
Analyzing Social Presence Factors in Experience Design of Online learning

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ABSTRACT

The advancement of information technology has led to an increase in the number of interactive activities in the online learning process, and various emerging classroom media have made great strides in terms of interactivity, flexibility, and efficiency. However, there are still issues with a single interaction mode, insufficient content depth, and low participation. This also creates additional requirements and challenges for the design of online classroom platforms. Social presence is one of the direct characteristics influencing the quality of online learning; therefore, this study explores user experience design in online learning contexts with the aim of enhancing users' social presence. By means of literature research, user interviews and case studies, we review the formation mechanism and influencing factors of social presence theory, and then construct a four-stage framework of online classroom interaction experience and its influencing factors, namely learning expectation experience, way-finding interaction experience, collaborative sharing experience and value reflection experience, to provide theoretical guidance for the design practice of related platforms.

Keywords: Social presence, User experience, Online learning, Interaction

INTRODUCTION

The rapid development of computer and Internet technologies has reshaped the way knowledge is acquired, communicated and interacted with. Learning methods and channels are no longer limited to traditional classroom venues; online classrooms, blended learning and other learning channels have become major trends in education, and many traditional classrooms are being transformed into online classrooms, with an increasingly large number of learners in online classrooms, increasingly diverse usage scenarios, and increasingly rich access to knowledge needs and preferences. Various emerging classroom media have made great progress in terms of interactivity, flexibility, and efficiency, and interactive activities based on computer and multimedia technologies have become more widespread and important. This also poses new requirements and challenges to the experience design of online classroom platforms.

Social presence, or the degree to which a person is viewed as “real” in mediated communication, is a key idea associated with the quality of the online learning experience (Gunawardena and Zittle, 1997). It has been determined that social presence is essential for learner engagement and the success of online collaboration. It enables users to improve social interaction, gain

emotional support, and produce positive experiences like immediacy, intimacy, belongingness, immersion, and efficacy, all of which will enhance users' learning outcomes and desire to keep learning.

This article employs the methods of literature review, user research, and case study, referring to theories of social interaction, social presence, and learning experience in education, concentrating on the interactive experience in online classroom, assessing the objects, contents, particular behaviors, features, and expectations of users in the online classroom, and analyzing how to help users acquire social presence and increase their social connection with each other. The study also examines how users might learn from others' experiences, co-construct knowledge, and develop a constant desire to learn through interaction.

Literature Reviews on Theory of Social Presence

Social presence theory was first conceptualized by Short et al. in the field of communication and defined as the degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships (Short et al., 1976). It was later applied in different ways in the fields of distance education, marketing, etc.

Social presence theory suggests that the degree of "social presence" in a communication medium influences the nature and quality of interpersonal interactions. Social presence refers to the feeling of "being there" or "being together" that people experience in a communication medium. The theory suggests that the more social presence a medium has, the more it supports rich interpersonal communication and the more it fosters relationships and communities. Conversely, the less social presence a medium has, the more it supports functional, task-oriented communication, and the less it fosters relationships and communities.

In the field of distance education, Randy Garrison has conducted research on the Community of Inquiry (CoI), in which they argue that the establishment of three elements of learning communities: social presence, cognitive presence, and pedagogical presence, and that these three elements can only work together to make the learning experience truly accessible to learners, while social presence is the basis for the establishment and development of learning communities (Garrison et al., 1999). Social presence is the basis for the establishment and development of learning communities. Therefore, this paper chooses the social presence theory as the entry point and intends to propose design models and strategies to enhance the user experience.

In general, the specific manifestations of social presence can be summarized as immediacy in the temporal dimension and intimacy in the spatial dimension (Gunawardena and Zittle, 1997). Intimacy depends on nonverbal factors such as physical distance, eye contact, physical proximity, smiling, facial expressions, and personal conversation topics. Immediacy is the psychological distance between the communicator and the communicative recipient and is conveyed through verbal and nonverbal cues.

For the online classroom scenario, the specific manifestations of social immediacy can be divided into five areas: social respect, social sharing, open-mindedness, social identity, and intimacy (Sung and Mayer, 2012).

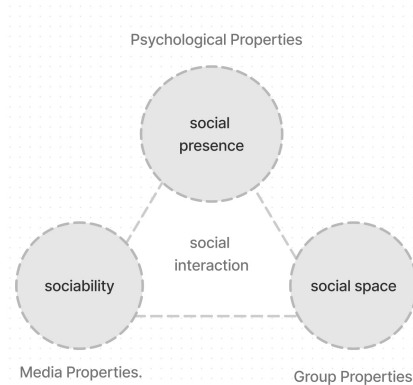


Figure 1: The social presence, sociability, and social space triangle.

Formation Mechanism of Social Presence

There are many types of presence, which are classified into social presence and spatial presence. It is believed that presence is a neuropsychological phenomenon that evolved from the interplay of our biological and cultural inheritance, with the goal of implementing the will: presence is the intuitive perception that successfully translates intention into action. In this vision, the ability to feel “presence” in virtual reality systems (artifacts) is essentially no different from the ability to feel “presence” in our bodies and in the physical environment around us.

There are many studies on the factors influencing social presence, and Kreijns et al. summarized them into two important correlation structures, namely social competence and social space, based on previous studies, and constructed a model of the association between the three (Kreijns et al., 2022), as shown in Figure 1.

In this model, sociality is defined as the basic functional and design features that online platforms provide for users’ social behavior, i.e., the mediating properties that enable users to engage in social interactions or provide guidance, and thus can be enhanced by design. It is a fundamental condition for users to interact socially within a community and supports the existence of social presence, social space and user experience. Social space is defined as a network of human relationships embedded in a group structure of norms and values, rules and roles, and beliefs and ideals, and is concerned with interpersonal and emotional connections between teams. A good social space can be reflected in the sense of community, group atmosphere, mutual trust, social identity and group cohesion, and thus can be seen as a group attribute. When users perceive a good social space in the platform, they can also enhance their own social presence. Social spaces are influenced by social interactions between users, depend on sociality to exist, and can be improved by design.

Social presence is a psychological attribute of individuals and groups, so indirectly, the social nature of the medium can be improved through design to enhance the social presence of users. The specific ways to promote the generation and sustainability of social presence need to be studied from the perspective of the individual into its formation mechanism, as shown in Figure 2.

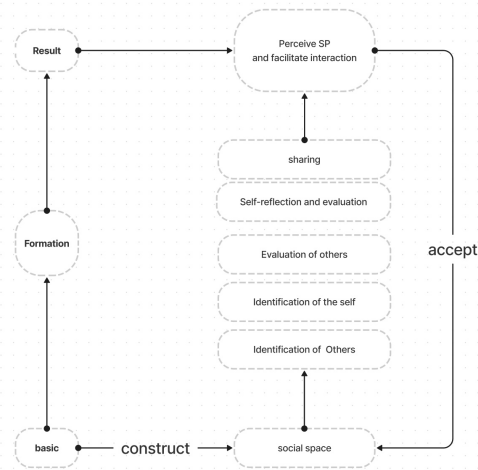


Figure 2: The formation mechanism of social presence. (Adapted from U.S Air Force, 2005).

The first stage is the perception and orientation of social space. The second stage is the perceived recognition, reflection, and sharing of others and one-self, and finally, in turn, promotes the construction of social space and the emotional experience of social presence.

The formation of presence begins with the positioning of the user in space. The formation of physical presence can be seen as the user's presence in his or her world is defined by the physical presence of that actor, the mental processes and frameworks that the user operates within when interacting, and other historical and social contextual factors that create a mental readiness in the user to participate in the presence (i.e., user variables). To enter the virtual world, the user must use physical communication channels (i.e., the reason for the presence).

In the second stage, he engages in activities in a shared space by recognizing the performance of other social actors through his avatar. As the observer develops a perception of his own embodied representation as an avatar, the recognition of his digital image follows. Collaborative engagement in shared task activities ensues as the social actor's cognitive attention is focused on interactions with the social actor, his or her avatar, and the avatar's embodied actions. The social actor will assess and perceive another social actor (i.e., the person behind the incarnation) by assessing and perceiving his or her behavior and appearance. As this process develops, the social actor will reflect on and evaluate himself or herself as he or she observes his or her avatar interacting with the digital body of another actor. The result is a reflection and consideration of his or her true self, including motivations, additional actions and attitudes in the context of the actions and interactions. This represents a cycle of shifting attention to the virtual and real self, the virtual and real selves of other social actors, and the context of the interaction.

Based on conceptual similarities we have grouped factors into the following major categories: Control Factors, Sensory Factors, Distraction Factors, and Realism Factors (Witmer and Singer, 1998), as shown in Table 1.

Table 1. Factors contribute to a sense of social presence.

Control factors	Sensory factors	Distraction factors	Realism factors
Degree of control	Sensory modality	Isolation	Scene realism
Immediacy of control	Environmental richness	Selective attention	Information consistent with objective world
Anticipation of events	Multimodal presentation information	Interface awareness	Meaningfulness of experience
Mode of control	Consistency of multimodal information		Separation anxiety/disorientation
Physical environment modifiability	Degree of movement perception	Active search	

Definition of Elements of Online Classroom Interactive Experience Based on Social Presence

First, we conducted user research. On the basis of the aforesaid understanding of the social presence generation process, a semi-structured user interview outline was constructed based on typical user scenarios. The findings were then summarized using grounded theory to refine the elements of experience in online classrooms into four aspects: learning expectation experience, way-finding interaction experience, collaborative cognitive experience, and value reflection experience, which are mapped to the formation of learning expectations.

The user study uses youth as the main interview group, including high school and college students, and uses contexts such as online teaching in schools and online courses for self-empowerment. Based on the study of the formation mechanism of social presence in the previous chapter, a semi-structured user interview outline was developed based on the typical scenarios, specific interactive behaviors, reflective evaluations, the most and least satisfying experiences, and future expectations of the users, and the outline was adjusted according to the user's expressions and the actual situation in the actual interview, so that the users could express their opinions smoothly and naturally and obtain as comprehensive information as possible. The interview outline was adjusted according to the user's expression and actual situation, so that the user could express his or her views smoothly and naturally, and obtain as comprehensive information as possible.

After the interviews, the effective interview texts were coded in chronological order according to the user behavior, and the core keywords were extracted for the core coding by applying the rooting theory to the user's interviewed responses in order of open coding and correlation coding, so as to construct a conceptual framework of user interaction experience in online learning

This study inductively aggregated the 20 fundamental categories it had obtained through open coding into the following four key categories: A1 learning anticipation experience, A2 way-finding interaction experience, A3 collaborative cognitive experience, and A4 value reflection experience as described in Table 2.

The learning anticipation experience mainly includes two key factors, which are learning preparation and initial construction of social space. The contents of learning readiness are learning material readiness, learning state

Table 2. Coding process of user interview.

Core coding	Axial coding	Open coding	Original user statement
Learning expectation experience	Learning Preparation	Goal Expectations	If it is the first class, see what other students with me, or know in advance who the teacher is and some basic information, have a psychological preparation
		Learning Content Perception	In an offline class, the teacher will open the PPT when the teacher arrives early, so you will have a preliminary understanding of what you are going to learn today; or the WeChat group will lay out the prep content in advance
		Preparation of Learning Materials	Look at the teacher's notice in WeChat, the last assignment, what needs to be prepared in advance
		Perception of members	Before class, we would say hello to the teacher in the discussion forum, or send an emoji, and after class, we would also send the teacher goodbye and other words, so we felt a little emotional connection
		State transition	Sometimes we are still lying in bed, so we can't turn on the camera.
		Learning Community	Learning environment
		Sense of belonging to a group	The classroom is the place where all students and teachers gather together, and there is a sense of community
Way-finding interaction experience	Identity Confirmation	Interaction objects are continuously perceivable	Without seeing other members' reactions, they will speak all at once, without communication
		Personal identity	I like to change my avatar to an animal or other cute image, it will make me feel more relaxed
	Interaction with learning materials	Interaction with learning materials	will be very fatigue, and sometimes go out of focus
		Take notes efficiently	In the group, the teacher will share the study materials, and the video will also have subtitles, more convenient to take notes and review later
	Interaction with others	Limitation of interaction mode	Usually a WeChat group will be created first, and the teacher's notices, shared study materials and links to live broadcasts. Then live in Tencent conference.
		Low frequency of interaction	I feel that the operation is cumbersome and everyone finds it troublesome to raise their hands to speak
Collaborative cognitive experience	Direct interaction between members	Lack of timely interactive feedback	Discussion list if there are too many statements, the teacher may not see completely, and also have time asynchronous
		Group discussion	The group discussion feature is useful and increases interaction

Continued

Table 2. Continued.

Core coding	Axial coding	Open coding	Original user statement
	Indirect interaction mediated by learning materials	Visualize the results of interaction	There are teachers who initiate online polls during their classes so that people can see the polls and have a sense of participation.
		Sharing Notes	After class, if I left any notes behind, I would ask my classmates to borrow some and take pictures and send them to me
Value reflection experience	Perception	Get Inspired	When I speak, I am still encouraged if the comment section has encouraging or liking emoji feedback, can make me a little more confident
		Generate empathy	Other people's speech is very reasonable I will like or send other emoji to express views
	Reflection	Boost self-efficacy	It is very rewarding to get praise from the teacher or get high marks in the final course

readiness, and learning motivation, and the initial construction of social space can be understood in terms of both spatial and cultural structures. These two components motivate users to interact and learn, hastening their entry into the learning process and laying the groundwork for formal learning process.

In a traditional classroom, the user enters the classroom as a spatial place to switch from a living state to a learning state, and has the learning materials and tools ready, has an initial impression of the course content, and forms learning expectations; at the same time, he or she interacts face-to-face with the teacher and classmates to acquire verbal and non-verbal cues, all of which elements provide the basis for formal learning. In contrast, in the online classroom scenario, the vast majority of information, interactions, and scenarios occur on screen, and the separation of space and time means that teachers and learners must make an extra effort to communicate with each other (Wei et al., 2012). Interaction cues in traditional classrooms are inadequate or even missing, and there are distracting elements in the real physical environment that affect the user's learning experience. For example, learning platforms such as Microsoft Teams, students can establish class group chats before learning, and teachers can release relevant learning materials and course schedules in the group chats, and students can advance. Students can view them in advance to get ready for the formal class. Social space can be initially constructed by control factors and reality factors, for example, the online activity platform gallery uses visual design methods to create a space for users to happen events, and users can control the avatar by using mouse or keyboard to realize moving freely in the space, chatting with other members by voice, viewing uploaded materials, etc.

The experience of way-finding interaction is mainly influenced by the elements of identification, interaction with learning materials, interaction between students, and interaction between students and teachers. Pathfinding interaction is a concept in connectionist theory that refers to the interaction of symbols, markers, and cues that learners interact with their environment

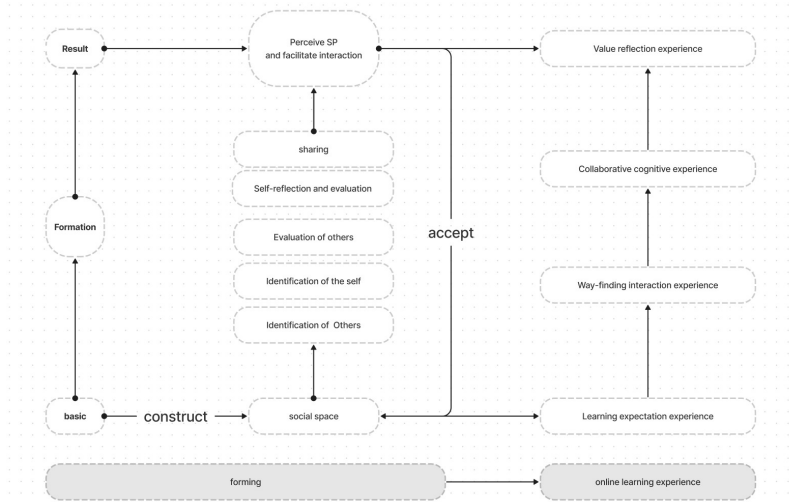


Figure 3: The formation mechanism and online learning experience.

in order to orient themselves in the learning environment (or interaction space). Interactions include interpersonal interactions (between individuals and individuals, between individuals and groups, between individuals and networks) and interactions between people and learning content, which are at a lower level, such as the simplest greetings, sending expressions, expressing approval or disapproval, viewing learning resources and integrating aggregated information, listening to the teacher, and listening to classmates. The interaction structure is basically a point-to-point interaction and does not form a social network with aggregation. In the design process, some design points can be proposed from the perspective of control factors, such as providing timely and perceptible feedback, multiple operation methods, for example, users can control the avatar by using mouse or keyboard to realize free movement in the space, automatically open voice for chatting after approaching other members, view learning materials uploaded in the space, etc.

Collaborative cognitive experience refers to the formation of social networks with aggregation between users through social interactions, which refers to direct interactions between users on the one hand, and includes indirect interactions mediated by learning materials, such as shared notes, on the other hand. In WeChat reading software, the function of shared annotations allows all users who read the sentence to see the annotations. This refined and personalized function can enhance the immediacy and intimacy of users more than the global perspective of comments, collections, and likes, and thus enhance the sense of social presence. By migrating this functionality to the online classroom scenario, the platform can be designed to provide users with real-time notes, annotations on instructional videos according to a timeline, questions, etc., facilitating the construction of interactive networks between users and other students and teachers.

Reflective value experience is the stage where the user develops a self-assessment of effectiveness and a value judgment of the entire experience and its results, which usually occurs after the user has been using the platform for a period of time. Effect evaluation and value judgment is the advanced stage of learning experience, which usually occurs at the end of the course learning, and is the overall comprehension and psychological feedback of learners on the learning process and results of the online course, as well as the feelings and evaluation of learners on whether the goals are achieved, learning efficiency and gains, which can enhance users' self-value identity and build a social space cultural atmosphere, and eventually promote social interaction and social presence in turn interaction and social presence. These four experiential stages and the formation of social presence can be mapped to each other, as shown in Figure 3.

CONCLUSION

The rapid development of computer networks and mobile Internet technologies has led to significant changes in the information ecology, content, and context of online learning, and has prompted a shift from traditional classrooms to blended learning and online distance learning. In the process of this transformation, how to improve users' knowledge acquisition effectiveness and sense of access, their willingness to continue learning and enhance the user stickiness of the platform have become the focus of design attention. Social presence is essentially a psychological phenomenon, which is the ability of users to participate in online communities and establish connections with others. Therefore, the introduction of social presence theory can provide theoretical guidance for the design of interactive experiences in online classroom platforms. This project proposes design strategies to improve the interactive experience of online classroom from the perspective of social presence theory, and the following conclusions are obtained:

1. The appropriateness of social presence theory in the experience design of online classroom platform. This paper explores the formation mechanism, manifestation and influencing factors of social presence, and analyses that social presence can help users generate positive experiences such as belonging, identity, immersion, efficacy and satisfaction, enhance users' willingness to continue learning and self-regulation ability, and thus improve users' learning effect and the user stickiness of the platform.
2. The experience design of online classroom platforms are evaluated from the standpoint of social presence. This study focuses on the online learning experience with the aim of promoting social interactions that lead to greater online learning and improve the design of interactive experiences in online classrooms by promoting social presence. We summarize the elements of online classroom interactive experience based on social presence theory including learning anticipation experience, way-finding interaction experience, collaborative cognitive experience, and value reflection experience. Secondly, existing cases are cited and analyzed in relation to the influencing factors of social presence (control factors, sensory factors, realism factors and distraction factors) to provide theoretical support for the design.

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