

Manchu Ice Frolicking: Presenting Digital Games to Promote Cultural Learning and Dissemination

Jiani Tong*, Sitthisak Champadaeng

Faculty of Applied Fine Arts and Cultural Science, Maharakham University, Thailand

Corresponding author: Jiani Tong, E-mail: 843705301@qq.com

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ABSTRACT

In this case study a digital game “Fantasy Ice Frolicking” was developed to evaluate the application of digital technology in the transmission of cultural heritage. This study adopted multiple qualitative research methods. Data were collected and analyzed through literature analysis, field research, interviews, observations, and user testing. The research subjects included eight participants: Manchu culture research experts, Manchu Ice Frolicking inheritors, and digital game design experts; as well as 50 target users aged 18 to 35. The research findings are as follows: (i) In the Qing Dynasty, Manchu Ice Frolicking reached its peak as a court activity, demonstrating its importance in promoting national identity and cultural cohesion. However, the challenges faced by modern society, such as the decline of cultural knowledge and the breakdown of intergenerational transmission, have hindered its continuation. Innovative approaches are therefore imperative to ensure the preservation and adaptation of this cultural heritage. (ii) In the “Presenting a Digital Game for Promoting of Manchu Ice Frolicking Culture for Learning and Dissemination,” players engage profoundly with traditional tools, rules, and values through an immersive game experience and interactive narrative. Evaluation results have demonstrated that participants’ knowledge, interest, and cultural identity towards the Manchu Ice Frolicking culture underwent substantial enhancement. This study underscores the potential of digital platforms in enhancing cultural education and provides an effective model for learning and disseminating cultural heritage.

Key words: Manchu Ice Frolicking, Digital Game, Cultural learning, Dissemination

INTRODUCTION

Manchu Ice Frolicking, also referred to as “Ice Frolicking” or “Ice Skills,” is a distinctive ice and snow activity that has been transmitted through successive generations by the Manchu people inhabiting Northeast China. Its origins can be traced to the winter production activities of the northern Chinese people, encompassing a diverse array of ice sports. The diverse forms of expression and historical development of Manchu Ice Frolicking in the northeast have contributed to the formation of a representative traditional culture of ice frolicking in the Xinbin area of Liaoning (Ren, 2020). The region holds significant historical importance as the birthplace of the Manchu people and the historical starting point of the establishment of the Jurchen Kingdom by Nurhachu, the first Qing emperor, which laid the foundation for the rise of the Qing dynasty. Manchu Ice Frolicking emerged during this era, distinguished by its distinctive ethnic characteristics and profound historical and cultural implications. The practice of Manchu Ice Frolicking encompasses a variety of activities, including ice cart play, plow drag, single-legged ice stilt ride, foot gliders skate, *ula* sliders skate, ice spinning

top beat and ice raft shore. These activities reflect the local people’s ingenuity and demonstrate their innovative use of everyday items such as trees, tin, and straw ropes. During the Qing Dynasty, the cultural practice of ice frolicking was formally recognized by the imperial court as a “national custom” and was incorporated into royal entertainment, thereby further solidifying its symbolic cultural significance (Zhu & Liu, 2021). In 2018, Xinbin Manchu Ice Frolicking was included in the sixth batch of representative intangible cultural heritage projects in Fushun City.

However, with the acceleration of modernization and changes in lifestyle, the Manchu Ice Frolicking culture has gradually been marginalized, and the process of inheritance is at risk of being disrupted, especially as the younger generation’s knowledge of and interest in it gradually wanes (Chen et al., 2022). Current cultural education and promotion methods are insufficient to stimulate young people’s interest in ice frolicking, and the limitations of cultural inheritance methods make the protection and innovation of ice frolicking culture face even greater challenges. Based on this, how to use innovative digital technology to bridge the cultural gap between generations and effectively integrate

the Manchu Ice Frolicking culture into the contemporary cultural system has become an urgent issue that needs to be addressed.

The advent of digital technology, particularly gamified learning, has emerged as a novel instrument for the preservation and transmission of cultural heritage (Wang, 2024). Digital games, characterized by their high interactivity, immersion, and entertainment value, serve as effective conduits for integrating historical and cultural elements into the realm of entertainment. These games facilitate a vivid and immersive experience, allowing players to engage with cultural heritage in a dynamic and engaging manner within the virtual domain. Through an interactive learning process, digital games can assist young people in comprehending and identifying traditional culture, thereby enhancing their cultural identity, and fostering a sense of responsibility for cultural heritage preservation (Li et al., 2023). Consequently, digital games transcend their role as a mere form of entertainment, serving as a potent catalyst for stimulating interest in cultural learning and promoting the preservation of cultural heritage.

This study aims to explore the potential of digital games to facilitate the inheritance and learning of traditional cultural practices, particularly the Manchu Ice Frolicking culture. To this end, a digital game has been designed and developed under the title “Fantasy Ice Frolicking.” The research is grounded in Herbert Blumer’s symbolic interaction theory and Weber Schram’s mass communication theory. The objective is to facilitate the acquisition of knowledge about the history and skills associated with Manchu Ice Frolicking culture through an immersive interactive experience, thereby promoting the digital preservation and innovative development of Manchu Ice Frolicking culture. This study explores the potential of digital games to enhance the enjoyment and efficacy of cultural education, offering novel theoretical perspectives and practical methodologies for the dissemination and advancement of Manchu Ice Frolicking culture within modern society.

Objectives

1. To study the historical development and cultural significance of Manchu Ice Frolicking culture.
2. To study the presentation of a digital game for promoting Manchu Ice Frolicking culture learning and its dissemination.

METHODOLOGY

Research Design

This study adopted a mixed research method, combining literature analysis, field research, digital game design and user feedback to achieve the research objectives. First, through literature analysis, historical research and semi-structured interviews, the history and development of the Manchu Ice Frolicking culture was systematically organized, with a particular focus on its symbols and cultural connotations. Second, the digital game “Fantasy

Ice frolicking” was designed and developed to verify the application effect of digital games in cultural inheritance and education. Finally, through player feedback and evaluation, the role of the game in enhancing cultural awareness and interest was analyzed.

Sample and Population

The sample for this study included participants from a variety of backgrounds: Manchu culture research experts, Manchu Ice Frolicking inheritors, and digital game design experts. Involved was a total of eight people, as well as 50 target users aged 18-35, who constituted the core user group for the game. The latter included college students, teachers, cultural researchers, and ice frolicking enthusiasts who expressed interest in Manchu culture.

Data Collection

The data collection process primarily entailed three steps:

1. Conducting interviews with Manchu culture experts, game designers, and target users to understand cultural symbols and the user experience from multiple perspectives,
2. Utilizing the Nielsen heuristic evaluation method to identify potential issues with the game interface and functions, and
3. Evaluating changes in users’ knowledge of Manchu Ice Frolicking culture before and after the experience through questionnaires and in-depth interviews.

Data Analysis

This study adopts a quantitative and qualitative approach to comprehensively analyze the data. The questionnaire data was processed using SPSS software. Also, descriptive statistics and paired t-tests were utilized to assess changes in users’ cultural knowledge, interest, and sense of identity. The study then conducted a before-and-after comparison of user experience, facilitating the analysis of significant differences in the cultural communication effect of the game. Concurrently, the interview data was systematically organized and analyzed to explore the correlation between digital games and cultural learning and communication.

RESULTS

The research results can be presented as follows:

Historical Development and Cultural Significance of Manchu Ice Frolicking

The historical development of Manchu Ice Frolicking is a process that profoundly reflects the social and cultural changes of the Manchu people and their adaptation to their environment. The evolution of Manchu Ice Frolicking can be categorized into five significant historical phases: germination, development, decline, integration, and prosperity. This

evolution is further evidence of its profound historical significance and cultural value. In its nascent stage (before 1625), Manchu Ice Frolicking emerged as a survival skill, a necessity to endure the frigid conditions of the northern region. The Manchu people inhabited the frigid northern expanse of China, rendering ice frolicking an indispensable component of hunting and quotidian pursuits. The utilization of various ice tools, including bamboo horses, dog sleds, wooden horses, and Ula skis, not only facilitated movement but also enhanced the efficiency of winter hunting. With the rise of the Manchu political power, Manchu Ice Frolicking underwent a period of development from 1625 to 1795, being incorporated into military training and social recreational activities. During the early Qing dynasty, Manchu Ice Frolicking was utilized by Manchu leaders, including Nurhachu, to assess the military capabilities of soldiers and foster cohesion within the military. Concurrently, as the influence of Manchu culture expanded into the Central Plains, ice frolicking was promoted as a social and recreational activity to a broader segment of society. It became an important cultural activity during the winter months, serving the dual purpose of strengthening national unity and cultural identity. During the Qing Dynasty, ice frolicking had evolved into a cultural symbol and a prominent “national custom” activity. It transcended the realm of mere sport, encompassing courtly entertainment performances and military training programs. This multifaceted activity served as a pivotal medium for the exhibition of Manchu culture and the cultivation of national pride.

However, the Daoguang period (1795-1894) witnessed a decline in the history of Manchu Ice Frolicking. As the Qing Dynasty gradually declined, socioeconomic and cultural activities were generally affected, and Ice Frolicking was no exception. During this period, Ice Frolicking underwent a transition from a once-royal event to a marginalized activity. Its societal and cultural standing underwent a pronounced decline, and its practice was largely confined to specific regions and ethnic communities. It transformed into a seasonal traditional activity, existing primarily within the folk culture, devoid of systematic organization and promotion. In the late Qing Dynasty, with the influence of Western culture and the introduction of new sports, traditional ice sports began to be regarded as an outdated form of entertainment. The ice sports extravaganza, once a central feature of the court’s cultural scene, gradually lost its prominence, while folk ice activities, such as masked ice-skating parties, gained immense popularity. The amalgamation of Chinese and Western elements in ice sports culture, which was appreciated by both the refined and the common people, became a distinctive characteristic. This cultural amalgamation, spanning from 1894 to 1949, exemplified a period of significant integration. Following the establishment of the People’s Republic of China, Manchu Ice Frolicking experienced a period of resurgence, marked by a flourishing of cultural activities from 1949 to the present. The promotion of national sports for all has contributed to the revival of Manchu Ice Frolicking as a measure to enhance national fitness and protect cultural heritage. In contemporary society, particularly driven by the promotion of tourism and cultural

festivals, traditional Manchu Ice Frolicking has been reborn as a local cultural heritage in places such as Xinbin.

The historical evolution of Manchu Ice Frolicking serves as a testament to the adaptability and transformation of the Manchu people, who have transitioned from a hunter-gatherer society to an influential ruling ethnic group in Chinese history. This cultural practice also underscores the resilience and adaptability of Manchu culture. As a cultural practice, Manchu Ice Frolicking exemplifies the adaptability of the Manchu people to the natural environment and has had a profound impact in political, social, and cultural spheres. Its evolution from a survival skill to a cultural symbol underscores the transformation and adaptation of Manchu culture in the face of historical change.

The significance of the Manchu Ice Frolicking culture is as follows:

Cultural heritage and national identity

Manchu Ice Frolicking carries the historical memory and cultural traditions of the Manchu people, showcasing their unique wisdom. As an ancient ice activity, ice frolicking gradually evolved into a cultural symbol of the Manchu people from the Qing Dynasty onwards. Presently, as an intangible cultural heritage, Ice Frolicking is preserved through oral transmission, festive events, and other means, providing a conduit for modern society to engage in dialogue with history. During the Qing Dynasty, rulers strategically incorporated ice frolicking into state ceremonies, leveraging its symbolism to bolster national identity and legitimize their rule. In the contemporary era, the promotion of ice frolicking has not only fortified the cultural identity of the Manchu people but also facilitated cultural exchange, enhancing their sense of identity within the broader context of China’s multiculturalism.

National spirit and social functions

Ice frolicking is a manifestation of the Manchu people’s national spirit, characterized by qualities such as bravery, perseverance, and cooperation. In the harsh winter environment, ice frolicking serves not only to exercise physical agility but also to cultivate the ability to overcome challenges. During the Qing Dynasty, ice frolicking was utilized as a form of military training, contributing to the enhancement of the Manchu army’s combat effectiveness and cohesion. In the contemporary era, the town of Xinbin has adopted this tradition, preserving its cultural heritage through festivals and other forms of expression. These activities serve to reinforce the sense of pride and unity among the Manchu people. Moreover, during the Qing Dynasty, ice frolicking functioned not only as a form of winter entertainment, but also as a conduit for cultural exchange among diverse ethnic groups, fostering connections between the ruling class and the public. In the contemporary era, the social functions of ice frolicking persist through tourism and associated activities, thereby contributing to the economic development of local communities and the enhancement of communal bonds.

Artistic aesthetics and modern development

Manchu Ice Frolicking showcases the artistic aesthetics of the Manchu people in harsh environments through its unique skills and forms of expression. The scope of ice frolicking activities encompasses both competitive events and artistic expressions, including costumes and landscapes, reflecting the aesthetic inclinations of the Manchu people. Presently, as an intangible cultural heritage, ice frolicking has been given a modern expression in festivals and tourist events. Xinbin's integration of ice frolicking with local tourism exemplifies a contemporary approach to cultural presentation, rejuvenating traditional practices with a contemporary appeal.

However, despite its significance in ethnic identity and cultural exchange, Manchu Ice Frolicking still faces challenges in the modernization process. The younger generation's knowledge of Manchu Ice Frolicking is gradually fading, and the activity is subject to geographical and seasonal restrictions, resulting in declining participation. The absence of a systematic approach to data preservation and research further hinders the transmission of knowledge about it. Innovations in digital technology present a significant opportunity to address these challenges. The integration of technologies such as virtual reality and big data has the potential to transcend seasonal constraints, ensuring more widespread cultural dissemination and experience, thereby revitalizing the inheritance and promotion of Manchu Ice Frolicking.

In summary, Manchu Ice Frolicking is not only a symbol of Manchu culture, but also an embodiment of national identity, courage, and creativity. The integration of contemporary digital technologies holds promise for revitalizing cultural preservation and promotion, with the potential to foster cultural pride, cross-cultural understanding, and local economic development.

Presenting a Digital Game for Promoting of Manchu Ice Frolicking Culture Learning and its Dissemination

In this section, the authors propose a digital application model for Manchu Ice Frolicking culture, drawing upon the principles of symbolic interaction theory and cultural diffusion theory. Utilizing the game design of "Fantasy Ice Frolicking" as a case study, the researchers explore strategies for effective dissemination and reproduction of cultural symbols through games. This approach aims to ensure the modern transformation and innovative development of Manchu Ice Frolicking culture. The cultural symbol system of ice frolicking, as proposed by Pang, P. (1986), can be divided into three levels: material culture, institutional culture, and spiritual culture. The material culture symbol system, as outlined by Pang (1986), encompasses various elements, including the tools and equipment utilized for ice frolicking activities, such as vehicles, sledges, ice skates, and other related equipment. These tools and equipment not only provide a tangible basis for the practice of ice frolicking but also symbolize the cultural identity of the Manchu people. The symbol system of ice frolicking extends to the institutional culture, which reflects the organizational structure and rule system of this traditional sport. These elements symbolize the sense of

order and social norms that are integral to Manchu sports activities. Competencies such as "support, charge, ride, slide, and fight" have gradually formed the institutionalized characteristics of Manchu Ice Frolicking in competitions. Spiritually, ice frolicking embodies qualities such as courage, wisdom, and unity. Further, the Manchu people, who face a cold climate, demonstrate their tenacity and adaptability to and respect for their environment through ice frolicking activities. These spiritual symbols are manifest not only in the competitions and interactions among participants but also influence people's values and social identity. In the game design, researchers meticulously re-encode and embed these spiritual symbols through aesthetics, mechanisms, narratives, and technology to ensure the authenticity and historical accuracy of the cultural content. The extraction of material culture symbols involves the use of high-quality visual design and 3D modeling techniques to restore ice-play tools, Manchu costumes, and ice and snow landscapes, thereby ensuring the authenticity of cultural elements.

Institutional culture is presented in the game through rules and mechanisms, such as the construction of multi-level interactive modes for racing competitions and skill demonstrations. This allows players to experience the traditions and values of Manchu Ice Frolicking while adhering to the rules of the game.

Regarding the extraction of symbols of spiritual culture, players can be guided to profoundly experience the unity, cooperation, and bravery inherent in Ice Frolicking through storylines and mission challenges, thereby promoting their understanding and perception of the Manchu spirit (Figure 1).

Symbolic interactionism is predicated on the premise that human beings utilize symbols as a medium for conveying information, communicating, and interacting. The emphasis in this theoretical framework is on the meaning that is "constructed" through symbols. That is to say, it is the meaning of things which is determined by people in the process of social interaction. This meaning is not fixed and unchanging; rather, it depends on the specific context and situation of the interaction. To a certain extent, it is determined through negotiation between the participants. This dynamic nature of meaning underscores the notion that symbols are not predetermined or static; rather, they are continually generated, adjusted, developed, and changed through constant social interaction. Within the paradigm of game design, participants encompass the producers of symbols (the subject of game creation) and the recipients of symbols (players). These participants interact with symbols to collectively construct a shared meaning, thereby exemplifying the dynamic and collaborative nature of symbolism in human interaction. This dynamic interaction renders games a living cultural space, wherein symbols and meanings constantly flow and transform between the creativity of designers and the experience of players. Norman, (2010) posits that the thinking process of the human brain can be summarized as having three levels: instinct, behavior, and reflection. These three levels, in combination, constitute one's response to the environment and the way information is processed. In the domain of game design, the construction

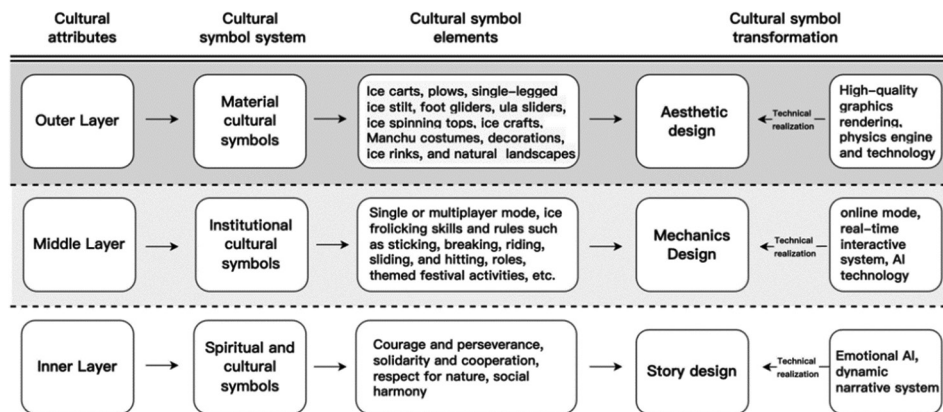


Figure 1. Model for extracting symbolic elements from Manchu Ice Frolicking

of meaning of the cultural symbols of Manchu Ice Frolicking is similarly intricate, involving direct perception, behavioral experience, and profound reflection. Through these three levels, the game designer can effectively convey the deeper meaning of cultural symbols to players, ensuring that they not only experience the surface gameplay, but also gain a deeper understanding and appreciation of the core values and spirit of Manchu culture. Specifically, the game elicits immediate responses and a sense of participation through multi-sensory experiences involving sight, sound, and touch. It simulates ice frolicking activities and interactive tasks, allowing players to engage deeply with the cultural symbols of Manchu Ice Frolicking. Following the completion of these tasks, players are prompted to reflect on and comprehend the cultural symbols. In the process, players form a personalized understanding of the cultural symbols of ice frolicking through self-exploration and interactive experiences, thereby achieving a deeper level of identification with and reflection on the Manchu Ice Frolicking culture in the game. Game theory, according to the research of Alaswad and Nadolny (2015), is the application of gamification to classroom teaching. The creator of a game needs to:

1. Analyze the target group: It may be necessary to study the characteristics of the target group, such as age level, tool skills, grade level, and duration of the activity.
2. Determine the objectives of learning the ice rink: What is the creator's goal to make the target group accept the ice rink culture.
3. Determine the structure of the game content: The creator must determine the learning content that the target group will learn. The content sequence from easy to difficult or the content is connected and can be learned at every step.
4. Plan the strategy of the game activity that the players must follow sequentially: The creator should set the rules of the game or activity by drawing on the game components.

At the same time, there is an important link between culture and communication. Culture cannot exist without communication, and communication itself involves the spread of culture. This study is founded on Schram's theory of cultural diffusion, and it employs a digital game communication

model of Manchu Ice Frolicking culture from five dimensions: sources, media organizations, audiences, information, and feedback. In the context of game design, the role of sources is of particular significance, as they furnish the essential historical and cultural background information necessary for game development. These sources encompass historical documents, ethnographic research, the insights of experts in the field of intangible cultural heritage, cultural practices, and direct communication with local communities. Media organizations play a pivotal role in the development, publication, maintenance, and promotion of the games. These media entities encompass game development teams, publishing platforms, marketing teams, and customer service teams, each of which plays a pivotal role in the successful dissemination of the game. The game's audience can be broadly categorized into three groups: those interested in history and culture, those seeking an entertaining experience, and key groups such as educational institutions and cultural researchers. Information or symbolic content refers to all the cultural symbols and content that are encoded into the game to convey the culture of Manchu Ice Frolicking. This information constitutes a pivotal element in game development, not only in terms of its capacity to attract players, but also in terms of the accurate and respectful conveyance of Manchu culture. Considering the five aspects, a digital game dissemination model for Manchu Ice Frolicking is hereby proposed. This model has the potential to circumvent the geographical and seasonal limitations of conventional tourism, thereby facilitating a more expansive display and dissemination of Manchu Ice Frolicking culture. Moreover, it offers an efficacious approach to enhancing cultural identity and engagement among youth, particularly about attracting young people, and fostering their interest in and sense of affiliation with traditional culture.

As demonstrated in the foregoing analysis (Figure 2), "Fantasy Ice Frolicking" is positioned not solely as a form of entertainment, but also as a cultural and educational platform. Utilizing 3D modeling and physics engine technology, the game simulates traditional Manchu Ice Frolicking, thereby providing an interactive form that profoundly integrates cultural heritage with competitive experience. The gameplay encompasses a range of ice-based activities, such as ice cart play, plow drag, and a single-legged ice stilt ride.

These activities are meticulously designed to accurately replicate the physical characteristics and regulations of traditional Manchu ice sports. The game’s design is such that every action and operation of the player directly influences the character’s performance on the ice. Continuous participation in competitions and the completion of tasks leads to an enhancement in the character’s skill level, facilitating the collection of resources for upgrading and customizing the equipment. This, in turn, provides a competitive edge. Simultaneously, the game endeavors to replicate the authentic experience of ice sports. For instance, in ice cart play, plow drag, and *ula* skate sliders, rapid skating is prioritized to complete the track in the shortest time, while foot skate gliders demands that players execute a series of dexterous movements, such as spinning and jumping, with exact manipulation to attain a high score. Playing ice spinning top beat emphasizes meticulous techniques and strategies. Players must ensure that the skittle maintains its rotation on the ice by striking it with precision to complete the level. The game also conveys the historical background and cultural stories of Manchu Ice Frolicking to players through prompts, dialogues, and tasks. Through the dissemination of digital platforms, players around the world can experience Manchu Ice Frolicking in the virtual world, promoting cross-cultural exchange and understanding. People from different cultural backgrounds

can participate and share the fun and cultural connotations of Manchu Ice Frolicking, thereby promoting the protection and development of cultural diversity (Figure 3).

This game evaluation used two evaluation methods: one was to test the usability of the game based on the Jacob Nielsen heuristic evaluation method, the other was to evaluate the functional effectiveness of the game based on the before-and-after comparison test method. In the usability test, the development team recruited a total of five evaluators with different backgrounds to evaluate the game interface and interaction design from ten heuristic principles that included system state, user control, and consistency of operation (Table 1). The main functions such as the main game interface, character selection, and map information were tested. For the before-and-after comparative testing method, 50 target players aged 18-35 were recruited through social media, gaming communities and an online questionnaire platform. The players’ changes in knowledge of Manchu Ice Frolicking culture and skills were assessed, and the effect of the game on cultural knowledge and skill improvement was analyzed using a paired t-test (Table 2).

The assessment results indicated that the game “Fantasy Ice Frolicking” had a significant impact on enhancing cultural identity and inheritance. Statistical analysis, employing a before-and-after comparison test method, revealed a

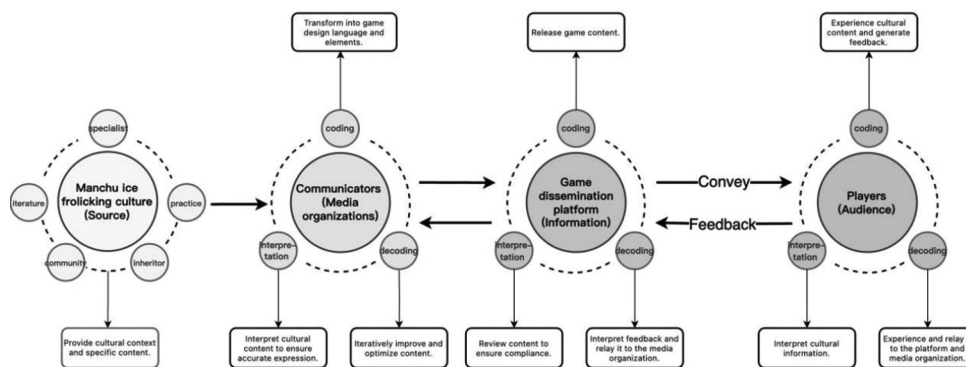


Figure 2. The symbolic interactive construction model of Manchu Ice Frolicking

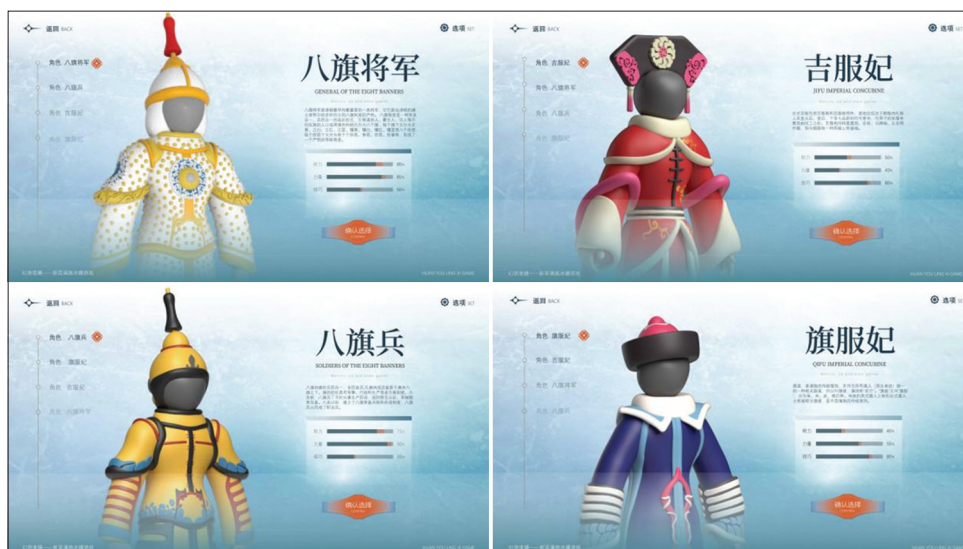


Figure 3. Game Character Modeling the costume is adapted from the Manchu costume

Table 1. Game usability evaluation content based on Nielsen's Heuristic evaluation methods

Evaluation principle	Evaluation points
Visibility of system status	Evaluate whether the game interface clearly displays the player's system status, such as current progress, time remaining, score, and other information; and whether feedback can be obtained quickly through visual information at different stages.
Match between system and reality	Evaluate whether the language, icons, actions, etc., in the game match real-world concepts and objects; and check that the game uses terminology and concepts that are familiar to the player.
User control and freedom	Evaluate whether the player has free control over the progress of the game and can easily undo or re-open the action if needed. Also evaluate whether options such as pause, save, and quit are provided explicitly.
Consistency and standards	Evaluate whether the icons, fonts, colors, etc., in the interface are consistent, whether the operation logic and rules are unified, and evaluate whether different parts follow the same design specifications.
Error prevention	Evaluate whether the game provides confirmation cues prior to critical actions and provides precautions where mistakes may be made, and whether it recognizes potential errors and provides guidance.
Recognition rather than recall	Evaluate whether the game interface is intuitive and provides enough visual cues and contextual information to minimize the memory burden on the player.
Flexibility and efficiency	Evaluate whether the game provides efficient operation methods such as shortcut keys to meet the needs of players of different levels, and whether efficiency can be improved through flexible operation.
Aesthetic and minimalist design	Evaluate whether the game interface and scene design is simple and aesthetically pleasing, whether information is presented in a clear and organized manner, and whether excessive visual elements and complex layouts are avoided.
Help users recognize, diagnose, and recover from errors.	Evaluate whether the game provides clear error messages and easy-to-understand information in the event of an error. Evaluate if detailed and easy-to-follow troubleshooting steps and solutions are provided to help the user recover from the error.
Help and documentation	Evaluate whether the game provides detailed help documentation and guides, whether the built-in help functions are easy to access and use. Also, evaluate whether the content of the documentation is easy to understand and follow.

Table 2. Before-and-after comparative testing content

Evaluation content	Category	Description
Manchu ice frolicking culture	Cultural history	The extent of players' understanding of Manchu Ice Frolicking culture
	Cultural interests	The level of players' interest in Manchu Ice Frolicking culture
	Knowledge learning	The effectiveness of learning about Manchu Ice Frolicking culture
Manchu ice frolicking skills learning	Tools	Players' understanding and mastery of the tools used in ice frolicking
	Techniques	Players' mastery of ice frolicking techniques and skills
	Competition rules	Players' understanding and adherence to the rules of ice frolicking competitions

substantial enhancement in players' knowledge, interest, and skills in Manchu Ice Frolicking culture following the gaming experience (Manchu Ice Frolicking culture: $t = -18.068$, $p < 0.001$; Manchu Ice Frolicking skills: $t = -11.690$, $p < 0.001$). This outcome serves to substantiate the efficacy of symbolic interaction theory in the domain of game design, since multi-sensory immersive experiences and interactive feedback mechanisms facilitate not only the acquisition of cultural knowledge but also the deepening of players' understanding and identification with the culture through symbolic

interaction. This finding demonstrates that digital games can serve as an innovative medium for the transmission of cultural heritage, effectively presenting cultural symbols and dynamically conveying cultural connotations through players' actions and reflective experiences.

DISCUSSION

The extant research provides a substantial foundation for exploring the historical development of Manchu Ice

Frolicking culture, especially concerning its origin and development during the Qing Dynasty, and its historical status as a “national custom” activity. Niu et al. (2020) have explored the evolution of Ice Frolicking from military training to imperial entertainment, focusing on several significant historical periods, including Nurhachu’s reign, the Qianlong period, and the Ice Frolicking ceremony of the Qing court in 1894. This study provides a solid basis for understanding the importance of Manchu Ice Frolicking as a symbol of Qing culture. Xu et al. (2023) proposed the recreational, national, and military nature of Ice Frolicking culture, and emphasized its role as a symbol of national spirit and cultural connotations. This view is further verified in this study. The present study undertakes a more detailed analysis of the multiple functions of ice frolicking in Qing society, demonstrating its important role in enhancing national cohesion and cultural identity. These studies have laid a solid foundation for understanding the multifaceted value of Manchu Ice Frolicking as a cultural symbol in the Qing Dynasty. However, while the extant literature has provided an in-depth discussion of the historical evolution and cultural value of Manchu Ice Frolicking, most of these studies focus on its development before the Qing Dynasty, especially its heyday as a “national custom” activity. Existing research is relatively limited in terms of the late Qing Dynasty and its decline, as well as the inheritance and revival of ice frolicking after the founding of New China. For instance, while scholars such as Ren (2022) have conducted in-depth analyses of the origin of ice frolicking and its symbolic significance in Manchu society, the scope of their discussions is primarily confined to the pre-Qing Dynasty. Further, they neglect to thoroughly explore the transformation and evolution of ice hockey culture in modern society. Consequently, while extant research provides substantial academic resources for comprehending the historical context and cultural value of ice frolicking, a considerable lacuna persists concerning the modern development of Manchu Ice Frolicking and its revitalization as an intangible cultural heritage.

Building upon this academic foundation, this study undertakes a comprehensive temporal expansion of the historical development of Manchu Ice Frolicking. It adopts a systematic field research method, expanding the historical period under investigation. Contrary to the studies of Niu et al. (2020), Zhu and Liu (2021), and others that primarily focus on the historical development of the Qing Dynasty, this study broadens the time frame to encompass the period following the establishment of the New China. It also systematically examines the revival and modernization of Manchu Ice Frolicking during this era and provides a novel academic perspective on the diverse applications of intangible cultural heritage in contemporary society.

This design, which integrates the cultural symbols of Fantasy Ice Frolicking, is an innovative creation that combines with digital technology to engage learning and spirituality through mixed media, allowing learners to not only experience Manchu culture through their eyes but also understand and inherit this culture through emotional resonance and deep reflection, thus contributing to academic achievement. This is consistent with the research

of Kawinkoonlasate (2024). Their results revealed that the flipped digital classroom approach effectively improved learners’ writing tasks, boosted motivation, and created a more conducive learning environment, positively influencing writing quality. Learners responded positively to the flipped digital classroom model, noting increased engagement in active learning. The study recommends considering the flipped digital classroom approach as a viable instructional strategy to enhance classroom dynamics and improve academic outcomes.

CONCLUSION

This study proposes an innovative model of “cultural education + interactive experience” by embedding the symbolic system of Manchu Ice Frolicking culture into the design of a digital game, emphasizing the educational function of digital games in cultural inheritance. The model has yielded notable outcomes, particularly in fostering enhanced comprehension and enthusiasm among young individuals for Manchu Ice Frolicking culture.

Digital games, as a novel medium for cultural and educational exchange, have effectively disrupted the conventional unidirectional dissemination of cultural knowledge, thereby establishing an interactive heritage-transmission paradigm. By engaging in multi-sensory game experiences, players assume roles that extend beyond passive recipients of culture; they also become active interpreters and re-creators of cultural symbols.

This two-way interactive model not only reinforces the mass communication theory of Schram, which underscores the significance of feedback mechanisms in cultural transmission, but also further advances the participatory and generative nature of communication. In the context of digital games, players not only transmit cultural content through interaction, but also co-construct and dynamically reconstruct cultural meaning through their actions and feedback. This paradigm shift transcends the constraints imposed by conventional cultural preservation initiatives, which predominantly rely on visual displays. It establishes a multifaceted, interactive cultural heritage platform that facilitates the enrichment and evolution of cultural symbols through the continuous interaction between players and the game environment.

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