions did not show substantial improvement.

Previous studies have also shown that participation in SEL significantly reduces problem behaviors and negative emotions (Weissberg et al., 2011), which supports the finding that students in the experimental class were more active and optimistic than students in the control class. This finding also aligns with studies by Korpershoek et al. (2016) and Mahoney et al. (2018) which highlight how social-emotional skills taught through SEL can improve students' psychosocial health. SEL programs help students develop emotional management strategies, mental resilience, and self-confidence, which not only reduce academic stress but also support their overall well-being. This reinforces the importance of integrating SEL into the school curriculum to create an inclusive and conducive learning environment. By prioritizing SEL, students can be better prepared to face academic and life challenges, as recommended by studies by Sande et al. (2019) and Sharma, A (2024). Continuous implementation and evaluation of SEL programs are essential to ensure long-term impacts on student well-being.

CONCLUSION

The results of this study indicate that the implementation of Social Emotional Learning (SEL) contributes significantly to managing academic stress and improving students' well-being. In the experimental class, a decrease in academic stress levels of 10.24% (N-gain: -0.1) was accompanied by an increase in students' well-being categories in most indicators, such as the ability to manage emotions, resilience in facing challenges, and self-confidence. In contrast, in the control class, a decrease in academic stress levels of only 1.93% (N-gain: -0.02) did not have a significant impact on students' well-being categories. The reciprocal relationship between decreasing academic stress and increasing well-being confirms that SEL is a strategic bridge to support students' emotional and social balance in learning. The learning approach that integrates biology material with SEL provides a holistic learning experience. Students

not only understand the physiological processes of the human body, but also learn how emotional regulation affects physical and mental health. These results are in line with the literature that emphasizes the importance of SEL in improving students' emotional regulation, social skills, academic motivation, and well-being.

RECOMMENDATION

1. For Teachers

Integrate SEL materials into learning, especially in subjects such as biology, by emphasizing the relevance between the physiological aspects of the body and emotional regulation. Use active learning methods, such as simulations, group discussions, and reflections, to develop students' social-emotional skills.

2. For Students

Practice emotional regulation strategies taught in SEL, such as mindfulness and deep breathing, in everyday life. Increase participation in learning and social activities to support the development of interpersonal skills.

3. For Schools

Make SEL an integral part of the curriculum by integrating it into various subjects. Provide regular training for teachers on SEL implementation methods in learning. Facilitate a supportive learning environment, such as a reflection room or SEL-based counseling program.

4. For Further Researchers

More Specific Measurement of Learning Outcomes

Examine the effect of SEL implementation on student learning outcomes in more detail, covering cognitive, affective, and psychomotor aspects.

Examining other aspects of SEL (Social Emotional Learning)

Which includes the main components of CASEL (Self-Awareness, Social Awareness, Relationship Skills, Decision-Making)

Trial with a Wider Sample

This study can be expanded by involving a larger and more diverse sample, both in terms of geographical area and education level. This will provide a more general picture and allow for generalization of the research results.

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