

Current Situation Analysis and Enhancement Countermeasures of Resilience of College Polytechnic Students under the Perspective of Positive Psychology

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The problem of the mental health education of college students is related to the quality of their education, and the improvement of the level of resilience provides a new perspective for enhancing the effectiveness of the mental health education of science and engineering students. With the investigation of science and engineering graduate students of a university in Guangxi, the resilience level of graduate students of science and engineering was investigated. Through the investigation, it is found that the overall resilience of science and engineering students is in the upper middle level, and the internal manpower and external support scores are high, and the two are significantly related; there are certain differences between the dimensions of internal manpower and external support, and the tutor guidance style and family relationship will significantly affect the resilience of science and engineering students.

Keywords: science and engineering, student, resilience

I. Formulation of the Problem

At present, the scale of graduate students in China, especially those in science and engineering, continues to expand. According to statistics, in 2022, the number of graduate students in China reached 3.6536 million, among which the enrollment scale of graduate students and doctoral students in science, industry, agriculture and medicine is close to 60% and more than 80% respectively. Graduate students in science and engineering have become a group that cannot be ignored in the current graduate education and management of colleges and universities. Compared with the humanities graduate student, science and engineering graduate students most of the time in the laboratory, daily life is relatively monotonous, communication circle is given priority to with tutor group, social range is relatively narrow, in academic research, career development, life emotion, interpersonal relationships are facing more complex impact and pressure, but they tend to more rational thinking tend to through patience restraint and other rigid coping with stress and difficulties, which brings great challenges to their mental health. Therefore, it is urgent to enhance the effectiveness of mental health education for science and engineering postgraduates and effectively improve their mental health quality.

Previous studies have shown that the development of resilience not only helps students to better cope with the adversity and stress in study, work and life, but also can effectively promote the mental health development of students and realize self-development and transcendence. Therefore, to clarify the connotation structure of the resilience of science and engineering graduate students, analyze the current situation and characteristics of science and engineering graduate students, and help to find the countermeasures of science and engineering graduate students, so as to help science and engineering graduate students to cope with adversity and setbacks, and enhance their mental health quality.

II. The Research Process

(I) Study Design

Resilience, also known as “psychological resilience”, “psychological resilience” and “resilience”, first appeared in physics, referring to the ability of an object to return to its original shape from deformation after being applied to pressure, and then extended to the effective adjustment and adaptation in the face of stress, difficulties or changes. Although scholars have not reached a consensus on the definition of resilience, many studies tend to understand it as a process or result of the interaction of individual internal forces and external environmental resources, rather than just a fixed trait or personal attribute. In other words, the resilience is the synthesis of the process, ability and results of mutual adjustment between the individual and the outside world. It is the ability or characteristic reflected by the individual in the interaction between the individual and the environment, which can finally make the individual produce good adaptation results in the face of difficulties, pressure and setbacks.

As for the connotation structure of resilience, it is usually considered as a multidimensional structure, which is specifically reflected in its source and evaluation criteria. The International Resilience Research Project (IRRP), according to different sources of resilience, it is divided into external support and resources to enhance resilience (I have), long-term development to face difficulties (I am) and interpersonal and problem solving skills (I can) to deal with real adversity. Not only is the emphasis emphasized that the development of resilience needs to tap the potential within the individual, and exercise your ability to deal with stress and setbacks. It also depends on reliable external support. From the evaluation criteria, the level of resilience is influenced by internal and external protection factors, which are the psychological ability or personality traits of the individual to cope with adversity and overcome difficulties, such as optimism, hope, self-efficacy, goal, self-esteem and autonomy, while external protection factors are the social support and opportunity provided by family, school, community and peer group, which is embodied in positive and caring interpersonal relationship, upward family atmosphere, pro social behavior, etc.

For Chinese graduate students, under the background of economic globalization and anti-globalization, they are faced with the internal self-development and external environment changes of both opportunities and challenges. The connotation structure of their resilience has both common dimensions and personalized connotation elements. On the basis of drawing on the psychological resilience scale of Hu Yueqin and others, combined with the background of life and thought and behavior characteristics of graduate students in China, we try to construct a structural model of graduate resilience, which is divided into two dimensions: internal human resources and external support (as shown in Figure 1).

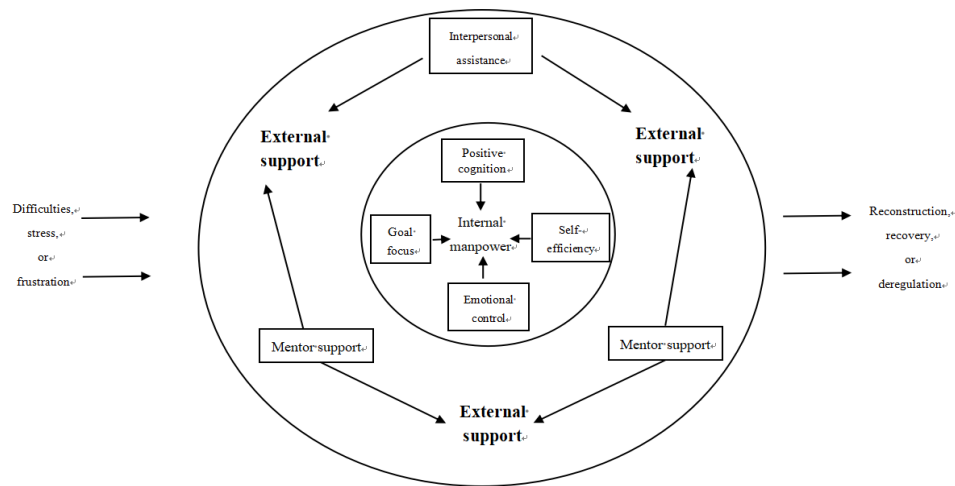


Figure 1. Structural model of graduate resilience.

Internal human power is mainly the psychological characteristics presented by individuals in the psychological process of “knowledge, feeling, meaning and action”. Positive cognition advocates that individuals abandon the dichotomous thinking of prosperity and adversity, emphasize the dialectical view of the effects of adversity, more actively face the pressure and challenges in study and life; emotional control is a key psychological indicator of individuals’ adaptation to social life. It does not require individuals to always maintain high emotional states, but advocates for accurate awareness of mood fluctuations in difficult situations. And it can be effectively control and adjust, to get out of the whirlpool of emotions as quickly as possible, to more objectively deal with pressure, setbacks and difficulties; goal focus emphasizes the individual’s thinking on the value and meaning of life, when individuals individual a clear goal pursuit, more likely to gain an enduring intrinsic drive, in the face of stress, setbacks, and difficulties, is also better at performing self-regulation. In order to achieve the final desired goal through persistence and adaptation; Self-efficacy is the subjective belief, judgment, or self-perception shown in the face of stress, difficulties, and frustration. High self-efficacy is not only not afraid of difficulties, with the good enough courage and confidence to cope, and be confident in your ability to deal with it.

External support is mainly the support resources and strength obtained by individuals to participate in life, study, and work. It has been shown that the higher the household capital stock, the more confident the individual can face the difficulties and setbacks. Warm and reliable family support is not just the spiritual of resist external pressure and difficulties, and it will affect the formation of its internal protective factors in the process of growth; in a large part, resilience depends on good interpersonal relationships. Positive and meaningful interpersonal assistance will help individuals to vent their emotions and gain external support; Mentors are very special and important others in the postgraduate study period. Mentor support is also an important dimension of extrinsic support for graduate students different from other groups. Supervisor support is considered as an important way to help graduate students overcome difficulties and psychological crises.

(II) Research Tools

According to the structural model of graduate resilience and combined with the preliminary interviews with science and engineering students, this study compiled a questionnaire of science and engineering students. The questionnaire consists of two parts, the first part is basic information collection, including gender, grade, origin, family situation, mentor style; the second part is the stress level scale, a total of 26 items, including target focus, emotional control, positive cognition, self-efficacy, family support, interpersonal assistance and mentor support seven dimensions, rick level 5 score, each question is 1-5 points according to the options. After the first draft of the questionnaire, the researchers invited 15 science and engineering graduate students as subjects, revised the understandability of the questionnaire, and finally formed the final draft of the questionnaire. The KMO value of the second part was 0.895, and the sphericity test of Bartlett's reached a significant level ($P < 0.001$), with good intrinsic consistency. Data were statistically analyzed using the SPSS 27.0 software.

(III) Research Subjects

Graduate students of science and engineering from a university in Guangxi were selected as the survey object, 450 questionnaires were distributed, and 436 valid questionnaires were returned, with an effective rate of 96.89%. Among them, 244 (56%) were male students and 192 (44%) were female students; the first, second and third years of graduate students were 200 (45.9%), 120 (27.5%) and 116 (26.6%), respectively; and the places of origin of the students were from the city, 156 (35.8%), and the countryside, 280 (64.2%). Informed consent was obtained from the study participants.

III. Finding

(I) The Overall Level of Resilience of Science and Engineering Graduate Students is Strong, and the Internal Manpower is Significantly Related to the External Support Force

The overall level of science and engineering graduate students in all dimensions of resilience is generally high. According to the survey, the overall average score of resilience is higher than the theoretical median value ($M=3.766$, $SD=.810$), indicating that the surveyed science and engineering graduate students have a strong level of resilience, and science and engineering graduate students can play the internal protective factors or external positive factors in the face of adversity or setbacks. However, this study also found that the proportion of scores lower than the theoretical median value was 7.3%, and the proportion of internal human dimensions lower than the theoretical median value reached 15.3%. It can be seen that although the resilience of science and engineering graduate students is above the middle level, there is still more room for improvement, and students with low resilience occupy a certain proportion to be paid attention to, which further demonstrates the necessity of improving the resilience of science and engineering graduate students.

There was no significant difference in the resilience level of science and engineering graduate students in terms of origin, grade and gender, but there were still slight differences within each dimension. In terms of gender, the overall resilience level of boys ($M=3.855$, $SD=.510$) was slightly higher than the girls ($M=3.652$, $SD=.474$), which is basically consistent with the findings of Lu Jia (2014) and Xu Shanshan (2023). In times of adversity or difficulties, boys tend to regulate emotions, be more rational and tend to focus on personal goals (Table 1); however, in interpersonal assistance, girls score higher than boys, indicating that girls are better at

expressing emotions or relieving stress through meaningful relationships. This may be because the positioning of gender roles and social expectations hope that men can be more tolerant, independent and independent of others. Therefore, when encountering adversity and difficulties, boys often tolerate internally, but less vent or seek support and help from others. From the perspective of origin, the resilience level of urban students ($M=3.795$, $SD=.505$) is comparable to the level of rural graduate students ($M=3.749$, $SD=.504$), but in the dimension of interpersonal assistance, urban graduate students ($M=3.989$, $SD=.770$) scored significantly higher than the rural graduate students ($M=3.689$, $SD=.814$), which may be related to the growing environment and family conditions. Relatively speaking, rural students are inferior to urban students in terms of verbal expression and social skills, so the differences in interpersonal assistance are relatively obvious.

Table 1

Differences of Gender Factors in the Dimensions of Emotional Control, Goal Focus and Self-efficacy

		The number of cases	Average	Standard deviation	σ	Levene checkout		Significance (double-tailed)
						F	Conspicuousness	
Emotional control	male	244	3.524	.721	.462	1.337	.248	<.001
	female	192	3.147	.715	.516			
Goal focus	male	244	4.100	.532	.034	14.196	<.001	<.001
	female	192	3.668	.650	.47			
Self-efficacy	male	244	3.814	.805	.052	.003	.958	<.001
	female	192	3.444	.758	.055			
Resilience	male	244	3.855	.510	.033	.141	.708	<.001
	female	192	3.652	.474	.034			

The internal manpower of science and engineering graduate students is significantly correlated with the external support force. In previous studies, scholars generally agree that resilience is not innate, nor is it static. Resilience is related to individual traits, but also influenced by factors such as acquired environment, education and family, and the two interact and influence each other. This study once again confirms this view. The pearson correlation coefficient between the internal manpower and the external support force is .620, and reached the significance level of .001 (as shown in Table 2). It can be seen that the resilience is the result of the interaction with the external environment in the individual, and the resilience can be improved from two dimensions of internal human and external support force.

Table 2

The Correlation Analysis of Internal Manpower and External Support of Graduate Students

		Internal manpower	External support
Internal manpower	pearson Correlation	1	.620**
	Significance (double-tailed)		.000
	The number of cases	436	436
External support	pearson Correlation	.620**	1
	Significance (double-tailed)	.000	
	The number of cases	436	436

(II) Graduate Students of Science and Engineering Have Strong Overall Manpower, But There are Differences in Different Dimensions, Especially the Emotional Control Dimension Has Great Room for Improvement

As can be seen from the survey results (as shown in Table 3), the overall internal manpower of science and engineering graduate students is higher than the average ($M=3.728$, $SD=.566$), but the different dimensions of manpower are not balanced, with positive cognition ($M=3.994$, $SD=.599$) and target concern ($M=3.910$, $SD=.625$) has a high score, which further shows that science and engineering graduates can have a positive understanding of failure and adversity, which is consistent with the research results of Jiang Yuxian et al. (2020), Chen Quan (2014) and other scholars. With the growth of age and the enrichment of life experience, science and engineering graduate students tend to be rational and mature in their cognition of the events they have experienced, and they can often objectively evaluate the success or failure. At the same time, science and engineering graduates will have a clearer understanding of their major after the course of careful choice of undergraduate study or postgraduate entrance examination. More than 90 percent of science and engineering graduate students say that they “have clear goals” and “set goals to push themselves forward”, which further proves that their goals are at a high level. Emotional control is strongly related to resilience, but there is still plenty of room for improvement. Wen Ya (2014) and other researchers have conducted an empirical study on the relationship between the psychological resilience and emotion of graduate students, showing that emotional control has a positive promotion effect on the psychological resilience level of graduate students. This study also reached the same conclusion: the pearson correlation coefficient between emotional control and resilience is .763, and reached the significance level of 001, that is to say, the improvement of emotional control ability will also be conducive to the improvement of resilience level. However, according to the data, the level of emotional control of science and engineering graduate students ($M=3.358$, $SD=.742$) remains to be improved. Influenced by social culture and traditional ideas, science and engineering graduate students have some misunderstanding about emotional control. They believe that expressing emotions, especially negative emotions, is a sign of cowardice and not strong enough, so they are used to hold their emotions in their hearts and pretend as if nothing had happened. In fact, behind the seemingly “calm” is the inhibitory expression of real emotions, rather than the positive emotional regulation. Through the interview, I also learned that “saying it is useless” and “I don’t know how to say it” are common reasons for science and engineering graduate students to suppress emotional expression, which further shows that science and engineering graduate students fail to fully understand the significance of reasonable emotional expression and their ability in emotional expression is still insufficient. Therefore, to make science and engineering graduate resilience level, we need to help the group out of emotional control, master a better way of emotional regulation, improve emotional expression skills, allow them to try to understand, admit and actively adjust their emotions, and get more positive energy to deal with stress, difficulties and setbacks.

Table 3

Descriptive Statistics of Each Dimensions of Individual Manpower Within Graduate Students

Variable	Sample capacity	Least value	Crest value	Average value	Standard deviation
Emotional control	436	1.5	5	3.358	.742
Positive cognition	436	2.2	5	3.994	.599

Goal focus	436	2	5	3.910	.625
Self-efficacy	436	1	5	3.651	.805
Internal manpower	436	2.1	5	3.728	.566

(III) Graduate Students of Science and Engineering Have Strong External Support, But the Support of Their Tutors Needs to be Improved

The research data show that the science and engineering graduate students have a strong external support force ($M=3.815$, $SD=.548$), but with interpersonal assistance ($M=3.797$, $SD=.810$), and family support ($M=4.017$, $SD=.660$) as compared to preceptor support ($M=3.632$, $SD=.660$), there is more room for improvement (see Table 4).

Table 4

Descriptive Statistical Analysis of Each Dimension of External Support Force for Graduate Students

Variable	Sample capacity	Least value	Crest value	Average value	Standard deviation
Interpersonal assistance	436	2	5	3.797	.810
Mentor support	436	1	5	3.632	.825
Family support	436	2.5	5	4.017	.660
External support	436	2.4	5	3.815	.548

The relationship between graduate supervisors and students (hereinafter referred to as the guidance relationship) is a key factor affecting the quality of graduate training and the physical and mental health of graduate students. According to the Code of Conduct for Graduate Tutors issued by the Ministry of Education in 2020, graduate supervisors should not only do their best to give guidance in graduate research, but also pay attention to the employment pressure and mental health of graduate students, and strive to build a harmonious relationship between graduate supervisors. The ideal guidance relationship should be the full mutual respect and trust between supervisors and graduate students, which can realize the inheritance and innovation of professional knowledge and the two-way interaction of emotional communication. However, in reality, the guidance relationship presents complexity and diversification. A study by Wang Wenwen (2018) showed that only 59.69% of graduate students had a good relationship with their supervisors. Xiao Xianglong (2020) found that 90.6% of graduate students believed that the ideal guidance relationship is good teachers, while in reality, the proportion of good teachers is only 66.4%. At present, there are still some instances of alienation of the tutorial-academic relationship, for example, students believe that the tutor is the boss, and the process of graduate school is actually working for the tutor, and this kind of employing the boss type is especially prominent in the tutor of graduate students in science and technology majors; what's more, it is believed that the tutor transfers the pressure of personal scientific research to the graduate students and "squeezes" the students to complete the scientific research results for them. What's more, some think that the supervisors transfer the pressure of personal research to graduate students and "squeeze" the students to fulfill their research achievements. To a certain extent, this study also confirms the existence of diversified supervisory relationships. Among the 436 graduate students surveyed, the largest number of graduate students thought that their supervisors were mentors and friends, accounting for 39.4%, followed by the traditional mentor and disciple type, accounting for 25.7%, and the laissez-faire type, the type that squeezes students for their research achievements, and the type that hires bosses, accounting for a certain percentage as well.

The level of difference in resilience of graduate students under different types of supervisors was further compared by the test of difference. The results showed that there was a significant difference in the level of resilience of graduate students depending on the type of mentor ($F=19.702$, $p=0.014<0.01$). This was shown by the fact that the highest level of graduate student resilience was found in those who spent time with a mentor of the mentor-teacher type, followed by the traditional mentor-apprentice type, while the lowest level of graduate student resilience was found in those who spent time with a mentor of the results-pressing type. The researcher also tried to conduct a correlation analysis combining graduate students' resilience and rapport with mentors, and finally found that the pearson correlation coefficient of resilience and rapport with mentors was 0.496, and this correlation coefficient reached the significance level of .001, that is to say, there is a significant positive correlation between resilience and rapport with mentors (e.g., Table 6), i.e., the better the relationship with the mentor, the higher the level of resilience of graduate students.

Table 5

Differential Test of Graduate Resilience Levels Among Different Types of Tutors

Variable	Option	Frequency	Average value	Standard deviation	t / F	p
Tutor type	Traditional mentoring	112	3.811	0.464	19.702	0.000
	laissez-faire	76	3.556	0.445		
	Hire a boss	20	3.563	0.503		
	Good teachers and helpful friends	172	3.978	0.468		
	Results pressing type	48	3.391	0.427		
	mixed type	8	3.306	0.238		

Note: Mixed type of mentor mainly refers to two or more types of mentor.

Table 6

Correlation Analysis of Graduate Student Resilience and Harmony with Supervisors

		Harmonious relationship with the mentor	Resilience
Harmonious relationship with the mentor	Pearson Correlation	1	0.496***
	Significance (double-tailed)		<.001
	The number of cases	436	436
Resilience	Pearson Correlation	0.496***	1
	Significance (double-tailed)	.000	
	The number of cases	436	436

From the above results, it can be seen that different types of mentors to give students different degrees of support will have a significant impact on the resilience level of graduate students. Therefore, it can be seen that to effectively improve the resilience level of graduate students, it is necessary to strengthen the construction of the tutor team, actively build a harmonious guidance relationship, so that the tutor can become the object of trust and rely on students in the face of pressure, difficulties and setbacks, rather than the object to avoid and unwilling to face.

(IV) The Resilience Level of Science and Engineering Graduate Students is Significantly Related to Their Family Relationship

Among the 436 graduate students surveyed, more than 85 percent said they had a relatively harmonious or very harmonious relationship with their family members, while only four said they had a strained relationship with their family members. By analyzing the correlation of graduate students and harmony of family

relationship (Table 7), the researchers found that the correlation coefficient of graduate students and harmony of family relationship was 0.422, and the correlation coefficient was reached. The significance level of 001, that is, there is a significant positive correlation between the graduate resilience and the harmony of family relationship. With the improvement of family harmony, the resilience level will increase accordingly.

Table 7

Correlation Analysis of Graduate Student Resilience and Family Harmony

		Family relationship harmony degree	Resilience
Family relationship harmony degree	Pearson correlation	1	0.422***
	Significance (double-tailed)		<.001
	The number of cases	436	436
Resilience	Pearson correlation	0.422***	1
	Significance (double-tailed)	.000	
	The number of cases	436	436

The family is usually regarded as the background factors or one of the external protective factors that promote the generation of individual resilience. The resilience shown by the individual largely reflects the ability of the whole family to cope with adversity. For the graduate students, family is an important source of economic support and spiritual support. Therefore, a harmonious family atmosphere is of great significance for providing protection and support for graduate students facing adversity.

IV. Conclusion

In the practice of mental health education in colleges and universities, there still exists the phenomenon of “emphasizing on the basic rather than the research” and “emphasizing on the professional rather than the moral education” in postgraduate education. Resilience is a positive psychological quality of individuals in the face of adversity and setbacks, and its cultivation and enhancement is important for the stable and lasting healthy development of graduate students in science and engineering, which also provides a new working idea for the current mental health education of graduate students in colleges and universities.

(I) Focus on Improving the Internal Manpower of Science and Engineering Graduate Students

At present, almost no colleges and universities specially offer courses related to mental health education for graduate students. Some colleges and universities are not aware enough of the necessity of offering relevant courses for graduate students, and some colleges and universities are limited by the practical difficulties such as the lack of teachers in mental health education. Therefore, how to keep the main position of classroom teaching and improve the internal manpower of all science and engineering graduate students through a wide coverage of “net casting” classroom teaching is of more realistic significance. Combined with the current university teachers, objective reality and science and engineering graduate student learning autonomy is strong, the network, graduate education departments should give full play to the advantages of resource coordination and integration, good at making use of digital network technology and resources gathering limited teachers, strive to build personal internal force of online mental health courses, let the students through online courses learning attribution theory, emotional expression skills, interpersonal communication theory and methods, and promote graduate student positive cognitive, emotional control dimension of effective promotion.

(II) Strengthen the Team Building of Graduate Supervisors in Science and Engineering Science

Most graduate tutors of science and engineering go from school to school, and have been engaged in the professional study, teaching and scientific research of science and engineering for a long time. They know little about the theories and methods of mental health education, so they have insufficient knowledge reserve and practical ability in mental health education. Not only that, a considerable number of tutors themselves are also facing multiple pressures such as professional title promotion and employment assessment, and have great mental pressure and are in a sub-health state for a long time. Therefore, colleges and universities in the new graduate tutor in special training, need to increase graduate mental health related module, in the daily learning of graduate tutor to increase the interpersonal communication, emotional regulation salon lectures, let graduate tutor can master the basic knowledge of mental health education, master common psychological problems and psychological counseling skills, and in the face of graduate psychological crisis intervention and treatment methods.

(III) Build a Strong Social Support System for Science and Engineering Graduate Students

The cultivation and promotion of resilience is a complex and systematic engineering, which depends on the cooperation of multiple internal and external factors. A good social support network can effectively promote the benign interaction of all kinds of resources and provide strong external support for the healthy development of students. For science and engineering graduate students, the strong social support is inseparable from the harmonious family atmosphere, harmonious peer relationship and strong professional support. Therefore, enhancing the level of resilience among postgraduate students of science and engineering has to help build harmonious peer relationships. On the one hand, graduate supervisors should pay attention to the creation of good team atmosphere, encourage the communication and interaction between the graduate students and subjects, and create a good academic atmosphere and teamwork atmosphere; on the other hand, graduate counselors should actively create a platform for the harmonious peer relationship of graduate students, such as carrying out community activities, to find like-minded friends for graduate students. In addition, the promotion of the science and engineering graduate students resilience level needs to get strong professional support. Firstly, establish the archives of graduate resilience in time, and screen out the groups with low resilience through interviews. Secondly, mental health education teachers in universities can design group counseling programs for science and engineering graduate students to improve their resilience. Finally, we should do a good job in the popularization of science and professional support resources, actively promote the cooperation with mental health centers and social professional institutions, promote the combination of medical and education and social education, build a diversified service system for students, and open the channels for science and engineering graduate students to obtain professional support.

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