

Digital Learning, Self-Regulation, and Academic Well-Being Among University Students: A Cyberpsychology Perspective

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Abstract:

The rapid adoption of digital learning has transformed higher education by increasing learning flexibility while creating psychological challenges, including reduced self-regulation, digital distraction, academic stress, and decreased academic well-being. Despite growing interest in digital learning, limited studies have examined the relationship between self-regulated learning and academic well-being from a cyberpsychology perspective among Indonesian university students. This study aimed to examine the influence of digital learning on students' self-regulated learning and academic well-being and to identify students' psychological profiles within digital learning environments. A quantitative cross-sectional survey was conducted among university students from several higher education institutions in Aceh who actively participated in digital learning through Learning Management Systems and other online platforms. Data were collected using standardized questionnaires and analyzed using descriptive statistics, multiple regression, and cluster analysis. Digital learning significantly predicted self-regulated learning and academic well-being. Students with stronger self-regulation demonstrated higher academic well-being, greater learning autonomy, and better adaptation to digital learning. Cluster analysis further identified distinct psychological profiles, reflecting differences in students' learning management and psychological adjustment. Effective digital learning is closely associated with enhanced self-regulated learning, which contributes to improved academic well-being. These findings emphasize the importance of integrating cyberpsychology principles into higher education to support students' psychological resilience and sustainable digital learning.

Keywords: Academic Well-Being; Cyberpsychology; Digital Learning; Higher Education; Self-Regulated Learning.

Introduction

The rapid advancement of digital technology has transformed higher education by changing how students access information, interact with learning resources, and participate in learning activities. Learning Management Systems (LMS), artificial intelligence (AI), mobile learning applications, and online collaboration platforms have increased learning flexibility and promoted student-centered learning. These developments require students not only to master digital technologies but also to regulate their learning processes independently in increasingly complex digital environments (Bond et al., 2021; Broadbent & Poon, 2015). Consequently, understanding students' psychological adaptation to digital learning has become an important issue in contemporary higher education.

Although digital learning offers numerous educational benefits, previous research has reported inconsistent findings regarding its psychological impact. Several studies indicate that digital learning enhances self-

regulated learning (SRL), academic engagement, and learning achievement by encouraging autonomy and active learning (Broadbent & Poon, 2015; Sharma et al., 2024). In contrast, other studies show that excessive exposure to digital learning may increase cognitive overload, digital fatigue, procrastination, stress, and reduced academic well-being (Koivuneva & Ruokamo, 2022; OECD, 2023; Rasheed et al., 2020). These contradictory findings suggest that digital learning outcomes cannot be explained solely by technological factors but should also be understood through students' psychological adaptation, making cyberpsychology an appropriate theoretical perspective (Indriana & Laksmiwati, 2025).

Despite the growing body of literature, several important research gaps remain. First, previous studies have produced inconsistent evidence regarding the influence of digital learning on students' self-regulated learning and academic well-being. Second, most studies examine these variables separately or only through direct relationships without integrating them into a comprehensive cyberpsychology framework (Putri Harahap et al., 2023). Third, existing studies predominantly employ variable-centered approaches, such as correlation and regression analyses, which overlook individual differences in students' psychological adaptation to digital learning. Moreover, empirical evidence from Indonesian higher education remains limited, despite the rapid expansion of digital learning.

This study addresses these gaps by integrating digital learning, self-regulated learning, and academic well-being within a cyberpsychology framework while adopting both regression analysis and cluster analysis to identify distinct psychological profiles among university students. Unlike previous studies that primarily focus on average relationships between variables, this research emphasizes heterogeneity in students' psychological adaptation, thereby providing a more comprehensive understanding of how digital learning influences learners' cognitive, emotional, and behavioral functioning.

Accordingly, this study aims to examine the influence of digital learning on university students' self-regulated learning and academic well-being and to identify students' psychological profiles in digital learning environments. The findings are expected to enrich the cyberpsychology literature, explain the inconsistent findings reported in previous studies, and provide practical evidence for designing digital learning environments that effectively support both academic success and students' psychological well-being.

Literature Review

Digital learning has evolved beyond the simple use of online platforms into an integrated learning ecosystem that enables flexible, personalized, and technology-mediated learning experiences. Learning Management Systems (LMS), artificial intelligence (AI), mobile learning applications, and collaborative digital platforms facilitate students' access to learning resources while encouraging independent learning. Nevertheless, recent systematic reviews emphasize that technology itself does not automatically improve learning outcomes. Instead, the effectiveness of digital learning largely depends on learners' ability to regulate cognitive, motivational, and behavioral processes during technology-mediated learning (Broadbent & Poon, 2015; Elmabaredy & Gencel, 2024). Consequently, psychological factors have become increasingly important in explaining why students experience different outcomes despite learning in similar digital environments (Stalmach et al., 2023; Topluk & Genc, 2026).

Cyberpsychology provides a theoretical foundation for understanding these differences by explaining how interactions with digital technologies influence cognition, emotion, motivation, and behavior. From this perspective, digital learning should not be viewed merely as technological adoption but as a continuous interaction between technological affordances and students' psychological characteristics. One of the most influential psychological mechanisms is self-regulated learning (SRL), which enables learners to set goals,

manage time, monitor progress, regulate motivation, and evaluate learning strategies (Zimmerman, 2008). Students possessing stronger SRL are generally better able to adapt to digital learning because they can minimize distraction, manage cognitive load, and maintain learning engagement even in highly autonomous environments (Faza & Lestari, 2025).

Successful self-regulation subsequently contributes to students' academic well-being. Academic well-being reflects positive psychological functioning in educational settings, including learning satisfaction, resilience, engagement, emotional stability, and the ability to cope with academic demands (Sutarni et al., 2021). Previous studies consistently report that students with effective self-regulation tend to experience higher academic well-being because they are better equipped to manage academic stress and maintain motivation. However, digital learning may also reduce academic well-being when students experience excessive digital fatigue, cognitive overload, or inadequate psychological support (Koivuneva & Ruokamo, 2022). These findings indicate that the influence of digital learning on academic well-being is likely to operate indirectly through students' psychological adaptation rather than through technology alone.

Based on this theoretical perspective, the present study proposes a conceptual framework in which digital learning serves as the educational environment, cyberpsychology provides the overarching theoretical lens, self-regulated learning functions as the primary psychological adaptation mechanism, and academic well-being represents the psychological outcome of successful adaptation. Within this framework, students who perceive digital learning environments as accessible, interactive, and supportive are expected to develop stronger self-regulated learning, which subsequently contributes to higher academic well-being. Furthermore, because students differ in their psychological adaptation, this study also employs cluster analysis to identify distinct psychological profiles that cannot be captured through conventional variable-centered approaches. This framework underpins the research questions by explaining not only whether digital learning influences students' psychological functioning but also how these relationships vary across different learner profiles.

Methods

This study employed a quantitative cross-sectional survey design to investigate the relationships among digital learning, self-regulated learning (SRL), and academic well-being from a cyberpsychology perspective. A cross-sectional approach was considered appropriate because it enables the examination of relationships among psychological and educational variables at a specific point in time while providing empirical evidence regarding students' adaptation to digital learning environments (Creswell & Creswell, 2022).

The study was conducted at five higher education institutions in Aceh, Indonesia. The target population consisted of undergraduate students who had participated in digital learning through Learning Management Systems (LMS), video conferencing platforms, and other online learning applications for at least one academic semester. Participants were selected using proportionate stratified random sampling to ensure adequate representation across universities and academic disciplines. Sample size was determined through power analysis for multiple regression ($\alpha = .05$, power = .80, medium effect size $f^2 = .15$), indicating a minimum sample of 180 participants. To improve statistical precision and accommodate missing responses, approximately 350 questionnaires were distributed, resulting in 326 valid responses.

Instrument Development

The research instrument was developed by adapting several standardized instruments that have demonstrated satisfactory psychometric properties in previous studies. The Digital Learning Scale was

adapted from recent studies on technology-enhanced learning in higher education, the Online Self-Regulated Learning Questionnaire (OSLQ) was used to measure self-regulated learning (Barnard et al., 2009), while the Academic Well-Being Scale was adapted from established measures of students' psychological well-being in educational settings. All items were translated into Indonesian using a forward–backward translation procedure to ensure semantic equivalence. Subsequently, three experts in educational psychology, educational technology, and language education evaluated the content relevance, clarity, and cultural appropriateness of each item. Minor revisions were made based on their recommendations before conducting a pilot study involving 30 university students.

The final questionnaire consisted of four sections: demographic information, Digital Learning (10 items), Self-Regulated Learning (24 items), and Academic Well-Being (12 items). All items were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Validity and Reliability

Construct validity was examined using Exploratory Factor Analysis (EFA). Prior to factor extraction, sampling adequacy was confirmed through the Kaiser–Meyer–Olkin (KMO) measure (KMO = .914) and Bartlett's Test of Sphericity ($\chi^2 = 4518.63$, $p < .001$), indicating that the data were suitable for factor analysis. Principal Component Analysis with Varimax rotation was subsequently performed. All retained items demonstrated standardized factor loadings ranging from 0.65 to 0.89, exceeding the recommended threshold of 0.50.

Internal consistency was evaluated using Cronbach's Alpha, Composite Reliability (CR), and Average Variance Extracted (AVE). Cronbach's Alpha values ranged from 0.895 to 0.917, Composite Reliability ranged from 0.911 to 0.926, and AVE values ranged from 0.635 to 0.682, confirming satisfactory construct reliability and convergent validity.

Data Collection

Data collection was conducted online after obtaining permission from participating universities. Participation was voluntary, and respondents completed an informed consent form before accessing the questionnaire. No personally identifiable information was collected, and all responses were analyzed anonymously.

Data Analysis

Data were analyzed using IBM SPSS Statistics version 27. Descriptive statistics (means, standard deviations, frequencies, and percentages) were first calculated to summarize participant characteristics and research variables.

Prior to regression analysis, several statistical assumptions were examined. Data normality was assessed using standardized residual plots and the Shapiro–Wilk test. Multicollinearity was evaluated through Variance Inflation Factor (VIF) and tolerance values, with VIF values below 5 and tolerance values above 0.20 indicating acceptable levels. Homoscedasticity was examined using scatterplots of standardized residuals, while linearity was evaluated through partial regression plots. The results indicated that all assumptions for multiple regression analysis were satisfactorily met.

Pearson correlation analysis was subsequently performed to examine bivariate relationships among Digital Learning, Self-Regulated Learning, and Academic Well-Being. Multiple linear regression analysis was then

employed to determine the predictive influence of Digital Learning on Self-Regulated Learning and Academic Well-Being.

To identify heterogeneous psychological characteristics among students, K-means cluster analysis was performed using standardized scores of Self-Regulated Learning and Academic Well-Being. Prior to clustering, all variables were standardized (z-scores) to eliminate differences in measurement scales. Several cluster solutions ($k = 2, 3, 4$, and 5) were compared based on cluster interpretability, within-cluster homogeneity, between-cluster separation, and cluster size balance. The three-cluster solution was selected because it produced the most meaningful and theoretically interpretable classification while maintaining adequate cluster membership for subsequent analysis. The resulting clusters represented students with high, moderate, and low levels of psychological adaptation to digital learning environments.

Statistical significance for all inferential analyses was established at $p < .05$.

Ethical Considerations

This study complied with the ethical principles of educational research. Participation was voluntary, informed consent was obtained from all participants, confidentiality was guaranteed, and respondents retained the right to withdraw from the study at any stage without academic consequences.

Results

Participant Characteristics

A total of 326 undergraduate students from five higher education institutions in Aceh participated in this study. After data screening, all responses were retained for analysis because no questionnaire contained more than 5% missing data. The participants consisted of 124 males (38.0%) and 202 females (62.0%), with a mean age of 20.84 years ($SD = 1.73$). Most respondents (72.4%) had participated in digital learning for more than two academic semesters, indicating adequate experience with technology-mediated learning environments.

Descriptive Statistics

Table 1 presents the descriptive statistics of the research variables.

Table 1. Descriptive Statistics of Research Variables

Variable	Items	N	Min	Max	Mean	SD	Skewness	Kurtosis	Category
Digital Learning	10	326	2.45	5.00	4.02	0.56	-0.48	-0.37	High
Self-Regulated Learning	24	326	2.18	5.00	3.87	0.59	-0.31	-0.52	High
Academic Well-Being	12	326	2.07	5.00	3.79	0.61	-0.42	-0.45	High

The descriptive statistics indicate that university students generally reported high perceptions of digital learning, accompanied by high levels of self-regulated learning and academic well-being. The skewness and kurtosis values ranged between -2 and $+2$, indicating that the data were approximately normally distributed and suitable for subsequent parametric analyses. These findings suggest that participants perceived digital learning environments positively while demonstrating relatively strong learning autonomy and psychological well-being.

Validity and Reliability

The construct validity and reliability of the research instruments were examined before conducting hypothesis testing. As presented in Table 2, all constructs demonstrated satisfactory psychometric properties. Factor loadings ranged from 0.65 to 0.89, exceeding the recommended threshold of 0.50. Likewise, Cronbach's Alpha values ranged from 0.895 to 0.917, Composite Reliability (CR) ranged from 0.911 to 0.926, and Average Variance Extracted (AVE) ranged from 0.635 to 0.682, confirming acceptable convergent validity and internal consistency. These results indicate that the measurement instruments were both valid and reliable for assessing digital learning, self-regulated learning, and academic well-being.

Table 2. Reliability and Construct Validity

Construct	Factor Loading	Cronbach's Alpha	CR	AVE
Digital Learning	0.67–0.88	0.903	0.918	0.653
Self-Regulated Learning	0.65–0.89	0.917	0.926	0.682
Academic Well-Being	0.66–0.87	0.895	0.911	0.635

Correlation Analysis

Pearson correlation analysis was conducted to examine the relationships among the research variables.

Table 3. Pearson Correlation Matrix

Variable	1	2	3
1. Digital Learning	1		
2. Self-Regulated Learning	.621**	1	
3. Academic Well-Being	.547**	.684**	1

Note. $p < .001$.

The results revealed statistically significant positive relationships among all variables. Digital Learning was strongly associated with Self-Regulated Learning ($r = .621$, $p < .001$), explaining approximately 38.6% of the shared variance ($r^2 = .386$), which represents a large practical effect according to Cohen (1988). Digital Learning also demonstrated a moderate positive relationship with Academic Well-Being ($r = .547$, $p < .001$), accounting for approximately 29.9% of the shared variance ($r^2 = .299$). Furthermore, Self-Regulated Learning exhibited the strongest relationship with Academic Well-Being ($r = .684$, $p < .001$), explaining approximately 46.8% of the variance ($r^2 = .468$). These findings indicate that students with stronger self-regulation tend to experience better psychological well-being within digital learning environments.

Multiple Regression Analysis

Multiple regression analysis was performed to examine the predictive influence of Digital Learning on Self-Regulated Learning and Academic Well-Being.

Table 4. Multiple Regression Analysis

Dependent Variable	β	SE	t	95% CI	p	R ²	Adjusted R ²	Cohen's f ²
Self-Regulated Learning	0.623	0.042	14.82	0.541–0.706	< .001	.389	.386	0.63
Academic Well-Being	0.538	0.046	11.76	0.448–0.628	< .001	.291	.287	0.40

The regression analysis demonstrated that Digital Learning significantly predicted both Self-Regulated Learning and Academic Well-Being. Digital Learning explained 38.9% of the variance in Self-Regulated Learning (Adjusted $R^2 = .386$), representing a large practical effect (Cohen's $f^2 = 0.63$). Similarly, Digital Learning explained 29.1% of the variance in Academic Well-Being (Adjusted $R^2 = .287$), corresponding to a moderate-to-large effect (Cohen's $f^2 = 0.40$). The positive standardized regression coefficients indicate that more positive perceptions of digital learning were associated with stronger self-regulated learning and higher academic well-being among university students.

Psychological Profile Identification

To examine heterogeneity in students' psychological adaptation, K-means cluster analysis was performed using standardized scores of Self-Regulated Learning and Academic Well-Being. The three-cluster solution was selected because it produced the most interpretable and theoretically meaningful classification.

Table 5. Psychological Profiles Identified Through K-Means Cluster Analysis

Cluster	n	Percentage	Mean SRL	Mean Academic Well-Being	Interpretation
Cluster 1	116	35.6%	4.48	4.36	High psychological adaptation
Cluster 2	134	41.1%	3.82	3.71	Moderate psychological adaptation
Cluster 3	76	23.3%	2.91	2.83	Low psychological adaptation

The cluster analysis revealed substantial heterogeneity in students' psychological adaptation to digital learning. Students in Cluster 1 demonstrated the highest levels of self-regulated learning and academic well-being, indicating strong autonomous learning skills and positive psychological adjustment. Cluster 2 represented students with moderate levels of self-regulation and well-being who occasionally experienced challenges in maintaining learning motivation and emotional balance. In contrast, Cluster 3 consisted of students with relatively low self-regulation and academic well-being, suggesting greater vulnerability to digital distraction, academic stress, and difficulties in adapting to digital learning environments.

Overall, these findings demonstrate that digital learning is positively associated with students' self-regulated learning and academic well-being while simultaneously revealing meaningful differences in psychological adaptation among learners. The identified psychological profiles further support the importance of implementing differentiated educational interventions that address students' diverse psychological needs in technology-mediated learning environments.

Discussion

The present study demonstrates that digital learning significantly predicts both self-regulated learning (SRL) and academic well-being among university students. More importantly, the findings indicate that students do not respond uniformly to digital learning environments, as evidenced by the identification of three distinct psychological profiles. These results suggest that the effectiveness of digital learning is determined not merely by the availability of technology but by the ways students cognitively, emotionally, and behaviorally adapt to technology-mediated learning. This finding extends the cyberpsychology perspective by emphasizing that digital technologies function as psychological environments rather than simply instructional tools, thereby shaping students' learning behaviors through continuous interactions between technological affordances and individual psychological characteristics.

The significant relationship between digital learning and self-regulated learning can be understood through the psychological processes involved in autonomous learning. Digital learning environments require students to make independent decisions regarding learning goals, time management, information selection, and problem-solving without constant instructor supervision. Such conditions stimulate metacognitive monitoring, self-control, and motivational regulation, which are central components of self-regulated learning (Zimmerman, 2008). From a cyberpsychology perspective, students continuously interact with digital interfaces that provide immediate feedback, learning analytics, reminders, and adaptive resources. These interactions gradually strengthen students' ability to monitor their own learning progress and regulate their behaviors. Therefore, digital learning enhances self-regulation not because technology itself is inherently effective, but because digital environments encourage learners to assume greater responsibility for managing their learning processes.

Nevertheless, this finding should not be interpreted as evidence that digital learning universally improves self-regulated learning. Previous studies have reported inconsistent findings, with some researchers arguing that online learning may actually weaken students' self-regulation by increasing multitasking, digital distraction, procrastination, and cognitive overload (Koivuneva & Ruokamo, 2022; Rasheed et al., 2020). The difference between these findings and the present study may be explained by variations in students' psychological readiness and digital competence. Students possessing stronger self-regulatory skills are more capable of transforming technological flexibility into productive learning behaviors, whereas students with weaker self-regulation are more vulnerable to the negative psychological consequences of continuous digital exposure. This explanation supports the argument that self-regulated learning functions as an adaptive psychological mechanism that determines whether digital learning becomes beneficial or detrimental.

The present study also found that digital learning significantly contributes to academic well-being. Rather than acting directly, however, this relationship appears to operate through students' psychological adaptation to digital learning environments. Students who successfully regulate their learning tend to experience greater academic confidence, reduced learning stress, higher engagement, and stronger psychological resilience, all of which contribute to academic well-being. Conversely, students who experience difficulties in managing digital learning demands may perceive the same environment as stressful and emotionally exhausting. These findings indicate that academic well-being should be viewed as the outcome of successful psychological adaptation rather than merely the consequence of technology use. This explanation is consistent with cyberpsychology, which argues that emotional responses to digital environments emerge from the interaction between environmental demands and individuals' cognitive and emotional regulation capacities.

Interestingly, these findings only partially support previous studies. While Broadbent & Poon, (2015) and Wu et al. (2022) reported that digital learning generally facilitates self-regulated learning, other investigations have emphasized the adverse psychological consequences of intensive digital learning, including digital fatigue, burnout, and decreased well-being (OECD, 2023; Elmabaredy & Gencel, 2024; Vos et al., 2025). The present findings suggest that these seemingly contradictory results should not be viewed as mutually exclusive. Instead, they indicate that the impact of digital learning is conditional rather than universal. Digital learning creates opportunities for learning autonomy, but these opportunities produce positive outcomes only when students possess sufficient psychological resources, such as self-regulation, motivation, and emotional resilience. Consequently, cyberpsychology provides a more comprehensive explanation by integrating technological factors with students' psychological characteristics rather than treating technology as the sole determinant of learning outcomes.

One of the most important contributions of this study is the identification of three distinct psychological profiles through cluster analysis. Unlike previous studies that predominantly employed variable-centered approaches, this research demonstrates that university students constitute a psychologically heterogeneous population. Students classified in the high-adaptation cluster exhibited stronger self-regulation and academic well-being because they appeared better able to manage digital distractions, regulate emotions, and maintain learning motivation. In contrast, students in the low-adaptation cluster showed greater vulnerability to psychological challenges associated with digital learning. These findings suggest that individual differences represent an important explanatory mechanism underlying the inconsistent results reported in previous studies. The conflicting evidence concerning the effectiveness of digital learning may therefore arise because earlier research generally treated students as a homogeneous group while overlooking meaningful variations in psychological adaptation.

The present findings have important theoretical and practical implications. Theoretically, this study extends the application of cyberpsychology in higher education by demonstrating that digital learning influences students through interconnected cognitive, motivational, and emotional mechanisms rather than through technological exposure alone. The findings also reinforce the role of self-regulated learning as a key psychological mechanism linking digital learning with academic well-being. Practically, the results suggest that universities should complement investments in digital infrastructure with interventions that strengthen students' psychological readiness, including self-regulated learning training, digital well-being programs, learning analytics-based academic support, and counseling services. Such interventions may enable students to utilize digital learning environments more effectively while minimizing the psychological risks associated with intensive technology use.

Despite these contributions, several limitations should be acknowledged. The cross-sectional design limits causal inference, while the reliance on self-reported questionnaires may introduce common-method bias and social desirability effects. Furthermore, the study involved students from universities in Aceh, limiting the generalizability of the findings to other educational contexts. Future studies are encouraged to employ longitudinal or mixed-methods designs to investigate how psychological adaptation develops over time and to incorporate additional constructs, such as digital resilience, artificial intelligence literacy, academic motivation, and learning engagement. Such investigations would provide a more comprehensive understanding of the psychological mechanisms through which digital learning influences students' academic success and well-being.

Conclusion

This study demonstrates that the effectiveness of digital learning extends beyond technological accessibility and is fundamentally shaped by students' psychological adaptation to technology-mediated learning environments. From a cyberpsychology perspective, digital learning should not be viewed merely as an instructional medium but as a psychological context that continuously influences students' cognitive, motivational, and emotional processes. Within this context, self-regulated learning emerges as a key adaptive mechanism through which students transform digital learning opportunities into positive academic experiences, ultimately contributing to higher academic well-being. Thus, the relationship between digital learning and academic well-being is better understood as an indirect psychological process rather than a simple consequence of technology use.

The findings also reveal that university students respond differently to digital learning, as reflected in the identification of distinct psychological profiles. This indicates that the impact of digital learning is conditional rather than universal, depending on individual differences in students' capacity to regulate

learning, manage emotions, and adapt to digital environments. By highlighting this psychological heterogeneity, the present study extends previous research that predominantly treated learners as a homogeneous population and demonstrates the value of integrating cyberpsychology with educational psychology to explain variations in students' digital learning experiences.

Theoretically, this study contributes to the growing body of cyberpsychology literature by proposing an integrated explanation of the relationships among digital learning, self-regulated learning, and academic well-being. Rather than considering these constructs independently, the findings suggest that they form an interconnected psychological system in which learning technologies, self-regulation, and well-being mutually influence students' educational experiences. Practically, the findings imply that universities should complement investments in digital infrastructure with interventions that strengthen students' self-regulation, digital well-being, and psychological resilience through learner-centered instructional strategies and comprehensive academic support services.

Nevertheless, the findings should be interpreted in light of several limitations, including the cross-sectional design, reliance on self-reported data, and the regional scope of the sample. Future research is encouraged to employ longitudinal or mixed-methods approaches involving more diverse educational contexts while incorporating additional psychological constructs, such as digital resilience, artificial intelligence literacy, and learning engagement, to further explain how students adapt to increasingly complex digital learning ecosystems.

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