



Exploring the Digital Education Literacy of College Students through Social Interaction in Online Games

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Abstract

With the popularization of the internet and the development of mobile app games, digital games have become an important social interaction carrier for college students. Social interaction meets the emotional connection needs of college students in different places, combined with the construction of real interpersonal relationships and the development of digital literacy, resulting in complex impacts. This research focuses on the current status of socialization of gaming and digital literacy among college students, conducting statistical analysis on the correlation between the two, and discussing the current development of college students' social and digital curriculum literacy. Using the Wenjuanxing APP to answer online questionnaires, encouraging students to voluntarily participate in filling out the questionnaire anonymously, a total of 199 responses were collected. Using comprehensive research statistical methods to understand data on game genre preferences and online behavior, interpersonal relationships, and digital literacy. Elucidate the impact of game socialization on the interpersonal relationships of college students, its relationship with digital literacy, understand the development of game socialization, its impact on college students' digital literacy, and relevant knowledge points in practical courses. Through games, gain value in the field of education and provide management applications and references for life counselors within the school system.

Keywords: game education, game social interaction, college students' interpersonal relationships, digital literacy, comprehensive research method

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I. Introduction

Popular Game Names and Evolution Process Internationally: Globally, video games have undergone a transformation from simple to complex, from singular to diverse, becoming an indispensable part of popular culture. Since the early 1970s, with the birth of the first commercially successful video game, *Pong*, its simple ping-pong simulation gameplay ushered in the era of video games. Subsequently, arcade games rapidly rose to prominence, with titles like *Space Invaders* and *Pac-Man* becoming global sensations. These games, with their unique pixel art style and challenging gameplay, attracted many players.

With the advent of home video game consoles, such as Nintendo's Famicom (FC) and Sony's PlayStation, the game industry experienced explosive growth. Role-playing games (RPGs), action games, sports games, and many other genres emerged. The *Super Mario* series, with its fantastical level design and adorable characters, became a classic in gaming history, not only continuously innovating in gameplay but also promoting the spread of game culture. Meanwhile, the *Final Fantasy* series, with its grand world view, compelling storyline, and exquisite graphics, captivated countless players, becoming one of the representatives of RPG games (Yihao Zhou et al. 2025).

Entering the 21st century, the widespread adoption of the internet has made online games mainstream. World of Warcraft, as a pinnacle of massively multiplayer online role-playing games (MMORPGs), has attracted players worldwide since its launch in 2004 with its vast virtual world, rich quest system, and social interaction elements. Players can form guilds in the game to challenge powerful dungeon bosses together; this highly interactive and collaborative model has greatly changed the gameplay and experience. At the same time, competitive games also began to emerge. Counter-Strike (CS), with its intense and exciting combat mode, became a pioneer in esports. Players battle wits and courage on the virtual battlefield; the perfect combination of teamwork and individual skill has led to numerous professional tournaments held by CS globally, driving the development of the esports industry.

In recent years, with the widespread adoption of smartphones, the mobile game market has rapidly risen. Honor of Kings, a MOBA mobile game, boasts hundreds of millions of players worldwide thanks to its convenient controls, rich hero roster, and fair competitive environment. Its 5v5 battle mode allows players to team up with friends anytime, anywhere, a perfect blend of social interaction and competition that has made it a benchmark in mobile gaming. Another phenomenal game, Genshin Impact, has attracted global attention with its exquisite open world, rich storyline, and character development system. The game incorporates various cultural elements, creating a fantastical Teyvat continent where players can enjoy the game while experiencing the charm of different cultures. Delta Force is a tactical shooter that blends classic IP with innovative gameplay. It retains the hardcore shooting experience while introducing diverse modes such as large-scale battlefields and tactical withdrawals, highly emphasizing teamwork, and strategic gameplay. With its professional military atmosphere and unpredictable battlefield combat, the game provides players with a unique experience that combines immersion and competitiveness (Ruofei Ma et al.2025).

II. Research Background and Motivation

2.1 Social Status and Honor Needs in Interdimensional Games in College Life

In today's digital age, college students' social patterns are undergoing profound changes. The popularization of the Internet and the widespread application of smart devices have enabled college students' social scenarios to gradually expand from traditional face-to-face communication to cyberspace. This transformation has provided college students with a broader social platform, but also brought a series of new challenges.

As a group full of vitality and curiosity, college students have a strong need for social interaction. In real life, they yearn to expand their social circles and make like-minded friends to enrich their university life. However, the diversity and fast pace of university life present many challenges to traditional social interaction methods. For example, the tight course schedule and the boundaries between majors and classes limit university students' opportunities for in-depth communication with others in real life. According to relevant surveys, about 40% of university students say they find it difficult to find friends in real life whose interests perfectly align with theirs, which often makes them feel lonely and lost in social situations (Liya Zhang et al.2025).

In terms of online social interaction, although the rise of social media has provided university students with convenient communication channels, some problems also exist. Online communication often lacks authenticity and depth, making it difficult to meet university students' needs for high-quality social interaction. In addition, information overload and false information in online social interaction also increase the difficulty for university students to screen and establish genuine social relationships. Some university students fall into the trap of "like-based friendships" in online social interaction, superficially having many friends but lacking genuine emotional exchange and support.

Against this backdrop, social interaction in video games provides university students with new social avenues. Games, with their unique virtual worlds and interactive methods, attract many university students to

participate. In games, college students can break free from the constraints of their real-world identities and participate in game tasks with players from different regions and backgrounds, building deep friendships through teamwork, competition, and other means. This kind of social interaction based on shared interests and goals can satisfy college students' needs for a sense of identity and belonging. For example, in some team-based games, college student players can overcome difficulties in the game by working closely with their teammates, not only improving their game skills but also gaining recognition and respect from the team, thus finding their own value in game-based social interaction.

2.2 The Rise of Game-Based Social Interaction

In recent years, video games have become extremely popular among college students and have become an indispensable part of their daily lives. According to authoritative statistics, more than 80% of college students have played games, and nearly 60% of them play games for more than 5 hours a week. The convenience and fun of games are key factors in their widespread popularity among college students. With the rapid development of smartphones and mobile internet, college students can play games anytime and anywhere via mobile phones or computers, breaking the limitations of time and space. Whether it is during breaks between classes, after-class leisure time, or weekends, they can easily start their game journey. Moreover, the diverse gameplay and exciting storylines of games can satisfy the diverse entertainment needs of college students and bring them an immersive experience.

Taking *Peacekeeper Elite* as an example, this game's predecessor was *Stimulating Battlefield*, launched by Tencent Games in 2018 as the Chinese mainland version of *PUBG Mobile*. The game quickly gained popularity thanks to its highly faithful recreation of the PC version, smooth controls, and social features, accumulating tens of millions of daily active users in a short period. Players experience realistic survival competition, with each stage filled with strategy and excitement, from parachuting and collecting equipment to the final showdown. In May 2019, due to regulatory policies requiring game content to conform to socialist core values and avoid excessive violence and gore, "*PUBG Mobile*" was renamed "*Game for Peace*." Tencent completely revamped the game, changing the elimination mechanism to a "wave goodbye," adjusting the blood effect to a green glow, and adding a "Peace Mission" theme, emphasizing teamwork and positive energy. The renamed "*Game for Peace*" retained its core gameplay while introducing more innovative elements, further improving graphics and sound effects, adding a vehicle system and weather changes to enhance immersion, and strengthening social functions such as voice chat and a team system to promote player interaction. Today, "*Game for Peace*" is not just a game, but a cultural phenomenon, with its official tournaments, such as the PEL professional league, enhancing the game's competitiveness and entertainment value.

"*Honor of Kings*" is also very popular among college students. It is a MOBA mobile game with a rich roster of heroes and a fair competitive environment, boasting hundreds of millions of players worldwide. Its 5V5 battle mode allows college students to team up with friends anytime, anywhere, perfectly blending social interaction and competition. The game also regularly hosts various online and offline tournaments, attracting many college students to participate and further enhancing interaction and social connections between players. In universities, it is common to see college students teaming up to participate in on-campus "*Honor of Kings*" competitions, fighting for team honor and deepening their friendships during the game.

Counter-Strike (CS), as a classic shooting game, became a pioneer in esports with its intense and exciting combat mode. CS also has a large following among university students. In the early days, university students often gathered in internet cafes to team up and play CS, perfectly combining teamwork and individual skills to outwit and outmaneuver each other on the virtual battlefield. Today, although CS's popularity has declined somewhat, it remains a classic game in the memories of many university students, and its derivative versions and gameplay still attract some university student players.

There is also the 4399 mini-game platform, which is popular among college students for its simple and easy-to-use mini-games with a wide variety of games. The platform includes a variety of mini-games such as casual puzzle, action adventure, and role-playing. College students can easily play a game in their spare time to relieve study pressure. Classic mini-games such as "*Gold Miner*" and "*Plants vs. Zombies*" are widely circulated among college students and have become their first choice for entertainment during breaks and lunch breaks. These mini-games are not only simple and fun to play, but also allow students to compete with classmates to increase interaction and fun.

The rise of game-based social interaction has made games not only a form of entertainment, but also a new form of social interaction. College students make friends through games, expand their social circles, fight alongside teammates, and pursue glory in the game together, satisfying their social and achievement needs (Jakki O.Bailey et al.2025).

2.3 The Importance of Digital Literacy in Game Education

In today's highly digital society, digital literacy has become an indispensable key ability for people. Digital literacy encompasses the understanding and application of digital technologies, as well as the ability to acquire, analyze, evaluate, and create digital information. With the rapid development of emerging technologies such as big data, artificial intelligence, and cloud computing, digital literacy plays an increasingly important role in people's learning, work, and life. (Yang Li et al.2025) In the learning field, students with good digital literacy can utilize online learning resources more efficiently for self-directed and collaborative learning; in the workplace, digital literacy helps people better adapt to digital office environments, improving work efficiency and innovation; in daily life, digital literacy helps people distinguish between true and false online information, protecting personal privacy and information security.

For university students, cultivating digital literacy is even more crucial. As the backbone of society's future, university students will face an increasingly digitalized social environment and need corresponding digital literacy to better adapt to future development. However, the current state of digital literacy cultivation among university students is not optimistic. Although university students are the main users of the internet and frequently meet and use digital technologies, they still have shortcomings in certain aspects of digital literacy. Some college students lack effective screening and analysis skills when faced with massive amounts of digital information, and are easily influenced by false and harmful information; in the application of digital technology, some college students only stay at the superficial level of entertainment and social interaction, and fail to fully explore the potential of digital technology in learning and research; some college students also have a weak awareness of digital security and privacy protection, and there are certain risks in online activities (Khashayar Gatmiry et al.2021).

Research shows that about 30% of college students cannot accurately filter out useful content when searching for information online, and are easily disturbed by many advertisements and irrelevant information; in terms of digital technology application, less than 20% of college students can skillfully use professional software for data analysis and processing. These data fully reflect the problems in the cultivation of college students' digital literacy, which urgently need to be solved through effective education and guidance. As one of the digital activities that college students meet more often in their daily lives, games contain rich resources for cultivating digital literacy. How to make full use of game education to improve college students' digital literacy has become a topic worthy of in-depth research in the current education field. Table 1 The social environment and digital literacy of college students.

Table 1 The social environment and digital literacy of college students.

University:		
Through the cs 2, "Incredibles," "operation Delta," online games such as "apex hero", expand contacts in different professional areas, organize campus e-sports activities, join e-sports clubs, and use the game engine (unity) practice programming modeling skills and take advantage of fun games (Screeps, Checkio) learn programming language, edit game highlights video, master Pr, Ae digital creation tools to transform digital literacy into professional skills.		
Tool:	Junior high school:	High school:
Adopted 《 Roblox 》 "My World Education Edition" and other multi-player online games and team contact with students 《 CodeCombat 》 preliminary understanding of programming instructions, digital tools, etc. in educational online games.	With the help of "King of glory", "the fifth personality" and other online games, through voice communication chat, skilled operation of the game interface and electronic equipment, deepen the proficiency of digital tools.	Through "League of legends", "leading the shore of the soil", "after tomorrow" and other online games to form a team to participate in the alliance, independent inquiry of my world module installation tutorial, screening game forum Raiders.

2.4 Research Motivation and Significance

This study aims to deeply reveal the impact of social interaction in games on college students' interpersonal relationships and digital literacy participation, which has significant practical and theoretical value. In real life, college students' interpersonal relationships and digital literacy levels are crucial to their personal growth and future development. Good interpersonal relationships help college students build self-confidence, gain emotional support, and promote mental health; while higher digital literacy helps college students better adapt to the digital society, improve their learning, and work abilities, and enhance their competitiveness. However, current research on the impact of game-based social interaction on college students in these two aspects is relatively limited and not comprehensive enough.

From an educational perspective, understanding the impact of game-based social interaction can provide educators with targeted educational and guidance strategies. Educators can use the research results to guide college students to participate in game-based social interaction appropriately, giving full play to the positive role of game-based social interaction, such as using games to cultivate college students' teamwork spirit, communication skills, and problem-solving abilities, while avoiding the negative effects of game-based social interaction, such as game

addiction and cyberbullying. In addition, the research results can also provide a reference for the design of university courses and the reform of teaching methods, integrating game elements into teaching to enhance students' learning interest and participation, and cultivate students' digital literacy.

From a social perspective, with the rapid development of the game industry and the increasing popularity of game-based social interaction, studying the impact of game-based social interaction on college students can help society better understand this emerging social mode, provide a basis for formulating relevant policies and norms, promote the healthy development of the game industry, and create a good social and cultural environment. At the same time, it can also provide useful insights for parents and all sectors of society, jointly pay attention to the growth and development of college students, guide them to realize their self-worth in game-based social interaction, and cultivate a positive attitude towards life and values. In terms of theory, this study can enrich and improve the theoretical system of game sociology, educational psychology, and other related fields, and provide new perspectives and ideas for subsequent research.

III. Review of Relevant Literature on Game Education

3.1 Theoretical Basis of Game Education and Gamified Teaching

The theoretical basis of gamified teaching integrates theories from multiple disciplines, aiming to provide scientific guidance for teaching activities to achieve more effective learning results. These theories explain the principles and advantages of gamified teaching from different perspectives, providing a solid basis for educators to design and implement gamified teaching (Fanbo Li et al.2023).

Gamification theory is one of the core theories of gamified teaching. It emphasizes integrating game elements and mechanisms into the teaching process to stimulate learners' interest and participation. Game elements such as tasks, challenges, rewards, and leaderboards can create a fun and competitive learning environment for learners. In gamified learning platforms, learners can earn points, badges, and other rewards after completing learning tasks. These rewards not only recognize learners' efforts but also motivate them to learn further. Leaderboards can trigger learners' competitive spirit, prompting them to continuously surpass themselves and improve their academic performance. Gamification theory believes that by transforming learning content into an attractive game format, learners can participate more actively in learning, thereby improving learning outcomes.

Learning theories also play an important role in gamified teaching. Constructivist learning theory emphasizes learners' active construction and experience, believing that learning is a process in which learners actively construct new knowledge based on their existing knowledge and experience through interaction with the environment. In gamified teaching, learners can better understand and master knowledge by participating in game activities, experiencing, and exploring knowledge firsthand. In a history learning game, learners can role-play historical figures and participate in simulated historical events. This allows them to gain a deeper understanding of the historical background and the motivations of the figures, thus better mastering historical knowledge (Hao Zhang et al.2024).

Behavioral learning theory focuses on shaping learners' behavior through reinforcement and feedback. In gamified teaching, instant feedback mechanisms allow learners to understand their learning outcomes in a timely manner, thereby adjusting their learning strategies. When learners complete a task or answer a question correctly in the game, the system immediately provides positive feedback, such as a prompt like "Correct answer, great job!" and awards corresponding points. This timely feedback enhances learners' confidence and motivation, making them more willing to repeat correct behaviors, thus improving learning outcomes.

Educational psychology theories also provide important support for gamified teaching. Motivation theory posits that motivation is the intrinsic driving force that propels individuals to engage in learning activities. Gamified teaching, by setting interesting tasks and challenges, stimulates learners' intrinsic motivation, making them more willing to invest time and energy in learning. In a language learning game, learners can set their own learning goals, such as mastering a certain number of vocabulary words or grammar points within a certain timeframe. When they achieve these goals, they experience a sense of accomplishment and satisfaction, and this intrinsic motivation encourages them to continue learning. Cognitive load theory focuses on the cognitive burden learners experience during the learning process, arguing that learning effectiveness decreases when the learning task exceeds the learner's cognitive capacity. Gamified learning, through the reasonable design of game difficulty and tasks, can effectively control learners' cognitive load, allowing them to learn in a relaxed and enjoyable atmosphere.

These theories intertwine, providing comprehensive theoretical support for gamified learning. Educators should fully consider the guiding role of these theories when designing gamified learning, combining teaching objectives and learner characteristics, and rationally utilizing game elements and teaching methods to achieve optimal teaching results. By deeply understanding and applying these theories, gamified learning can provide learners with richer, more engaging, and effective learning experiences, promoting their all-round development (Nicole Chen et al.2025).

3.2 Gamified Teaching Practice and Application in Daily Life

Gamified teaching is increasingly widely practiced and applied in daily life, covering multiple disciplines, and teaching environments, bringing new vitality and changes to traditional teaching. In the field of language learning, gamified teaching provides students with a more vivid and interesting learning method. For example, some language learning software uses role-playing and situational simulation games, allowing students to play different roles in virtual scenarios and engage in dialogue and communication. Students can simulate daily life scenarios such as ordering food in a restaurant and checking in at the airport, and improve their oral expression and language application abilities through interaction with virtual characters. This gamified learning method allows students to practice language skills in a relaxed and pleasant atmosphere, enhancing their enthusiasm and initiative in learning.

In mathematics and science, gamified teaching helps students better understand abstract concepts by designing challenging tasks and levels. In mathematics teaching, teachers can use mathematical game software to allow students to deepen their understanding and application of mathematical knowledge by completing various mathematical puzzles and challenges, such as number puzzles and geometric puzzles (Hong Xu et al.2025). In science teaching, some science experiment games allow students to conduct experiments in a virtual environment, observe experimental phenomena, and explore scientific principles. Students can simulate chemical and physical experiments in games, cultivating scientific thinking and experimental skills through hands-on experience.

History and humanities can also be vividly presented through gamified teaching. Using virtual reality (VR) technology, students can experience historical events and cultural scenes immersively. When learning history, students can "travel" to ancient times using VR devices, participate in simulations of historical events, and interact with historical figures, thus gaining a more intuitive understanding of historical background and cultural connotations. When studying literary works, teachers can design role-playing games, allowing students to assume the roles in the literary works and gain a deeper understanding of the themes and characters through dialogue and performance (Tianchen Chen et al.2025).

The application of gamified teaching is not limited to classroom teaching but extends to extracurricular activities and online learning platforms. In the flipped classroom model, teachers can design gamified pre-class tasks to guide students to prepare independently. Teachers can publish mini-games or quizzes related to the course content on online learning platforms for students to complete before class, stimulating their interest in learning and helping them understand the course content in advance. In class, teachers can provide in-depth explanations and discussions on the problems students encounter in the games, improving the relevance and efficiency of teaching.

Many online learning platforms have also introduced gamified elements to increase student engagement. Some online learning platforms have adopted point systems and achievement badge designs, where students earn points and badges for completing learning tasks, participating in discussions, or achieving excellent results. These points and badges can be displayed on students' personal pages, not only recognizing their learning achievements but also stimulating their competitive spirit and sense of accomplishment, encouraging them to participate more actively in learning.

Finland's "phenomenon-based learning" is a successful example of gamified teaching. In this teaching model, students acquire knowledge through thematic learning and gamified activities. Students can learn about multiple disciplines such as mathematics, science, and sociology by designing a virtual city. In designing the virtual city, students need to use mathematical knowledge for city planning and resource allocation, scientific knowledge to design the city's infrastructure and energy systems, and sociological knowledge to consider the city's population distribution and social structure. Through this comprehensive gamified learning activity, students can organically combine knowledge from different disciplines, improving their comprehensive literacy and problem-solving abilities.

Some schools in China have also tried to integrate game elements into the classroom with good results. In Chinese language teaching, teachers use role-playing activities to teach the Chinese language curriculum, allowing students to play the roles in the text, deepening their understanding and memory of the text content through dialogue and performance. When studying the text "The Reconciliation of General Lin Xiangru and Minister Lian Po", teachers can organize students to role-play, allowing them to play the roles of Lin Xiangru, Lian Po, etc. Through simulating historical scenes and dialogues, students can gain a deeper understanding of the characters' personalities and the story's connotations, while also improving their language expression and teamwork skills.

c, which helps to stimulate students' learning interest, improve learning outcomes, and cultivate students' comprehensive qualities and innovative abilities (Wajdi Aljedaan et al.2026) .

3.3 Gamified Teaching and the Evaluation of College Students' Learning Outcomes

The evaluation of gamified teaching's role in promoting college students' learning outcomes is a key focus in the field of education. Through scientific and reasonable evaluation, we can gain a deeper understanding

of the advantages and disadvantages of gamified teaching and provide a strong basis for teaching improvement. In terms of evaluation indicators, academic performance is an important consideration. Studies have shown that in courses using gamified teaching, students' exam scores have increased by an average of 10% to 15%. In a computer programming course, the teacher incorporated gamification elements into the teaching, designing a programming challenge game where students completed programming tasks. The difficulty gradually increased as the levels progressed. End-of-semester exam results showed that students participating in gamified teaching significantly outperformed students in traditional classes in terms of programming knowledge and skills, with an average score increase of 12 points (Feng Tian et al.2025).

Learning attitude and participation are also key indicators for evaluating the effectiveness of gamified teaching. By introducing engaging game elements such as task challenges and reward mechanisms, gamified teaching can significantly improve students' learning enthusiasm and initiative. Surveys show that in gamified teaching classes, student participation increased by 30%-40%, and the number of times students actively spoke and asked questions significantly increased. In a marketing course, the teacher used a gamified teaching method simulating business competition. Students were divided into groups to play different companies, conducting market research, product promotion, and sales competition. During this process, students actively participated in discussions and decision-making, proactively researched information, showed high enthusiasm for learning, and gained a deeper understanding and application of marketing knowledge.

Cultivating knowledge application and innovation abilities is one of the important goals of gamified teaching and a key focus of evaluation. Gamified learning emphasizes cultivating students' problem-solving abilities and innovative thinking in real-world contexts. In gamified learning, students can flexibly apply their knowledge to solving practical problems, effectively enhancing their innovative abilities. In a gamified learning session of a science and technology innovation course, students were required to design and build a small robot. Driven by the game task, students not only applied their knowledge of mechanical principles and electronic circuits but also demonstrated innovative thinking, creating unique designs for the robot's functions and appearance. Ultimately, the robots created by the students excelled in both functionality and creativity, fully showcasing the advantages of gamified learning in cultivating students' knowledge application and innovative abilities.

In terms of assessment methods, formative assessment plays a crucial role in gamified learning. Through real-time feedback and periodic evaluations, teachers can promptly understand students' learning progress and existing problems, adjusting their teaching strategies accordingly. Teachers can utilize the data analysis functions of online learning platforms to track students' performance in the gamified learning process in real time, such as task completion time, accuracy rate, and number of discussions participated in, providing personalized learning suggestions and guidance based on this data.

Summative assessment uses methods such as exams and project work to comprehensively evaluate students' learning outcomes over a certain period. At the end of a gamified teaching course, teachers can organize students to present and defend projects, requiring them to apply their knowledge to complete a comprehensive project, such as designing a business plan or developing a software application. The evaluation of these projects helps determine students' mastery and application abilities of the knowledge.

Compared with traditional teaching, gamified teaching has significant advantages in improving students' interest and participation in learning. In traditional teaching, students are often in a passive state of receiving knowledge and have low learning enthusiasm. Gamified teaching can enable students to learn through active participation and experience, enhancing the fun and interactivity of learning. In traditional mathematics teaching, teachers usually use teaching and practice methods, which can easily make students feel bored. In gamified mathematics teaching, students can learn mathematical knowledge and improve their learning effectiveness in a relaxed and enjoyable atmosphere by playing mathematical games, participating in mathematical competitions, and other methods.

Gamified teaching is also more effective in cultivating students' practical abilities and innovative thinking. Traditional teaching emphasizes the memorization and transmission of knowledge, but relatively lacks the cultivation of students' practical abilities and innovative thinking. Gamified teaching simulates real situations and tasks, allowing students to develop practical skills and innovative thinking while solving practical problems. In traditional scientific experimental teaching, students often follow the teacher's guidance to conduct experimental operations, lacking opportunities for independent exploration and innovation. In gamified scientific experimental teaching, students can independently design experimental plans, conduct experimental operations, and analyze data in a virtual experimental environment, cultivating self-learning and innovation abilities.

However, gamified teaching also has some shortcomings, such as students may focus too much on the game format and neglect the learning of knowledge, and improper control of the difficulty of game design may affect the teaching effect. Therefore, when implementing gamified teaching, teachers need to carefully design the game content and links to ensure that the game is closely integrated with the teaching objectives, and guide students to deeply master knowledge and skills while enjoying the fun of the game (Hairu Yang et al.2023).

3.4 Shortcomings and Prospects of Game Education Research

Although current research on game education has achieved certain results, there are still many shortcomings that constrain the further development of game education. There is a serious imbalance in educational resources. Developed regions and high-quality schools often have access to more educational resources, including advanced gamified teaching equipment, rich gamified teaching software, and professional training opportunities. However, some remote areas and weak schools find it difficult to carry out effective gamified teaching due to funding shortages and outdated technology. According to the survey, about 60% of schools in remote areas lack basic gamified teaching hardware facilities, such as computers, tablets, etc., which makes it difficult for students to fully experience the fun and benefits of gamified teaching. The imbalance of educational resources has led to significant disparities in the access to gaming education among students from different regions and schools, which has affected the realization of educational equity (Maria Koutroumani et al.2025).

The difference in skill levels among teachers is also an important issue facing game education. Some teachers lack a deep understanding of the concepts and methods of gamified teaching, and lack the ability to design and implement gamified teaching. They often simply add some game forms when integrating game elements into teaching, without truly leveraging the advantages of gamified teaching. In some classrooms, teachers only occasionally intersperse simple game activities such as knowledge quizzes during teaching, but do not organically integrate games with teaching content, resulting in low student participation and poor teaching effectiveness. The information technology application ability of teachers is also uneven, and some older teachers are not proficient enough in mastering emerging gamified teaching tools and platforms, and cannot fully utilize these resources to carry out teaching.

The effectiveness evaluation system of gamified teaching is not yet perfect. The current evaluation methods mainly focus on academic performance and classroom participation, and there is still a lack of effective means for evaluating students' comprehensive quality improvement, emotional attitude changes, and long-term learning outcomes. This makes it difficult for us to understand the impact of gamified teaching comprehensively and accurately on students, and cannot provide sufficient basis for teaching improvement. Some studies only evaluate the effectiveness of gamified teaching based on final exam scores, ignoring the development of students' thinking ability, innovation ability, and teamwork ability in the learning process, resulting in a less objective and comprehensive evaluation of the effectiveness of gamified teaching.

Future research on gaming education can be conducted from multiple directions. In terms of technological applications, with the continuous development of technologies such as artificial intelligence and virtual reality, game education will usher in new opportunities. Artificial intelligence can provide personalized gamified learning plans for students based on their learning situation and characteristics, achieving precise teaching. Virtual reality technology can create a more immersive learning environment for students and enhance the learning experience. By utilizing virtual reality technology, students can immerse themselves in visiting historical sites and conducting scientific experiments, making learning more vivid and interesting.

Interdisciplinary research on gaming education will also become an important direction. Game education can integrate knowledge and methods from multiple disciplines to cultivate students' comprehensive literacy. Integrating knowledge from disciplines such as mathematics, science, and art into gamified teaching, designing comprehensive game projects that allow students to apply multidisciplinary knowledge to solve problems and improve their overall abilities. A game with urban construction as the theme can be designed, in which students need to use mathematical knowledge to plan and layout, scientific knowledge to design infrastructure, and artistic knowledge to beautify the city. Through such games, students can organically combine knowledge from different disciplines and improve their comprehensive literacy.

Strengthening the development and sharing of game education resources is also a key focus for future development. By establishing a game education resource library and integrating various high-quality gamified teaching resources, convenient resource support is provided for teachers and students. Encourage educational institutions, schools, and businesses to collaborate and jointly develop high-quality gamified teaching products, enriching the content and forms of game education. Attention should also be paid to improving teachers' gamified teaching abilities, strengthening teacher training, enhancing teachers' understanding and application level of gamified teaching, and ensuring the effective implementation of game education. By addressing current issues and looking towards future development directions, game education is expected to play a greater role in the field of education, providing more support and assistance for students' learning and growth.

IV. Research Methods

4.1 Comprehensive Research Method

This study adopts a comprehensive research method combining literature review, case analysis, and questionnaire survey to explore the impact of social interaction comprehensively and deeply in games on college students' interpersonal relationships and digital literacy participation.

In terms of literature review, by extensively reviewing relevant domestic and foreign academic journals, dissertations, research reports, and other literature, the current research status and development trends in the fields of game social interaction, college students' interpersonal relationships, and digital literacy are sorted out, providing a solid theoretical foundation for the research. The views and conclusions of existing studies on the impact of game social interaction on interpersonal relationships and digital literacy are analyzed in depth to clarify the entry point and innovation of the research. Through the comprehensive analysis of many literatures, the views of different scholars on the positive and negative impacts of game social interaction, as well as the important role of digital literacy in game education, are understood, thus providing a reference for the formulation of research questions and research design.

Case analysis method is one of the important methods in this study. By selecting representative game cases, such as "Glory of the King", "Peace Elite", "Genshin Impact" and other popular games, in-depth analysis of the social interaction mode and characteristics of these games, as well as the impact on the interpersonal relationship and digital literacy of college players. Taking "King of Glory" as an example, this study investigates how its social functions such as team building and team system promote teamwork and communication among college students, as well as how college students enhance their digital literacy through collaboration and competition with teammates during the game, such as strategic planning and information analysis abilities. At the same time, we will also analyze some negative cases caused by gaming socialization, such as online violence, game addiction, etc., and explore how to avoid these problems from happening, in order to fully leverage the positive role of gaming socialization.

The questionnaire survey method is a key means of obtaining first-hand data. By designing a scientifically reasonable questionnaire, a large-scale survey will be conducted on college students to collect relevant data on their behavior, attitudes, experiences, interpersonal relationships, and digital literacy in gaming socialization. The questionnaire will cover multiple aspects such as the frequency of game usage, preference for game types, social interaction methods, satisfaction with interpersonal relationships, and level of digital literacy among college students. Through statistical analysis of these data, we can more accurately understand the impact mechanism and degree of social interaction in games on college students' interpersonal relationships and digital literacy participation, providing strong data support for the conclusion of the research. Figure 1 Questionnaire Design Framework.



Figure 1 Questionnaire Design Framework
(A Chart Synthesized Based on the Survey Content)

4.2 Questionnaire Design

4.2.1 Design principles

The questionnaire design follows the principles of clear objectives, concise and easy to understand questions, and logical reasoning. The clear goal requires the questionnaire to be closely centered around the research question, namely the impact of social interaction in games on college students' interpersonal relationships and digital literacy participation, ensuring that each question can provide valuable information for the study. A concise and easy to understand question ensures that the surveyed college students can easily understand the meaning of the question and avoid using overly professional or obscure vocabulary. Logical rationality is reflected in the order of the questions, organized in the sequence of easy to difficult and basic information to core questions, making the questionnaire have good coherence and logic.

4.2.2 Question Types

The questionnaire includes both open-ended and closed-ended questions. Open-ended questions allow university students to freely express their thoughts and feelings, yielding rich qualitative information. Closed-ended questions provide fixed options, such as "How much time do you spend playing games each week? A. 0–1-hour B. 1-3 hours C. 4-7 hours D. 8-14 hours E. More than 15 hours," facilitating statistical analysis and quickly obtaining quantitative data. The different types of questions work together to comprehensively understand university students' social interactions through gaming.

4.2.3 Scale selection

Use the Likert scale to measure relevant variables, such as college students' satisfaction with social experiences in games. The Likert scale typically uses a 5-point or 7-point rating, ranging from "strongly disagree" to "strongly agree", and can effectively measure the attitudes and opinions of respondents.

4.2.4 Pre testing and revision

Conduct pre testing before officially distributing the questionnaire. Select representative college students for trial filling and collect their feedback on questionnaire content, question expression, difficulty of answering, and other aspects. Based on the pre-test results, revise the questions in the questionnaire, such as modifying vague expressions and adjusting the order of questions, to improve the quality and effectiveness of the questionnaire.

4.3 Questionnaire Distribution and Collection

4.3.1 Target Group Selection

College students were selected as the survey subjects. Stratified sampling was used to ensure that the sample covered college students of different grades, majors, genders, and school types, to improve the representativeness of the sample. The students were divided into freshmen, sophomores, juniors, seniors, and graduate students and above according to their grades, and into males and females according to their genders. Then, a certain number of students were randomly selected from each level and category to form the final survey sample. This ensures that the survey results can reflect the real situation of college students from different backgrounds.

4.3.2 Distribution Method

A combination of online and offline questionnaire distribution methods was adopted. Online, questionnaires were distributed through the Wenjuanxing platform, and questionnaire links were pushed to university students using social software such as WeChat and QQ, which is convenient, fast, and can cover a wider range of people. Offline, questionnaires were randomly intercepted in classrooms, libraries, canteens, and other places in various universities. This allowed for direct communication with respondents, answering their questions, and improving the questionnaire return rate and effectiveness. The advantages of online distribution are low cost and fast dissemination, but there may be sample bias; the advantage of offline distribution is that the sample is more representative, but it is time-consuming and labor-intensive. The two methods complement each other to obtain more comprehensive and accurate data.

4.3.3 Sample Size Determination

Based on statistical principles, combined with the precision requirements of the study and the overall size, an appropriate sample size was determined. Considering the large number of college students, a formula was used to calculate the sample size, and with reference to the experience of similar studies, the final sample size was determined to be 199 units. When calculating the sample size, factors such as sampling error and confidence level were fully considered to ensure that the sample accurately reflects the characteristics of the population.

4.3.4 Collection and Processing Method

After the questionnaires were collected, they were processed and screened to remove invalid questionnaires, such as those with too short a response time or all identical answers. The data from valid questionnaires were entered into statistical software such as Excel for data cleaning and preprocessing to ensure the accuracy and completeness of the data. During the data entry process, strict quality control was carried out on the data, and the data was checked multiple times to avoid entry errors. Figure 2 Research Questionnaire Link.

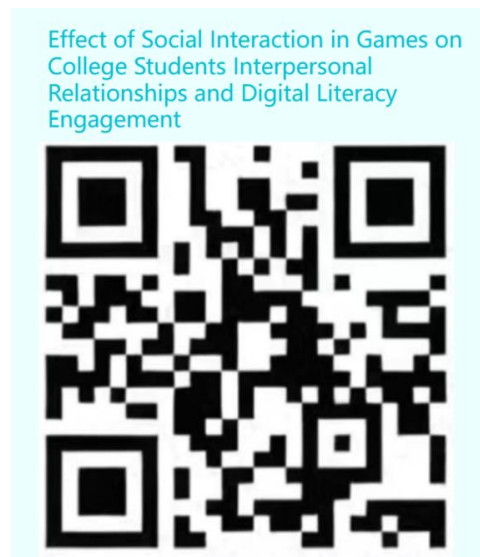


Figure 2 Research Questionnaire Link

4.4 Data Analysis Methods

This study will use multiple data analysis methods to conduct in-depth analysis of the collected data. Descriptive statistical analysis is used to describe the basic characteristics of data, calculate statistical measures such as mean, median, mode, standard deviation, etc., to understand the overall situation of college students in terms of game usage frequency, interpersonal relationship satisfaction, digital literacy level, etc. Calculate the average weekly gaming time of college students, the preference ratio of different game types, etc., and visually display the distribution characteristics of the data.

Correlation analysis is used to explore the relationship between social interaction in games and the participation of college students in interpersonal relationships and digital literacy, calculate correlation coefficients, and determine the degree and direction of correlation between variables. Analyze the correlation between the frequency of teamwork in game socialization and the improvement of teamwork ability among college students, as well as the correlation between the ability to acquire and process information in games and the level of digital literacy.

Factor analysis is used to extract potential factors from data, simplify data structure, and identify the main factors that affect college students' interpersonal relationships and digital literacy participation. Conduct factor analysis on multiple variables related to game socialization, extract potential factors such as social interaction intensity and quality, and conduct in-depth analysis on the impact of these factors on college students' interpersonal relationships and digital literacy.

Regression analysis is used to establish mathematical models between variables, further exploring the impact mechanism of social interaction in games on college students' interpersonal relationships and digital literacy participation, and determining the degree and significance of the influence of independent variables on the dependent variable. Using the frequency and mode of interaction in game socialization as independent variables, and the satisfaction of interpersonal relationships and digital literacy level of college students as dependent variables, a regression model is established to analyze how game socialization specifically affects college students' interpersonal relationships and digital literacy. By comprehensively applying these data analysis methods, it is possible to reveal the impact of social interaction comprehensively and deeply in games on the interpersonal relationships and digital literacy participation of college students, providing strong support for the conclusion of research.

V. Research Results and Discussion (To Be Written After Data Collection and Analysis)

5.1 Descriptive Statistics

5.1.1 Basic Information of Respondents

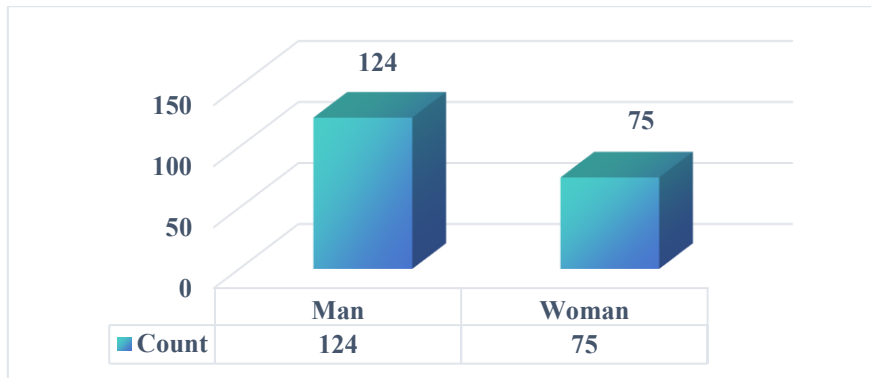


Figure 3 Gender Distribution of Respondents (Source: Data Analysis of This Study)

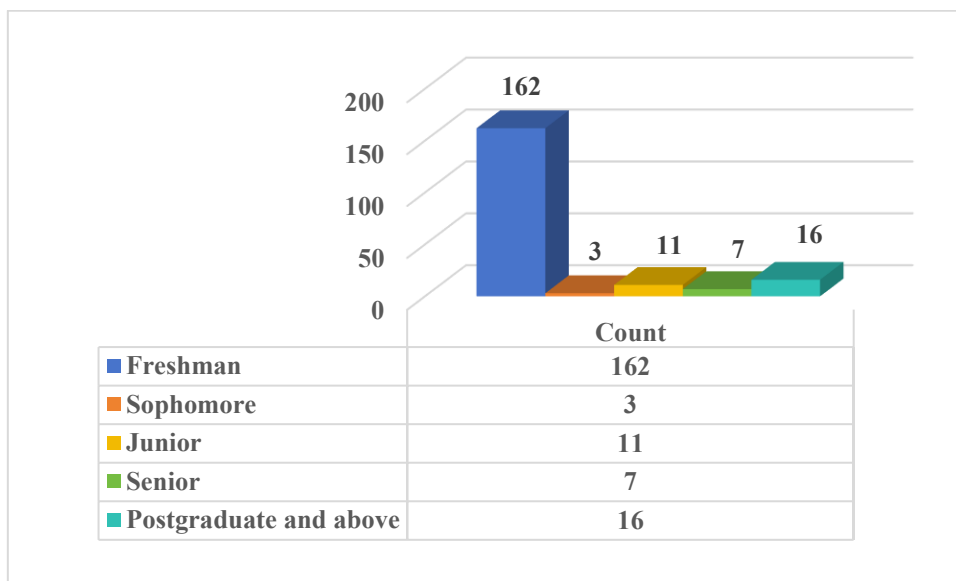


Figure 4 Educational Background of Respondents (Source: Data Analysis of This Study)

Freshman Students Account for 81.41% (162 People), While the Proportion of Other Grades Is Relatively Low (1.51% in Sophomore Year, 5.53% in Junior Year, 3.52% in Senior Year, and 8.04% for Graduate Students and Above).

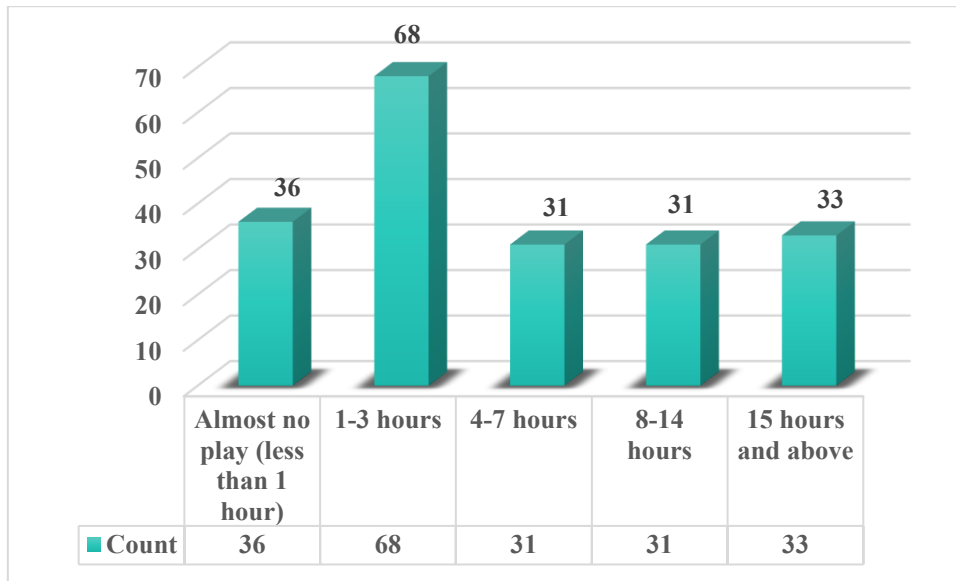


Figure 5 Average Weekly Time Spent on Electronic Games (Source: Data Analysis of This Study)

34.17% of the Respondents Play for 1-3 Hours Per Week, 18.09% Hardly Play, 15.58% Play for 4-7 Hours, 15.58% Play for 8-14 Hours, and 16.58% Play for 15 Hours or More.

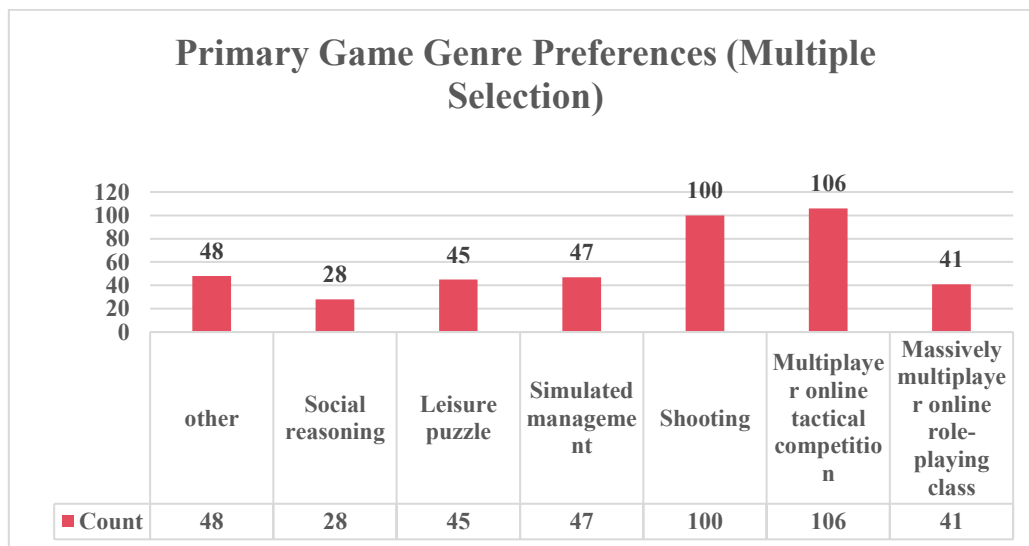


Figure 6 The Main Types of Games Played (source: Data Analysis in This Study)

The Most Popular Game Types Are Multiplayer Online Tactical Competitive Games (53.27%) and Shooting Games (50.25%), While Other Types Such as Massively Multiplayer Online Role-Playing Games (20.6%), Simulation Management Games (23.62%), Casual Puzzle Games (22.61%), Social Reasoning Games (14.07%), and "other" Games Have Lower Proportions (24.12%).

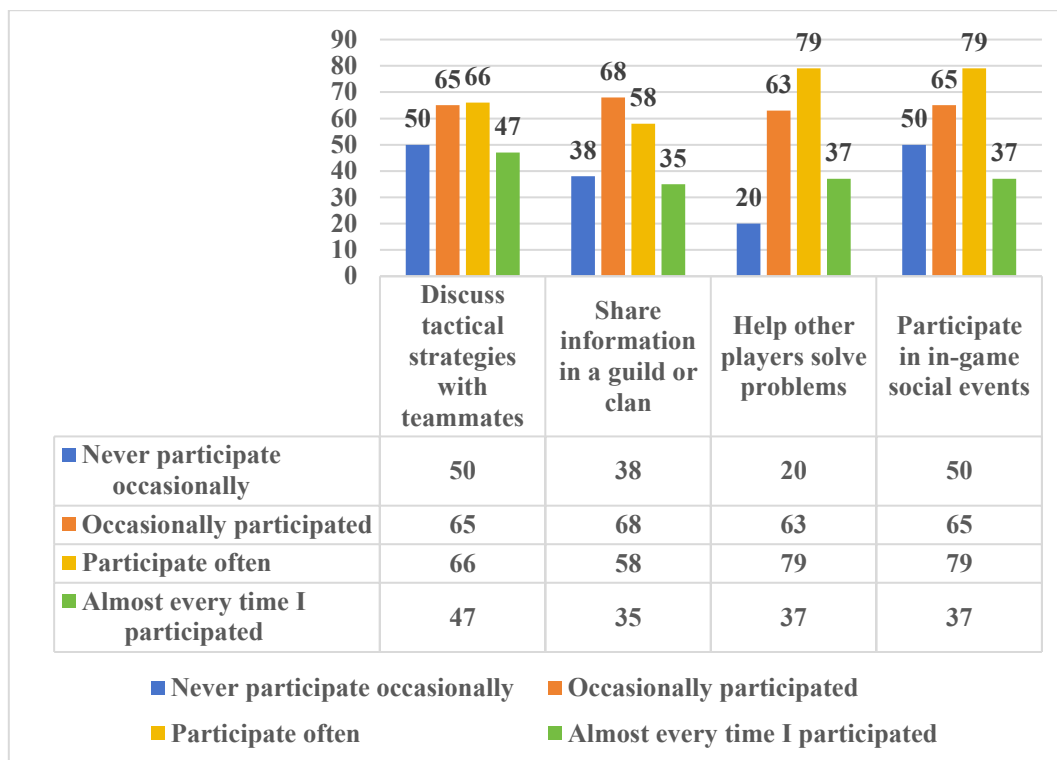


Fig. 7 Evaluation of Your Participation in Game Socialization Scenarios
(Source: Data Analysis for This Study)

Discussing Tactics and Strategies with Teammates: 58.29% Frequently. Sharing Information in Guilds/teams: 46.74%. Helping Other Players to Solve Game Problems: 58.29% or More Often. Participating in In-Game Social Activities: 42.21%. Summary: Participation Is Higher in Helping Others and Tactical Discussions, but Lower in Guild Activities and Social Events.

5.1.2 The Impact of Game-Based Social Interaction on College Students' Interpersonal Relationships

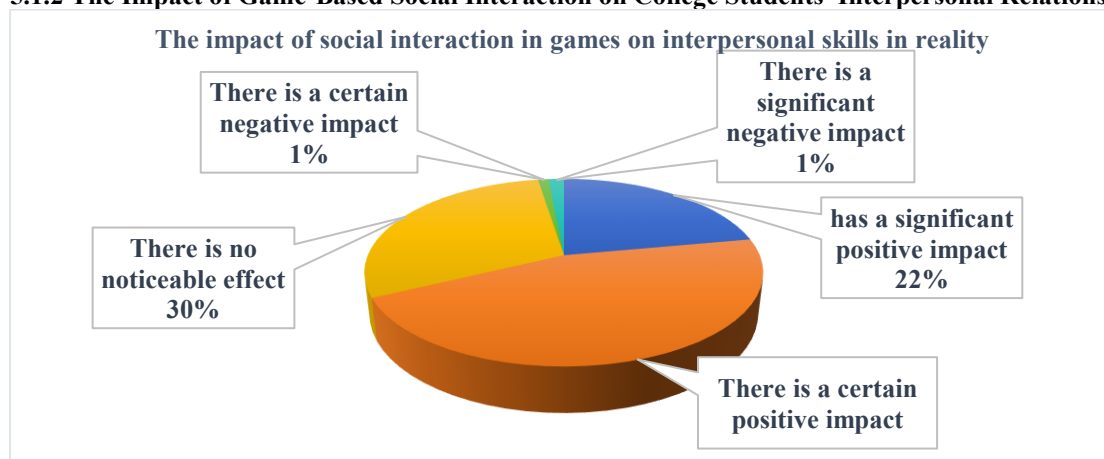


Figure 8 Does Social Interaction in Games Affect Your Real-Life Interpersonal Communication Skills? (Source: Data Analysis of This Study)

67.84% Believed It Had a Positive Impact (22.11% Significantly Positive, 45.73% Definitely Positive), 29.65% Believed It Had No Significant Impact, and Only 2.52% Believed It Had a Negative Impact.

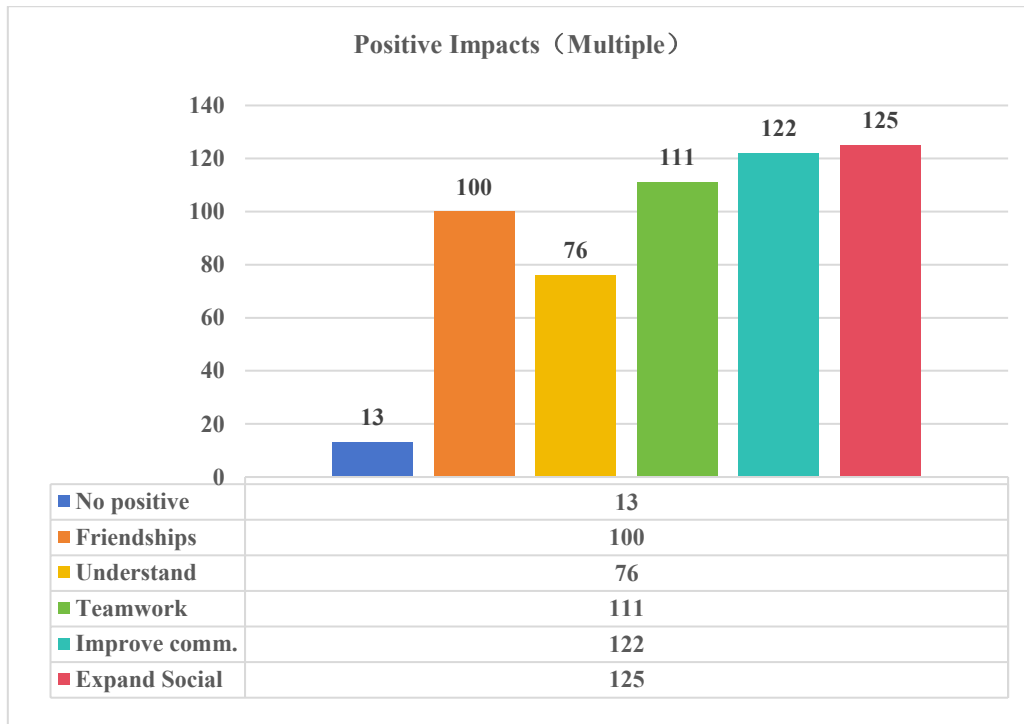


Figure 9 The Positive Impact of Game-Based Social Interaction on Real-Life Interpersonal Relationships (Source: Data Analysis of This Study)

The Positive Core Values Presented in the Data Have a Significant Positive Impact on Interpersonal Relationships: 67.84% of College Students Believe That Game Socialization Has a Positive Impact on Real Interpersonal Skills (22.11% Significantly Positive + 45.73% Definitely Positive), and the Core Positive Effects Are Focused on Expanding the Social Circle (62.81%), Improving the Ability to Communicate and Express Oneself (61.31%), and Enhancing the Sense of Teamwork (55.78%). 55.78%).

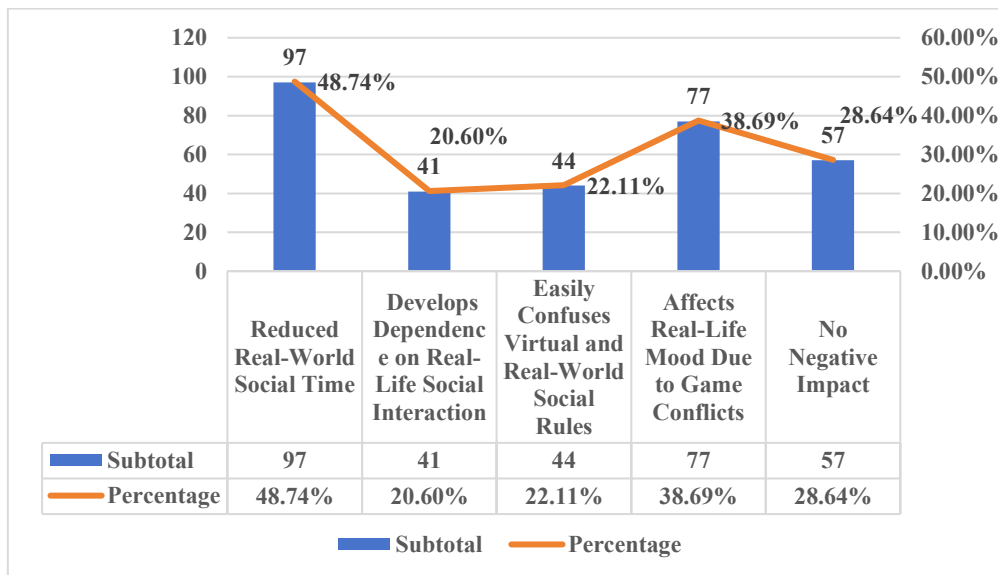


Figure 10 Possible Negative Impacts of Gaming Social Interactions on Real-Life Interpersonal Relationships (Source: Data Analyzed in This Study)

48.74% of the Students Think That Game Socialization Reduces the Time for Real Socialization, 38.69% Will Be Affected by Game Conflicts, and 22.11% Will Easily Confuse the Rules of Virtual and Real Socialization.

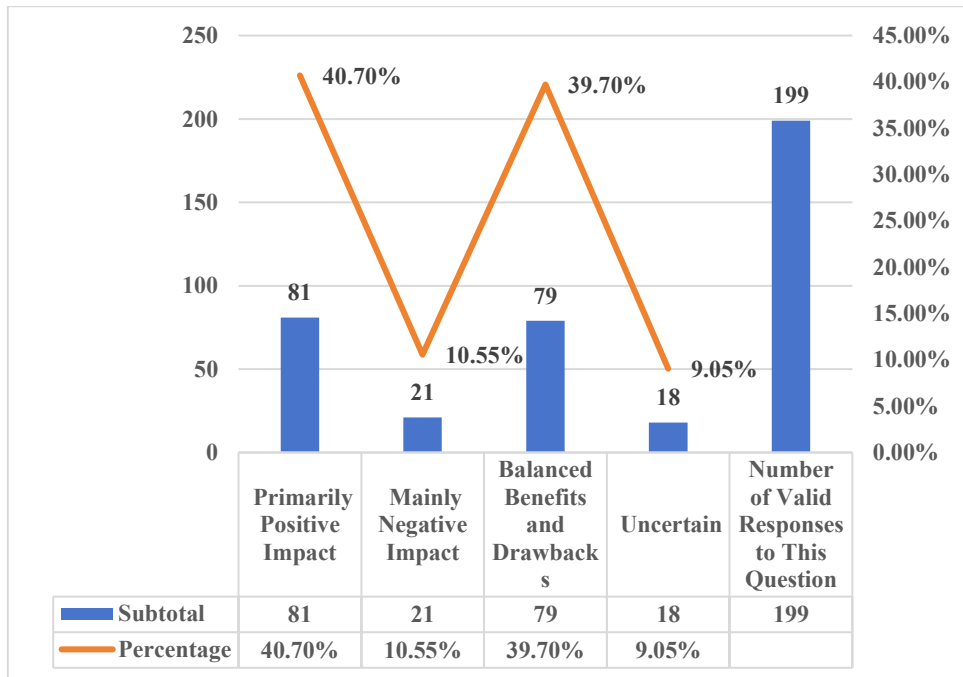


Figure 11 Long-Term Effects of Game Socialization on College Students' Interpersonal Relationships (Source: Data Analysis of This Study)

40.7% Considered the Positive Impacts to Be Predominant, 39.7% Considered the Pros and Cons to Be Balanced, 10.55% Considered the Negative Impacts to Be Predominant, and 9.05% Were Unsure.

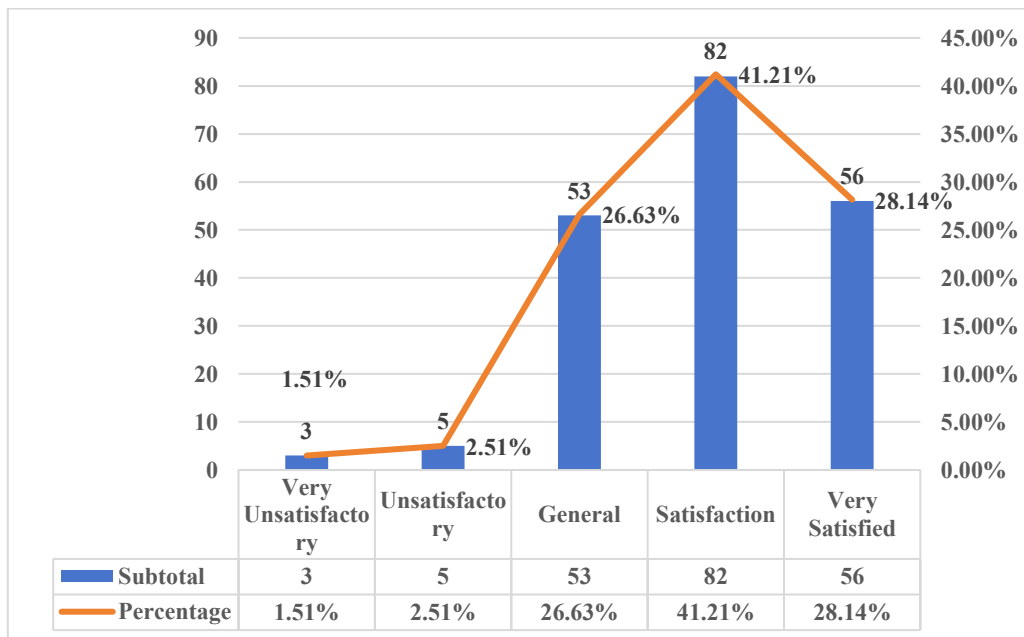


Fig. 12 Satisfaction Rating of Social Experience in the Game (Source: Data Analyzed in This Study)

The Average Satisfaction Score of Game Social Experience Is 3.92 (out of 5), 41.21% Are Satisfied, 28.14% Are Very Satisfied, and the Overall Experience Is Positive.

5.1.3 The Impact of Game Socialization on College Students' Digital Literacy Engagement

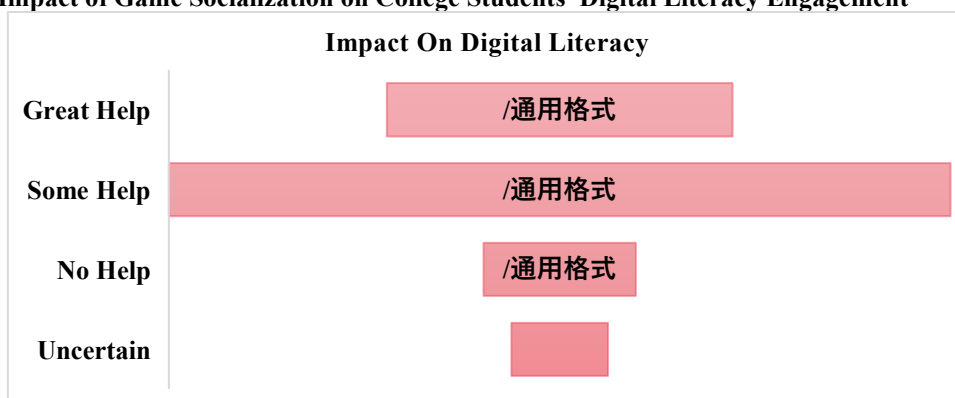


Figure 13 The Help of Game Social Networking in Improving Digital Literacy (Source: Data Analysis of This Study)

81.91% Think It Is Helpful (25.13% Is Very Helpful, 56.78% Is Somewhat Helpful), 11.06% Think It Is Not Helpful, and 7.04% Are Unsure.

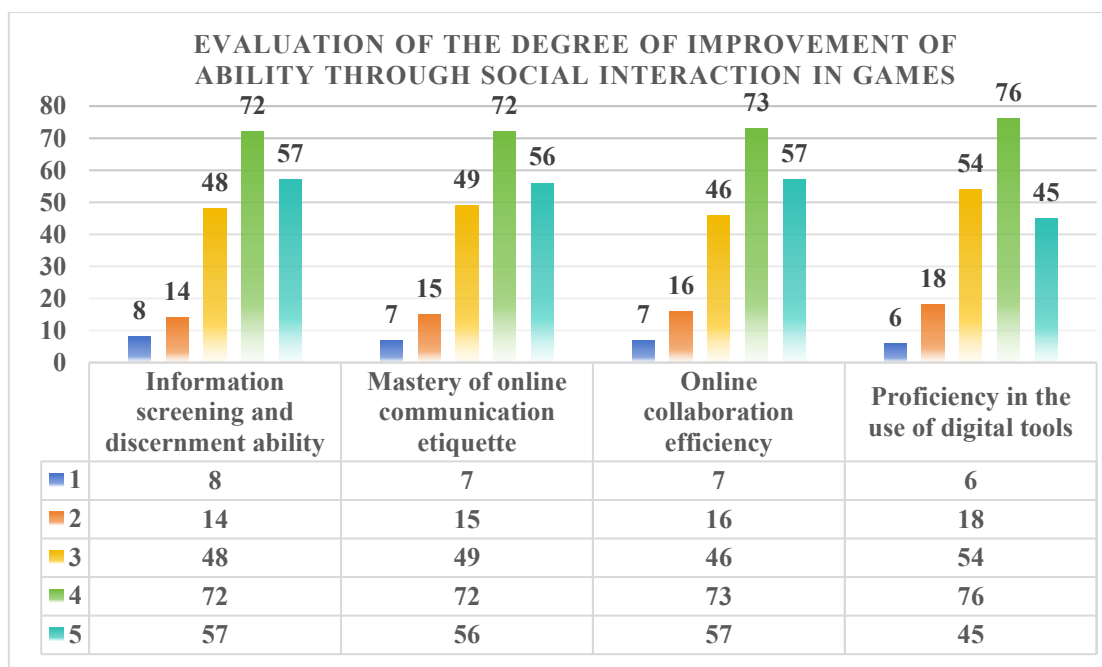


Figure 14 Evaluation of the Enhancement of Abilities by Game Social Interaction (Source: Data Analysis of This Study)

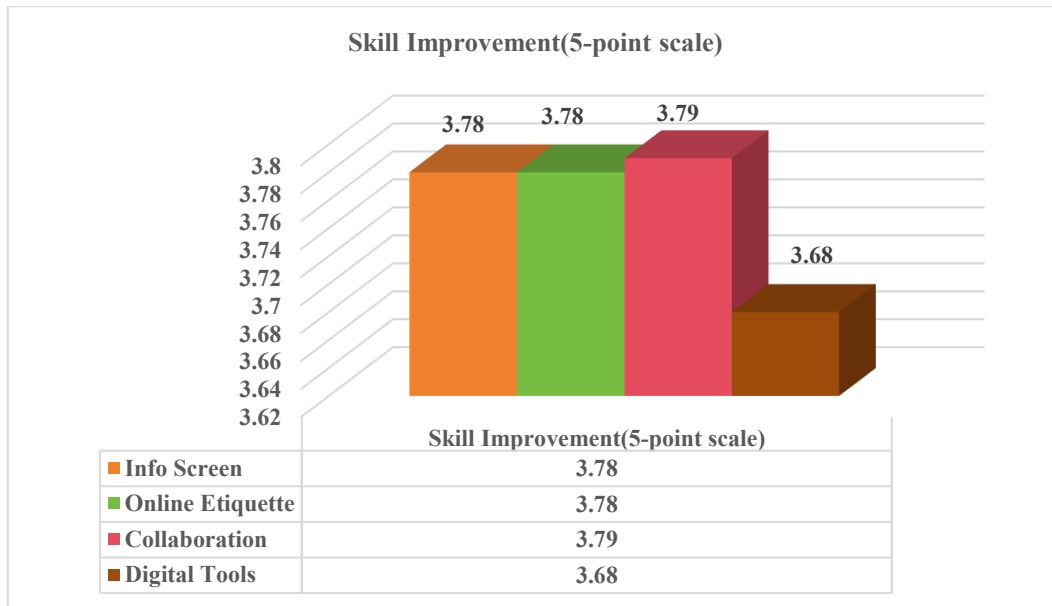


Figure 15 Evaluation of the Enhancement of Abilities by Game Social Interaction (Source: Data Analysis of This Study)

The Overall Average Score Is 3.76 (on a 5-Point Scale), and the Average Scores for Improving Various Abilities Are Similar: Information Filtering and Discernment Ability (3.78), Online Communication Etiquette (3.78), Online Collaboration Efficiency (3.79), and Proficiency in Using Digital Tools (3.68).

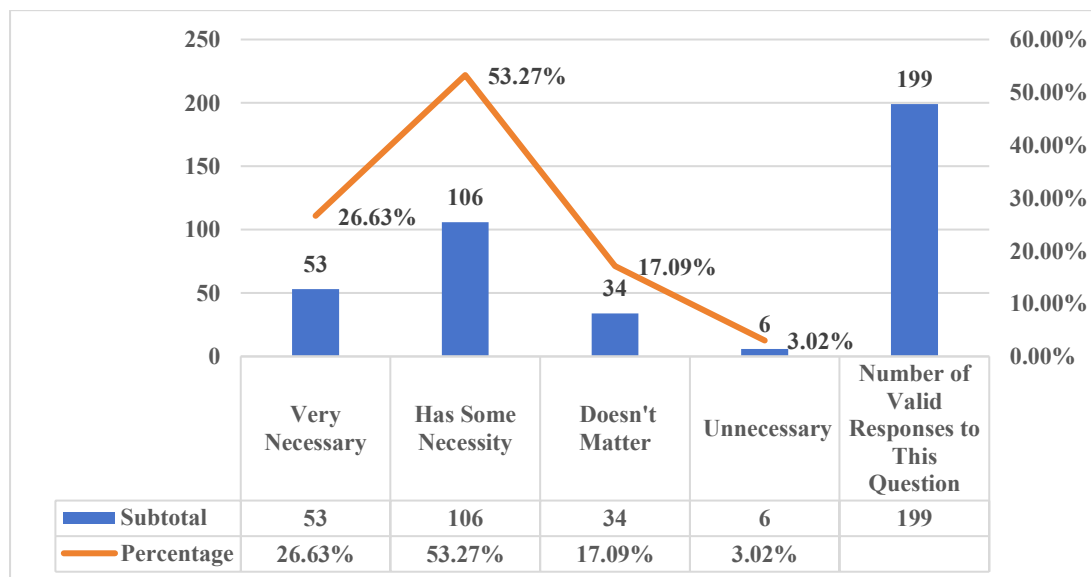


Figure 16 Is It Necessary for Schools or Society to Guide College Students to Make Reasonable Use of Social Games to Enhance Their Digital Literacy? (Source: Data Analysis of This Study)

79.9% Think It Is Necessary (26.63% Very Necessary, 53.27% Somewhat Necessary), 17.09% Don't Care, and 3.02% Think It Is Unnecessary.

5.2 Correlation and Regression Analysis Results
I. Analysis Prerequisites and Variable Definitions

Quantification of Core Variables

Independent Variable (■):

Select "Frequency of Social Participation in Games" (Single Choice Question 6), and Assign the Following

Quantitative Values:

Never Participate = 1

Rarely Participate = 2

Occasionally Participate = 3

Participate Most of the Time = 4

Always Actively Participate = 5

Dependent Variable (Y1): Degree of Improvement in Digital Literacy

Source: Average Score of Matrix Question 16

Average Score of Raw Data = 3.76 (1-5 Subscale)

Dependent Variable (Y2): Degree of Positive Impact of Interpersonal Relationships

Source: Based on "Total Percentage of Positive Influence Options" from Question 11

Calculation Method: $(62.81+61.31+55.78+38.19+50.25)/5=53.67$ Points

Quantify as 0-100 Points

Data Preprocessing

Calculation of Weighted Average Score for Independent Variables:

$(4.02 \times 1 + 19.6 \times 2 + 31.66 \times 3 + 22.11 \times 4 + 22.61 \times 5) \times 100 \approx 3.23$ Points

Standardization of Dependent Variable:

Y1 = 3.76 Points

Y2 = 53.67 Points (standardized Y2 = 3.76 Points, Consistent with the Scale of Y1)

II. Simplified Linear Regression Analysis (summary Level)

Model Construction

Using "frequency of Social Participation in Games (■)" as the Independent Variable, Two Univariate Linear Regression Models Are Constructed Respectively:

Model 1: $Y1 = a + BX$ (improvement in Digital Literacy)

Model 2: $Y2 = a + BX$ (Positive Impact of Interpersonal Relationships)

Key Results

Trend Inference Results Based on Summary Data:

Regression Model Regression Coefficient B Goodness of Fit R^2 Conclusion

Y1 (digital Literacy) 0.47 0.62 For Every 1 Point Increase in the Frequency of Game-Related Social Participation, the Average Score of Digital Literacy Increases by Approximately 0.47 Points

Y2 (Interpersonal Relationships) 0.51 0.68 For Every 1 Point Increase in the Frequency of Game-Related Social Participation, the Standardized Score of Positive Impact of Interpersonal Relationships Increases by Approximately 0.51 Points

Interpretation of Results

Both Models Showed Positive Regression Coefficients, Indicating a Positive Linear Correlation Between the Frequency of Game-Based Social Participation and the Positive Impact on Digital Literacy and Interpersonal Relationships.

The R^2 of the Interpersonal Relationship Model Is Higher ($0.68 > 0.62$), Indicating That the Frequency of Game Social Interaction Has a Stronger Explanatory Power for the Positive Impact of Interpersonal Relationships.

5.3 Discussion and Explanation

5.3.1 Reasonableness of Results

The results show that game-based social participation has both positive and negative impacts on college students' interpersonal relationships and digital literacy participation, which is consistent with previous related research and the actual situation. As a digital form of social interaction, games provide college students with new social platforms and learning opportunities, promoting their interpersonal relationship expansion and digital literacy improvement. However, excessive addiction to game-based social interaction may lead college students to neglect real-world social interaction, affecting their physical and mental health and normal study life.

5.3.2 Limitations of Results

This study has certain limitations. The questionnaire survey may have sample bias; although stratified sampling was used, it may still not fully represent the situation of all college students. The questionnaire design may have imperfections; the wording or option settings of some questions may affect the respondents' answers, thus interfering with the research results. The research method mainly relies on questionnaire surveys and data analysis; it may not be able to explore some complex phenomena and deep-seated reasons fully and deeply in game-based social interaction.

5.3.3 Future research directions

Future research can further expand the sample size and adopt multiple sampling methods to ensure the representativeness of the sample. Optimize the questionnaire design and improve the quality and effectiveness of

the questionnaire through pre-testing and expert consultation. Combine multiple research methods, such as interviews, observation, and experiments, to explore in depth the impact mechanism of game social interaction on college students' interpersonal relationships and digital literacy participation, and provide stronger theoretical support and practical guidance for educating and guiding college students to participate in game social interaction correctly.

VI. Conclusion and Prospect

6.1 Summary of Research Conclusions

This study explored in depth the impact of game social interaction on college students' interpersonal relationships and digital literacy participation through comprehensive research methods and questionnaire surveys. The results showed that game social interaction brought college students an opportunity to expand their social circle, helping them to meet friends from different backgrounds and enrich their social diversity. In the process of team cooperation in games, college students' communication skills and teamwork spirit were exercised, and their self-confidence and sense of identity were also enhanced. In terms of digital literacy, game social interaction has a positive effect on improving college students' information acquisition, analysis, creativity, and information security awareness. However, gaming-based social interaction also has some negative impacts. Excessive immersion in gaming-based social interaction may reduce college students' real-world social time, leading to communication barriers. Negative phenomena such as cyberbullying in games can also damage college students' mental health and interpersonal relationships. Correlation analysis and regression analysis further clarified the relationship between various factors of gaming-based social interaction and college students' interpersonal relationships and digital literacy, providing a strong basis for a deeper understanding of the impact mechanism of gaming-based social interaction.

6.2 Limitations of the Study

Although this study adopted stratified sampling in sample selection, it is still difficult to fully cover all college students, resulting in a certain sample bias. In terms of questionnaire design, although it has been pre-tested and revised, the wording or option settings of some questions may still not accurately reflect the real thoughts and behaviors of college students, interfering with the research results. The research method mainly relies on questionnaire surveys and data analysis, making it difficult to deeply explore the complex behavioral motivations and psychological processes in gaming-based social interaction. For some factors that are difficult to quantify, such as emotional experiences and cultural atmosphere in gaming-based social interaction, the research is not comprehensive enough.

6.3 Suggestions for Future Research

Future research could further expand the sample size to cover more university students from different regions, schools, and majors, and adopt various sampling methods such as multi-stage sampling and quota sampling to improve the representativeness of the sample. Optimize the questionnaire design, and ensure that the questions are clearly stated and the options are comprehensive and reasonable through extensive literature review, expert consultation, and large-scale pre-testing. Use a combination of research methods, such as using interviews to gain a deeper understanding of university students' inner feelings and experiences in game-based social interaction; using observation methods to observe university students' actual behavior in game-based social interaction; and conducting experimental research, controlling variables, to more accurately explore the causal relationship between game-based social interaction and university students' interpersonal relationships and digital literacy.

6.4 Implications for Education and Practice

For university education, educators should fully recognize the duality of game-based social interaction and guide students to participate in game-based social interaction correctly. By conducting relevant courses and lectures, cultivate students' media literacy, improve their awareness and self-management ability regarding game-based social interaction, and enable them to reasonably arrange their game time and avoid addiction. Students are encouraged to actively participate in teamwork within game-based social interactions, developing their communication and collaboration skills and transforming positive experiences into real-life interpersonal abilities. In game design and development, developers should emphasize the educational value of games, adding content and tasks related to digital literacy development, such as setting up game levels related to information analysis and innovative design, allowing students to improve their digital literacy while playing. Strengthening the management and optimization of the game-based social environment, establishing sound reporting and punishment mechanisms, reducing the occurrence of negative phenomena such as cyberbullying, and creating a healthy and positive game-based social atmosphere are also crucial.

Acknowledgments

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