



The application of Metaverse XiRang game in the mixed teaching of art and Design in Colleges and Universities

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Abstract

Metaverse is a digital world created by human beings according to the physical world. Its deep integration of virtual and real features has created a new opportunity for the innovative development of game teaching in art design courses in colleges and universities under the epidemic situation. In the field of art design, the investigation and research on the learning mode of its courses show that traditional teaching can hardly bring good experience to students, which is manifested in the following aspects: the lack of “presence” in online learning caused by epidemic situation, resulting in weak display of teaching effect, and unreasonable organization of group learning in the course. Therefore, in view of these problems, this paper puts forward three paths about the innovative application of art design courses by using the teaching strategy of Xirang games, namely, interaction on the same screen and presence experience, interaction between real individuals and virtual images, and division of cooperative learning interest groups. At last, by using the research methods of semi-structured interview, eye movement experiment and scale, it is concluded that virtual game learning plays an active role in promoting the teaching reform in colleges and universities, stimulating learners to develop higher-order thinking abilities such as creativity and criticism, solving the problems of traditional teaching, and promoting learners to move from “outside the teaching scene” to “inside the teaching scene” and from “outside the knowledge” to “inside the knowledge”, which leads to a new teaching direction for the future teaching mode.

Keywords Metaverse · Art design teaching · Game teaching · Scientific grouping · Sense of presence

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1 Introduction

Metaverse is a digital world created by human beings according to the physical world (Xun et al., 2021). It originated from the book *Avalanche* by Neal Stephenson, a science fiction writer in 1992. With the development of science and technology and society, Metaverse will become a future teaching opportunity. Its deep integration of virtual and reality provides a support point for the combination of education and games. Teachers and students can create their own digital identities in the virtual world and have an immersive interactive experience (Xun et al., 2021). In the field of art teaching in colleges and universities, gamification has gradually become a way of learning. Taking advantage of gamification learning has gradually attracted wide attention from academic circles and industry, and gradually formed a new educational trend (Xueying et al., 2015).

In art design teaching, online teaching lacks effective supervision and management of teachers and opportunities for face-to-face interaction with teachers and classmates, which leads to loose teaching structure and difficult control of teaching level (Liping et al., 2021). Online education has advantages that offline education does not have, but its disadvantages are also obvious. Web teaching is simple and monotonous, and it is difficult to arouse students' enthusiasm. The plane interaction is boring and students' sense of participation is not strong (Zegan, 2022); The separation of time and space between teaching and learning is even less interactive, and the existing curriculum resources are difficult to meet the dynamic individualized learning needs of students (Wang Dongdong et al., 2020); Lack of skills training environment, lack of practice links (Liu, 2021a), "emphasis on teaching, neglect of practice", lack of interaction between teachers and students (Qiliang et al., 2014), real-time interaction is difficult and the experience is poor, and the sense of presence and immersion compared with offline classroom can't be formed (Lili et al., 2022), which makes it difficult to bring students a sense of experience and presence. Art teaching should be combined with students' interactive experience, emphasizing the effectiveness of learning. In the learning process, teachers take the lead in group learning, students learn passively and can't arrange the learning environment and content independently, and their enthusiasm for learning burnout is not high (Liping et al., 2021). Scientific and reasonable grouping is a reasonable premise to mobilize students to actively discuss and promote progress (Yangyang, 2022). In this study, the existing problems of online teaching are understood as follows: 1. Online learning lacks "presence"; 2. Weak display of teaching effect; 3. The organization of group learning in the course is unreasonable. At present, the form of online education can't meet students' needs for virtual immersion learning environment and social interaction, so it's crucial to find a new online education method (Zegan, 2022), so we should adapt to this new teaching method as soon as possible.

This paper puts forward a new application of art design teaching method involving metaverse games, which can further solve the problem of offline teaching in epidemic situation and improve the quality of education. Using Metaverse technology combined with Xirang Game (a Metaverse social software launched

by Baidu Company, in this virtual world, users need to create virtual characters and nicknames to generate unique virtual characters and enter the virtual world built in Xirang App), the mixed teaching mode of art design is adopted to change the traditional teaching method, that is, the organic combination of online teaching and traditional teaching (“online” + “offline” teaching) (Liping et al., 2021). The epidemic situation in COVID-19 forced the rapid development of online teaching, and promoted the popularization and normalization of mixed teaching of art and design in the post-epidemic era (Wei, 2021). Therefore, in order to change the traditional teaching mode at present, we can use the new technology in the metaverse era to lead a new teaching direction for the future teaching mode, so as to enhance students’ motivation and creativity in the learning process.

2 Research 1: On-screen interaction and presence experience

After the outbreak of COVID-19, students studied online at home, and large-scale online teaching became the norm in this period. In the post-epidemic era, in order to enable students and teachers to communicate and learn, online and offline integrated learning mode is implemented. Although it is possible to provide learners with diverse learning methods and conveniences at any learning time, learning place and teaching resources, it is still unavoidable that online communication methods such as meetings and lectures are difficult and have poor experience. First of all, the teaching contents of art courses have certain artistry, which should be demonstrated by teachers’ demonstrations. In the process of online teaching, it is difficult for students to have artistic resonance, which also has a certain impact on students’ learning effect (Wei, 2021) Re-art design courses often need the support of professional classrooms, training conditions and equipment. For example, the training of studios, production equipment, professional equipment and other courses is difficult (Liu, 2022), and students lack the sense of presence, experience and some manipulation functions. However, in the metaverse, teachers in traditional classrooms are no longer constrained by classrooms and existing teaching aids, and the metaverse classroom is full of imagination (Wei, 2022).

Metacosmic deep immersion experience provides learning immersion and presence for gamification education and learning. The core feature of Metaverse is immersion experience (Liu, 2021b). Teachers, students, parents and other personnel can create their own personalized learning space in Metaverse, and start unique and personalized immersion experience learning. Immersive online education under the metaverse concept has become an important development direction (Hai et al., 2022). The “flow theory” has also become the immersion theory, which was put forward by Mihalyi Csikszentmihalyi. It can be understood that when people participate in some activities, they will unconsciously devote themselves to them, concentrate their attention and enter a state of immersion (Xifan et al., 2016). Therefore, immersion theory describes learners’ sense of participation in an “immersion” state, which can provide reference and direction for Metaverse to support learning practice and innovation of game education, so as to enhance learners’ sense of participation and motivation in game education. In the era of metaverse, immersion learning has

gradually become a normal way of learning (Wenchao et al., 2022). The teaching fields presented by Metaverse are very similar, which can provide students with a virtual environment that is realistic in the real world (Cai et al., 2022). Yang Bin, vice-president of Tsinghua University, talked about Metaverse's empowerment of future teaching at the 2021 World massive open online course and Online Education Conference, and believed that Metaverse could provide better support for future graphic design in two aspects: immersion and concentration, imagination and creation (Lili et al., 2022). In the metaverse, users don't need to spend time learning the traditional mode, but only need to spend time in the metaverse, which is close to the real world, through immersive experience. Experience this virtual world through games, which greatly improves the realism and immersion of the virtual world (Qian et al., 2022). The highly authentic and immersive features of the educational metaverse will further enhance users' sense of existence and presence, and make it possible for users to learn as if they were there (Cai et al., 2022). Using the characteristics of distributed virtual-real integration of Metaverse, learners can learn through virtual curriculum learning communities or platforms. Metaverse can enhance the aesthetic feeling, immersion feeling and acquisition feeling of learning process through scene empowerment, which also provides a practical platform for entrepreneurial innovation education in colleges and universities (Jinwu, 2022a). Zhu Jiaming believes that the biggest potential field of Metaverse is education, and there is a natural fit between Metaverse and education, and learning and seeking knowledge are endless. In this way, Metaverse provides the largest space and the best technical support for such learning (Hai et al., 2022). The application of Metaverse education platform can cross the boundaries of time and space, present an omnipotent knowledge world for learners, and create a new mode of immersion experiential learning (Wei, 2022).

2.1 Research contents

During the epidemic period, art design courses mostly let students learn art and culture through pictures and videos in the form of online meetings. Under the network teaching environment, teachers and learners are very dependent on network technology. Traditional online conference teaching is mainly provided by online teaching platforms such as Tencent Conference, Nail, Zoom, etc., which provide online teaching course resources and implement live online teaching (Lindong, 2021). However, due to the limitation of technology, it is still impossible to provide students with a 100% reduction of the real virtual situation, and it is difficult for students to form a sense of presence and immersion. Therefore, although blended teaching provides flexibility and personal learning approaches (Jamalova et al., 2022), it is ultimately forced by the limitations of the current level of science and technology, and it is difficult to bring better experience to students. Including art design courses, there will always be some unexpected situations that can't be discussed and studied together. The Xirang game can create an almost real meeting situation for students. If you wear headphones, you can immediately experience the immersive audio visual effect. If you turn on the microphone, you can connect the microphone immediately,

realize multi-person voice communication (Ding, 2022), effectively stimulate learners' learning motivation, and observe and experience academic discussions at different times and places in an immersive way. For example, the Creator Tower in the Xirang game, the space for holding a conference in the virtual world can accommodate 100,000 people to interact on the same screen at the same time, which is a huge space for activities. Thereby spanning time and space, creating an almost real meeting site, and making learning interest happen naturally in related situations. The metaverse itself is a world full of digital information, and the information consciousness of students who study in the metaverse will be cultivated imperceptibly (Cai et al., 2022). At the same time, through the blessing of games, students can break through the time and space constraints, so that learners can change from passive learning to active learning, and avoid the dullness of online learning caused by the epidemic situation, which makes students' attention distracted and unable to concentrate on their studies.

In order to better solve the problems in the mixed education of art and design and bring a better learning experience, this study borrows the game of Xirang soil for further research and analysis. Through eye movement experiment, the experimenter was visually tracked to observe the experimenter's perception and interest in this virtual conference platform in the game, and the results were verified by questionnaire and eye tracking technology.

Hypothesis 1: Metaverse Xirang game can bring immersion and presence to online teaching of epidemic situation, and change the traditional online meeting mode.

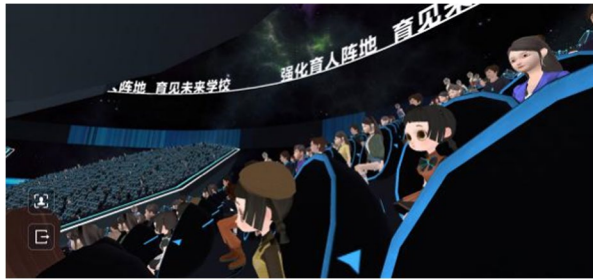
2.2 Experimental design

Select the conference center scene (see Fig. 1) from the Metaverse Xirang game. During the experiment, click the picture to play it, and then analyze the eye movement indicators such as the total gaze time and gaze times of the subjects browsing the experiment. From the perspective of internal drive theory in psychology, this paper makes an in-depth study on user behavior analysis. The experimenter's behavior when browsing experimental objects can really reflect the user's browsing interest to some extent, and it can be found that there is a certain relationship between the user's browsing behavior and the user's interest in browsing objects.

Fig. 1 Virtual conference center scene



Fig. 2 Virtual conference center interface 1



This research hopes to get users' understanding of virtual knowledge and their feelings after using it. Therefore, in this eye movement experiment, it is of great significance to systematically study and analyze the experimenter's interest, and to use the user questionnaire and eye tracking technology to predict and demonstrate the design results, for the presence and immersion experience of virtual conference in the new situation..

2.3 Experimental method

In this experiment, due to the limitation of conditions and time, the method of case study is adopted. That is to say, a small number of subjects are called to conduct small-scale research, so 40 students from an art college of a university are selected as the experimental subjects, and all the subjects have normal naked eye vision or corrected vision. Before the start of the experiment, the subjects were informed of the relevant experimental operation information in advance, and at the same time, the subjects were asked to fill in the relevant personal information and participation letters. Introduce the eye movement equipment, experimental process and requirements to the subjects, and guide them to sit about 70 cm in front of the computer screen to relieve their emotions. After the eye movement instrument is calibrated correctly, start the experiment. The subjects sat upright, and their eye movements were recorded by eye movement meter. In this experiment, we look at pictures (see Figs. 1, 2, 3). After browsing all the experimental materials, the subjects were invited to fill out the questionnaire of measuring experience to collect their subjective feelings.

Fig. 3 Virtual conference center interface 2



I hope to get the user's understanding of the virtual conference and the feeling after the experience, and verify that the virtual conference is a kind of exhibition form that is actually needed through investigation, and the distribution of the questionnaire is carried out along with the eye-kinescope experiment. A questionnaire survey on the feasibility of virtual conference is conducted for the users who have experienced the performance experiment, so as to obtain their psychological feelings and evaluation of the virtual conference after experiencing the virtual conference platform.

2.4 Experimental results and analysis

The deleted Cronbach coefficient is the reliability coefficient value of the remaining six items after a certain item is deleted. As shown in the table above, the Value of the Alpha coefficient of Cronbach is between 0 and 1, and if the Alpha coefficient does not exceed 0.6, it is generally considered that the reliability is insufficient; When it reaches 0.7–0.8, the watch has considerable reliability, and when it reaches 0.8–0.9, it shows that the reliability is very good. The reliability of this study is 0.875, which indicates that the research scale has high reliability, good stability and consistency (Tables 1 and 2).

From the analysis of the questionnaire after the experiment, it can be seen that the users are generally satisfied with the use of virtual conference technology and online conference compared with those who have experienced virtual conference before. However, it can be seen from the survey that compared with the traditional form of meeting, most people prefer the form of virtual meeting, and the advantages brought by virtual meeting and exhibition have been recognized by users. It further tells us that the virtual conference based on metaverse technology meets the needs of users. Compared with the traditional conference display mode, the virtual conference technology includes many elements such as text, static images, sound, dynamic images and games. The immersive experience it brings can't be ignored. As long as users enter the conference center tower, they can automatically match seats and hear the speeches of speakers on the stage. Although the current research is still negative, there are still many imperfections, and there is still a huge room for growth from our envisaged goal. However, with the help of this technology, the exhibition effect of the conference can be further enhanced, the virtual conference can effectively replace the shortcomings of the traditional conference, and the teaching effect of the conference can be realized to stimulate students' browsing interest on the principle of observing students' interest. Giving people a good emotional experience, facilitating people's lives, enriching people's learning styles, and keeping students in a state of concentration (Alhalafawy et al., 2022), thus verifying the effectiveness and feasibility of the virtual meeting that can bring us a sense of presence and immersion.

3 Research 2: Interaction between real individuals and virtual images

Metaverse is a cross space that is closely related to the real world but transcends the virtual world. Different from the real world, people can have their own digital identities in Metaverse and interact with virtual learning objects. (Xun et al.,

Table 1 Summary of experience problems based on virtual meeting in Xirang Game

Subject	Very disagree	Dis- agree	Common	Basically agree	Very much agree
1 What is your overall satisfaction with the current online conference?	0	0	17.5%	62.5%	20%
2 What is your overall satisfaction with using virtual conference?	0	2.5%	22.5%	60%	15%
3 What is the emotional experience that virtual meeting brings to you when you experience virtual meeting?	0	5%	20%	55%	20%
4 Compared with traditional meetings, virtual meetings are preferred?	2.5%	2.5	27.5%	40%	27.5%
5 Virtual meetings can bring us a sense of presence and immersion?	2.5%	2.5	20	52.5%	22.5%
6 During the epidemic, this meeting form can bring us convenience?	2.5%	2.5	10	20	65%
7 This kind of meeting has a great development prospect?	2.5%	0	5	40%	52.5%

For the above questions, the Likert scale is used to show the average value. "1" means "very much agree", "2" means "basically agree", "3" means "average", "4" means "disagree" and "5" means "very different". The following data are obtained through SPSS26 analysis.

Table 2 Reliability coefficient of variable

Subject	Correlation between corrected items and totals (CITC)	Clone Bach after deleting item Alpha	Cloning Bach Based on Standardization Term Alpha	Cronbach's Alpha
1	0.437	0.884		
2	0.496	0.879		
3	0.762	0.847		
4	0.695	0.856	0.875	0.878
5	0.712	0.853		
6	0.752	0.848		
7	0.773	0.845		

The corrected item total correlation CITC, this indicator indicates the correlation between the above seven items. If this value is greater than 0.4, it means that one item has a high correlation with the other six items. In this item, the CITC values of all items are greater than 0.4, so there is a high correlation between the items

2021). At present, the traditional art design teaching not only has the problem of “presence”, but also has a very big drawback, that is, the communication between teachers and students is weakened, and the classroom lacks interest. The sense of social contact is relatively weak, and emotional communication is obviously hindered, which leads to the low efficiency of communication between teachers and students (Tuodandan et al., 2021). Students are not highly interested in participating, and it is difficult to understand the content of design courses in the classroom. Students’ online autonomous learning ability is insufficient, and learning participation is difficult to guarantee (Dongdong et al., 2020). In the interactive activities between teachers and students in online teaching, there is a widespread phenomenon of zero interaction between teachers and students. It is difficult for students to have active emotional participation in learning when facing the teacher’s small avatar and courseware page on the computer or mobile phone screen, and there is a lack of interaction between teachers and students, so it is difficult for teachers to get feedback from students (Qiliang et al., 2014). Online teaching is a kind of physical absence. Therefore, the game teaching supported by the meta universe technology can solve the problems that traditional teaching is divorced from practice, that students in teaching are not clear and precise about theoretical learning, and that practice and theory cannot be well integrated. The “Xirang” game world provides an immersive virtual space parallel to the physical world, realizing the interaction between real individuals and virtual images, and alleviating the dilemma of low learning enthusiasm during the epidemic.

The elements of social interaction in the universe provide real-time interaction opportunities for gamification art design education. Metaverse is an open, virtual-real and interactive space. Using Metaverse technology can create different learning situations for learners, and find problems and explore learning in the created different situations (Zhouxiu et al., 2022). Teachers and students, as the main objects in innovative teaching practice, can be immersed in the

educational metaverse to socialize and establish cooperative learning relationship, thus promoting the interaction between students and teachers, as well as learning resources and environment (Cai et al., 2022). Jane Mc Gonigal, an American game research theorist, once pointed out that experiencers should be fed back in real time in the process of gamification learning (2012). This means that in the process of virtual teaching, we should pay attention to the real-time interaction with students, and keep abreast of students' learning situation, so that students can have positive self-identification in their learning (Hai et al., 2022). In such an open, real-time interactive space, it is convenient for learners to collaborate and exchange learning, which greatly promotes learners' learning efficiency (Zhouxiu et al., 2022). metaverse encourages participants to create content in metaverse. Everyone can be the builder of metaverse and create their own world, which can bring infinite possibilities for interactive teaching (Ke et al., 2022). In the metaverse, we can observe, appreciate and copy any work in close range, in all directions and in all details, and its immersive reality can completely be a substitute for the actual visiting behavior (Ming, 2022). Students are placed in an immersive situational experience environment, which stimulates students' multiple senses, enables them to face real situations, and then exercises their sensitivity to information and judgment on the value of information (Cai et al., 2022). For example, the VR/AR+ Education Laboratory of Beijing Normal University and the primary school affiliated to Tsinghua University in Tsinghua University have carried out a series of language learning activities based on AR technology, providing an augmented reality learning environment for students, such as observing and interacting with the sun and the earth, and conducting English dialogue learning. Such simulated scenes provide a very good learning platform for art education, and students can take advantage of opportunities to better understand the purpose of course learning (Cai et al., 2022). VR Education Holdings has developed a meta-space called ENGAGE Oasis, which allows students from different schools, different regions and different majors to meet with each other directly and learn and communicate with each other. In addition, ENGAGE Oasis also allows students to choose their own learning style according to their own preferences, formulate their own learning goals, and provide students with an intimate learning experience through virtual classrooms and virtual meetings (Graham, 2021). Qiao Weibing also believes that Metaverse will make great changes in the educational scene, and the new educational scene and model contains a new learning revolution. Different from the traditional educational model based on textbooks, teachers and classrooms, Metaverse will bring a new model of space-time learning (Jinwu, 2022b).

3.1 Research contents

In the Metaverse game, as an experiencer, you can put your virtual image in an immersive scene. First of all, creating our own virtual characters and nicknames can generate a unique virtual avatar in the game world, which can express our identity and character. In the next step, you can enter the virtual world constructed in Xirang

Fig. 4 Interactive communication with partners



Game. No matter with teachers or classmates, you can have instant voice and interactive communication with classmates and partners through virtual identities, discuss various learning topics and contents, and make like-minded friends (see Fig. 4).

In addition to socializing in the game anytime and anywhere, you can also interact with the avatars in the game to provide more learning and social opportunities. For example, in the art exhibition scene in the game, you can immerse yourself in the traditional culture of China with your own virtual identity, feel the artifacts and their decorative patterns in different historical periods, and realize the interaction between its users and virtual characters with the help of Metaverse technology. For example, the intangible cultural heritage Fengyang Phoenix Painting depicted in it (see Fig. 5), through the immersion experience, students can not only understand its line drawing technique, but also its color expression technique of “multicolored, plain color, ink and wash”. And the Sanxingdui site on display is even more desirable (see Fig. 6). In the game, apart from studying the traditional patterns, the biggest difference is that you can experience it with your hands, and learn the knowledge background of each cultural relic more intuitively. Understand different folk customs and classic traditional visual elements, so that students can blend traditional and modern design on the basis of studying traditional graphics. Besides, we can also take the “Radish Flying” spacecraft to the Three-body Pavilion (see Fig. 7) to learn about another realm of art and explore the magnificent competition for the survival of civilization. Game-based learning concept can create an interesting and dynamic learning environment (Poonsawad, 2022), thus enhancing students’ thinking height in traditional culture and modern design, and designing more exciting works of art.

The purpose of this study is to verify whether students can learn in this interactive and highly immersive game, get in touch with excellent design works, learn

Fig. 5 Fengyang Phoenix Painting



Fig. 6 Sanxingdui Site

quickly and conveniently, improve their autonomous learning ability, enable students to have positive self-identity in their learning, improve their cognition, appreciation and experience of traditional culture, and promote the interaction among students, learning resources and learning environment. Through structured interview, the feasibility of combining games with education is discussed, so the hypothesis is put forward:

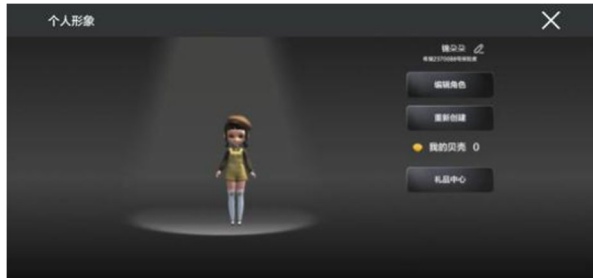
Hypothesis 2: With the help of Metaverse Xirang Game, the dilemma of low learning enthusiasm during the epidemic can be effectively alleviated.

3.2 Experimental design

In order to explore the feasibility of game and art design education, this paper mainly selects game modules closely related to art design courses for experiments. First of all, each user can create his own virtual image according to his own actual situation (see Fig. 8). Log in to “Xirang” on personal computers, mobile phones and wearable devices, and we can invite and add our classmates and teachers (see Fig. 9) to carry out our own game journey such as listening, shopping, communicating and watching exhibitions. This experiment mainly studies the following three modules, including: 1. Art Exhibition Hall; 2. Three-body Pavilion; 3. Sanxingdui Site (see Figs. 10, 11, 12), by letting the experimenters experience the games in these three module spaces, and then taking a semi-structured interview to study the experience process of Xirang game, the purpose of which is to know the real feelings of users when using the game.

Fig. 7 The Three-body Pavilion

Fig. 8 Customize personal image



3.3 Experiment method

According to the actual needs of this study, this paper explores the feasibility and implementation effect of game teaching, as well as the learning characteristics, learning habits and needs of college art college students in the new era, so as to provide guidance information for the follow-up effect of Xirang game experience. Therefore, students from an art college of a university are selected as the interview objects, and one-to-one individual interviews are conducted with players with certain Xirang game experience (see Table 3). First communicate the purpose of the interview by telephone, make an appointment for the specific time of the interview, and send the interview outline to the interviewee for reference. The interview method is QQ or WeChat, and the text or language communication can be used to promote benign interaction and keep the conversation going smoothly. During the interview process, the subjects mainly experience the above three types of game modules, and encourage the subjects to tell their experiences and feelings, and make specific research from the sensory, behavioral and reflective layers of the experiencers, hoping to have more clear data through analysis.

In view of the above three levels, this experiment sorts out the related data and investigation of the five dimensions of Xirang games, such as senses, performance, interaction, emotion and self-realization, and extracts some research reference items as follows: Sensory level, namely sensory experience, is the intuitive feeling of the experiencer on Xirang games, which is mainly influenced by the game interface color matching, use experience and other factors, and is the “first impression” of users on products. The behavior layer mainly includes performance experience and interactive experience, which refers to whether the fluency and stability meet the

Fig. 9 Invite social friends interface

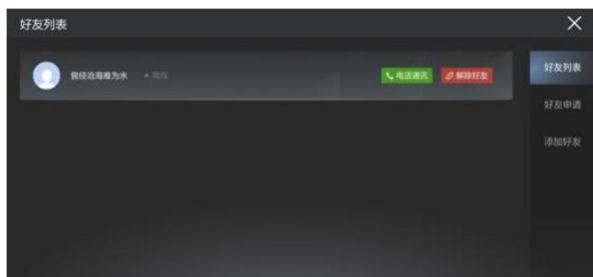
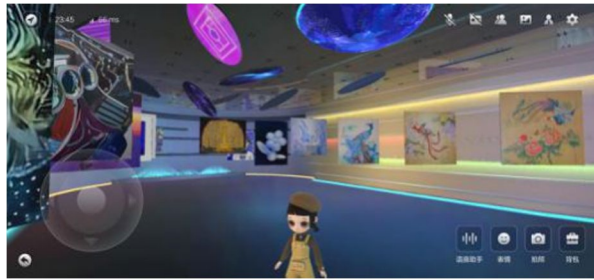


Fig. 10 Art exhibition module game interface



expectations of the experimenter when experiencing the game, and whether students can get feedback during the game when they communicate and interact with virtual images and scenes. The reflective layer mainly includes emotional experience and self-realization, which refers to whether this kind of immersive social experience can bring emotional pleasure and establish emotional resonance with users. It is also the embodiment of users' self-realization to achieve a sense of accomplishment, and is an important content of this experimental study. The research is mainly carried out from the following five issues (see Table 4).

3.4 Experimental results and analysis

After the interview, with the consent of the interviewees, the interview records in QQ and WeChat will be copied, and the respondents' answers will be summarized and sorted out, and the basic data of the interview will be formed to prepare for the subsequent research output. Firstly, the key information of each experience user's answer is put forward. Secondly, the key feelings of users describing the experience of Xirang game module are recorded, and whether the above experience can bring personalized experience of art teaching is discussed, so as to find a new teaching mode from games and improve students' interest in learning. In view of the above five dimensions, the five dimensions of Xirang Game, namely, senses, performance, interaction, emotion and self-realization, were further refined into the following reference items, summarized and improved, and finally the preliminary user experience interview content was obtained, as shown in the following table (Table 5).

Fig. 11 Three-body pavilion module game interface



Fig. 12 Sanxingdui Ruins Module Game Interface



According to the above-mentioned research dimensions, the interviewees evaluated each dimension subject according to their own actual feelings and with reference to the following evaluation grade standards. Grades include: Very satisfied: 5 points; Satisfied: 4 points; General: 3 points; Not too satisfied: 2 points; Extremely dissatisfied: 1 point. Each question has a full score of 5 points, and the result is an average score system, that is, the scores of items in each dimension are added separately, and then divided by the number of items in each dimension to get the average score of each dimension. Through SPSS26 analysis, the scoring results are finally displayed in the form of EXCEL radar chart (Fig. 13).

To sum up, through interviews with students, I am looking forward to the feasibility of Xirang games and art design. As can be seen from the radar chart above, Xirang games are outstanding in three aspects: self-realization, interactive experience and emotional experience, especially interactive experience and self-realization. These two aspects are the advantages of Xirang games. Users can communicate and interact with the virtual images in the games, and experience the immersive sound and visual effects by mutual voice and interactive communication. Although the interaction form is relatively single at present, and sometimes the interaction effect is not ideal, which affects the experience, the key technical points, including the interaction mode, still need to be broken.

Therefore, at present, the three technological mountains of Metaverse experience-vision, hearing and interaction need to be improved. Only by building a more complete and solid infrastructure can we achieve more immersive effects, more realistic experiences and more natural interactions. In this way, we can

Table 3 Interview the basic information of the subjects

Variable	Category	Sample number	Proportion
Gender	man	5	33.3%
	woman	10	66.7%
Age	16–18 years old	1	6.7%
	19–22 years old	2	26.7%
	23 years old and above	10	66.7%
Educational background	undergraduate and specialist	3	20.0%
	postgraduate	12	80.0%

know the crystallization of ancient wisdom anytime and anywhere through the urban layout of the Xirang world, for example, urban decorative elements can be seen everywhere. Besides, exploring Sanxingdui, excavating the Millennium national treasures, visiting the Three-body Museum and watching the Three-body Fleet shuttle overhead can be easily realized. There are also Shaolin Temple, Baoqingfang, Shijiazhuang Zhao Zhouqiao and Hangzhou West Lake and other buildings, which are linked with their dreams in the game.

4 Research 3: Homogeneous and heterogeneous grouping and interest group division

As early as thousands of years ago, Confucius put forward the way of cooperative learning. “If you study alone without friends, you will be ignorant.” Advocate students’ active learning, give full play to students’ subjectivity, enthusiasm and participation in a diversified and open learning environment, and promote effective learning strategies. However, at present, it is found that students don’t fully understand the course content; Online discussion is easy to get out of touch, and it is urgent to have a high self-learning consciousness. (Liping et al., 2021). Teaching in groups should make full use of students’ cohesion and give full play to their collective advantages (Dianyuan, 2011). The form of art courses is usually encouraged, and students study independently in groups (Yangyang, 2022). The advantage is that it takes a short time, but there are also some drawbacks. However, the main form of traditional teaching is the class teaching system, which has the advantage of large-scale teaching and a larger number of educational objects. It is easy to ignore students’ differences and personality development, and it is not conducive to mobilizing students’ initiative (Yangyang, 2022). In the process of learning, if teachers are the leading group, students learn passively and can’t arrange the learning environment and content independently, and they lack the opportunity to choose effective learning strategies that suit them, then students are unlikely to develop the ability of autonomous learning (Chunlin, 2006). Such grouping often fails to fully consider the interest differences among individual students, and there is no detailed task assignment arrangement (Yue et al., 2021). Metaverse can break through the

Table 4 Summary of interview questions

Aspect	Question
Sensory layer	What do you think of your first impression of these three game modules?
Behavior layer	What do you think of the performance experience in this game? Such as basic functions and experience fluency. What do you think of the interactive experience of each module during the game? For example, the experience of digging the Sanxingdui site by yourself?
Reflection layer	Did your experience bring you a sense of pleasure different from traditional courses? Do you think it is helpful for you to understand traditional patterns, architecture, etc. after experiencing the three modules?

Table 5 Summary of interview questions based on user experience of Xirang games

Aspect	Fine item	Interview question answer summary
Sense organ experience	Beautiful design	Simple and beautiful design, strong visual effect.
	Overall tone	The overall color tone is comfortable and harmonious, full of artistic flavor.
	page layout	Page setting and color matching are beautiful and harmonious.
Performance experience	module contents	The game is intuitive, rich in content and realistic in scene.
	Smooth operation	The whole experience is easy to understand, rich in gameplay and interesting.
	Operational guidelines	For the first time, you will be prompted.
Mutually experience	Functional structure	Complete functions and strong operability.
	Interaction	New and diverse interactions, such as interaction with virtual objects and multi-person voice communication, are full of immersion.
	Interactive feedback	Mutual voice, interactive communication, immersive sound visual effect.
Emotional experience	Interactive conciseness	The interface is simple to operate.
	Pleasure	The experience is pleasant, full of Chinese flavor and interesting.
	Habits	Develop a brand-new learning experience.
Self - realization	self-promotion	Social interest has been improved, good teaching methods, access to excellent design works, and quick and convenient learning.
	Sharing	Provide more teaching resources and teaching conditions, improve students' interest in learning, and reduce the burden of teachers and parents.
	Self - realization	Improve interest, enrich classroom life and make life more personalized.

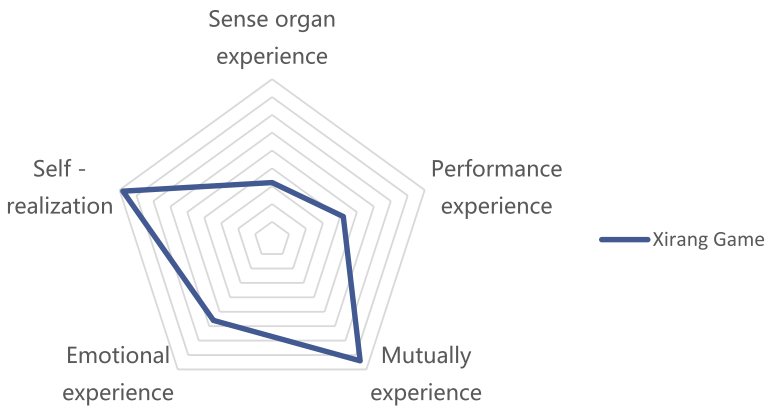


Fig. 13 Evaluation results of various dimensions of Xirang game

restrictions of real world conditions to a certain extent, bring a brand-new mode of cooperation and sharing to the curriculum, and create better conditions for students to exchange and share information, carry out collaborative innovation and form good information moral quality (Cai et al., 2022).

The immersion, presence, interaction and realistic game mode teaching created by Metaverse provide a new opportunity for blended teaching in the epidemic era. From the current situation of online learning, the phenomena such as learners' lack of group cooperation and members' low level of knowledge cognition persist (Baichang et al., 2021). A good interactive teaching method should play a guiding role in the behavior of experiencers, promote deep interaction and enhance learners' deep learning. Morath, an education expert, pointed out that if the learning loss caused by the epidemic could not be compensated, the learners' learning ability and level would not be improved as they should be (Qian et al., 2022). In the metaverse, learners can become collaborators in the process of immersion learning, form a learning community with the same interests or learning goals, match their own learning interest areas in it through virtual avatars, and conduct immersion learning in the inquiry process of interacting or cooperating with others (Wenchao et al., 2022). Cooperative learning is a teaching activity and learning strategy that promotes students' learning through student-student interaction (Yangyang, 2022). Metaverse will be the future form of social network. Participants can have face-to-face interaction with any friends in or outside Metaverse anytime and anywhere (Guoming, 2021). Through the interactive discussion between students and students, it is conducive to training students' language expression ability and interpersonal skills. More importantly, in this process, we can fully mobilize the enthusiasm and initiative of each classmate (Yangyang, 2022). Learners get more opportunities to communicate and cooperate with teachers and peers, which helps to maintain positive emotional experience, strengthen emotional perception and community perception in learning, and promote cooperative learning (Yifang, 2022). Although the related research of the universe has just started, its technical characteristics determine that its

future educational research and application is immeasurable. Another advantage of meta-technology is that for us to learn traditional culture and history, courseware and teaching materials under meta-technology can not be limited to books and slides. We can experience this historical and social situation, optimize our cognition and promote our thinking development (Xin, 2022). The application of metaverse education platform can cross the boundaries of time and space, present an omnipotent knowledge world for learners, and create a new mode of immersive experiential learning (Wei, 2022).

4.1 Research contents

In the game of Xirang soil, friends with similar interests can meet here. However, in the course of art design, according to the modern educational concept, usually under the guidance and control of teachers, students form a number of study groups. Generally, there are two forms, homogeneous grouping: people with the same level are divided into a group; Heterogeneous grouping: grouping students with different interests and personalities into a group. However, this is not a scientific way of distribution, ignoring the relationship level and the degree of coordination among students; If students are grouped by themselves, there may be bad phenomena of strong alliance and differentiation of advantages and disadvantages. No matter teachers' thinking grouping or students' independent grouping, they can't get the best ending method.

Therefore, in order to better solve the problems in the mixed education of art and design, and to ensure accurate group cooperation and autonomous learning, this study uses the Xirang game for further discussion. Through eye movement experiments, students can be grouped scientifically in class, that is, they can be grouped scientifically according to students' interests. At the same time, in the process of grouping, attention should be paid to balancing the distribution of members in each group, maximizing the differences within groups and the similarities between groups, so as to form a fair "homogeneous" group (Yue et al., 2021). Combine behavioral participation, emotional participation and cognitive participation organically, so that students' interest in learning through cooperation can realize seamless perception, reflect strong interaction, promote the change of learners' mind and enhance their innovative self-confidence.

Hypothesis 3: The problem of unscientific grouping in traditional teaching can be improved with the help of Metaverse Xirang games.

4.2 Experimental design

Starting from the interest areas of different modules in the Xirang game, and starting from the dimension of individual interest, this paper studies students' interest in each module. They are science and technology: exhibition of three-body museum; Traditional culture: Sanxingdui site; Academic: seminar for 10,000 people; Artwork: Art Exhibition Hall (see Figs. 14, 15, 16, and 17). The experimental materials are presented in the form of pictures.

Fig. 14 Science and Technology: Three-body pavilion



Before the experiment, each subject combined themselves according to the traditional grouping method, and each subject was unlimited in number, and the grouping list was recorded. During the experiment, click the picture with the mouse to play. By observing the eye movement indexes and interest degree of the subjects browsing, such as the total gaze time and gaze times, the length of gaze time represents the subjects' emphasis on the information of the area of interest and the depth of cognitive processing. Readers will spend a longer time gazing at the area they are interested in, while the time gazing at the area they are not interested in will be shorter. Therefore, this study believes that it is the most scientific to combine two people who will look at the modules of interest for a longer time and comment for the longest time.

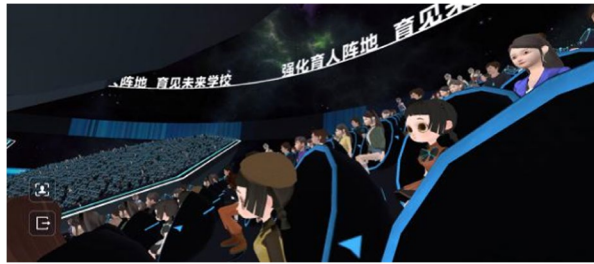
4.3 Experiment method

- 1) **Subjects** In this experiment, 39 college students were randomly selected as experimental subjects, including 37 girls and 2 boys, all of whom were students of Art College. All subjects' naked eye vision or corrected vision were normal, and there were no color blindness or weak color.
- 2) **Instruments and materials** In this experiment, the desktop eye tracker is used, which is a non-contact and freely movable eye tracking system. The hardware includes a notebook computer and a tracking module. There are four kinds of interest modules in the experiment. During the experiment, the experiment is carried out by observing pictures.

Fig. 15 Traditional culture: Sanxingdui site



Fig. 16 Academic: seminar for 10,000 people



- 3) **Experimental sequence** Before the start of the experiment, seven students divided themselves into groups according to the requirements of the class, that is, around four topics. After the grouping, the names of the groups were recorded (see Table 6). At the beginning of the experiment, the eye movement equipment, experimental process and requirements are introduced to the subjects, and the position and sitting position of the subjects are adjusted so that the center of the subjects' sight falls near the center of the screen when they relax and is calibrated. After reading the instruction, the subjects first show a "+" on the screen to remind them to start the experiment and ask them to browse the experimental materials. After browsing, the subjects click the space bar to jump to the next one. After the subjects browse all the experimental materials, they finish the experiment and collect their subjective feelings.

4.4 Experimental results and analysis

In order to calculate the interest degree of each student on different topics, it is necessary to select the eye movement data related to the user's interest degree. Because there are many kinds of eye movement data in the area of interest, in order to facilitate the calculation of users' interest, this paper mainly studies the relationship between fixation time and fixation times and interest, and makes SPSS26 analysis on the data of total fixation time and fixation times of four kinds of topics (see Table 7).

After watching the pictures, the subjects were asked to report their interest in the advertising content. Combined with Likert scale, the interest was scored in five

Fig. 17 Work of art: Art Exhibition Hall

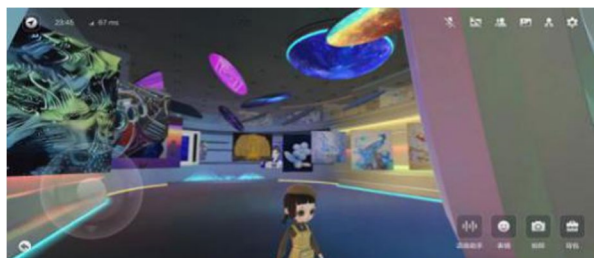


Table 6 Grouping list based on traditional grouping method

Group	Group Member									
Science and Technology	8	15	18	19	20	22	23	24	29	39
Traditional Culture	3	4	5	7	13	14	30	33	37	
Academic	1	2	9	10	11	27	31	34	35	36
Work of art	6	12	16	17	20	21	25	26	28	32

*The names of seven students are replaced by 1, 2, 3, 4, 5, 6 and 7, respectively, for the convenience of later data statistics

grades, from least interest to most interest, the order was 1, 2, 3, 4 and 5. Then the experimental data were imported into SPSS26. The user's interest degree obtained by eye data is limited and one-sided, which can't accurately reflect the user's interest needs. It is necessary to integrate the three types of data. Finally, the correlation of gaze time, gaze times and interest degree is analyzed to determine the correlation among them.

As can be seen from Table 8, the subjects have significant main effects on three indicators: fixation time, fixation times and interest degree of different topics ($P < 0.05$, $P = 0$). The closer Pearson correlation coefficient is to 1, the stronger the correlation between variables. According to the results, the correlation between gaze time and gaze times is 0.956, the correlation between gaze time and interest degree is 0.330, and the correlation between gaze times and interest degree is 0.304. There are multiple correlations among them, all of which are positive correlations. Therefore, the number of fixations in the area of interest is the best indicator to measure the degree of attention of the subjects in the area of interest. The more fixations, the more attention the subjects pay to the area. The scientific groups obtained according to the above methods (see Table 9). Students form teams according to the results of grouping, collect subjective feelings at the end of the course, and investigate their satisfaction with the course learning after grouping with science (see Fig. 18), whether it has improved compared with the previous grouping.

To sum up, in the collection and absorption of information, the data results obtained from different levels of interest are different, which can make the interested

Table 7 Statistics of gaze time and times of four modules

Theme	Category	Average Value	Standard Deviation
Science and Technology	fixation time	13,890.44	14,045.058
	fixation count	38.97	38.026
Traditional Culture	fixation time	14,403.31	13,976.381
	fixation count	39.08	36.254
Academic	fixation time	15,053.26	13,750.887
	fixation count	42.46	36.837
Work of art	fixation time	12,717.49	9778.711
	fixation count	37.44	29.634

Table 8 Pearson correlation analysis

		Fixation Time	Fixation Count	Degree of interest
Fixation Time	Pearson correlation	1		
	<i>P</i> value			
Fixation Count	Pearson correlation	.956**	1	
	<i>P</i> value	.000		
Degree of interest	Pearson correlation	.330**	.304**	1
	<i>P</i> value	.000	.000	

**At the level of 0.01 (two tails), the correlation is significant

activities and behaviors more lasting and focused. It can be seen from the satisfaction of experiencers after the scientific grouping experience that more than half of the students agree with this grouping method. Scientific grouping makes students more motivated to complete their tasks actively in the process of research, and it can also better stimulate students to explore various inspirations in the external environment and improve their interest in their art courses.

This paper explores the scientific grouping strategy based on eye movement experiment. Through the division of interest groups, each student's interest is fully taken care of in grouping, the students are assigned the tasks they are interested in, and the students' interests are combined for scientific grouping, so as to improve the motivation of group members to complete the tasks. When students are interested in grouped topics, they will pay close attention to their own research topics. Students will have a pleasant emotional response to the course content, arouse interest, and improve the efficiency of active learning. So as to better cultivate students' ability to explore design problems, promote the development of thinking, optimize the cognitive structure of design, and improve their innovative consciousness and practical ability.

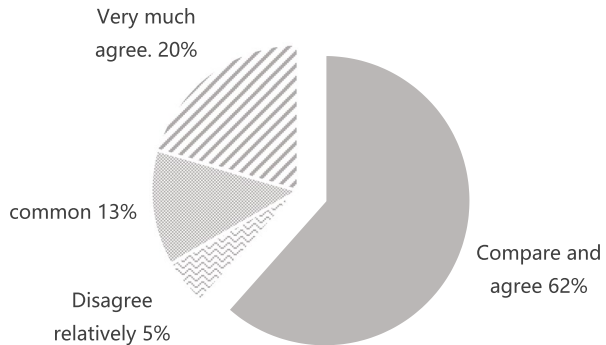
5 Discussion

In the metaverse era, this new art teaching method has become a trend. Compared with previous teaching methods, today's students are more eager to pursue real immersive social experience. Yang Bin believes that metaverse can provide better support for future art design in two aspects: immersion and concentration,

Table 9 Grouping List Based on Eye Movement Experiment

Group	Group Member									
Science and Technology	1	2	14	16	17	18	24	25	31	35
Traditional Culture	4	5	7	11	19	22	34	36	39	
Academic	3	9	10	20	23	26	27	28	33	37
Work of art	6	8	12	13	15	21	29	30	32	38

Fig. 18 Experimenters' satisfaction with scientific grouping



imagination and creation (Lili et al. 2022). Everything is a game, and the biggest feature of the game is that it can simulate everything. Therefore, through the combination of scale, structural interview and eye movement experiment, to verify the future possibility of enriching teaching methods with game forms in art design teaching, it may become the development direction of the next generation of teaching, surpassing the limitation of traditional teaching mode and forming a new teaching method.

In this paper, according to the development trend of meta-cosmic technology in the world and the reality of the development of design education industry in China, the research on art design education based on Xirang games is put forward. Through the eye movement experiment, this paper makes a deep exploration of the virtual conference platform in Xirang games. Compared with the traditional exhibition mode, the experiencers all agree with the new conference experience which includes static images, sounds, dynamic images, games and other elements. In this way, following the principle of users' interest, we can stimulate users' browsing interest through virtual meetings, which makes this learning method of presence more effective to replace the shortcomings of traditional learning. On the basis of the above research, exploring this learning style has brought more advantages. Under the metaverse ecology, teachers don't just teach on the screen, but students and teachers can define their own unique virtual images to experience. Students tend to use new technologies to express their learning feelings in their personal learning, thus verifying the existence of the advantage effect of game teaching. In the practice of appreciating excellent works of art, we can effectively accumulate aesthetic knowledge and form aesthetic ability. Through the semi-structured interview method, the influence of this kind of teaching on learning is further verified, the learning efficiency is improved, and the organic unity of games and learning is achieved. In addition, the eye movement experiment is used to divide the group science to solve the difficult problems in art design. The experimental results show that the learning effect based on interest group is better than the traditional grouping method. Therefore, on the basis of user interest analysis, we can better realize the organic combination of students' behaviors, emotions, cognitive participation in class by means of games, so that students' learning interest can be developed in cooperation, and students' aesthetic sense, rational sense and moral sense can be effectively developed. In the

original experimental plan, EEG system was considered to test the user's experience effect, but it was not used in this study due to the limitation of time and experimental equipment. In the current research, there are few new art teaching cases at home and abroad, and there are few angles and methods that can be used for reference. This makes this research have some problems and shortcomings: the educational metaverse created by this research still has some shortcomings in immersion, which needs to be further optimized; From the choice of experimental materials, this study selected the Xirang soil game as the main research object, which was limited by experimental conditions, so it was impossible to make a detailed and in-depth analysis of each module of the game. In addition, during the experiment, due to the complexity of the operation, the number of participants is small, and the obtained data and analysis conclusions can only reflect the effect of education metaverse to a certain extent, and the follow-up research will expand the research scale. Therefore, there are still some problems and defects in the experimental results..

Generally speaking, this paper analyzes the limitations of students in traditional learning and their enthusiasm in the process of virtual game learning by taking the above three parts as examples, verifies the significance of Metaverse technology itself for students' game teaching, and puts forward the necessity of breaking through traditional teaching and applying virtual game teaching. It is expected that there will be better equipment in the future to support students to explore the free educational metaverse, and this technical difficulty is worthy of further study.

6 Conclusion

This paper takes the teaching application of art design of Xirang games as the research content. Under the influence of the current wave of metaverse, the reform in education and teaching is inevitable. Metaverse without time and space limitation can connect the real world with virtual space, and provide a sense of reality similar to the real world. Adding attractive elements such as games to the traditional learning platform and learning space is a great opportunity for the development of education (Zhouxiu et al., 2022). Art design, as a design course relying on network computer, can promote the reform of art design teaching in an all-round way through the development of virtual game teaching mode, improve students' subjective initiative, enhance students' practical operation ability and realize the supplement and sharing of resources. Therefore, it can be said that it is very meaningful to implement this new model. Eye movement experiment, scale and semi-structured interview research methods are used to verify the initial experience of this teaching form. The results show that this method is superior to the traditional students' interest in learning, and can effectively stimulate students' real interest in the learning process. As a new topic and research field in China, the application of meta-technology in education is rare. However, this paper realizes this experience effect from the perspective of teaching innovation. These not only have positive significance for the domestic convention and exhibition industry, but also provide reference and inspiration for the future research and development of meta-cosmic art education.

Appendix A

Table 10 Summary of interview questions based on the user experience of Xirang games

Aspect	Fine item	Interview question answer summary
Sense organ experience	Beautiful design	"Simple and beautiful design, strong visual effect";
	Overall tone	"The overall tone is also more comfortable";
	page layout module contents	"Text typesetting, page setting and color matching are beautiful and harmonious" "The game module content is very intuitive"; "Rich in content"; "The most impressive thing is the art exhibition module, which gives people a real feeling"; "Especially when you enter the game interface, you can feel that a lot of China elements, China landscape, culture and history are incorporated into the game".
Performance experience	Smooth operation	"The overall experience is simple and easy to understand"; "In the module game, there are rich gameplay for traditional culture"; "First of all, you can create an exclusive virtual avatar here, create your own virtual world image, and swim with friends in the digital world. Different ways of playing feel more interesting."; "For example, when you enter the central platform of the game at the beginning, that is, the" birthplace ",all you can see are small partners who are interested in this aspect, giving people a different play experience"; "Character movement is rather clumsy" and "details need to be optimized"; "For the first time, the system will prompt you".
	Operational guidelines Functional structure Interaction	"The product has complete basic functions, strong usability and ease of use". "Interaction is novel and diverse"; "In the Three-body Pavilion, you can interact with the objects you are interested in, so as to have a deeper understanding of the information you want to know, instead of conveying information in traditional ways such as paper media"; "If you turn on the microphone, you can realize multi-person voice communication. Maybe this is part of the immersion that Metaverse shows us".
Mutually experience	Interactive feedback	"You can talk to each other and interact with each other"; "It's fun to add friends, send expressions, and hear each other's voices when approaching each other"; "When you put on headphones, you can immediately experience the immersive sound visual effect in the game".
	Interactive conciseness	"The interactive interface is easy to operate and saves time"
	Improvement and deficiency	"After logging in, the background music volume is too high, and the volume key can't be found"; "But I think there is another deficiency, that is, the sound acceptance range does not change with the distance." "The interactivity and openness are generally, and the entertainment is not particularly high"; "For the points of interest that I want to know more, I can't interact with them at all".

Table 10 (continued)

Aspect	Fine item	Interview question answer summary
Emotional experience	Pleasure	<p>“The overall experience is good, and it is convenient to interact at any time”;</p> <p>“With Chinese flavor, you can enjoy artworks in an environment of ink painting”;</p> <p>“It was quite interesting to visit the campus of Communication University of China”.</p> <p>“In this multi-player interactive virtual game world that spans virtual reality and reality, like an infinite Mobius ring planet, a large number of China elements are integrated into it, which is more interesting than the traditional way of class”.</p>
Self - realization	Habits self-promotion	<p>“I have developed a brand-new learning experience and feel happy”.</p> <p>“To improve users’ social interest, we can discuss the same problem in a targeted way and understand the true meaning of design.”</p> <p>“Enriching art teaching through games is a good teaching method”</p> <p>“Contact with some excellent design works, so that some students with poor teaching conditions can quickly and conveniently learn about China traditional culture, China traditional patterns, China landscape and so on through mobile phones and other electronic devices”.</p>
	Sharing	<p>“Such game teaching resources can make students contact with some vivid design works, and make some students with poor teaching conditions improve their interest in learning” and “lighten the burden of teachers and parents”.</p>
	Self - realization	<p>“Improve interest and enrich classroom life”;</p> <p>“Make my life more personalized”.</p>

Appendix B

Table 11 The subjects' gaze time and times of the four modules were counted

		Average Value	Standard Deviation			Average Value	Standard Deviation
1	fixation time	7602.75	1824.546	21	fixation time	15,078.25	2115.543
	fixation count	7	3.162		fixation count	55.25	12.447
2	fixation time	20,097.25	2855.331	22	fixation time	17,348.75	2906.412
	fixation count	66.5	9.849		fixation count	6	5.715
3	fixation time	2899.25	763.368	23	fixation time	43,184.25	16,252.526
	fixation count	4.25	1.258		fixation count	109.5	38.553
4	fixation time	2366.25	377.984	24	fixation time	26,376.25	4806.413
	fixation count	7.5	1.915		fixation count	88.75	14.975
5	fixation time	2686.75	1568.773	25	fixation time	61,383.5	19,951.58
	fixation count	10.25	6.131		fixation count	160.75	36.99
6	fixation time	2386.25	316.521	26	fixation time	26,033.25	8491.424
	fixation count	9.5	21,121		fixation count	38.75	12.5
7	fixation time	21,121	6872.66	27	fixation time	9653.25	7550.849
	fixation count	55.25	17.251		fixation count	27.75	18.554
8	fixation time	6652.75	2156.732	28	fixation time	11,925.75	8302.172
	fixation count	19.75	6.994		fixation count	38.75	26.45
9	fixation time	7080.5	795.75	29	fixation time	13,243.5	6217.245
	fixation count	26	3.742		fixation count	32.5	15.546
10	fixation time	12,203.75	4078.825	30	fixation time	32,773.75	6465.365
	fixation count	15.25	4.646		fixation count	104.25	21.469
11	fixation time	24,692.25	2858.541	31	fixation time	6864	1080.928
	fixation count	88.25	13.793		fixation count	23.25	4.924
12	fixation time	20,745.25	7697.187	32	fixation time	13,311.5	3480.864
	fixation count	40.25	15.174		fixation count	47	14.213
13	fixation time	8062	649.224	33	fixation time	4576.25	2226.024
	fixation count	32.25	4.425		fixation count	23.75	12.285
14	fixation time	14,994.5	5151.296	34	fixation time	9729.00	2155.405
	fixation count	32	5.598		fixation count	38.50	6.455
15	fixation time	8634.5	2664.503	35	fixation time	3769.25	1130.239
	fixation count	30.25	7.932		fixation count	12.00	5.354
16	fixation time	5959	512.71	36	fixation time	3411.25	2738.786
	fixation count	20	3.559		fixation count	14.25	8.618
17	fixation time	13,206.25	3661.012	37	fixation time	8439.25	1690.721
	fixation count	38.5	9.469		fixation count	39.75	8.617
18	fixation time	11,439	1924.961	38	fixation time	2846.25	1403.704
	fixation count	35.5	8.347		fixation count	12.25	5.560
19	fixation time	20,621	2948.639	39	fixation time	4545.50	1379.441
	fixation count	46	10.801		fixation count	17.75	5.252
20	fixation time	18,685.75	5392.284				
	fixation count	65	22.181				

Authors' contributions All authors contributed to the study conception and design. Material preparation, data collection and analysis and the first draft of the manuscript was written by [Yang Jin]. Methodology, review and editing by [Zhu Tiejun]. And all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Data availability The datasets generated during and / or analyzed during the current study are publicly available.

Code availability Not applicable.

Declarations

Ethics approval The work submitted by me is original and has not been published elsewhere in any form or language. I declare that I have not distorted the research results. In the research, questionnaires / interview surveys and scales are used scientifically, appropriate and relevant literature is cited to support the proposed Proposition, and good scientific practice rules are followed.

Consent to participate Informed consent was obtained from all individual participants included in the study.

Consent for publication All authors approved the final manuscript and the submission to this journal.

Conflict of interest The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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