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The Association between Family Socioeconomic Status and Children's Digital Literacy: The Explanatory Role of Parental Mediation

Xiaohan Shi [1,2], Jing He [1,2,3] and Gengfeng Niu [1,2,*]

[1] School of Psychology, Central China Normal University, Wuhan 430079, China; sxhgloria@mails.ccnu.edu.cn (X.S.); psyhejing@163.com (J.H.)
[2] Key Laboratory of Adolescent Cyberpsychology and Behavior (CCNU), Ministry of Education, Wuhan 430079, China
[3] Shenzhen Baoan District Yanchuan Experimental School, Shenzhen 518101, China
* Correspondence: niugfpsy@ccnu.edu.cn

Abstract: In the current information society, digital literacy has become an indispensable part of individuals' overall literacy. Thus, investigating the factors influencing digital literacy is of theoretical and practical significance, especially for developing children. Against this background, the present study examined the association between family socioeconomic status and children's digital literacy and the mediating roles of active and restrictive parental internet mediation in this association. A total of 1050 Chinese students ranging from Grades 4 to 8 completed questionnaires in their classrooms. Regression-based analyses showed that (1) family socioeconomic status was positively associated with digital literacy and (2) active parental mediation could significantly mediate this relationship, but the mediating effect of restrictive parental mediation was insignificant. This research not only deepens our understanding of the factors affecting digital literacy but also provides an empirical reference point for interventions to improve children's digital literacy.

Keywords: family socioeconomic status; digital literacy; active parental internet mediation; restrictive parental internet mediation; mediating effect

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1. Introduction

With the rapid spread of information and communication technology (ICT) worldwide, digital technology and various applications have become ubiquitous in our daily lives, which can be seen as a double-edged sword. With this trend, people are tasked with making full use of the benefits of digital technology while avoiding the potential negative effects. Digital literacy has been shown to promote engagement in online learning and is associated with lower vulnerability to the negative impacts of digital technology, such as excessive use and cyberbullying [1]. Digital literacy is the awareness, attitude, and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyze and synthesize digital resources, construct new knowledge, create media expressions, and interact with others [2]. However, there are research findings that children report a high confidence in their digital literacy but significantly overestimate their competence; for example, they lack awareness of privacy and security issues and are not skilled at searching, evaluating, and managing online information [2]. These findings call us to pay attention to policies aimed at developing the digital literacies of school students.

In addition, the ecological systems theory points out that the family is a microsystem that shapes individuals' development and adaptation [3,4]. Additionally, the family systems theory points out that objective family environment (such as parents' social status, economic income, occupation, and other objective conditions) and subjective family environment

(such as parents' idea, mode of action, parenting mode, and other subjective conditions) affect individual development [5]. Among them, family socioeconomic status is closely related to parental internet mediation and children's digital literacy development [1,6]. Against this backdrop, it is of great importance to examine the family factors influencing the development of children's digital literacy and the underlying mechanisms of this influence. At the same time, most of the relevant studies were conducted in Western culture; examining this issue in Chinese culture could provide more evidence and perspective, and this study holds important implications for policymaking and practical improvement.

2. Literature Review

2.1. Family Socioeconomic Status and Digital Literacy

Family socioeconomic status (SES) is a comprehensive measure of family economic and social status [7]. Researchers have reached the general conclusion that low-SES families use digital technology less than high-SES families do [8]. This is one example of what has been called the digital divide. This term is used to describe a discrepancy between two groups in their access to information and communication technology [9]. This digital divide, in turn, creates other forms of disadvantage, including social inequities [10].

The digital divide is often evident when there are groups of people who differ in SES. For example, research suggests that students from families with a high SES tend to have more technical resources, greater access to the internet, and a higher level of self-efficacy and skills in using digital technology (e.g., the internet and smartphones). In contrast, students from families with a low SES may have less digital technology and may face difficulties in accessing the internet from home [11]. A meta-analysis of 32 independent K–12 student samples found a significantly positive correlation between family socioeconomic status and ICT literacy, a key element of digital literacy [6]. In addition, the digital literacy of the parents and teachers of children from low-SES families may be insufficient to teach ICT-related skills [1]. Based on these discussions, this study aimed to examine the mechanism underlying the relation between family socioeconomic status and digital literacy, which is largely unclear; it is reasonable to hypothesize that family SES will be positively associated with children's digital literacy (H1).

2.2. Parental Internet Mediation as a Link between SES and Digital Literacy

In the family, parents' supervision and regulation is another factor closely associated with multiple aspects of healthy development [1]. In the digital era, this means supervising and regulating children's digital technology usage. Generally, parental supervision and regulation of children's internet use (defined as parental internet mediation) considers two aspects or styles: active mediation and restrictive mediation [12,13]. The main forms of active parental mediation include parents and children talking about how to use digital media and parents providing guidance and advice when their children are confronted with challenges; restrictive mediation is characterized by the use of rules to control children's online time, limit browsing content, and regulate other online activities [14]. These two different styles of parental internet mediation may have different influences on children; active parental mediation can empower children and support their active engagement with online media [15], help children use digital media effectively, and improve digital literacy. In contrast, restrictive parental mediation may jeopardize the possibility of developing digital literacy [15]. Limiting exposure to internet media by using restrictive mediation deprives children of the opportunity to learn critical thinking skills and to adapt to the changing media environment [14]. Thus, it was hypothesized that active parental mediation would be positively associated with digital literacy (H2), whereas restrictive parental mediation would be negatively associated with digital literacy (H3).

Moreover, family socioeconomic status has been found to be closely associated with parental involvement [16], especially since the family stress model of economic hardship asserts that low family SES, including low parent education, low family income, and poor occupational status, would make parenting difficult [17]. The family stress model of

economic hardship states that family stress (especially if it is caused by economic stress) may affect parental involvement and thus affect children's cognitive abilities and social adjustment and create more internalization and externalization problems [17]. For example, high-SES parents usually have higher digital technology skills, are more aware of the negative effects of technology, and are capable of providing effective support and guidance to their children in using the internet [13]. Parents with low income and low education may not be aware of the potential negative effects, nor do they have the time and energy to mediate their children's online activities, and, therefore, will be less likely to control their children's internet use [1]. Although studies pointed out that parental mediation strategies for digital devices are more restrictive in low-income and low-educated families [18], these studies were conducted in Western culture. In China, though parents are very concerned about the negative impact of Internet technology on children and adolescents (i.e., internet addiction), financially stressed parents have less energy and time to mediate their children's online activity [19]. Thus, it is reasonable to hypothesize that a high family SES will be positively associated with both active parental internet mediation (H4) and restrictive parental internet mediation (H5).

In addition, previous studies have pointed out that parenting practices are important explanatory mechanisms through which factors such as family socioeconomic status affect children's development and adaptation [20]. Therefore, we hypothesized that there would be parallel indirect effects of active mediation and restrictive mediation on the association between family SES and digital literacy in children (H6).

2.3. The Present Study

In this study, we constructed a conceptual model that specified pathways between family SES and digital literacy via active parental mediation and restrictive parental mediation. First, we tested whether active parental mediation was an explanatory mechanism in the association between a high family SES and high digital literacy in children. Second, we examined whether restrictive mediation was an explanatory mechanism in the association between a low family SES and low digital literacy in children. Third, we investigated whether there was evidence of parallel statistical mediation in which the association between SES and digital literacy is explained by both active and restrictive mediation.

3. Methods

3.1. Sampling and Participants

This study was approved by the Ethics Committee for Psychological Research of the corresponding author's institution. Convenience sampling was adopted to recruit students from six schools (22.29% grade 4, 23.90% grade 5, 17.90% grade 6, 20.29% grade 7, and 15.62% grade 8) in central China to participate. In this study, we introduced the children to the principles of voluntary participation and confidentiality. A total of 1050 children aged between 9 and 15 (M_{age} = 11.82 $\pm$ 1.43) participated in this study in school voluntarily; 46.6% of them were boys, and 94.4% of students have used the internet in the past six months.

3.2. Measures

3.2.1. Family Socioeconomic Status

The Family Affluence Scale (FAS) was used to assess Family SES with the aim of avoiding too many missing values on the traditional measures of SES, such as family income or parental education [21]. The FAS includes four items: Does your family own a car, van, or truck? (yes, two or more = 2; yes, one = 1; no = 0); During the past 12 months, how many times did you travel away on holiday with your family? (more than twice = 3; twice = 2; once = 1; not at all = 0); How many computers does your family own? (more than two = 3; two = 2; one = 1; none = 0); Do you have your bedroom for yourself? (yes = 1; no = 0). Scores on these items were summed to a total score, with higher scores indicating a higher SES. Indeed, other research in Chinese children and adolescent samples has shown

alpha values of 0.50 [22]. Therefore, Cronbach's alpha in the present study was 0.55, which is comparable to that of previous studies and is considered a helpful measure of SES.

3.2.2. Active Parental Internet Mediation and Restrictive Parental Internet Mediation

Parental internet mediation was measured with 12 items that had been used in previous research [15]. In the present study, it was translated into Chinese using the standard procedure to determine the Chinese version. The children answered yes (=1) or no (=0) to indicate whether either of their parents had ever engaged in each of the 12 mediation behaviors. There were 6 items for measuring active parental internet mediation (e.g., Have either of your parents ever done any of the following things with you?: Helped you when something is difficult to do or find on the internet, explained which websites are beneficial, or taught you strategies to go online safely). We performed confirmatory factor analysis (CFA) to examine the structure of the active internet mediation scale. The findings from the CFA confirmed the one-factor structure of the active internet mediation scale: χ^2/df = 2.58, RMSEA = 0.04, SRMR = 0.04, TLI = 0.98, GFI = 0.99, CFI = 0.99. The remaining 6 items were designed to assess restrictive parental internet mediation (e.g., "When you use the internet at home, do either of your parents sometimes check any of the following things: the messages in your email or instant messaging account, your online time, or your web browsing"). The findings from the CFA confirmed the one-factor structure of the restrictive internet mediation scale: χ^2/df = 3.01, RMSEA = 0.04, SRMR = 0.04, TLI = 0.98, GFI = 0.99, CFI = 0.99. The Cronbach's alphas of the two subscales were 0.87 and 0.84, respectively.

3.2.3. Digital Literacy

According to previous research, digital literacy was measured by 20 items [2]. The children were instructed to evaluate to what extent they were capable of performing various digital literacy tasks, using a six-point scale ranging from 1 ("with great difficulty") to 6 ("with great ease"). This scale assessed six components of digital literacy: real-time literacy (e.g., "ignoring those advertisements that pop up when searching for information on the internet"); visual literacy (e.g., "understanding what is displayed in web pictures"); information literacy (e.g., "finding the information you want on the internet"); reproduction literacy (e.g., "using pictures uploaded by others to create my new pictures"); branching literacy (e.g., "browsing a complex website with many web pages"); social-emotional literacy (e.g., "respecting others' views when replying to emails, forums, WeChat or QQ"). Scores on the 20 items were averaged to create an overall score, with higher scores representing higher levels of digital literacy. As mentioned above, individual digital literacy is complex and contains different dimensions of skills, but each person's digital literacy is unique and adept at different skills [2]. Therefore, this study used average scores to reflect individuals' overall digital literacy, regardless of dimension. We performed confirmatory factor analysis (CFA) to examine the structure of the digital literacy scale. The findings from the CFA confirmed the 6-factor structure of the digital literacy scale: χ^2/df = 3.78, RMSEA = 0.05, SRMR= 0.04, TLI = 0.95, GFI = 0.95, CFI = 0.96. Cronbach's alpha for the scale was 0.93.

3.2.4. Control Variables

We included age and gender as control variables in the analysis because younger children and girls receive more restrictive and active mediation than older children and boys [23], and older children have been shown to have higher digital literacy [24].

3.3. Statistical Analysis

Data analysis was conducted in two steps. First, we conducted a preliminary analysis based on descriptive statistics (means and standard deviations) and a correlation matrix. Second, a parallel mediation analysis was performed using the PROCESS Macro for SPSS (Model 4) (SPSS Version 27, IBM, New York, NY, USA) to test whether there was an indirect effect of active parental mediation and restrictive parental mediation on the relationship

between family socioeconomic status and digital literacy [25]. The bootstrapping method with 5000 iterations of bias-corrected resampling was adapted to estimate the 95% confidence interval of the direct effect, total indirect effects, and specific indirect effects. An effect is considered significant if the 95% confidence interval does not include zero.

4. Results

4.1. Preliminary Analyses

Descriptive statistics and correlations among variables are presented in Table 1. As shown, the level of active parental mediation of children's internet use (M = 0.75, SD = 0.33) was greater than that of restrictive parental mediation (M = 0.46, SD = 0.36). Participants' average digital literacy (M = 3.60, SD = 0.90) was near the middle level of the six-point scale. Family SES, active parental mediation, restrictive parental mediation, and digital literacy were all significantly and positively correlated with each other.

Table 1. Descriptive statistics and correlations among study variables (N = 1065).

Variables	*M*	*SD*	1	2	3	4
1. Family SES	3.99	2.16	1			
2. active parental mediation	0.75	0.33	0.29 **	1		
3. restrictive parental mediation	0.46	0.36	0.18 **	0.35 **	1	
4. digital literacy	3.60	0.90	0.20 **	0.34 **	0.11 **	1

Note: ** $p < 0.01$

4.2. Difference Analyses

Given that older children have been shown to have higher digital literacy [26], and younger children and girls receive more restrictive and active mediation [23], we examined age and gender differences in digital literacy, restrictive mediation, and active mediation. Examination of questionnaire data revealed no significant gender differences in digital literacy (p = 0.98), restrictive mediation (p = 0.56), and active mediation (p = 0.19). The single-factor analysis of variance confirmed that there was a significant age difference in the subject's reports of digital literacy (F = 8.07; $p < 0.001$), restrictive mediation (F = 5.65; $p < 0.001$), and active mediation (F = 4.04; p = 0.001).

4.3. Testing for the Indirect Effect of Active Parental Mediation and Restrictive Parental Mediation

After controlling for age and gender, the regression model showed that family SES was significantly and positively associated with active parental mediation (β = 0.18, $p < 0.001$), restrictive parental mediation (β = 0.12, $p < 0.01$), and digital literacy (β = 0.18, $p < 0.001$); both active parental mediation (β = 0.23, $p < 0.001$) and restrictive parental mediation were also significantly and positively associated with digital literacy (β = 0.15, $p < 0.001$). When family SES, age, gender, active parental mediation, and restrictive parental mediation were all included as predictors of digital literacy, digital literacy was still significantly and positively associated with family SES (β = 0.13, $p < 0.001$) and active parental mediation (β = 0.23, $p < 0.001$), while its correlation with restrictive parental mediation was insignificant (β = 0.08, $p > 0.05$). The associations among the independent variable, mediating variables, and dependent variable met the prerequisites for further tests of statistical mediation.

To examine the mediation, after controlling for age and gender, we analyzed the indirect effects of active parental mediation and restrictive parental mediation in the relationship between family SES as the independent variable and digital literacy as the dependent variable. The results found that active parental mediation had a significant mediating effect in the association. Family SES was significantly positively related to active parental mediation (β = 0.18, $p < 0.001$), which in turn was significantly positively related to digital literacy (β = 0.23, $p < 0.001$); the indirect effect size was 0.04, and the bias-corrected confidence interval was 0.02 to 0.06. In contrast, the indirect effect of restrictive parental mediation in the association between family SES and digital literacy was not significant (the indirect effect size was 0.01, and the bias-corrected confidence interval was −0.02 to

0.03). The 95% confidence interval of the total mediation effect (0.04, 0.09) did not include 0, indicating that the parallel mediation effect was significant, with an effect size of 0.05 (see in Table 2). The final models for the whole sample are shown in Figure 1.

Table 2. Testing the indirect effects of active and restrictive parental mediation on the relationship between family SES and digital literacy.

Model Pathways	Effect	Boot SE	Boot LLCI	Boot ULCI
family SES → active parental mediation	0.20	0.03	0.12	0.24
family SES → restrictive parental mediation	0.12	0.03	0.05	0.16
active parental mediation → digital literacy	0.23	0.03	0.15	0.30
restrictive parental mediation → digital literacy	0.08	0.03	−0.01	0.15
family SES → active parental mediation → digital literacy	0.04	0.01	0.02	0.06
family SES → restrictive parental mediation → digital literacy	0.01	0.01	−0.02	0.03
family SES → digital literacy (direct effect)	0.13	0.03	0.07	0.19
family SES → digital literacy (total indirect effect)	0.05	0.01	0.04	0.09

Note. 95% confidence interval does not overlap with zero. LL = lower limit; CI = confidence interval; UL = upper limit.

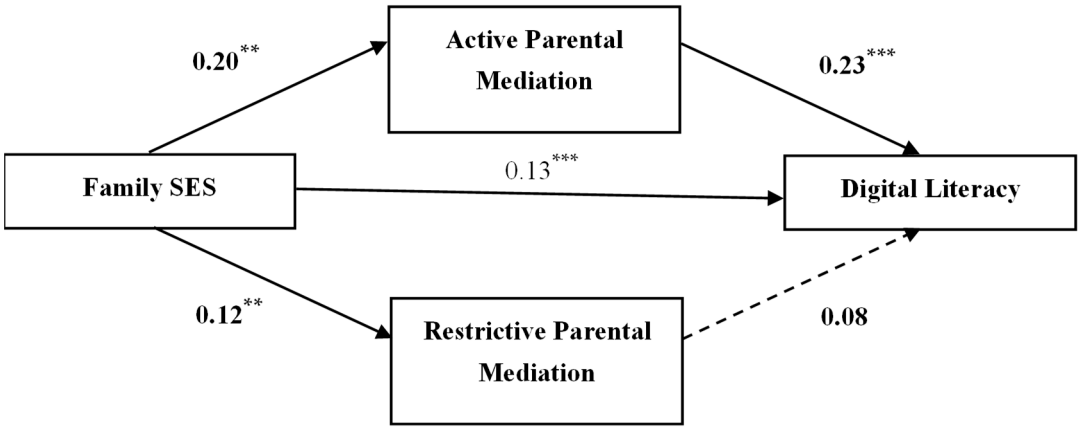

Figure 1. Associations between family SES and digital literacy for the whole sample (N_{total} = 1065). Parallel mediation analysis: active parental mediation and restrictive parental mediation as parallel mediators. Note: ** $p < 0.01$, *** $p < 0.001$.

5. Discussion

5.1. The Direct Path from Family SES to Digital Literacy

Family SES was closely associated with digital literacy, consistent with prior research [6]. To some extent, family SES could affect all aspects of the process of improving digital literacy. First, access to digital media and technology is a prerequisite for developing digital literacy. In particular, people with A lower family SES have lower access to information communication technology. For instance, Eamon found that children with A higher SES were 2.78 times more likely to use computers at home than children with a lower SES [27]. Without Internet access, individuals have less opportunity to use these tools for school and social connection. Second, mastering digital knowledge and developing computer skills allow individuals to efficiently find and organize information. However, children from low SES families are likely to be less knowledgeable about ICT and less proficient in using it [11]. Thus, a low SES appears to be associated with disadvantages with digital literacy that are likely to be exacerbated over time.

5.2. Parental Internet Mediation as an Explanatory Mechanism

It was found that SES was significantly associated with children's digital literacy. However, further analysis showed that the apparent correlation was related to an aspect of

family life, which was associated with both SES and digital literacy, namely parental internet mediation. Moreover, it was active parental mediation, not restrictive parental mediation, that made the difference. For example, children from high-SES families showed higher digital literacy only to the extent that their parents used more active internet mediation. In other words, parents with a higher SES may have more time and energy to mediate their children's internet use [20]. When parents actively participate in children's use of ICT, children are likely to feel supported and cared for, which increases the likelihood of positive development and decreases the likelihood of risky behavior [15]. Through active parental internet mediation, children are provided guidance and advice about using digital media (e.g., explanations for why some websites are good or bad or suggestions about ways to use digital devices safely), thus improving children's digital literacy. In contrast, the pressures that low-SES families face may boast the notion that they cannot afford to adopt digital technology [27], lack the knowledge and experience to proficiently use digital media, and lack the confidence and digital knowledge to guide their children in using specific devices [1].

SES was not only positively related to active parent Internet mediation, but also positively related to restrictive internet mediation. This means that high-SES parents were engaged in more parental mediation of both types than low-SES parents were. This may reflect greater awareness and involvement on the part of high-SES families; even though active parental mediation may be more effective in the promotion of digital literacy, high-SES parents may also use restrictive parental mediation for other purposes, such as limiting the overall use of ICT. Low-SES parents may be relatively less involved in children's ICT use [20]. These parents may be less aware of the risks of digital technology or maybe less confident in managing their children's behavior, even when their children use digital media excessively or inappropriately [27].

At the same time, the result found that although active parental internet mediation explained the association between SES and digital literacy, this was not the case for restrictive parental internet mediation. This was surprising because the correlations among variables suggested that restrictive parental internet mediation was associated with higher digital literacy. However, restrictive parental mediation did not explain the link between SES and digital literacy.

One possible explanation for this unexpected result is that there are possible cultural differences in the influences of restrictive parental mediation [28]. In China, child-rearing ideologies are mostly influenced by Confucian philosophy and traditions [29]: "the subordinate member is required to display loyalty and respect to the senior member, who is required to responsibly and justly govern, teach and discipline the younger members" [29]. Children might be more compliant with their parents' internet mediation than would be true in Western countries. In this context, restrictive parenting may be more common than in Western countries, and there may be fewer negative effects of this parenting practice. Therefore, both restrictive parental mediation and active parental mediation were linked to digital literacy, but only active parental mediation may exert a stronger effect on the levels of digital literacy than restrictive parental mediation. Through restrictive mediation and the control of activities and time online, parents are not really teaching their children how to use digital devices or how to protect their digital identity [24]. They are just checking their children's messages or preventing them from visiting certain sites. Previous research has shown that restrictive mediation is related to a reduction of online opportunities, including using social networking sites to instantly and directly communicate with others, playing games or downloading music/films for entertainment, and searching for information to learn or study [24]. In contrast, active parental mediation could have a more positive effect on children's digital skills.

5.3. Limitations and Implications

Some limitations of this study need to be acknowledged. First, the findings are based on a cross-sectional design with children in central China, which could not reach the causal

inference. In addition, considering the diversity of parenting practices across different cultures, we should limit the generalizability of our conclusions [28]. Future research can adopt longitudinal designs or experimental methods to draw stronger conclusions about causal relations among family socioeconomic status, parental internet mediation, and digital literacy; it will be important to conduct this study with more diverse samples. Second, it was the children, not the parents, who reported their family socioeconomic status and parental mediation practices, which may bias the results. Collecting data from both parents and children could increase the validity of the data. Third, the other mechanism underlying this mechanism and the important individual differences (such as parenting style) should be examined in future studies.

Moreover, the measure of SES had low reliability, and the new version of the Family Affluence Scale (FAS III) may have better internal consistency that makes the results precise [30]. Children were asked about their parents' internet mediation as a collective unit, thus ignoring potential differences between fathers and mothers in attitudes about internet use and mediation strategies. A previous study found that fathers and mothers play different roles in influencing children's physiological and psychological development [31]. Therefore, future studies should compare the specific effects of mothers' and fathers' internet mediation on children's digital literacy. Finally, our research evaluated children's perceptions of their digital literacy. In an earlier study, adolescents overestimated their actual digital literacy [2], and it is unclear if this bias is also apparent in children. This suggests the value of additionally measuring actual digital literacy in future research.

Despite this study's limitations, the results have value in terms of their potential application. To the best of our knowledge, this is one of the first studies to demonstrate that parental internet mediation (active and restrictive parental mediation) may explain the correlation between family SES and children's digital literacy. These results also expand our understanding of factors that may shape digital literacy. Moreover, this research provides information that would be relevant for interventions designed to improve children's digital literacy, especially for children from low-SES families. In this socioeconomic context, both teachers and parents may need support in gaining access to digital technology and in helping children learn early digital literacy.

A previous study showed that restrictive parental mediation mainly reduced online risks at the expense of online opportunities [24]. Restricting digital media usage may be helpful, such as reducing the risks associated with the use of ICT, but it is less helpful for promoting children's digital literacy. This indicates the value of developing active parental mediation rather than restrictive parental mediation, with the aim of helping children regulate their usage and develop good digital literacy. Full participation in children's internet activity, including discussions before, during, and after internet use, can help children weigh the benefits and risks of their internet activity, use the internet to acquire knowledge from credible sources, and use the internet effectively for educational purposes. These goals are better met by active parental internet mediation than by restrictive parental internet mediation.

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