

# Research on the Influencing Factors of Negative Participation Behavior with Danmaku in Video Lectures

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## Abstract

Danmaku is a new video interaction technology, which can create a good online learning atmosphere and improve the classroom interaction effect of online learning. However, when watching video lectures, only a small number of people actively interact with each other using Danmaku, while most of them show negative participation behavior. Based on the theory of cognition affection and conation, cognitive load theory and technology acceptance theory, this study proposed a theoretical model of influencing factors of negative participation behavior in video lectures. The results showed that task conflict affected participation intention through cognitive load. Low interaction and system design affect attitude, and attitude significantly affect participation intention. Personality traits play a moderating role between cognitive load and participation willingness. However, the hypotheses of information overload on cognitive load and pseudo-timeliness on attitude are not supported. The research structure provides a new way to enhance online education interaction.

## Keywords

Online Education; Danmaku; Negative Participation Behavior; Participation Willingness.

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## 1. Introduction

In recent years, online education has seen rapid development due to the popularity of the Internet and the impact of COVID-19, the use of online learning in China increased significantly in 2020, with the number of online learning registrations increasing exponentially. According to the 46th Statistical Report on Internet Development in China released by China Internet Network Information Center (CNNIC) in 2020, as of June 2020, the number of online education users in China has reached 381 million, accounting for 40.5% of the total Internet users (The 46th Statistical Report on Internet Development in China, 2020). Although the number is lower than that in the second quarter, But overall online learning has become an important part of Internet users' learning life.

The main problem of online education is the lack of interaction, especially in the video lectures. Online education mainly includes video lectures, video conferencing tools, and online learning software, among them, video lectures are most widely employed. Video lectures are accessible on various devices, such as smart phones and tablets (Giannakos, Jaccheri, & Krogstie, 2016), they offer students the flexibility to study according to their own schedules, students can view lectures when they have time or re-watch difficult lectures as needed (Wieling & Hofman, 2010). However, such videos involve only a lecturer teaching, they lack interaction among the teachers and students. To achieve learning goals, it is essential for learners to interact with lecturers and their peers and to share perspectives and ideas (Osman, Duffy, Chang, & Lee, 2011). Interaction also enhances initiatives toward improving learning performance (Morrison & Lowther, 2001). With Danmaku, the video viewing process has the feel of simultaneous communication with many people watching together. Most learners with video lectures are willing to use Danmaku in China. One study surveyed 213

Chinese online learners about the use of Danmaku found that 61% of students turned on Danmaku when watching video lectures (Yao, Bort, & Huang, 2017).

Learning videos are different from entertainment videos. If this technology is applied to video lectures, it can enhance the sense of timely communication and interaction in online education and create an atmosphere of learning together, which break the loneliness and boredom of learning. Hence, we should encourage learners to increase engagement, generate high-quality Danmaku comments, build a good learning environment, and pool wisdom to promote the development of online education.

However, the proportion of online learners who post comments on Danmaku is relatively low. Zhang et. al. (2017) conducted a surveyed among 9269 learners of an online course teaching Adobe Photoshop with 97 video lectures. The results showed that fewer than 7% of learners posted Danmaku comments among over 10 video lectures, almost no learners conversed interactively in Danmaku in every class. Evidently, learners' participation in Danmaku interaction is generally insufficient: most learners remain silent in Danmaku. The behavior that users only watching Danmaku but not posting comments there is defined as passive participation behavior in this research. There are not many people involved in the interaction of the Danmaku, so the value of the Danmaku can not be fully played. How to improve the interaction of the Danmaku is a significant problem. Therefore, This study focuses on the following research questions:

- 1) What are the factors that affect learners' negative participation in video lectures?
- 2) What is the internal mechanism of factors influencing learners' negative participation behavior in video lectures?

This study focuses on the interactive behavior of Danmaku in online education environment, draws on the research results of negative use behavior of social media, takes the negative participation behavior of Danmaku as the research object, explores the influencing factors of negative participation behavior of Danmaku, constructs a theoretical model, and provides some suggestions for enhancing the interactive behavior of online learning.

## 2. Literature Review

### 2.1 Danmaku Overview

Danmaku is a new interactive technology of video website. Comments sent by users float from right to left at the top of the video like moving bullets. If a large number of bullets appear on a video at the same time, it will form a "Danmaku"(Li, 2015). In 2006, Niconico.jp, a Japanese website for sharing animation, manga and video games, first introduced comments in the form of swiping from right to left at specific points in a video(Ma & Ge, 2014). It quickly caught on in Asia. AcFun, the earliest Danmaku website in China, was founded in 2007, followed by Bilibili, Tucao. One and other video platforms. In August 2012, Tudou introduced the function of "bean bubble" and was the first mainstream video website to introduce bullet subtitles. In March 2014, LetV opened the function of Danmaku in the animation section; In May of the same year, Tencent Video appeared "flying screen"; In August, IQiyi also launched a Danmaku function(Yang, 2019). At present, Danmaku technology has been widely used by mainstream video websites and audio websites, and has become the standard configuration of video websites. Bullet subtitles eliminate the gap between videos and comments, making video content a carrier of comments and social interaction. With Danmaku, users can easily share their thoughts, ask questions and express their feelings while watching videos.

Scholars have extensively discussed the functional characteristics, language characteristics and communication characteristics of Danmaku. The interface design of Danmaku, anonymity of sender, density of Danmaku, synchronization with video and other functional features can create an experience atmosphere of companionship and belonging for users(Liu, Suh, & Wagner, 2017). Therefore, for Danmaku users, sending Danmaku is a channel to seek information and vent emotions(Ma & Cao, 2017). Danmaku can help create an atmosphere to promote willingness, enthusiasm, and performance with online learning (Qian, 2017). Lin et al. (2018) examined the

effectiveness of Danmaku in 934 online course videos and found that Danmaku can effectively enhance learners' interaction, improve course participation, and promote the learning experience. However, Danmaku also leads to a higher cognitive load. Han (2015) reported that Danmaku comments produce an interactive instant feedback mechanism. However, the comments also interfere with the screen. Yi (2018) observed that in video lectures, Danmaku exerted different effects with different types of knowledge. Yi identified that with declarative knowledge learning, Danmaku reduced learning satisfaction and learners' performance in recall test. While with procedural knowledge learning, Danmaku plays a certain role in promoting learners' performance in transfer test. Wu et al. (2018) reported that Danmaku contains more explicit knowledge, whereas online comments contain more implicit knowledge. That is because explicit knowledge can be shared and explained instantly.

## 2.2 Negative Participation Behavior

Studies have examined negative user behavior with social media. Applying concepts from organizational behavior, one study divided negative user behavior with WeChat into four categories: diving, shielding, ignoring and quitting (Liu et al., 2017). Diving signifies the behavior whereby users often browse information published by others online. However, the users do not publish content and do not actively participate in communication and discussions (Liu et al., 2018). Diving is similar to the concept of passive participation behavior employed in the present study. People who dive on social media are called "lurkers" (Takahashi et al., 2003). Research on the causes of negative user behavior has focused on users' personal characteristics and platform environment factors. Users' personal characteristics include demographic factors, personality traits, identity recognition, and sense of belonging (Wang & Zhang, 2020; Zhang et al., 2019; Liu et al., 2012). For example, Nonnecke et al. (2004) found that users were reluctant to participate in posts owing to introversion and lack of confidence. Some students or adults are so busy that they have limited free time to submit posts in the online community, leading to passive user behavior. Preece et al. (2004) observed that when participants did not feel accepted by the community or did not identify with the community forum in which they participated, they would often choose to dive or even quit.

Platform environment factors include quality and quantity of information, system function, social environment, and privacy security. If participants perceive the quality of community forum information to be poor, or if participants who post on community forums receive long delays or no response, they tend to lose their participation enthusiasm (Liu et al., 2012). Community participants may also become bored owing to information overload or lack of information to stimulate interest in posting (Nonnecke et al., 2004). Preece et al. (2004) found that limitations with platform technology put high requirements on the technological ability of posters. Accordingly, participants with weak technological knowledge remain silent in Danmaku. Further, the risk of privacy leakage also leads to passive user behavior, causing users to take defensive protection behavior through fear of information leakage (Hu & Qiu, 2018).

To sum up, the factors causing negative user behavior with social media has been investigated in details. However, the passive participation behavior in Danmaku in video lectures has not hitherto been studied in online education. Therefore, on the basis of previous studies, this paper will start from learners' participation in online learning process and study their psychology of negative participation in the use of Danmaku.

## 3. Research Model and Hypotheses

### 3.1 Cognition Affection and Conation

Cognitive psychology is the middle of the 20th century developed branch of psychology, it is a subject of basic human behavior, the existing cognitive psychology tend to have broad and narrow sense, broad cognitive psychology refers to the perception, attention, intuition, memory and cognitive activities, as a major human cognitive process, pay attention to the psychological mechanism of human behavior, That is, the internal psychological process of information from input to output. In a

narrow sense, cognitive psychology refers to information processing psychology(Li W, 1998). Psychology in narrow sense is the mainstream direction of modern cognitive psychology, which holds that the process of human brain processing all kinds of information is the process of cognitive processing. The framework has been used in many studies as a theoretical background to explain people's cognitive and emotional willingness to act. This study intends to adopt a behavior model based on the framework of cognition affection and conation to explain the influence of various factors on learners' intention to participate in bullet-screen interaction.

### **3.2 Cognitive Load Theory**

Previous studies have shown that the same task exerts different cognitive load on learners with different experience levels, among which learners with low experience level have more cognitive load, while learners with high experience level have less cognitive load, that is to say, individuals with different characteristics have different cognitive load. In addition, the cognitive process has a great influence on the individual's behavioral intention, and the individual's will may be affected by the cognitive load generated in the process before taking a certain behavior(Chandler, 1991). This study believes that learners have cognitive load in the process of online learning, and the cognitive load theory can support the relationship between the cognitive load caused by learners in the process of online learning and their participation willingness in Danmaku.

### **3.3 Technology Acceptance Model**

The technology acceptance model (TAM) is widely used in the field of information systems to study the degree of individual acceptance of technology, and systematically expounds the causal relationship among external factors, perceived usefulness, perceived ease of use, attitude of use, behavioral intention and behavior(Davis, 1985). The model consists of three dimensions, namely external variables, perceived usefulness and perceived ease of use. Users' perceived usefulness, ease of use and attitude are positively correlated with behavioral intention, and behavioral intention positively affects user behavior. When users believe that a technology is useful and easy to learn and use, they will adopt it, and the better the experience, the more willing they are to use it [79]. The negative participation behavior of Danmaku studied in this paper is closely related to attitude, and this theory well supports the relationship between attitude and participation willingness.

### **3.4 Information Overload**

According to cognitive load theory, the capacity of individual cognitive resources is limited. When the amount of information to be processed exceeds the capacity, cognitive load will occur. Excessive information tends to increase people's cognitive burden(Turnbull et al., 2000). The content of online education video itself contains a large amount of knowledge information, and information overload will occur in the process of learning. Studies have found that cognitive overload occurs when people have more information than they can handle. Wang Na et al. (2021) also found that information overload would affect work efficiency and bring users great cognitive pressure. In this study, information overload consists of two parts: one is too much information in teaching videos; the other is too much information in Danmaku, which exceeds personal processing ability. Based on this, this paper assumes:

H1. Information overload positively affects cognitive load.

### **3.5 Task Conflict**

Task conflict refers to the conflict caused by switching between learning and other tasks when users watch video lectures(Sumuer, 2021). The resource-limited theory points out that the total amount of human cognitive resources is limited, and individuals need to use cognitive resources to complete each task, and they can share cognitive resources when completing several tasks at the same time. However, there is a problem of resource allocation, which follows the principle of "more than this and less than that, but the total amount remains unchanged"(Egeth & Kahneman, 1975). If a learner fires a Danmaku while watching an online educational video, it is necessary to allocate limited

cognitive resources between learning and the use of Danmaku so as to carry out these two tasks simultaneously (Posner, 1985). If individuals allocate all their available cognitive abilities to multiple cognitive processes, learning is interfered with. Considering a person's cognitive process, firing a barrage while watching a learning video may affect the learning process. Chen (2016) proposed that the interference of other tasks during learning causes individuals to consume a large amount of cognitive processing unrelated to cognitive ability, thus allocating fewer resources for basic and generative cognitive information processing necessary for understanding video content. Therefore, based on the cognitive theory of multimedia learning, this paper assumes that:

H2. Task conflict positively affects cognitive load.

### 3.6 Pseudo-Immediacy

Immediacy refers to the degree of psychological distance between individuals and communication partners and the directness of interaction (Mehrabian, 2010). In intermediary communication, immediacy increases the sense of contact with others by reducing the time needed for intermediary communication, thus reducing the sense of intermediary communication (Gunawardena, 1995). In the context of media use, immediacy can not only promote rapid and effective communication between users, but also positively influence users' perceptions of actively participating in the exchange of information with others, thereby increasing users' sense of social presence. In fact, all comments appear at the same time when the video is playing, rather than messages sent simultaneously by different people at the same time in real life. Therefore, the Danmaku you see now may be sent by others many days ago, while your own Danmaku may receive a reply after a long time. Such pseudo-real-time interaction makes it impossible for people who want to ask questions through Danmaku in online education to get timely answers, and users' attitude to interactive participation in Danmaku will be affected. Based on this, this paper assumes:

H3. The pseudo-immediacy of barrage has a positive impact on attitude.

### 3.7 Low Interactivity

Interactivity refers to "the degree of information exchange" (Hoffman & Novak, 2009). According to social exchange theory (Huang, 2003), information exchange in virtual communities is based on the expectation of reciprocity. When users obtain useful information or social support from other members, they may help them more actively to repay them. On the other hand, contributors also want help from other members and access to quality resources. Conversely, if active users who provide information cannot obtain useful information from the community or receive positive reactions from other members, their participation may be terminated (Zhao et al., 2017). In our study, interactivity represents the exchange of information between users in video lectures. In video lectures, there is a lack of interactive activities between teachers and students and between students, such as exchanging content, sharing ideas and answering questions. These interactions are essential to the learning process, so the lack of interaction will make learners lose their enthusiasm for learning and stimulate their interest in interaction, thus affecting students' satisfaction with the online learning experience. Based on this, this paper assumes:

H4. Low interaction of barrage positively affects attitude.

### 3.8 System Design

The usefulness and ease of use of system design will affect the user's use behavior. The theoretical framework of perceived value proposed by Sheth et al. (1991) shows that the value dimension that has the greatest impact on users is functional value, and the design attributes of products will affect users' cognition of functional value. Donald Norman (2015) believes that aesthetics, usability and practicability should be considered in system design. Whether people are attracted by the appearance, color and shape of something is an instinctive reaction. Arron Walter proposed a user demand model for website interface design and emphasized the importance of emotional design to meet user entertainment (Arron Walter Erin Kissane, 2014). Based on this, this paper assumes:

H5. System design positively affects attitude.

### 3.9 Cognitive Load

People are often unwilling to make extra efforts beyond the necessary efforts. If the cognitive load is too high, negative emotions will be generated because of the contradiction between their own will and external needs, which will also have an adverse impact on choice and decision-making. Meng et al. found that reducing external cognitive load can improve users' interactive experience, indicating that cognitive load negatively affects user experience (Meng et al., 2019). The user adaptive coping model suggests that when people feel stressed, they take steps to minimize negative outcomes. So the higher the cognitive load, the less willing people are to participate. Based on this, this paper assumes:

H6. Cognitive load significantly reduces participation willingness.

### 3.10 Attitude

An attitude is a person's perception or perception of something, that is, positive or negative emotions associated with something they like or dislike. In this study, the attitude refers to people's attitude towards the interactive participation of Danmaku in video lectures. Due to the quality of experience, people have a negative tendency towards the interactive participation of Danmaku in video lectures.

Studies have shown that there is a positive correlation between users' perceived fun and their attitude towards using the technology in social networking sites (SNSs) that focus on providing interesting services for users, and attitude affects their willingness to use the technology (Hung et al., 2016). Personal attitude would affect users' willingness to use mobile communication. When individuals form a positive attitude towards instant messaging, they will have a stronger intention to use it, so they are more likely to use it (Yoon et al., 2015; Lu et al., 2009). Obviously, when users form negative attitudes, their willingness to use will also decrease. So, suppose:

H7. Attitude significantly reduces participation willingness.

### 3.11 Personality traits

People with extroverted personality traits are optimistic, active, cheerful and other characteristics. They are more likely to adapt to the open way of information exchange under the Internet environment, and are more likely to share their ideas and opinions with strangers. Money et al. found that people with extroverted personality traits were more willing to share their experiences with others than those with introverted personality traits (Money, 1995). Zhou et al. (2014) found that personality traits of different members of online brand communities affect their knowledge sharing behaviors, and people with extroverted personality traits are more likely to have knowledge sharing behaviors. In addition, Mei et al. (2008) found that people with different personality traits have significant differences in cognitive ability. Therefore, the increased cognitive load of video lectures has different effects on people with different personality traits, and their willingness to share and participate in video lectures is different. Based on this, this paper assumes:

H8. Personality traits play a moderating role in the influence of cognitive load on participation willingness.

## 4. Method

### 4.1 Research Model

The research model (Figure 1) contains independent variables (information overload, task conflict, pseudo-immediacy, low interaction, system design), intermediate dependent variables (cognitive load, attitude), and dependent variables (participation willingness).

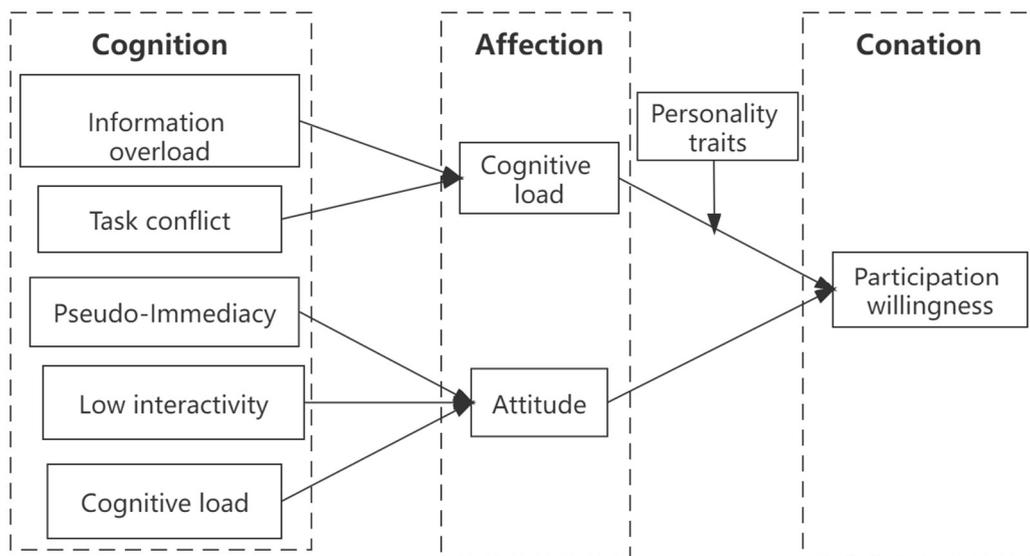


Figure 1. Research model

## 4.2 Measure

In this paper, the questionnaire survey method was used to verify the research hypothesis. The scale was designed based on the reference of the existing mature scale, including three parts. The first part is the basic information, the second part is the survey of the basic situation of online education Danmaku interaction participation, and the first two parts are tested by options. The third part is the test of each research variable, using five-level Likert scale to test, where 1~7 respectively represent "completely disagree", "disagree", "somewhat disagree", "uncertain", "somewhat agree", "agree" and "completely agree". The first part, basic information measurement. According to the personal characteristics of interviewees, mainly including gender, age, education background, occupation, etc. These items are set up to collect basic information as control variables for subsequent empirical research. The second part, the online education Danmaku interactive participation in the basic situation survey. This part is used to screen interviewees who meet the research requirements. Only interviewees who have had access to online education courses and used the Danmaku function can further fill in this questionnaire. The third part studies the measurement of hypothesis. This part is the main part of the questionnaire, which is the measurement of variables in the model. The interviewees answer according to their actual use. Finally, 309 valid questionnaires were collected. We used Smartpls3.0 software to analyze the data.

## 5. Results

### 5.1 Descriptive Statistics

The proportion of male and female in the questionnaire was 53.2% and 46.8% respectively, with a balanced proportion and no significant difference, which met the expected requirements. In terms of age distribution, the respondents are mainly young people, 19.0% of whom are 19-22 years old, 55.0% of whom are 23-26 years old, and 24.6% of whom are 27-30 years old. This is mainly caused by the younger characteristics of Danmaku, indicating that this survey group has more opportunities to contact Danmaku in daily life, which can better meet the requirements of this survey. In terms of the distribution of educational background, most of them are college students or above, accounting for 81% of the total sample. From the time of exposure to the Danmaku, 88% of respondents with more than one year of experience have some knowledge of the Danmaku, and their judgments on the issues related to the Danmaku video are more rational, which can meet the needs of this survey. See Table 1.

**Table 1.** Sample basic information statistics table

Items	Classification	Number	Percentage
Gender	Female	182	53.2%
	Male	160	46.8%
Age	<=18	2	0.5%
	19~22	65	19.0%
	23~26	188	55.0%
	27~30	84	24.6%
	31~50	3	0.9%
	>50	0	0%
Education	Junior high and below	1	0.3%
	High school	35	10.2%
	Junior college	29	8.5%
	University	130	38.0%
	Master degree or above	147	43.0%
Occupation	Student	169	49.4%
	Enterprise staff	102	29.8%
	Civil servants/employees of public institutions	37	10.8%
	Freelance	22	6.4%
	Unemployed or underemployed	12	3.5%

## 5.2 Reliability and Validity

Reliability analysis is the index of measuring data reliability, reflecting the consistency and stability of data. Cronbach's Alpha coefficient is generally used to test the reliability of the measurement model. When Cronbach's Alpha value is greater than or equal to 0.7, it indicates that the model has good reliability. Combined reliability (CR) is usually used to measure the internal consistency of each measurement item. When CR is greater than 0.7, it indicates that the model has good internal consistency. In this study, the reliability calculation results of the measurement model are shown in Table 2. Cronbach's Alpha value is greater than 0.7, and the combined reliability (CR) value is also greater than 0.7, both of which meet the standard and the data has good reliability. AVE validation is presented in Table 3.

**Table 2.** Reliability test results

Variable	Items	S.D.	CR	AVE	Cronbach's Alpha
Information overload	IO1	0.919	0.919	0.792	0.872
	IO2	0.901			
	IO3	0.848			
Task conflict	TC1	0.893	0.898	0.747	0.830
	TC2	0.907			
	TC3	0.788			
Pseudo immediacy	PI1	0.886	0.916	0.784	0.864
	PI2	0.839			
	PI3	0.930			
Low interactivity	LI1	0.836	0.920	0.793	0.870
	LI2	0.915			
	LI3	0.919			
System design	SD1	0.824	0.890	0.730	0.816
	SD2	0.876			
	SD3	0.862			
Personality traits	PT1	0.798	0.906	0.707	0.871
	PT2	0.859			
	PT3	0.817			
	PT4	0.886			
Cognitive load	CL1	0.925	0.944	0.849	0.911
	CL2	0.939			
	CL3	0.899			
attitude	ATT1	0.849	0.867	0.685	0.777
	ATT2	0.823			
	ATT3	0.811			
participation willingness	PW1	0.879	0.935	0.781	0.907
	PW2	0.887			
	PW3	0.913			
	PW4	0.855			

**Table 3.** Results of validation test

	IO	TC	PI	LI	SD	PT	CL	ATT	PW
IO	0.890								
TC	0.500	0.864							
PI	0.374	0.479	0.886						
LI	0.437	0.390	0.455	0.891					
SD	0.502	0.307	0.253	0.319	0.854				
PT	0.371	0.250	0.380	0.343	0.276	0.841			
CL	0.350	0.485	0.499	0.262	0.183	0.183	0.921		
ATT	0.594	0.536	0.384	0.510	0.338	0.303	0.416	0.820	
PW	0.402	0.592	0.521	0.402	0.251	0.217	0.483	0.576	0.884

### 5.3 Hypothesis Testing

Path analysis results showed that task conflict had a significant impact on cognitive load, with a significance level less than 0.001 and path coefficient of 0.414, indicating that task conflict had a positive impact on cognitive load, thus supporting hypothesis H2. Low interaction had a significant effect on attitude, the significance level was less than 0.001, and the path coefficient was 0.378, indicating that the effect was positive and hypothesis H4 was true. The system design has a significant positive influence on attitude, the significance level is less than 0.05, and the path coefficient is 0.175, assuming H5 is true. Cognitive load and attitude have significant influence on willingness to participate, and the significance level is less than 0.001, indicating that hypothesis H6 and H7 are valid. Personality characteristics played a moderating role between task conflict and willingness to participate, with a significance level less than 0.05 and a path coefficient of -0.134, indicating a negative moderating role. Hypothesis H8 was established. The relationship between information overload and cognitive load is not significant, and the relationship between pseudo immediacy and attitude is not significant, indicating that hypothesis H1 and H3 are not supported. See Table 4.

**Table 4.** Results of hypothesis testing

Hypotheses	Estimate	T	P	Supported?
H1 Information overload positively affects cognitive load.	0.143	1.712	0.088	No
H2 Task conflict positively affects cognitive load.	0.414	4.156	0.000	Yes
H3 The pseudo-immediacy of barrage has a positive impact on attitude.	0.168	1.787	0.075	No
H4 Low interaction of barrage positively affects attitude.	0.378	4.296	0.000	Yes
H5 System design positively affects attitude.	0.175	2.292	0.022	Yes
H6 Cognitive load significantly reduces participation willingness.	0.286	3.419	0.001	Yes
H7 Attitude significantly reduces participation willingness.	0.442	6.394	0.000	Yes
H8 Personality traits play a moderating role in the influence of cognitive load on participation willingness.	-0.134	2.003	0.046	Yes

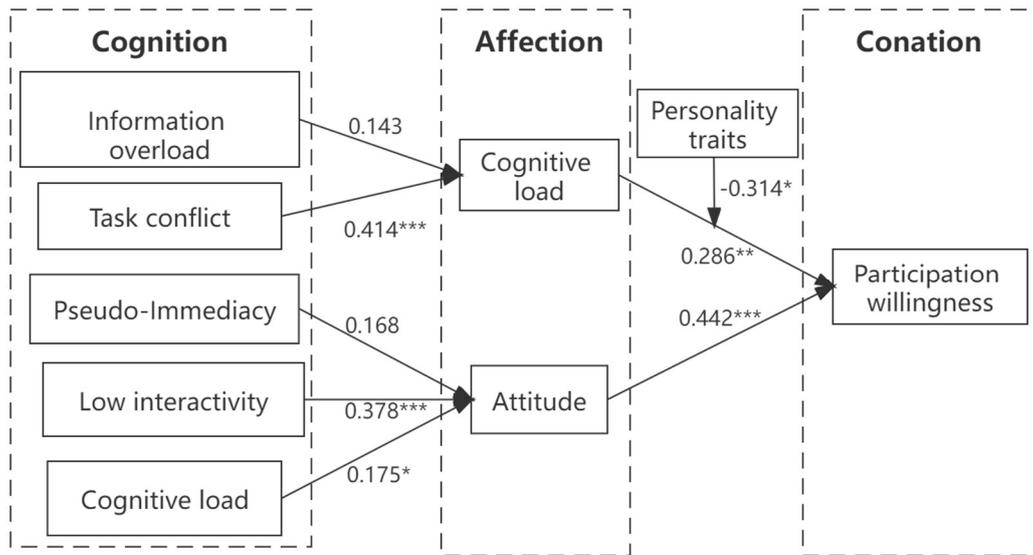


Figure 2. Results of the structural model

## 6. Conclusion

This study discusses the user perceived in online learning video shot screen interactive information overload, low task conflict, pseudo immediacy, interactivity, systems design and cognitive load and attitudes, the relationship between the cognitive load and the interaction of barrage to participate, the relationship between attitude and barrage participation intention, the relationship between the cognitive load and attitude in the middle of the role and personality traits. But there are limitations. The Danmaku that this paper focuses on is only one way of video interaction, so the research on the interaction path of negative participation in online education is not comprehensive enough. The follow-up research can take more video interaction tools into consideration and conduct horizontal and vertical comparison, so as to make the interaction research of online education more comprehensive. Further research could add more methods, such as experimental methods, text mining, data analysis and so on.

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