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REVIEW

A review on application of mobile media in personalized special education

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ABSTRACT

Personalized special education is an educational approach that focuses on the unique needs and abilities of students with special needs, making it ideal for inclusive classrooms. Research indicates that personalized learning can enhance learning outcomes, increase engagement, and improve overall experience. Mobile media, including digital content and apps, is crucial in special education for providing inclusive experiences. These devices offer various features and functions that can be customized to meet the unique needs of students with diverse learning requirements. Benefits of using mobile media include accessibility, interactive learning, inclusive education, assistive technologies, collaborative learning, increased engagement, motivation, and feedback and assessment. Assistive technology tools like text-to-speech capabilities enhance accessibility and facilitate learning for students with diverse needs. Therefore, the behavior characteristics of special children were analyzed, and the relevant use of mobile media was obtained through literature review, which provided theoretical support for the study of mobile media design for special children through edutainment.

Keywords: mobile media; special children; special education; digital media design

1. Introduction

Personalized special education refers to an educational approach that tailors instruction to meet the unique needs, abilities, and learning styles of individual students with special needs. Unlike traditional one-size-fits-all instruction, personalized education recognizes that each learner is distinct and requires customized support. By adapting the mode, content, or pace of instruction based on specific learner characteristics, personalized special education aims to address individual challenges and leverage students' strengths[1]. This approach is particularly relevant in inclusive classrooms, where diverse learners with varying abilities learn side by side Research has shown that personalized learning can lead to improved outcomes for students with disabilities, enhancing engagement, motivation, and overall learning experiences[1]. Personalized

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special education is gaining attention as a more effective approach compared to traditional special education practices. This shift in perspective aligns with the idea of tailoring education to individual needs rather than categorizing students into broad special education programs.

In South Korea, the enactment of the 1977 Special Education Promotion Act marked a significant milestone in providing free special education and related services to individuals with disabilities[2]. This legislative move highlights the importance of offering specialized support to address the diverse needs of students with disabilities. Support from general education teachers is crucial for special education teachers to feel integrated into the school environment, fostering a sense of accomplishment and acceptance. This underlines the significance of a supportive school community in enhancing the well-being of special education professionals.

Family media exposure during early childhood involves more than just screen time, including activities like sleeping and eating accompanied by background media. Mobile devices have become essential in daily life, with activities such as listening to music or making phone calls happening alongside other tasks[3]. These studies collectively highlight the multifaceted nature of mobile media and its influence on various aspects of society, from family dynamics and journalism to commerce and social interactions. Understanding the background of mobile media involves acknowledging its diverse impacts on individuals, communities, and societal practices.

Mobile media applications in special education serve various purposes, aiming to enhance the learning experience and support students with diverse needs. These applications are designed to facilitate communication, aid in understanding basic concepts, and provide specialized assistance tailored to individual requirements. A systematic review of mobile application studies in special education highlights the importance of utilizing mobile technologies to address the unique challenges faced by students with special needs. Specifically, mobile applications have shown promise in supporting students with dysgraphia by improving handwriting acquisition, demonstrating the potential of technology in addressing specific learning difficulties.

By leveraging mobile applications in special education, educators can create more inclusive and engaging learning environments, cater to individual learning styles, and provide targeted support to students with disabilities or learning differences. The use of mobile media in special education aligns with the broader trend of integrating technology into educational practices to enhance learning outcomes and promote accessibility for all students.

2. Literature review (theoretical framework)

2.1. Special children's personalized needs for mobile media

The use of mobile media in education, particularly in special education, is a topic of interest. The references provide valuable insights into various aspects of this area. They cover student perspectives on learning with mobile devices in higher education, a pedagogical framework for mobile learning and categorization of educational applications of mobile technologies[4], integrating mobile technologies in learning design These studies collectively contribute to our understanding of the role of mobile media in special education, its applications, and its impact on teaching and learning processes. Kraleva & Kralev developed the ChilDiBu mobile application specifically for Bulgarian children with special educational needs, recognizing that standard application design may not effectively cater to the needs of children with ASD and intellectual disabilities[5]. Febtriko et al.[6] explored the implementation of a mobile robots approach for media therapy for autistic children, demonstrating innovative methods to engage children with autism

through interactive technologies, showcasing the potential of interactive and engaging tools in facilitating language development. These studies collectively underscore the importance of leveraging mobile media and innovative technologies to address the personalized needs of children with special needs, offering tailored approaches to enhance learning, communication, and engagement for this unique population.

Mobile media, in the context of special education, encompasses digital content and these technologies are crucial for providing tailored and inclusive learning experiences for students with diverse needs. Through the utilization of mobile media, educators can establish interactive and accessible learning environments, address various learning preferences. The integration of mobile media in special education aligns with the broader trend of incorporating technology into educational methodologies to enhance accessibility and personalized instruction. Mobile devices, such as smartphones and tablets, are valuable tools for personalized learning in various educational settings, including special education. These devices offer a variety of features and functionalities that can be customized to meet the unique needs of students with diverse learning requirements. Here are some key points highlighting how mobile devices can serve as powerful tools for personalized learning:

Interactive Learning Resources: Mobile devices offer interactive learning resources like educational apps, videos, and games that cater to different learning styles and preferences. These resources engage students in active learning and can be personalized to address specific learning objectives[7].

Collaborative Learning Opportunities: Mobile devices facilitate collaborative learning experiences through features such as video conferencing, shared documents, and real-time communication. Students can participate in group projects, discussions, and peer feedback, fostering a collaborative learning environment[8].

Assistive Technology: Mobile devices offer a wide range of assistive technology tools that assist students with disabilities or special needs. These tools include text-to-speech functions, screen readers, and communication apps that enhance accessibility and facilitate learning for all students. These engaging features make learning more enjoyable and effective for students[9].

2.2. Components of mobile media application design

The components of mobile media application design are as follows: product concept, interactive logic, user interface design, code development, compilation and release, and data services.

To determine the overall goals, functions, and user requirements of an application during the product concept phase, it is essential to conduct research and analysis on user needs while defining the core functions and value proposition of the application. This process aligns with the principles of User-Centered Design (UCD) which emphasizes the importance of involving users in all stages of product development to ensure that the final product meets their needs and expectations[10].

Product architecture is crucial in defining a product concept, as it influences various managerial aspects such as product variety, performance, standardization, lead time, change, and organizational structure. Understanding product architecture helps shape core design concepts and integrate components effectively. Descent designs, which encompass core design concepts and a product architecture, shape technological innovations and industrial change. Adhering to dominant designs can streamline product development processes and enhance market acceptance. Variability models specify configurable features and constraints to ensure product validity. Efficiently identifying core features and understanding their relationships can articulate the product concept more clearly, aligning with user needs and market demands. Effective management of the front end of new product development helps organizations refine their concepts and align with user requirements and market trends.

In designing the interaction flow and user experience of an application, the interactive logic plays a crucial role in ensuring that users can intuitively and efficiently navigate and utilize the application. This encompasses interface navigation, user feedback on operations, and the design of interaction patterns to enhance user engagement and satisfaction.

Interface navigation is a crucial aspect of interactive design, focusing on user movement and access to features. It involves clear pathways, logical content organization, and intuitive controls. By incorporating information architecture and user interface design principles, designers can optimize the navigation experience. User feedback is vital for providing guidance and reassurance, with mechanisms like visual cues, notifications, and error messages. By implementing responsive feedback mechanisms, designers can reduce uncertainty and improve user confidence. Interaction patterns define how users engage with the application's elements and controls, encompassing common and complex interactions. Designers can select appropriate patterns based on user context and task requirements to create engaging interfaces. In summary, designing the interaction flow and user experience involves integrating interface navigation, user feedback mechanisms, and interaction patterns to enhance usability, efficiency, and overall user satisfaction.

User interface design is a crucial aspect in developing visually appealing and user-friendly applications. Research has shown that investigating the impact of screen layout elements on interface and screen design aesthetics Altaboli & Lin can help designers enhance the visual appeal of applications, making them more engaging for users[11]. Moreover, incorporating goal-oriented theory and multimedia analysis into the design process Zhuang et al.[12] has been found to enhance the user's operating experience, ensuring users enjoy an efficient, comfortable, and interesting interactive experience. Additionally, leveraging Gestalt principles in designing mobile interfaces Ripalda et al.[13] has been shown to contribute to achieving satisfactory usability by focusing on models, concepts, and processes that enhance user experience and satisfaction.

By integrating insights from these studies, designers can optimize the visual design, layout, and overall user experience of applications, ensuring that they are not only aesthetically pleasing but also user-friendly and engaging.

These references offer valuable insights into software development processes, including code refactoring, systematic software testing, and the complexity of software code structures. Refactoring encourages the development of smaller, more concise, single-purpose code fragments that can be reused in various contexts[14]. Systematic software testing is crucial for dynamically analyzing models[15]. Engineers spend approximately 50% of their working time reading code and searching for related information[16]. By applying principles from these studies, developers can improve code development efficiency and stability in both front-end and back-end programming phases, ensuring successful application functionality implementation and system stability.

The references provided offer valuable insights into software testing and code refactoring, essential components of the compilation and release phase of application development. Software testing aims to identify errors in the program and is the most widely used method for ensuring software quality Qin et al.[17]. Code refactoring enhances the efficiency and stability of the codebase, contributing to improved performance and reliability of the application. Incorporating principles from these studies can help developers enhance the quality and reliability of their applications during the compilation and release phase.

Data services are crucial for application development, facilitating efficient management and utilization of user data to achieve personalized and intelligent functionalities. By utilizing mobile cellular data, innovative design methods, and user-side personalization techniques with privacy preservation, applications can provide timely and personalized services while ensuring data security and privacy. Personalized

location-based services Liu & Wilde further enrich user experiences by integrating location data with personalized content[18]. Privacy by design methodologies Arfaoui et al.[19] are essential for safeguarding personal data in data services, particularly in the telecom domain. Scalable big data computing Ahnn plays a pivotal role in personalizing machine learning models for services like automatic speech recognition, underscoring the significance of scalability in efficiently delivering personalized services[20].

Components of mobile media application design for children with special needs play a crucial role in ensuring usability, engagement, and effectiveness. Several studies provide valuable insights into designing mobile applications tailored to the personalized needs of children with special needs: Allen et al. [21] highlighted the benefits of iPads and apps for children with Autism Spectrum Disorder (ASD), emphasizing the portability, touch screen interface, and multimodal output of devices like the iPad for promoting learning in children with ASD. Dargut & Erdem explored the use of mobile social story maps to develop cognitive and social skills in children with ASD, emphasizing the importance of visual presentation possibilities and ease of use in mobile technologies for enhancing social skills[22]. Must et al.[23] identified barriers to physical activity in children with ASD, highlighting the relationship between physical activity, screen time, and the challenges faced by children with ASD in engaging in physical activities. Ntalindwa et al.[24] conducted a qualitative study on the use of Information Communication Technologies (ICT) among children with ASD, emphasizing the improvement in cognitive software application usage among child participants, indicating the potential of ICT in supporting children with special needs.

These studies collectively underscore the importance of considering usability, engagement, and individualized needs in the design of mobile media applications for children with special needs, aiming to enhance learning, communication, and social skills effectively. Mobile media, including smartphones and tablets, offer numerous advantages in the realm of special education. These devices can be powerful tools for personalized learning, providing tailored support and enhancing educational experiences for students with diverse needs.

a. Accessibility: How mobile devices provide anytime, anywhere access to educational content.

Mobile devices, such as smartphones and tablets, offer anytime, anywhere access to educational content, providing advantages for personalized learning. These devices allow learners to access educational resources on-the-go, offering flexibility in learning schedules and locations. Mobile learning, also known as m-learning, enhances the learning process by granting access to learning materials from various locations and at any time. This accessibility supports continuous learning, enabling students to engage with educational content at their convenience, breaking down geographical barriers. The widespread use of mobile devices ensures that educational content is readily available, promoting seamless learning experiences. This access to educational resources through mobile devices enhances the flexibility and convenience of learning, empowering students to engage with content at their own pace and in diverse settings.

b. Individualization: How personalized apps and tools cater to diverse learning needs.

Personalized apps and tools are essential in addressing diverse learning needs, particularly in special education. These resources are tailored to individual learning styles, preferences, and requirements, providing customized support to enhance the educational experiences of students with diverse needs. The advantages of using personalized apps and tools for catering to diverse learning needs, as supported by the provided references.

Mobile applications provide personalized information to users through visuals, instructional videos, and interactive resources, catering to diverse learning preferences. These apps can also adapt learning pathways to individual needs and styles, ensuring content is tailored to individual needs. Learning analytics can be

integrated into educational apps, providing valuable insights for teachers, students, and families. Lastly, educational apps should consider different levels of functional diversity to ensure content and features are accessible and beneficial for all users, including those with diverse needs.

c. Engagement: How interactive features enhance student participation.

Interactive features in mobile learning can significantly enhance student participation by providing engaging and dynamic learning experiences. The advantages of interactive features in mobile learning for enhancing student participation, as supported by the provided references.

Mobile learning offers numerous benefits, including increased motivation, active learning, personalized engagement, enhanced communication, real-world applications, immediate feedback, collaborative learning, and ubiquitous learning. Interactive elements in mobile learning, such as gamified activities and multimedia resources, make learning more enjoyable and rewarding. These apps encourage active participation and hands-on learning experiences, fostering deeper understanding and retention of concepts. Personalized engagement caters to individual learning preferences, enhancing student interest and involvement. Interactive tools like online audience response systems facilitate communication between students and teachers, creating a more engaging learning environment. Real-world applications of theoretical concepts are promoted through interactive simulations and practical exercises. Interactive assessment tools provide students with immediate feedback, allowing them to track progress and identify areas for improvement. Collaborative learning is supported by features like group activities, peer discussions, and shared resources, fostering teamwork and peer interaction. Interactive mobile learning promotes ubiquitous learning by allowing students to engage with educational content anytime and anywhere.

In conclusion, the interactive features in mobile learning play a vital role in enhancing student participation by increasing motivation, promoting active learning, facilitating personalized engagement, and fostering collaboration. By incorporating interactive elements into mobile apps and tools, educators can create dynamic and engaging learning experiences that cater to diverse learning needs and preferences, ultimately leading to improved student engagement and academic achievement.

d. Data collection: How mobile media can track student progress and inform instructional adjustments.

Mobile media can play a significant role in tracking student progress and informing instructional adjustments in educational settings. By utilizing data collection tools and learning analytics embedded in mobile applications, educators can gather valuable insights into student performance, engagement. Mobile learning apps can track student progress in real-time, providing immediate feedback on performance and learning outcomes to both students and educators. Mobile learning analytics tools offer personalized insights into student behavior, learning patterns, and progress, enabling educators to tailor instruction to individual needs and preferences. Mobile learning analytics can support self-regulated learning by providing students with feedback on their progress, helping them set learning goals, and fostering metacognitive skills. Mobile learning analytics and data collection tools are essential in enhancing student engagement by providing interactive dashboards, progress tracking features, and personalized learning recommendations Alam [25]. These tools offer educators valuable insights into student performance and engagement, enabling the implementation of more targeted and effective instructional strategies. By utilizing the data collected through these tools, educators can customize their teaching approaches to meet individual student needs and preferences, ultimately resulting in improved learning outcomes and increased student engagement.

The integration of mobile learning analytics tools in educational settings can revolutionize the learning experience through real-time feedback, progress monitoring, and personalized recommendations to students.

This personalized approach empowers students to take control of their learning and fosters a deeper level of engagement and motivation. Through interactive dashboards, educators can visualize student data comprehensively and in a user-friendly manner, facilitating informed decisions about instructional design and student support.

Data collected through mobile learning apps enable continuous improvement in teaching practices, curriculum design, and student support services, leading to enhanced learning outcomes and student success. Mobile data collection tools facilitate the documentation of student interactions, interventions, and progress, supporting assessment, evaluation, and documentation of learning experiences. Mobile learning analytics tools offer continuous feedback and feedforwards to students, guiding them in their learning journey, identifying areas for improvement, and promoting self-directed learning. Mobile learning analytics tools can undergo usability testing and evaluation to ensure their effectiveness, user-friendliness, and alignment with learning objectives. Data collected through mobile learning apps can indeed provide valuable insights into student progress, engagement, and learning patterns, allowing for the customization of teaching strategies to better meet individual student needs[26]. By leveraging this data, educators can make informed decisions to enhance the learning experience, tailor instruction, and provide targeted support to students, ultimately contributing to improved learning outcomes and student success. Mobile technologies have been shown to support learning by enabling students to access learning material, create their own digital content, share it, and engage in collaborative discussions with classmates[26].

2.3. Factors that improve the mobile media user experience

Shen et al.[27] focused on leveraging affective factors in learning with mobile devices to enhance user experiences in mobile learning, emphasizing the importance of emotional interaction in improving user engagement. Kaasinen et al.[28] highlighted the necessity of multidisciplinary and multicultural cooperation to improve the user experience of mobile internet, stressing collaboration among various stakeholders to enhance user satisfaction. Ickin et al.[29] discussed the limited understanding of a mobile user's Quality of Experience (QoE) and the factors that influence it, underscoring the significance of analyzing contextual factors to enhance the user experience of personal mobile products. Zhang et al.[30] explored the influencing factors of mobile social media fatigue behavior, emphasizing the impact of internal and external factors on social media fatigue and user experience.

These examples demonstrate the diverse applications of mobile media in special education, ranging from supporting handwriting skills for students with dysgraphia to providing inclusive educational resources for children with special needs. Mobile applications play a crucial role in enhancing learning experiences, promoting accessibility, and catering to the individual needs of students with diverse learning requirements.

2.3.1. Assistive technology for students with sensory impairments.

Development of Sign Language Application PESAN KULIAH With Material Substance Modification Based on Student Characteristics with Hearing Impaired "by Utomo et al.[31] focuses on the development of a sign language application tailored to students with hearing impairments. This application aims to enhance communication and learning experiences for students with sensory impairments.

The text emphasizes the importance of promoting teacher proficiency in using assistive technology and mobile learning tools for student success. It also discusses the ethical considerations related to research using mobile devices and social media in education, and the need for inclusive education practices. The text also highlights the importance of pedagogical best practices in mobile pedagogies and technology integration for teacher education, encouraging creativity and personalization. The text also emphasizes the implementation of evidence-based practices in special education, ensuring interventions are delivered effectively and

consistently. The text also encourages collaboration and community support among educators to share best practices and strategies for implementing mobile media in special education. The text also emphasizes the importance of accessibility and equity in mobile media applications and technology tools, ensuring that they are accessible to all students, including those with sensory impairments. By following these best practices, educators can effectively implement mobile media in special education settings, enhance student learning experiences, and promote inclusive and accessible educational environments for all learners.

Accessibility and Equity Ensure that mobile media applications and technology tools are accessible to all students, including those with sensory impairments. Promote equity in access to educational resources and opportunities.

3. Conceptual framework

This chart shows the key elements and processes of personalized special education mobile media design. The overall process starts from the identification of individual differences and needs of special children, through the design and application development of mobile media, to improve user experience, and ultimately to provide personalized application design for special children in combination with family and school education.

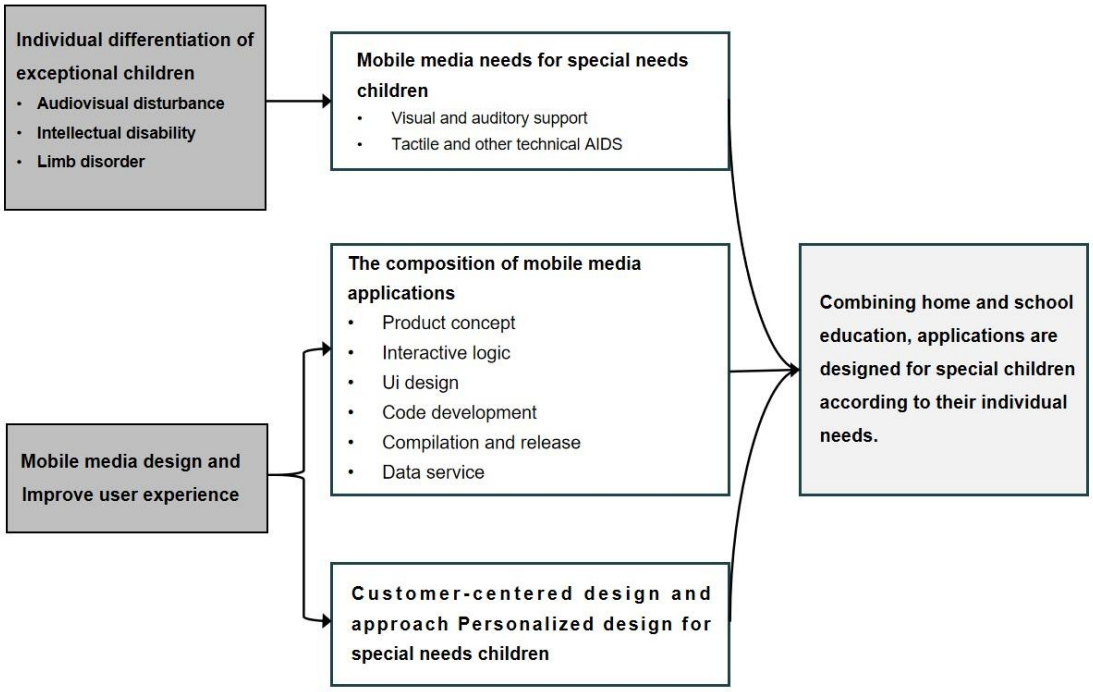

Figure 1. Conceptual framework.

4. Conclusion

The potential of mobile media in personalized special education lies in its ability to enhance self-management outcomes through well-designed mobile tools with decision-support features. These tools, such as personalized education apps, have shown promise in improving self-management outcomes for students with diverse needs. Additionally, mobile applications have been effectively used in special education to

provide personalized learning experiences and support students with disabilities[32]. Mobile technologies offer a personalized and contextual learning environment that can improve lifelong learning programs and continuing educational opportunities for students[33]. The use of mobile media in special education can facilitate personalized learning experiences, enhance communication between educators and students, and provide access to quality educational resources. Furthermore, mobile media can support individualized learning plans, promote inclusive education practices, and empower students with diverse learning needs to achieve academic success[34]. Overall, the integration of mobile media in special education has the potential to transform teaching and learning practices, promote personalized education experiences, and support the holistic development of students with diverse needs. Emphasizing the need for ongoing research and innovation in the field of mobile media in personalized special education is crucial to advancing educational practices and improving outcomes for students with diverse needs.

5. Significant and benefits of study

The effectiveness of mobile learning tools in improving learning outcomes, particularly in subjects like mathematics and language learning, has been demonstrated in various studies[35]. Additionally, the flexibility and accessibility of mobile media have been found to enhance student engagement, motivation, and self-directed learning behaviors, leading to improved educational outcomes[37]. Collaborative learning through mobile technologies has also been shown to have a positive impact on student learning in different environments[39].

Based on the provided references, the design of universally accessible apps in special education can benefit from ongoing research and innovation. By incorporating the latest advancements in technology and educational practices, developers can create apps that cater to the diverse needs of students with disabilities. Ongoing research can help identify best practices, accessibility features, and user-friendly design elements that enhance the usability and effectiveness of educational apps for students with special needs. Innovation in app design can lead to the development of personalized, inclusive, and engaging learning experiences that support the diverse learning requirements of students in special education settings. By staying informed about the latest research findings and technological advancements, developers can continuously improve the accessibility and effectiveness of educational apps for students with disabilities.

Incorporating mobile media into curriculum planning can enhance learning experiences, engage students, and promote personalized education. Research studies have shown that integrating mobile activities into the curriculum can facilitate knowledge construction, develop inquiry skills, and improve learning outcomes Hasan's[40]. The integration of mobile media in curriculum planning can also support cross-disciplinary approaches, enhance collaboration, and foster innovative teaching practices[41]. Ongoing research and innovation in curriculum planning with mobile media can lead to the development of effective teaching strategies, enhance student engagement, and support the holistic development of learners in various educational settings.

This study suggests that the digital application of mobile media has an influence on the behavior of special children and a personalized corrective effect. At the same time, it also provides a possible design model for the improvement of the behavior of special children. Received positive feedback from both children and parents.

Therefore, through the method of literature review, the behavior characteristics of special children are analyzed, and the relevant design theory of mobile media is obtained. Through the literature review on the personalized needs of special children, different situations of special children and mobile digital media

application design, this paper provides theoretical support for the digital application design of mobile media based on the characteristics of the personalized needs of special children.

Conflict of interest

No conflict of interest was reported by all authors.

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