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# Factors Influencing Adolescents' Digital Literacy in Online Games: A Systematic Literature Review

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**Abstract**

The growing prominence of online games as spaces for intensive digital interaction has encouraged adolescents to engage more actively in gaming, while simultaneously increasing their exposure to a range of online opportunities and risks. This condition requires adolescents to possess adequate digital literacy skills, enabling them to navigate information, interact safely, and understand the social implications of their behaviour in virtual environments. This study aims to identify individual, social, and platform-level factors that influence adolescents' digital literacy in the context of online games and to explain how these relationships are discussed in prior empirical research. Using a Systematic Literature Review method based on PRISMA 2020, this study analyses 26 articles selected through identification, screening, quality appraisal, and data extraction. The results demonstrate that adolescents' digital literacy is influenced by individual competencies, such as digital skills, self-efficacy, critical thinking, and psychological conditions; social factors, including parental mediation, peer support, and socioeconomic conditions; and platform factors, including game feature design, interaction mechanisms, and characteristics of metaverse environments. The relationships among these factors are mutually reinforcing: digital literacy develops when a responsive social environment and safe platform design support individual competencies. This study highlights the importance of an ecological approach to understanding and enhancing adolescents' digital literacy in online games. It encourages further research to explore more specific cultural contexts and game mechanics.

## A. Introduction

The rapid growth of the online gaming industry over the past decade has significantly transformed adolescents' patterns of digital interaction. Supported by technological advancements, increased internet access, and smartphone penetration, online games have become one of the most active digital spaces used by adolescents in their daily lives [1], [2]. In Indonesia, this trend is also prominent, where adolescents regard online games not only as a form of entertainment but also as a social space that partially replaces traditional face-to-face interaction [3], [4].


**Figure 1.** Age Distribution of Game Players in the United States
*Source: Statista, Entertainment Software Association Survey (2022)* [5]

This figure illustrates that gaming is a cross-age activity, with the 18–34 age group dominating at 36 per cent, followed by the 35–54 age group at 25 per cent, and those under 18 years at 24 per cent. In addition, 71 per cent of children under the age of 18 are reported to play games. These findings indicate that digital games have become an integral part of young people's lives and are relevant to examine within the context of their digital development. Online games have evolved into spaces for social interaction, creativity, and complex digital learning. Features such as chat, voice, guilds, and matchmaking enable adolescents to collaborate, strategize, and construct their social identities. [6], [7]. Online gaming environments also support the development of soft skills such as communication, problem-solving, cooperation, and empathy, functioning as informal yet intensive digital learning spaces [8], [9]. Although online games offer positive potential, the intensity of gaming activities also presents various digital risks. Adolescents constitute the group most vulnerable to cyberbullying, exposure to harmful content, social manipulation, grooming, and gaming addiction [10], [11]. This vulnerability is shaped by psychosocial developmental factors, low self-control, high online exposure, and insufficient digital literacy [12], [13]. Such risks increase when social environments, such as families or schools, do not play an optimal role in providing digital guidance.

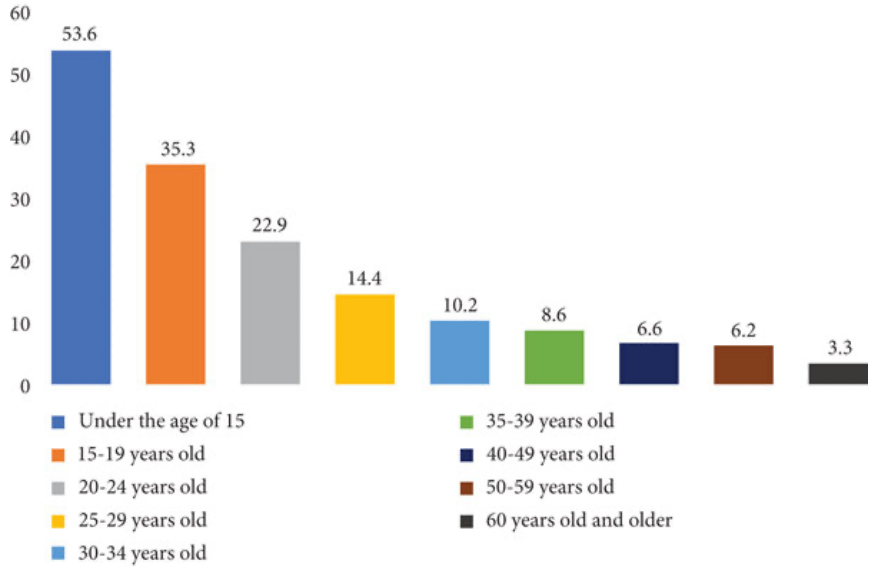



**Figure 2.** Age Group Distribution of Online Game Players
*Source: Bhatiasevi, Rukumnuaykit and Pholphirul (2023)* [14]

This figure shows that the age group under 15 years constitutes the most significant proportion of online game users, at 53.6 per cent, followed by the 15–19 age group at 35.3 per cent. The dominance of younger age groups indicates the urgency of digital literacy among adolescents, as they are the population with the highest exposure to game-based digital interactions. In this context, digital literacy becomes a core competency that adolescents must possess [14]. Digital literacy is not limited to technical abilities but also encompasses information skills, communication, content evaluation, digital safety, and media ethics [15]. Adolescents with high levels of digital literacy are more capable of managing risks, identifying digital manipulation, and maintaining their personal safety when interacting in online games [16], [17].

Social environmental factors influence the development of adolescents' digital literacy. Parental education, styles of digital mediation, school support, and dynamics within gaming communities have been shown to play essential roles in shaping adolescents' digital skills. [18], [19]. Active parental mediation, school-based literacy programs, and positive gaming community environments have been shown to enhance digital literacy while reducing the potential for risky behaviors. However, most prior research has focused more on digital literacy in social media and formal educational contexts, thereby failing to capture in depth the dynamics of digital interactions that occur in online games [20], [21], [22].

Online games possess unique characteristics, such as real-time interaction, virtual economies, intensive collaboration systems, and community dynamics, that differ from other digital platforms ([22], [23]). Therefore, studies on digital literacy in the context of online games require a different and more comprehensive approach. This research gap indicates the need for a Systematic Literature Review to systematically map the factors that influence adolescents' digital literacy in online games. An SLR is necessary to identify patterns in empirical findings, formulate the most influential determinant factors, and develop theoretical frameworks that can serve as the foundation for subsequent research and digital

education interventions for adolescents. The rapid development of the online gaming ecosystem, as described in the background section, indicates that this digital space significantly influences adolescents' patterns of interaction, learning, and behaviour, thereby necessitating an in-depth examination of their digital literacy competencies.

The primary issue arising from this phenomenon is that adolescents have become the group with the highest level of engagement in online games, while also being the most vulnerable to various digital risks. Although online games provide opportunities for collaboration, creativity, and digital skill development, they also create possibilities for cyberbullying, exposure to harmful content, social manipulation, and addiction. On the other hand, adequate digital literacy has been shown to protect adolescents from these risks; however, such competencies do not develop automatically and are strongly influenced by various factors, including individual characteristics, family support, peer dynamics, and the design and safety features of digital platforms. This complexity of factors operating within the online gaming ecosystem necessitates a more systematic and in-depth understanding. Considering this complexity, this study is designed to formulate objectives aligned with the need to understand how adolescents' digital literacy is shaped within the context of online games. Therefore, the aim of this research is to identify and classify individual, social, and platform-level factors that influence adolescents' digital literacy, while also analysing how these relationships have been described in prior empirical studies. This explanation forms the basis for understanding how digital literacy competencies are developed, influenced, or even weakened within the online gaming ecosystem. To direct the research focus more specifically, it is necessary to formulate research questions that can guide the systematic literature review process. Thus, the research questions posed in this study are as follows:

1. What individual, social, and platform-level factors influence adolescents' digital literacy in the context of online games based on empirical research?
2. How does the literature explain the relationships among these factors and the development of adolescents' digital literacy competencies in online gaming environments?

The urgency of this research becomes increasingly evident when viewed through the lens of gaps that have not been extensively addressed in previous studies. Most research on adolescents' digital literacy remains focused on social media or educational environments. It therefore has not provided an in-depth explanation of how digital literacy is formed within the context of online games, which are characterized by interactivity, immersion, and competition. To date, no systematic literature review has been identified that integrates three levels of analysis, namely individual, social, and platform, to understand how these levels operate together in shaping adolescents' digital literacy within digital gaming environments. Previous studies have also not described the mechanisms that connect these various factors, such as how individual abilities are influenced by social mediation and specific game features in ways that shape safe and responsible digital behaviour. Considering these gaps, this research makes a new contribution by providing a more targeted mapping of empirical findings and developing a conceptual framework that can be used to design research

instruments, digital education programs, and adolescent protection policies more aligned with the characteristics of the online gaming environment.

## B. Methods

This study employs a Systematic Literature Review approach structured in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines as introduced by Page et al. (2021) [23]. The SLR approach was selected because it provides a systematic, transparent, and replicable procedure for comprehensively identifying, selecting, and synthesizing empirical evidence. This method aligns with the study's objective, which is to gain an in-depth understanding of the factors influencing adolescents' digital literacy in the context of online games. This topic has been relatively seldom discussed in an integrated manner within the academic literature.

The first stage in the SLR process is identification, which involves collecting all potential articles through searches conducted across four reputable academic databases: Scopus, Wiley Online Library, Taylor and Francis Online, and ScienceDirect. These databases were selected based on the consideration that each provides multidisciplinary coverage relevant to digital literacy, online interaction risks, and adolescent behavior in digital environments. To ensure a focused search process, the researcher employed a combination of keywords that reflect the three main dimensions of the study: digital literacy, online games and virtual interaction (including online games and virtual worlds), and the target age group (adolescents, teenagers, and youth). These keywords were combined using Boolean operators to create a consistent search string applied across all databases.

*("digital literacy" OR "digital competence") AND ("online game" OR "video game" OR "metaverse" OR "virtual world") AND (adolescen* OR youth OR teenager)*

The second stage is screening, which involves filtering articles based on their titles and abstracts using predetermined inclusion and exclusion criteria. The inclusion criteria comprise articles published between 2020 and 2025, written in English or Indonesian, originating from reputable journals or conference proceedings, that present empirical data and demonstrate direct relevance to the topic of adolescents' digital literacy or digital behaviour in online games. The exclusion criteria include articles categorized as review papers or conceptual papers, those unavailable in full-text form, duplicates from other databases, or studies that do not specifically discuss adolescents or digital literacy contexts. These criteria were designed to ensure that the literature analyzed provides empirical contributions to understanding the factors that influence adolescents' digital literacy. The requirements are presented in the following table:

**Table 1.** Inclusion and Exclusion Criteria for the Literature

| Type | Criteria |
|---|---|
| **Inclusion** | Articles published between 2020 and 2025; written in English or Indonesian; empirical studies; focused on digital literacy, digital behaviour, or adolescent online risks; relevant to the context of online games or digital interaction; employing theoretical frameworks related to digital behaviour. |

| | |
|---|---|
| **Exclusion** | Review papers or SLRs; full-text unavailable; duplicates; focused on non-adolescent populations; not addressing digital literacy; focused on economic or technological sectors without social context. |

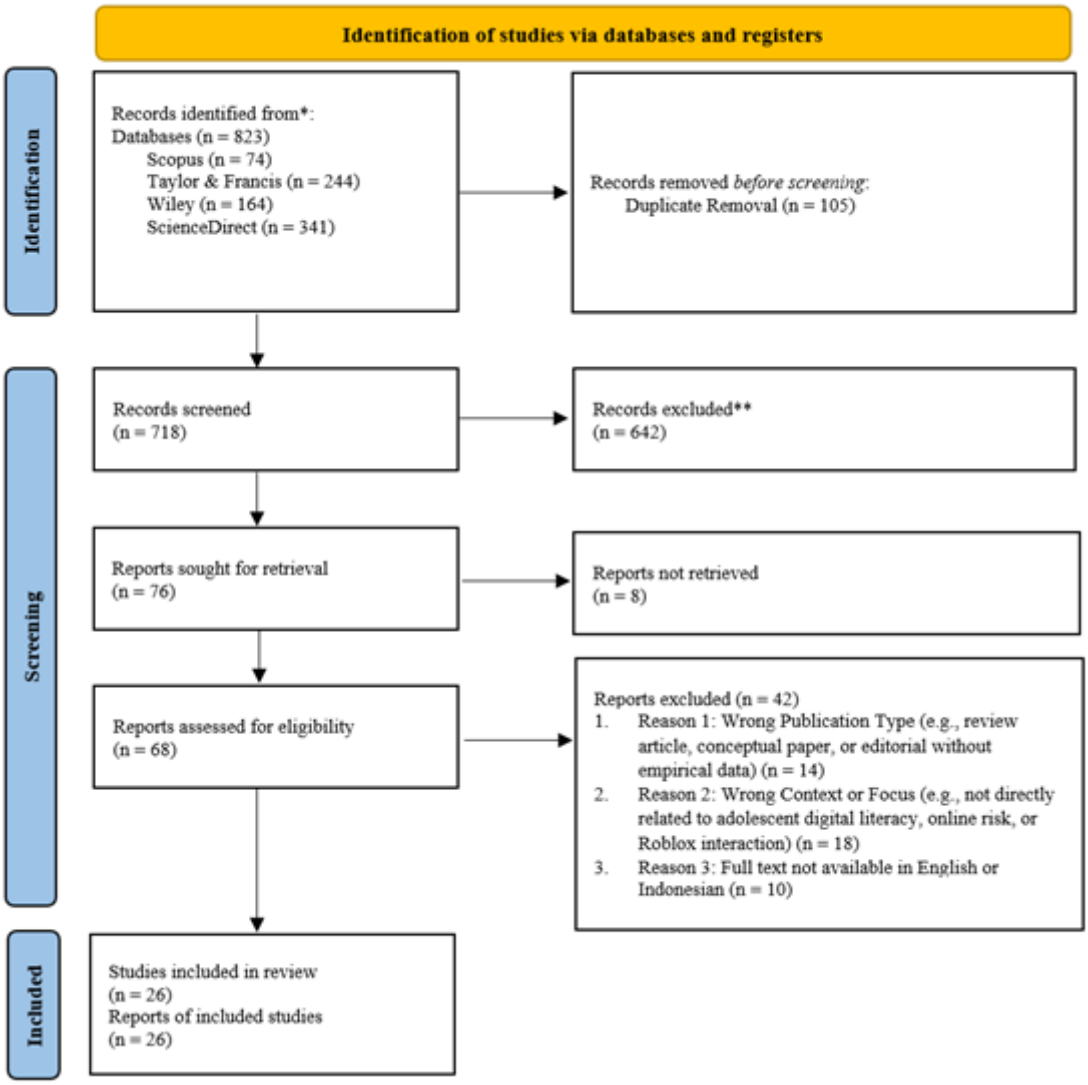
In addition to the initial screening, a Quality Assessment Checklist (QAC) was also employed to evaluate the methodological adequacy of each article. The quality assessment was conducted using seven leading indicators, which include clarity of research objectives, appropriateness of methodology, consistency in theoretical application, validity of data analysis techniques, relevance of research findings, depth of discussion, and practical contributions within the context of adolescents' digital literacy. These indicators are presented in the following table:

**Table 2.** Quality Assessment Checklist (QAC)

| Code | Assessment Questions |
|---|---|
| Q1 | Are the research objectives clearly stated and relevant to the topic of adolescents' digital literacy? |
| Q2 | Is the methodology described in detail and aligned with the research objectives? |
| Q3 | Is the theoretical framework applied appropriately and consistently? |
| Q4 | Are the data analysis techniques valid and replicable? |
| Q5 | Are the research findings relevant to adolescents' digital literacy or online risks? |
| Q6 | Does the discussion provide logical and in-depth theoretical interpretation? |
| Q7 | Do the conclusions offer practical recommendations for adolescent digital education or protection? |

The third stage is inclusion, which refers to the final selection of articles that meet all criteria and pass the quality assessment. The processes of identification, screening, eligibility evaluation, and final selection are visualized in the following PRISMA diagram:

**Figure 3.** Literature Selection Flow Using PRISMA 2020




This figure illustrates the process of identifying 823 articles, removing 105 duplicates, screening 718 articles based on titles and abstracts, evaluating 68 full-text articles, and selecting 26 articles that met the criteria and were included in this SLR analysis. After the articles were selected, a data extraction process was conducted, which included collecting essential information such as research methods, theoretical frameworks, respondent characteristics, variables examined, game platform contexts, and key findings related to adolescents' digital literacy. Data analysis was carried out using two approaches. First, thematic synthesis was employed to identify patterns of factors influencing digital literacy at the individual, social, and platform levels. Second, a bibliometric analysis was conducted using VOSviewer software to map keyword relationships, identify dominant thematic clusters, and visualize research trends related to adolescents' digital literacy in online games.

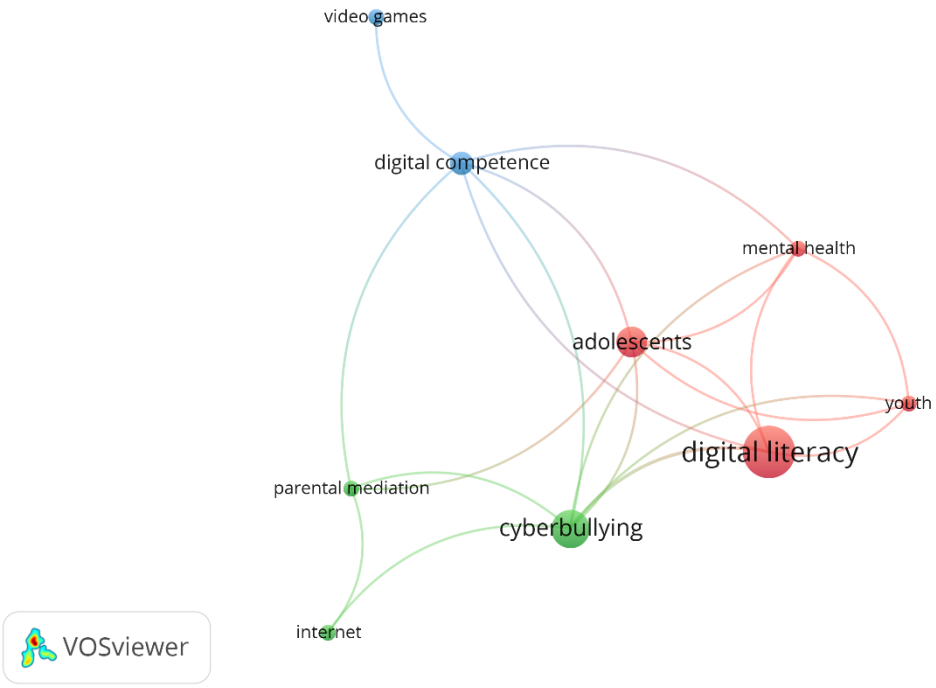



**Figure 4.** Keyword Network Visualization Using VOSviewer

This figure illustrates the conceptual relationships among the most frequently occurring keywords in the literature. Larger nodes, such as digital literacy and adolescents, indicate higher frequencies of appearance, while connecting lines represent the strength of relationships between concepts. The colour clusters identify dominant research themes, such as digital literacy and online risks, the role of parental mediation, digital competencies, and the context of video games. This visualization helps reveal the evolving structure of knowledge and the interconnected research areas within studies on adolescents' digital literacy.

## C. Results

### Quality and Characteristics of the Selected Studies

To ensure that only studies with adequate methodological quality were analysed in this review, all articles that reached the full-text assessment stage were evaluated using the Quality Assessment Checklist (QAC). This assessment helped identify studies that were relevant, methodologically robust, and aligned with the analytical objectives concerning adolescents' digital literacy in the context of online games. A summary of the quality assessment results is presented in the following table.

**Table 3.** Summary of Quality Assessment Results (QAC)

| Description | Number of Articles |
|---|---|
| Total full-text articles assessed | 68 |

| | |
|---|---|
| Articles that passed QAC (score ≥ 5) | 26 |
| Articles that did not pass QAC | 42 |
| Average quality score | 5.0 |
| Score range | 2–7 |

Based on the results of the quality assessment, a total of 26 articles were deemed suitable for further analysis. These studies exhibit variation in research contexts, methods, and analytical focus, yet collectively provide a rich understanding of the individual, social, and platform factors that contribute to shaping adolescents' digital literacy within the online gaming ecosystem. A summary of the scope and key characteristics of each study is presented in the following table.

**Table 4.** Summary of Studies Analyzing Factors of Adolescents' Digital Literacy in Online Games

| No. | Authors | Method and Context | Platform | Type of Factor | Variable Description | Study Context Category |
|---|---|---|---|---|---|---|
| 1 | Chiu et al. (2024) [24] | Mixed method: teacher survey and school document analysis | Not specified (general digital environment) | Individual | Digital competence | Non-game but relevant |
| 2 | Ganesh et al. (2022) [25] | Mixed method: 2×2 experiment (game vs NSA education) | Smartphone (Android) | Individual | Self-efficacy and security behaviour | Digital behaviour related to games |
| 3 | Akram & Lavuri (2024) [26] | Quantitative survey (n=431); SEM | Digital channels for information seeking | Individual | Online perceived risk | Non-game but relevant |
| 4 | Alaghband Rad et al. (2025) [27] | Qualitative: FGD and interviews; intervention development | General digital technologies (social media, games, educational apps) | Social | Parental mediation and monitoring | Non-game but relevant |
| 5 | Wu et al. (2023) [28] | MOSG experiment (self-disclosure, self-consciousness, affordances) | MOSG | Individual and Platform | Self-disclosure, public self-consciousness, game affordances | Metaverse or virtual world |
| 6 | Reginasari et al. (2021) [29] | Qualitative: thematic analysis (171 parents) | General internet and digital media | Social | Parental monitoring strategies | Non-game but relevant |
| 7 | Bonales-Daimiel et al. (2024) [30] | Qualitative: 31 interviews and gameplay observation | Sandbox metaverse games (Roblox, Fortnite, Minecraft) | Social | Social interaction and parental perception | Metaverse or virtual world |

| | | | | | | |
|---|---|---|---|---|---|---|
| 8 | Ziegel et al. (2025) [31] | Qualitative: 71 FGDs across 11 countries (adolescents aged 12–19) | Social media and online gaming | Individual | Social comparison | Non-game but relevant |
| 9 | Grigorescu et al. (2025) [32] | Multivariate analysis: logistic regression, PCA, GIS (Eurostat, 28 countries) | General internet (social media, messaging, daily use) | Individual | Low digital skills | Non-game but relevant |
| 10 | Maltby et al. (2024) [33] | Qualitative: thematic analysis (492 UK school principals) | General social media | Individual | Digital literacy and information perception | Non-game but relevant |
| 11 | Rangel-Pérez et al. (2023) [34] | Quantitative survey (n=371); SEM | Roblox, Fortnite, Brawl Stars | Individual | ICT skills pathway | Online game |
| 12 | Nadeem et al. (2025) [35] | Mixed method: interviews (n=100) and survey (n=337) | Roblox (Nikeland and Vans World) | Individual | Digital literacy (metaverse navigation) | Metaverse or virtual world |
| 13 | [36] | Quantitative survey (n=287); SEM (mobile gamers) | General mobile games | Individual | Online mobile game addiction | Online game |
| 14 | Tso et al. (2022) [37] | Cross-sectional study: 1,956 students; digital competence assessment and device-use questionnaire | Online games and general digital device use | Individual | Digital competence (general) | Non-game but relevant |
| 15 | Bai et al. (2022) [38] | Quantitative survey: 725 secondary school adolescents | General SNS (WeChat, Weibo, Q-zone) | Individual | Critical digital literacy | Non-game but relevant |
| 16 | Soldatova et al. (2020) [39] | Quantitative survey: 1,553 adolescents and 1,219 parents (EU Kids | General internet (social media, web, digital | Social | Parental mediation strategies | Non-game but relevant |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Online Russia) | services) | | | |
| 17 | Prabakaran et al. (2025) [40] | Mixed methods: metaverse vs traditional online experiment; pre–post retention test | AR/VR-based metaverse for language learning (immersive virtual environment similar to 3D educational games) | Platform | Metaverse exposure | Metaverse or virtual world |
| 18 | Tomczyk & Eger (2020) [41] | Quantitative survey: 1,693 students (digital security literacy test) | General internet and digital services (social media, online transactions, content sharing) | Individual | Digital security competence | Non-game but relevant |
| 19 | Ghazali et al. (2025) [42] | Cross-sectional study: 522 parents; KEPS-I questionnaire | General internet and social media | Social | Parental awareness of cyberbullying | Non-game but relevant |
| 20 | López-Martínez et al. (2024) [43] | Qualitative: 40 parent–teen dyad interviews (based on socioeconomic stratification) | General social media (Instagram, TikTok, YouTube, WhatsApp, Facebook) | Social | Socioeconomic status and parental mediation | Non-game but relevant |
| 21 | Thongnopakun et al. (2023) [44] | Online cross-sectional study: 720 university students; regression analysis on | Social media and online activities (including use for gaming) | Social | Social support | Non-game but relevant |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | cybervictimization | | | | |
| 22 | Balt et al. (2023) [45] | Qualitative: psychological autopsy; 55 interviews (parents and friends) | Social media and online communities (including game chats and forums) | Social | Digital literacy and parental mediation | Non-game but relevant |
| 23 | Muhammed & Samak (2025) [46] | Cross-sectional study: 3,361 adolescents; analysis of demographic and psychological factors | Social media and general digital platforms (chat, social media, games, other services) | Individual | Self-esteem | Non-game but relevant |
| 24 | Iqbal et al. (2021) [47] | Cross-sectional study: 347 mothers/caregivers; predictor analysis of internet mediation | General internet (web, social media, games, and online applications) | Social | Parental mediation (comprehensive) | Non-game but relevant |
| 25 | Larrañaga et al. (2022) [48] | Quantitative survey: 850 parents (EU Kids Online Spain) | General internet and social media | Social | Parental attitudes toward cyberbullying | Non-game but relevant |
| 26 | Ayhan et al. (2025) [49] | Quantitative survey: 664 secondary school students in Kyrgyzstan | Social media, online games, SMS, WhatsApp | Individual | Digital literacy and security awareness | Non-game but relevant |

Based on Table 4, it can be observed that previous studies employ a wide range of methodological approaches, including quantitative surveys, qualitative studies, experiments, and mixed-methods approaches. The digital platforms examined in these studies also vary, ranging from general gaming environments and mobile games to virtual configurations such as Roblox, Fortnite, and the metaverse. The table shows that most studies highlight individual factors such as digital competence, self-efficacy, critical digital literacy, online perceived risk, and digital security skills. Social factors appear in studies that examine the role of parental mediation, peer support, and digital community dynamics as essential elements influencing adolescents' digital behaviour. Meanwhile, platform-level factors are reflected in research focusing on game affordances, interaction features, and metaverse exposure, all of which shape how adolescents understand risks and navigate digital spaces. Interestingly, a substantial proportion of the articles fall into the Non-Game but Relevant category. Methodologically, this dominance is not problematic because adolescents' digital literacy is not formed solely within gaming contexts but through various interconnected digital activities such as social media use, online interactions, online risk exposure, and parental mediation patterns. These non-game studies actually broaden the understanding of fundamental factors that shape digital competence, such as self-regulation, evaluative ability, data protection, and online social interaction patterns, all of which also emerge and operate within online gaming environments. Thus, although not all studies focus directly on games, findings from the non-game category remain relevant because they provide a strong conceptual foundation for explaining how adolescents develop digital literacy that subsequently transfers into online gaming contexts. Overall, the synthesis in Table 4 demonstrates that adolescents' digital literacy is not merely a technical skill but the result of a complex interaction between individual capacities, the social contexts in which adolescents engage, and the characteristics of digital platforms, including online games. These patterns of findings provide a strong basis for subsequent analysis of how the three categories of factors influence adolescents' digital literacy competencies within online gaming environments.

## Publication Trends and Distribution of Research Factors

The analysis of publication trends was conducted to examine how academic attention toward adolescents' digital literacy in the context of online games has developed in recent years, as well as to identify thematic patterns in the factors most frequently studied. This examination is essential for understanding the direction of research development, the primary areas of focus among scholars, and the remaining gaps in knowledge. Three dimensions are analysed in this section: the distribution of research factor themes, the distribution of countries in which the studies were conducted, and the distribution of publication years.

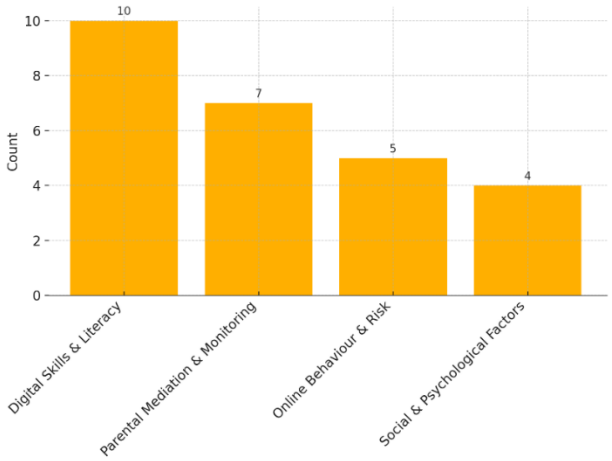



**Figure 5.** Distribution of Factor Themes in the Reviewed Studies

Based on Figure 5, the theme of Digital Skills and Digital Literacy constitutes the category with the highest number of studies, totalling 10 publications. This theme encompasses variables such as digital competence, critical digital literacy, navigating the metaverse, and digital security competence. The dominance of this theme suggests that individual technical and cognitive abilities remain the primary focus in research on adolescents' digital literacy in online games. The second most prominent theme is Parental Mediation and Monitoring, with 7 publications. Variables in this category, such as parental mediation, monitoring strategies, and parental awareness, show that social and family factors play a crucial role in shaping adolescents' digital literacy. Next, the theme of Online Behaviour and Risk (5 studies) highlights the importance of understanding digital behaviour, risk exposure, gaming addiction, and self-disclosure in online environments. Finally, the theme of Social and Psychological Factors (4 studies) highlights the role of social support, social comparison, and psychological aspects, such as self-esteem, in influencing adolescents' readiness for digital literacy. These four themes demonstrate that adolescents' digital literacy in online games is a multidimensional phenomenon involving individual competencies, social dynamics, and digital behaviour within risk-laden contexts.

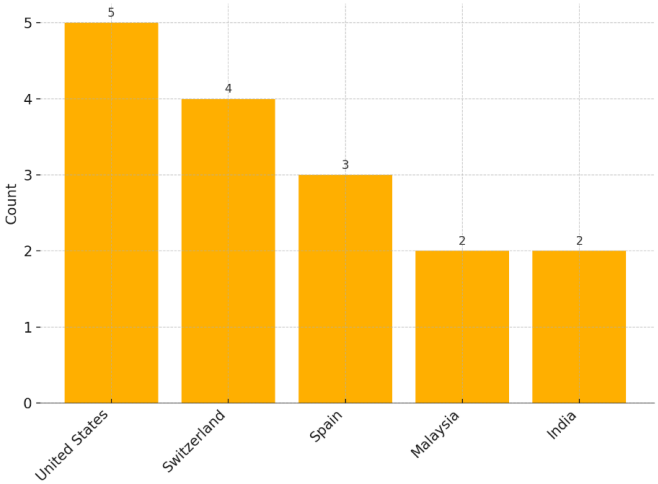


**Figure 6.** Distribution of Countries in Studies on Adolescents' Digital Literacy

Based on Figure 6, the five countries with the highest number of publications consist of the United States (5 studies), Switzerland (4 studies), Spain (3 studies), as well as Malaysia and India (2 studies each). The dominance of publications from the United States and Switzerland can be explained by the strength of their academic ecosystems and long-standing research traditions in digital behaviour, online safety, and youth digital wellbeing. Spain also appears significant, particularly due to the increasing number of studies focusing on family dynamics, digital social interaction, and the experiences of children and adolescents on platforms such as Roblox and Fortnite. Meanwhile, Malaysia and India reflect the growing interest in digital literacy research in the Asian region, particularly regarding cyberbullying, parental awareness, and the use of games as educational tools. This distribution pattern indicates that issues related to adolescents' digital literacy and digital risks in online games have become matters of global concern across continents, although cultural contexts in each country may influence risk patterns and digital literacy practices among adolescents.

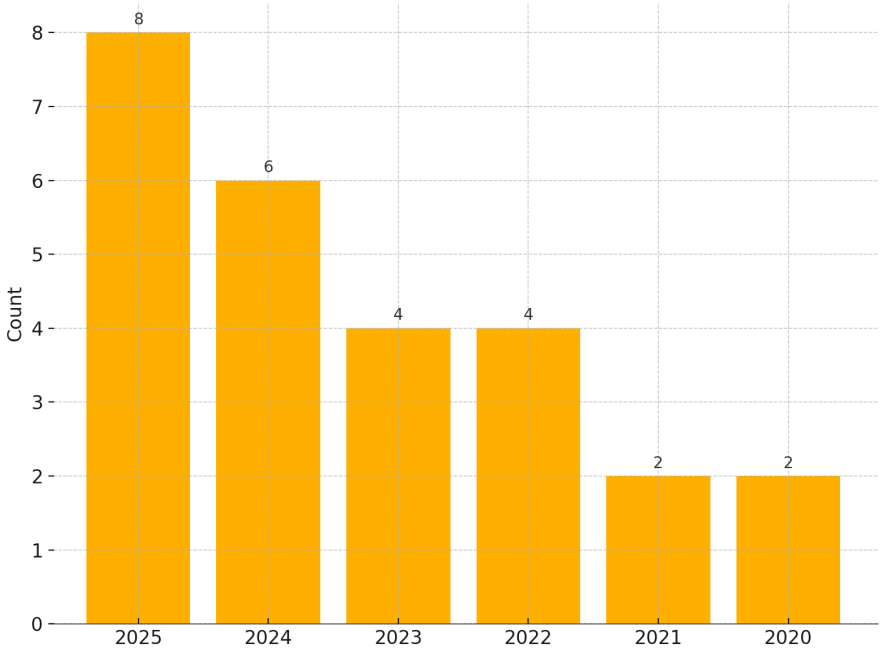



**Figure 7.** Distribution of Publication Years of the Reviewed Studies

Based on Figure 7, there is a significant increase in publications during the period from 2023 to 2025, with a peak in 2025 at 8 publications and 2024 with 6 publications. These data indicate that the topic of adolescents' digital literacy in online games is a very recent and rapidly developing issue, in line with the growth of metaverse platforms, the rising popularity of Roblox, and the increasing attention to digital risks in the post-pandemic period. The years before 2022 show a lower number of publications (2 publications in both 2020 and 2021), indicating that research on children's and adolescents' digital literacy was previously more centered on social media rather than online gaming environments. The surge in

publications over the past three years suggests a shift in academic attention toward a more comprehensive understanding of how adolescents interact, learn, and confront risks in virtual game-based environments.

## Discussion

### Synthesis of Individual, Social, and Platform Factors Shaping Adolescents' Digital Literacy in Online Games

The synthesis of the 26 reviewed articles demonstrates that adolescents' digital literacy in the context of online games results from multilayered interactions among individual, social, and platform-level factors. These three levels are inseparable because adolescents' digital literacy competencies are always mediated by social relationships at home and school, while concurrently shaped by the technological design of the games and virtual environments they use. Overall, the findings of previous studies indicate that digital literacy is not merely a collection of technical skills but a reflective capacity to navigate risks, evaluate information, and manage behavior and identity within digital play spaces.

At the individual level, most studies position digital competence and digital skills as direct determinants of adolescents' digital literacy. Tso et al. (2022) show that higher levels of digital competence correlate with adolescents' ability to use online games and digital devices more safely and purposefully. Similar findings appear in Tomczyk and Eger (2020), who emphasize that digital security competence enables adolescents to identify scams, phishing attempts, and risky practices while playing games or conducting transactions in digital environments. Bai et al. (2022) highlight critical digital literacy as the ability to interpret content on social networking sites, a skill that becomes relevant when adolescents transfer similar patterns of information consumption into in-game chat environments and guild communities. In contrast, cross-national analyses by Grigorescu et al. (2025) reveal that low levels of basic digital skills increase vulnerability to online risks, weakening adolescents' overall digital literacy even when they are highly connected to the internet.

Cognitive and affective dimensions also emerge strongly at the individual level. Ganesh et al. (2022) show that self-efficacy and digital security behavior significantly influence the extent to which adolescents make careful decisions in smartphone-based games. Adolescents who feel capable of protecting themselves tend to manage privacy settings more proactively and limit the sharing of personal information. Conversely, Akram and Lavuri (2024) illustrate that low online perceived risk is associated with impulsive and less reflective digital behavior, a situation that may easily occur in fast-paced interactive gaming environments. Psychologically, Muhammed and Samak (2025) show that self-esteem shapes how adolescents respond to social pressure and competitive dynamics on digital platforms; those with lower self-esteem are more vulnerable to unhealthy social comparison and validation-seeking. Findings by Ziegel et al. (2025) reinforce that social comparison practiced on social media easily transfers into game-based environments such as leaderboards, rankings, and avatar cosmetics, thus influencing how adolescents interpret their digital presence. Patterns of gameplay and addictive tendencies are also part of individual factors. Bodnar et al. (2023)

find that online mobile game addiction is associated with reduced self-control and increased exposure to risky situations, such as uncontrolled financial spending or prolonged engagement in toxic interactions. In this context, digital literacy extends beyond understanding security features to include the ability to regulate playtime, recognize signs of addictive gameplay, and negotiate healthy boundaries between gaming and offline life.

At the social level, parental mediation consistently emerges as a central factor. Multiple studies highlight typologies of parental mediation, including active mediation, restrictive mediation, monitoring, and technical mediation (Soldatova et al., 2020; Iqbal et al., 2021). Iqbal et al. (2021) demonstrate that mothers with stronger digital skills tend to employ active and constructive monitoring, which enhances adolescents' resilience and coping abilities online. Ghazali et al. (2025) demonstrate that greater parental awareness of cyberbullying prompts more proactive dialogue and guidance on digital safety. In contrast, Larrañaga et al. (2022) find that parents often underestimate the extent of cyberbullying experienced by their children, leading to insufficient support and mediation. Social dynamics extend beyond the family to include peers, schools, and digital community structures. Thongnopakun et al. (2023) emphasise that social support acts as a protective factor against cybervictimization among young adults who use social media and the internet extensively, including for gaming. In supportive community environments, adolescents are more likely to report risky incidents and negotiate shared norms of acceptable digital behaviour. López-Martínez et al. (2024) link socioeconomic status to parental mediation patterns and access to digital learning resources, raising important concerns about disparities in digital literacy across socioeconomic backgrounds. Findings from Balt et al. (2023) on extreme cases leading to suicide underscore that when family support is weak and digital literacy is inadequate, interactions in social media and online communities, including gaming channels, can intensify psychological vulnerabilities.

At the platform level, several studies demonstrate that the design and affordances of digital environments directly shape adolescents' digital literacy needs and practices. Wu et al. (2023) show that game affordances in multiplayer online social games influence adolescents' self-disclosure and management of public self-awareness. Bonales-Daimiel et al. (2024), through observations in sandbox metaverse games such as Roblox and Fortnite, find that highly open and creative game worlds encourage experimentation with digital identities but also expose adolescents to a wide spectrum of interactions, both supportive and harmful. Nadeem et al. (2025) and Rangel-Pérez et al. (2023) highlight that navigating metaverse and multiplayer game environments requires advanced digital literacy, as adolescents must understand virtual economic mechanics, reputation systems, and the implications of their actions within continuously connected ecosystems. Prabakaran et al. (2025) add that exposure to metaverse-based learning environments can enhance engagement, but long-term benefits emerge only when adolescents possess sufficient digital literacy to manage information, privacy, and social interactions in immersive spaces.

Synthesizing these findings, empirical evidence shows that adolescents' digital literacy in online games is shaped by a combination of individual competencies, social support and regulation, and platform design and culture.

Adolescents who possess strong digital competence, high self-efficacy, and healthy self-esteem are better equipped to leverage game features for learning and networking while avoiding risky behavior. However, these capacities are significantly shaped by the extent to which parents and social environments provide dialogic and empowering mediation rather than restrictions alone. Simultaneously, online gaming platforms can serve as catalysts for strengthening digital literacy when they offer clear safety features, transparent rules, and accessible reporting mechanisms, but can exacerbate vulnerabilities when designed primarily for monetization and engagement without protections for young users.

In sum, adolescents' digital literacy in online games is best understood as an ecology involving three core pillars: individual empowerment through digital literacy education that integrates technical, self-regulatory, and critical-reflective skills; social empowerment through more dialogic and supportive parental and school mediation; and platform-level advocacy for safety by design in game affordances and interaction mechanics. Without concurrent intervention at all three levels, adolescents' digital literacy in online games risks becoming unbalanced, strong in technical skills but weak in self-protection, critical capacity, and psychosocial digital wellbeing.

**Dynamics of the Relationships among Individual, Social, and Platform Factors in the Development of Adolescents' Digital Literacy in Online Game Environments**

The analyzed literature shows that the development of adolescents' digital literacy in online games does not occur in isolation but emerges from simultaneous interactions among individual, social, and platform-level factors. At the individual level, digital competence functions as the foundational element that shapes how adolescents interpret digital interactions. Digital competence connects everyday technological exposure with adolescents' ability to conduct critical evaluation, manage digital safety, and recognize risks within gaming environments [24], [37]. Beyond technical skills, digital literacy develops through critical thinking abilities such as validating information, detecting manipulation, and understanding the implications of game features [33], [38]. When adolescents have low digital competence, their exposure to harmful content, misinformation, and toxic interactions increases significantly, weakening overall digital literacy development [32].

Psychological factors form an important bridge between gameplay experiences and literacy competencies. Self-efficacy strengthens adolescents' tendencies to regulate privacy, filter conversations, and avoid risky in-game situations [25]. In contrast, low perceived risk is associated with impulsive and less reflective engagement with game features, including interactions with strangers or unsafe links [26]. Psychological dimensions such as self-esteem and tendencies toward social comparison mediate how adolescents respond to competitive pressures in leaderboards, rankings, or avatar identity spaces [31], [46]. Moreover, online mobile game addiction weakens reflective capacity and shifts adolescents' focus away from critical consideration toward reward-driven repetition, inhibiting the development of digital literacy [45].

At the social level, research consistently shows that the relationship between individual factors and digital literacy is shaped by family and community contexts. Dialogic forms of active parental mediation and monitoring strengthen adolescents' ability to understand risks and apply protective strategies consistently [39], [47]. Parents with higher digital skills are better able to explain consequences of online interactions, thereby reinforcing the association between individual competencies and digital literacy [29]. Conversely, when parents underestimate digital risks such as cyberbullying, adolescents lose important normative references for evaluating online interactions [48]. Parental awareness surrounding digital safety issues also shapes the quality of guidance, influencing how parents support adolescents in managing cyberharassment, social manipulation, or identity-related risks [42].

Peer support functions as a buffer that moderates the effects of negative content exposure on digital literacy development. In online community contexts, peer support increases adolescents' willingness to report risky behaviors and share protective strategies [44]. Socioeconomic status also shapes this relationship. Adolescents from families with higher socioeconomic status have greater access to devices, stable bandwidth, and adequate digital knowledge, strengthening positive literacy outcomes [43]. Findings from Bonales-Daimiel et al. (2024) indicate that parental involvement within metaverse and gaming spaces helps adolescents interpret complex social dynamics.

At the platform level, technological design plays a structural role in shaping how individual competencies and social support are enacted in practice. Game affordances such as communication systems, identity visibility, and reputation mechanisms influence how adolescents interpret risks and consequences of digital actions [28]. Games that facilitate rapid and intensive interaction require more advanced digital literacy, particularly concerning self-disclosure and privacy management. In sandbox metaverse environments, creativity and identity exploration directly relate to advanced digital literacy needs because adolescents must navigate community norms, virtual economic logic, and potential manipulation [30]. VR-based learning features and immersive environments connect immersive experiences with increased digital proficiency, but benefits arise only when adolescents possess sufficient foundational skills [35], [40]. Rangel-Pérez et al. (2023) show that ICT competence pathways develop when in-game interactions require information evaluation, social coordination, and understanding of implicit digital ecosystem rules.

Overall, the relationships among individual, social, and platform factors are interdependent. Individual competencies provide the foundational capability, social contexts reinforce or weaken that capability, and platform design determines how such competencies are enacted in practice. For this reason, adolescents' digital literacy in online gaming environments cannot be understood through a single dimension. The three categories must be viewed as an interconnected ecology. From the author's perspective, this ecological approach is essential for designing effective interventions that strengthen individual competencies, enhance family and community capacities, and promote safety by design in game development.

**Integration of Inter-Level Relationships**

The reviewed literature shows that the relationships among individual, social, and platform factors in the development of adolescents' digital literacy operate in an interconnected manner and cannot be understood in isolation. Adolescents' digital competence consistently unfolds within concrete social relationships, particularly within the family and peer communities. Adolescents with strong digital competence and critical digital literacy possess an initial foundation for evaluating information, recognizing risks, and managing identity in gaming environments [37], [38]. However, the effectiveness of these competencies is substantially shaped by the forms of parental mediation and social support they receive. When parents possess adequate digital skills and engage in dialogic active parental mediation, individual competencies are more likely to translate into consistent protective strategies, such as managing privacy settings, reporting incidents, and negotiating household gaming rules [29], [39], [47]. Conversely, when parents underestimate risks or rely solely on restrictive mediation without communication, adolescents tend to depend on personal judgment and peer pressure, which can weaken the protective function of their digital literacy [42], [48].

Individual competencies also determine how adolescents interpret and respond to game platform features. Research on self-efficacy and digital security behaviour shows that adolescents who feel confident in their abilities are more prepared to use safety features, filter conversations, and reject suspicious friend requests or transactions within games and smartphone gaming environments [25]. In contrast, low perceived risk and tendencies toward online mobile game addiction foster impulsive, repetitive, and less reflective usage patterns, making adolescents more susceptible to harmful invitations, links, or exploitative game mechanics [26], [45]. Simultaneously, features such as leaderboards, ranking systems, and avatar cosmetics interact with psychological aspects including self-esteem and social comparison, meaning that competitive experiences in games can strengthen confidence or exacerbate vulnerability to unhealthy comparison [31], [46]. Digital literacy, therefore, is shaped not only by the availability of platform features but also by how adolescents' competencies and psychological dispositions mediate their use in daily practice.

Platform design, in turn, can reinforce or weaken the function of social support surrounding adolescents. Game affordances such as communication systems, identity visibility, reputation mechanisms, and privacy settings create the structural space where parents, teachers, and peers can intervene. Platforms that provide clear reporting mechanisms, blocking tools, age restrictions, and firm moderation policies make it easier for parents and communities to convert their guidance into concrete in-game actions [28], [30]. Conversely, when platform design prioritizes engagement and monetization without adequate protections, even digitally aware families face limitations in safeguarding adolescents from harmful content, virtual economic manipulation, or toxic social dynamics [34], [35].

Integrating these findings reveals that the development of adolescents' digital literacy in online games results from simultaneous dynamic mechanisms: individual competencies shape how adolescents use social support and platform

features, social support influences how these competencies are applied, and platform design expands or restricts the agency of individuals and communities. An ecological approach that integrates these three levels is therefore essential for understanding and designing more effective digital literacy interventions for adolescents.

## D. Conclusion

The findings from the 26 studies reviewed indicate that adolescents' digital literacy in online games is shaped by three groups of factors: individual factors, social factors, and platform factors. At the individual level, digital abilities, critical thinking skills, risk awareness, self-confidence, and psychological conditions such as self-esteem and social comparison directly influence how adolescents evaluate information, interact with others, and maintain their safety while playing games. At the social level, parental guidance, peer support, and socioeconomic conditions strengthen or weaken these abilities. Adolescents tend to develop stronger digital literacy when they receive active, dialogic, and risk-aware guidance from their families. At the platform level, game design elements such as communication features, identity systems, reputation mechanisms, and metaverse environments demand advanced digital competencies because adolescents must understand the rules, risks, and behavioral consequences within virtual spaces. Thus, the development of adolescents' digital literacy reflects mutually influential relationships among personal abilities, environmental support, and the technological design of the platforms they use.

Based on these findings, this study recommends the importance of a comprehensive approach to improving adolescents' digital literacy. At the individual level, adolescents need to be trained to think critically, identify risks, and regulate their own digital behaviour. At the social level, parents require knowledge and skills to actively guide their children, provide clear rules, and engage in open dialogue about digital safety. Schools and communities also need to offer support that encourages healthy digital behaviour. At the platform level, game developers must implement safety by design principles, such as accessible privacy settings, clear reporting systems, and features that support the safety of young users. For future research, studies could expand to cross-cultural contexts, examine long-term development of digital literacy, and investigate in greater detail how specific game mechanics influence adolescents' digital behaviour. Through this multilayered approach, adolescents' digital literacy can develop more robustly and safely within an increasingly complex digital gaming ecosystem.

## E. References

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