

Understanding the Role of Augmented Reality in Enhancing Students' Emotions in Tourism Online Learning: A Pleasure-Arousal-Dominance Perspective

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ABSTRACT

ARTICLE HISTORY

Received:

14 May 2023

Accepted:

15 August 2023

Published:

20 October 2023

KEYWORDS

Augmented Reality

Online Learning

Emotion

Pleasure-Arousal-

Dominance

Educational Technology

The emergence of online learning has revolutionized higher education institutions by providing students with access to flexible and convenient learning options. However, there are challenges to online learning, such as the lack of physical interaction, which leads students to become bored and lose focus. While augmented reality has the potential to improve students' learning experiences by delivering immersive and interactive content, there has been little research into the potential of augmented reality in enhancing students' emotional experiences in online learning. The study aims to explore undergraduate students' emotional responses to augmented reality technology in online learning using the Pleasure-Arousal-Dominance framework. Based on the thematic analysis, it was found that most students agreed that online learning can be boring, sleepy, and demotivating if not delivered effectively. The study found that by integrating augmented reality into online teaching, it can provide more enjoyable, exciting, and pleasurable learning experiences. Thus, from a practical standpoint, it is suggested that augmented reality technology should be promoted in universities to improve online teaching delivery. Theoretically, this study has broadened the existing understanding of augmented reality mechanisms that can enhance online learning experiences. Several study limitations are discussed at the end of the paper as references and suggestions for future research.

e-ISSN 2600-7274

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1. INTRODUCTION

With the rise of online learning platforms, the landscape of higher education has undergone a substantial upheaval recently. This development has been prompted by the rising need for flexible and accessible learning opportunities that enable students to pursue higher education while overcoming time and geographic limitations (Bernabe et al., 2022). With the introduction of online learning, higher education institutions now have more options for meeting the individualized learning needs of a wide spectrum of students. However, despite the benefits of online learning, it presents challenges for student engagement (Maypa et al., 2023), particularly for those students located in developing Southeast Asian countries (Pratiwi & Priyana, 2022). Students may face barriers such as lack of motivation, heavy workload, procrastination, lack of interaction, and technical issues (Amador & Mederer, 2013). These challenges can lead to feelings of isolation and hinder full participation in coursework units.

In the world of online learning, augmented reality (AR) technology has emerged as a promising tool with the ability to develop immersive and engaging learning environments (Wang & Tan, 2023). Students can interact with course materials in ways that were previously unthinkable thanks to augmented reality, which combines digital information and the actual environment. Online learning environments with AR technology integration have the potential to increase interaction, engagement, and learning results overall (Chong, 2020). Understanding how augmented reality might improve students' emotional experiences is essential as online education expands because emotions are so important for learning and motivation.

Even though augmented reality-integrated learning is gaining popularity, there is still a glaring lack of study literature, particularly when it comes to Malaysia's higher education institutions (Sezali et al., 2020). A meta-analysis of empirical studies on augmented reality in education highlighted the need for more research on the pedagogical approaches that can enhance the impact of AR interventions in educational contexts, including online learning (Pellas et al., 2019). A huge study opportunity exists because only a small number of empirical studies have thoroughly studied how AR technology affects students' emotions while they are learning online. It is critical to determine whether the advantages and disadvantages of AR technology connect with the unique requirements and preferences of students in this region, given the distinctive cultural and educational setting of Malaysia.

By thoroughly exploring the impact of augmented reality on increasing students' emotions in the setting of online learning, this study aims to fill up this vacuum in the literature. The paper seeks to explore the emotional reactions of students to augmented reality-enhanced online learning resources from a Pleasure-Arousal-Dominance (PAD) perspective. The results of this study should offer insight on how AR technology might change online learning and what it means for enhancing student performance and engagement. Also, it may add significant knowledge to the ongoing discussion about the future of online learning, particularly in Malaysian and international higher education institutions, by developing a deeper understanding of this dynamic.

This research paper is structured into distinct sections to provide a comprehensive exploration of the role of augmented reality in enhancing students' emotions in online learning. Following this introduction, the subsequent section delves into the evolution of online learning and the relevant emotional literature, setting the foundation for our investigation. The paper then presents the research method, offering a detailed explanation of our research design and methodology. The paper culminates in two final sections, where it presents the empirical findings of our study and engages in a comprehensive discussion of their implications.

2. LITERATURE REVIEW

2.1 Online Learning

All concepts or methodologies acknowledge that motivating the student is crucial, and technologies and utilizing online learning are essential components of teaching and learning in higher education (Herwiana & Anam, 2022). Online learning for many higher learning institutions is nothing new, as many have been delivering programs and courses online. However, the urge to shift due to the pandemic has made everyone in the education line experience some difficulties due to the unfamiliar system, and the teaching and learning style is now out of the norm (Malik & Javed, 2021). Several studies about the adverse impact of online learning on students have been published recently. Azmi et al.'s (2022) research showed that students' feedback about online learning causes them to have higher anxiety levels and is less enjoyable than learning in a face-to-face classroom setting. The associated shift to online learning has harmed students' mental health, leading to increased stress and feeling bored in class (Malik & Javed, 2021).

Malaysia is also not spared from fully adopting online learning to maintain academic continuity during the pandemic. Many improvements should be made to improve the delivery of online teaching and learning in the country, even though studies have shown that students are gradually adjusting to the "new norm" (Selvanathan et al., 2023). While the study by Chung et al. (2020) stated that lack of motivation and difficulty focusing are among the most frequent responses given by students concerning their readiness to embrace online learning, loss of interest and demotivation in the method of teaching were reported as reasons for students' dropping out of online learning (Mahpar, 2021).

Scholars have developed several theories and models to study the interest and use of different technologies due to students' acceptance of specific technologies to assist their learning motivation in various ways (Hornig et al., 2019). Theories from the field of information systems, such as the widely used Technology Acceptance Model developed by Davis in 1989 or the enhanced Unified Theory of Acceptance and Use of Technology developed by Venkatesh et al. (2003), are frequently utilized in studies of technology. Nevertheless, both theories focus primarily on students' attitudes toward their intentions to use technology. This study differs as it aims to understand the role of augmented reality in enhancing students' emotional learning experiences within the PAD framework.

2.2 The Advancement of Augmented Reality Applications in Tourism Online Learning

With the help of AR technology, users can have more engaging learning experiences and multisensory experiences in the real world (Wang & Tan, 2023). It has the ability to enhance learning outcomes in disciplines like physics by increasing interest and motivation (Yilmaz, 2021). The classroom's merging of the physical and digital worlds is made possible by its unique real-time human-computer interactions (Valluru et al., 2023). High-quality sensors for physics labs can be obtained using AR as a tool for tracking and assessing experiments (Rosi et al., 2022). Additionally, AR has been investigated as a method to improve college learning, with positive student engagement and viability established (Silva et al., 2022). The many conceptualizations and applications of AR in teaching and learning are highlighted in these abstracts, focusing on how it might change the educational process and raise academic achievement.

The educational field, especially hospitality and tourist education, has shown much promise for augmented reality. Students' connection with physical environments is improved, and their learning is facilitated through the use of AR technology (Oueida et al., 2023; Cunha et al., 2023). It can be used in the hospitality industry to give students immersive experiences in hotel settings, enabling them to picture and engage with various activities and scenarios (Destria et al., 2022). Additionally, the tourism sector may use augmented reality to improve navigation and offer interactive visual cues to visitors, enhancing their overall experience (Yildiz, 2021). Teachers may give students more individualized and engaging learning experiences by integrating AR tools into the teaching and learning process, boosting students' motivation and subject-matter comprehension (Chong, 2020). The use of AR in hospitality and tourism education has the potential to fundamentally alter how students learn about and apply these professions.

2.3 The Role of Emotion in Learning: A Pleasure-Arousal-Dominance Perspective

Several studies have been conducted in recent years to investigate students' intentions to use online learning and integrate different external task environments, such as the student's perception, attitude, and other factors, into the model for assessment. Nevertheless, these studies continue to ignore the students' emotions while participating in online learning, which undoubtedly will impact their intention to use it (Stephan et al., 2019). In addition to modulating students' experiences with others and how they perceive and interact with others, emotions also influence their cognitive processes. Emotions are people's most basic instincts and frequently directly impact how people behave outside of themselves (Qu & Chen, 2021). Researchers have begun noticing how emotions affect how people use technology (Qu & Chen, 2021), which prompted the critical question of what emotional factors students will respond with that could be utilized to explain their behavioral intentions. The significance of the emotional aspects of learning has also been recognized, yet a proper inquiry into emotions in the learning process has been slow to emerge (Jiang & Koo, 2020).

Qu and Chen (2021) define emotion as an individual's conscious psychological imbalance caused by a particular stimulus. Individuals' behavioral intentions are easily influenced by their feelings and emotions, which is also reflected in the impact of technology. There are many different types of human emotions; thus, researchers must systematically incorporate them into their study model (Stephan et al., 2019). Otherwise, certain emotions with different names but similar emotional responses will be included in the study, and some will have negative consequences due to interference from other emotions (Zhao et al., 2022). The Mehrabian (1996) Pleasure, Arousal, and Dominance (PAD) emotion model will be employed to provide an appropriate classification framework for this study. As PAD separates human emotions into pleasure, arousal, and dominance, every emotion may be mapped out in this three-dimensional space.

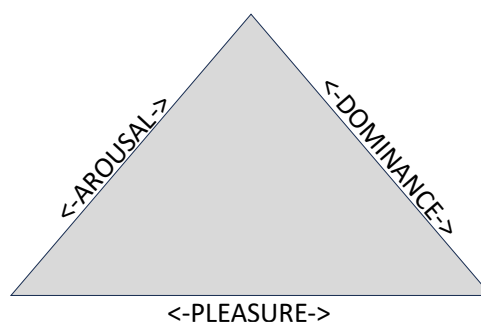


Figure 1: Pleasure-Arousal-Dominance Model (Mehrabian, 1996)

The emotional classification PAD model was created by Mehrabian (1996). The PAD model has been predominantly used in the field of marketing to express consumers' preferences in a variety of contexts (Kourouthanassis et al., 2015; Kumar et al., 2021). There have been fewer studies to clarify the impact of students' and teachers' emotions on higher education (Qu & Chen, 2021). The lack of study on the emotions of learning is even more visible in online learning contexts (Jiang & Koo, 2020). Although online learning has been depicted as less emotional and more impersonal or as lacking in emotional richness (e.g., lack of body language and gestures) when compared to face-to-face learning, the study by Majeski et al. (2018) has acknowledged how negative emotions (anger, frustration, boredom, and confusion) and positive emotions (e.g., engagement, excitement) experienced by students in online learning will support the overall process of learning (Jiang & Koo, 2020). Using the PAD model, this study demonstrates the significance of the emotions students respond to when evaluating the adoption of augmented reality in online learning.

Prior research has utilized a categorical approach to explore emotion recognition abilities in individuals, focusing mainly on basic emotion theory. Darwin established the basic emotion theory in 1872, and the number of psychologists and academics who have offered modifications to it has increased throughout the years (Gu et al., 2019). However, hedonic pleasure and arousal value, often known as core affects, are essential attributes of all emotions, including basic emotions (Gu et al., 2019). Since augmented reality technology has yet to be implemented in online learning, this study will concentrate on pleasure and arousal value, as dominance is mainly used to reflect changes in emotion during the encounter with the technology as a sense of control and influence over one's surroundings and others (Jiang et al., 2021).

Visual stimuli are used most often in psychological research because they feel natural, are easy to use, and are easy to measure when a stimulus starts and stops. The International Affective Picture System (IAPS) is the most used database in the world (Negrao et al., 2021). It is evaluated based on the three dimensions of valence, arousal, and dominance. Several studies (e.g., Li et al., 2022; Zhao et al., 2022) have shown that the IAPS works to elicit emotions and affective responses. Chen et al. (2018) and Li et al. (2022) stated that dynamic expressions make people feel more powerful emotions than static ones. Although emotional video stimulus databases are plentiful, only some contain videos. Chen et al. (2018) stated that watching video clips had a significant impact on the emotional intensity of the participants. Due to the limited content of earlier video stimulus databases, Zhao et al. (2022) said that visual stimulus materials need to be expanded to include more categories, especially in the most recent area of emotion research. Thus, in this study, a short video of how augmented reality can be used in online learning was chosen as a stimulus.

3. METHOD

3.1 Research Approach

This research adopts a qualitative research approach to gain in-depth insights into the emotional experiences of undergraduate students in the context of online learning, specifically focusing on the impact of augmented reality. Qualitative research is particularly well-suited for exploring the nuanced and subjective aspects of human experiences, allowing for a rich understanding of participants' emotions, perceptions, and perspectives (Creswell et al., 2007).

3.2 Population and Sampling Design

Since the study focuses on the Sustainable Tourism course, the population under investigation comprises undergraduate students majoring in Tourism Management. To ensure the selection of participants who could provide relevant and insightful data, a purposive sampling design was employed. Purposive sampling allows for the deliberate selection of individuals who possess specific characteristics or experiences relevant to the research objectives. In this study, the samples were purposefully selected from the final-year undergraduate students majoring in tourism management at a renowned public university. The sample size for this study consisted of 17 undergraduate students. With reference to Saunders et al. (2018), the choice of this sample size was based on the principle of data saturation, where data collection continued until no new themes or insights emerged from the participants' responses, indicating that saturation had been reached.

3.3 Data Collection Procedure

Data collection was conducted through online semi-structured interviews, organized in three focus groups. Each focus group was represented by six to five informants who had given their consent to participate in the study voluntarily. The study has received approval from the Research Ethics Committee, UiTM Sabah Branch, with reference number REC/03/2022 (PG/MR/45). The focus group approach was selected to encourage open discussion and interaction among participants, allowing for the exploration of shared and diverse emotional experiences in response to augmented reality-enhanced online learning. As stated by Krueger and Casey (2015), focus group interview can make the informants more comfortable and give spontaneous or natural answers. Previous studies revealed that over 80% of all themes were discoverable within two focus groups (Guest et al., 2017).

Each focus group session began with the participants engaging in mock online learning that utilized augmented reality teaching materials via the Microsoft Team platform. The online learning session focused on sustainable tourism and lasted for 30 minutes. During the online learning session, a short 80-second video was shown to the informants that related to a scenario of the application of augmented reality in education. Following the online learning activity, participants engaged in an online semi-structured focus group interview related to their affective learning experiences, which spanned for approximately 40 to 45 minutes. The online focus group interview allowed participants to reflect on their emotions, perceptions, and responses to the augmented reality components.

Table 1: Simplified Version of the Pleasure-Arousal Emotion Cue Cards (Zhao et al., 2022)

Pleasure Cue Cards		Arousal Cue Cards	
Card No.	Sub Category	Card No.	Sub Category
Card 1	Pleased	Card 5	Excited
Card 2	Wide-awake	Card 6	In control
Card 3	Enjoy	Card 7	Hopeful
Card 4	Focus	Card 8	Enthusiastic

Table 1 presents the simplified version of the Pleasure-Arousal attributes based on the work of Zhao et al. (2022), following the list provided in the Mehrabian (1996) study that was used to evaluate PAD emotions. In the focus group interview, the informants were given eight cue

cards, four representing pleasure and the other four representing arousal, and asked to choose three of the cards from each category that represented most about their emotions after experiencing the short video. There were several follow-up questions following the feedback provided by the informants in the focus group.

3.4 Data Analysis

The data collected through the semi-structured focus group interviews was analyzed using thematic analysis, a well-established qualitative research method for identifying, analyzing, and reporting patterns (themes) within qualitative data. The thematic analysis was conducted using NVivo software, a qualitative data analysis tool that facilitates systematic coding and organization of qualitative data. This software enabled efficient data management, coding, and theme development, ensuring the rigor and consistency of the analysis process. Thematic analysis involved several iterative steps, including data familiarization, initial coding, theme identification, and theme refinement. Through this process, the researchers identified key themes and patterns in the participants' emotional responses to augmented reality-enhanced online learning. The findings derived from this analysis were instrumental in gaining a comprehensive understanding of the emotional dynamics associated with the integration of augmented reality in the online learning environment.

The video audio recording's data was transcribed into text for further investigation. With the assistance of a professional translator, all responses were translated into English. Throughout the translation process, there were ongoing discussions between researchers and professional translators to ensure that the meanings of the translated data were as close as possible to the meanings of the original data. All translated data and quotes were encoded with the NVivo qualitative software. The thematic analysis approach was utilized to "find, evaluate, and report data patterns (themes)." It was described as a descriptive method that lowers data while combining it with other data analysis techniques (Bernard et al., 2017). The analysis was conducted because of the large number of research topics and issues that can be addressed using this data analysis technique (Bernard et al., 2017).

4. DATA ANALYSIS AND FINDINGS

Thematic analysis using open-ended responses from discussions or transcribed interviews can explore the context of teaching and learning in greater depth than quantitative analysis while allowing for greater freedom and interpretation in data analysis. It was conducted with the utmost care and attention to transparency, essential in qualitative research, to ensure confidence in the findings (Rosenthal, 2016). To prevent researcher bias, the second author validated the first author's coding adequacy by comparing the codes to the original statement.

Figure 2 shows the word cloud visualization about the students' emotions about traditional online learning that they had experienced. The top five emotions that the students mentioned are sleepy (13.9%), boring (9.8%), demotivating (6.4%), dull (5.2%), and hopeful (5.2%). Many other emotions are mentioned, like boredom, annoyance, and force. This concurs with previous findings by Azmi et al. (2022), who found that online learning can cause students to have higher anxiety levels and is less enjoyable. This can contribute to mental health by leading to increased stress and feeling bored in class (Malik & Javed, 2021). The findings also align with the study by Chung et al. (2020), who stated that lack of motivation and difficulty focusing are among the most frequent responses given by students concerning their readiness to embrace online learning. Arguably, the loss of students' interest in online learning is primarily because of the traditional teaching delivery approach, which does not arouse their learning experiences.



Figure 2: Word Cloud Visualization on Students' Learning Experiences using Traditional Online Method

When students were further questioned about their emotions that were not listed on the cue card, words like annoying, easily distracted, and tiresome were among those that they responded with. Nonetheless, some students did point out that there are benefits to online learning, like convenience, and are hopeful that improvements made to the delivery method will help students feel less negative emotion. The finding corresponds to previous studies that highlighted that online learning can be perceived as annoying, easily distracting, and tiresome for students (Bernabe et al., 2022). Students often struggle to stay focused and engaged during online courses, leading to distractions such as checking emails, chatting, or tuning out altogether (Landay, 2009). This may be due to a lack of tools and strategies provided by educators to address the kinesthetic, visual, tactile, and interactive needs of students in an online environment (Hase & Ellis, 2018). Additionally, the transition from traditional to online learning does not necessarily solve the issue of student-controlled learning, which is crucial for effective education delivery (Stavredes, 2011). Thus, despite the potential benefits of online learning, there is still a perception that it may be substandard.

The informants were asked about their emotions regarding the adoption of augmented reality in online learning. Figure 3 exhibits the word cloud representation of students' emotions after watching the short video about augmented reality applications in online learning. The top five emotions identified are enjoyed (7.5%), excited (5.3%), hopeful (4%), enthusiastic (3.7%), and pleased (3.1%). The finding is in line with earlier studies that found the quality of technology has an important impact on enhancing users' emotional experiences (Zhao et al., 2022) and that enjoyment and excitement are crucial for the value that students have chosen to attach to, which is learning content and technology (Stephan et al., 2019). This demonstrated a plausible link between technological value and enjoyment that was similar to the study conducted by Qu and Chen (2021). In a further question about their emotions that were not listed on the cue cards, students excitedly mentioned being delighted, fun, curious, thrilled, and motivated by what they would feel if they attended online classes that incorporated augmented reality technology.



Figure 3: Word Cloud Visualization on Students' Emotional Learning Experiences using Augmented Reality

A summary of the finalized map on themes, based on the PAD model, is presented in Table 2. As explained earlier in this study, only pleasure and arousal themes were derived from the session, representing the primary emotions students highlighted during the focus group discussion. All students unanimously agreed that augmented reality technology should be adopted at the university to improve teaching delivery, particularly online learning.

Table 2: Frequency of Emotions Experienced using Augmented Reality in Online Learning

Theme	Emotion listed	Frequency (%)
Pleasure	Enjoy	7.5%
	Pleased	3.1%
	Focus	2.9%
	Wide-awake	1.3%
Arousal	Excited	5.3%
	Hopeful	4%
	Enthusiastic	3.7%
	Eager	1.8%

5. DISCUSSION AND IMPLICATIONS

This study offers valuable insights into the role of technology, particularly augmented reality, in shaping students' emotions in online learning. It underscores the importance of emotional engagement in the digital learning environment and highlights the potential benefits of integrating advanced technologies to enhance the overall educational experience. These findings have implications for both researchers and practitioners in the field of online education, encouraging further exploration of technology's emotional impact and providing practical guidance for its effective implementation. As technology continues to evolve, understanding

and harnessing its potential to create positive emotional experiences for learners will remain a crucial aspect of education in the digital age.

From a theoretical perspective, this study adds to the growing body of literature that underscores the significance of emotional engagement in the online learning environment. The stark contrast between students' emotions before and after exposure to augmented reality-enhanced online learning materials highlights the potential of technology to transform the emotional landscape of education. It confirms the idea that technology's quality and effectiveness play a pivotal role in shaping students' emotional responses. Moreover, the alignment of students' emotions with the Pleasure and Arousal dimensions underscores the need for educators and instructional designers to consider emotional aspects when integrating technology into pedagogical practices.

Practically, the implications of this research are substantial. The positive emotional responses reported by students after engaging with augmented reality technology suggest that it can be a powerful tool for enhancing online learning experiences. Educators and institutions should take note of these findings and consider the integration of augmented reality into their online courses to improve student engagement and motivation. Moreover, students' unanimous agreement on the adoption of augmented reality in the university context emphasizes the demand for such technology and the potential benefits it can bring to higher education institutions. However, it is essential to consider the quality and usability of augmented reality applications to ensure that they align with students' expectations and provide a seamless learning experience.

6. CONCLUSION

The study attempted to explore undergraduate students' emotional responses to augmented reality technology in online learning using the Pleasure-Arousal-Dominance framework. Based on the thematic analysis, it was found that most students agreed that online learning can be boring, sleepy, and demotivating if not delivered effectively. The study found that by integrating augmented reality into online teaching, it can provide more enjoyable, exciting, and pleasurable learning experiences. The results underline the value of emotional involvement in online learning and the potential for augmented reality technology to change the emotional climate of education. The study offers a convincing case for the influence of AR technology in enhancing students' emotional responses. This was highlighted by the discrepancy in students' emotions before and after being exposed to AR-enhanced online learning materials. The study recommends that additional research be conducted in the future to evaluate how students' emotional responses to AR technologies impact their behavior and performance.

In terms of study limits and suggestions for future research, it would be advantageous to draw attention to any restrictions or potential biases in the study. Though the study focused primarily on the Pleasure and Arousal dimensions, future research may look at the Dominance dimension to provide a more in-depth knowledge of students' emotions. In addition, examining the long-term effects of AR on student engagement and academic results may potentially prove fruitful for future research. Furthermore, the study's qualitative methodology prevents it from being extrapolated to a larger population. Future studies are suggested to do a field survey in order to understand the subject from a wider perspective. Despite its shortcomings, the study has implications for both theory and practice and offers a substantial addition to the field of online education. It acts as a springboard for more research and development in this area.

The study adds to the body of knowledge by highlighting the significance of emotional engagement in online learning from a theoretical standpoint. This emphasizes how important it

is for educators and instructional designers to take into account the emotional components of technology integration into pedagogical activities. The study also links students' feelings to the Pleasure and Arousal dimensions, highlighting how crucial it is to take emotions into account during the learning process. Conferring to the favorable emotional reactions of the students, the study implies that AR technology can be a potent tool for enriching online learning experiences. This suggests the potential advantages of using AR in online tourism courses to raise student motivation and engagement. The acceptance of AR among students in the context of tourism online learning demonstrates the need for such technology and its potential advantages for higher education institutions. The study underlines the need to consider the quality and usability of AR applications to make sure they meet students' expectations and offer a seamless learning environment.

ACKNOWLEDGEMENT

The authors would like to express their gratitude to the management of UiTM Cawangan Sabah, Pulau Pinang, and Selangor for their endless support and encouragement.

AUTHORS' CONTRIBUTION

SAK and AN wrote the introduction and literature review sections. SAK collected and performed the thematic analysis using NVivo. SAK also wrote the data methodology and conclusion sections. AN and MRJ wrote the discussion and implication sections. All authors read and approved the final manuscript.

CONFLICT OF INTEREST

None declared.

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