

Research Article

Research Progress and Trend Outlook on College Students' Online Learning Satisfaction

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Abstract

Online learning satisfaction is an important indicator for measuring online learning experience. To understand the latest international research dynamics and grasp the cutting-edge trends, this study systematically combed and conducted a quantitative analysis of 494 literatures included in the core collection of the Web of Science database from 2010 to 2024 using CiteSpace, and drew a knowledge map of research on college students' online learning satisfaction. The research results show that the top three countries in terms of the number of published articles are the United States, China, and Australia. Tight cooperation networks have been formed among high-output institutions, promoting academic exchanges and cooperation. Research hotspots focus on three aspects: influencing factors of online learning satisfaction, strategies to improve online learning satisfaction, and evaluation methods for online learning satisfaction. Future research should focus on constructing transnational and interdisciplinary collaboration networks, deepening the research on the interaction mechanism of multiple factors, and developing dynamic evaluation tools combined with artificial intelligence to promote the sustainable development of the online education ecosystem.

Keywords

Online Learning Satisfaction, College Students, Research Themes, Research Trends

1. Introduction

Online learning satisfaction refers to learners' overall feelings and evaluations of online course resources, covering satisfaction with course content, instructional design, technical platforms, teacher-student interaction, and other aspects. It can intuitively reflect the sense of satisfaction and pleasure obtained by learners in the learning process. As a key indicator for measuring the quality of online learning, it is of great significance in improving learners' online engagement and learning effects, and promoting the effective evaluation of online teaching quality. On the one hand, online learning satisfaction plays an important role in improving online course design and teaching strategies [1]; on the other hand, it guides the continuous optimization of online learning platforms to meet the diverse needs of learners

and promote the continuous development of the online education field [2]. As the main audience of higher education, college students are in a critical period of knowledge accumulation and career preparation. Their learning needs are more diversified and personalized, and they have higher expectations for the functions of online learning platforms, the depth and breadth of course content, and the effectiveness of teacher-student interaction. However, they are also more susceptible to problems such as unstable networks, learning loneliness, and improper time management, which in turn affect their online learning satisfaction [3]. Therefore, with the help of CiteSpace bibliometric analysis software, this study systematically sorts out the research hotspots and frontier trends of college students' online

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learning satisfaction in the past 14 years, analyzes the key factors affecting online learning satisfaction, and discusses effective strategies to improve learning satisfaction, aiming to provide theoretical support and practical guidance for the innovation and development of online education and related research in our country in the future.

2. Data Acquisition and Research Methods

2.1. Data Source

The data source of this study is the core collection of the Web of Science database, and the retrieval time is January 2025. The subject term was set as "online learning satisfaction", and a total of 2,313 literatures were retrieved. To ensure the reliability and validity of the data, we also strictly screened and reviewed the collected literatures. The literature index databases were set as SCI, SSCI, CPCI-S, and CPCI-SSH; since the first literature was published in 2005, and the number of publications from 2005 to 2009 was small, which may reflect that the field was still in its infancy, and research interest and attention had not been widely formed. To ensure the timeliness and adequacy of the research, the time range was set from January 1, 2010, to December 31, 2024; the literature type was set as articles; and the literature categories were Education Scientific Disciplines and Education Educational Research. Finally, 494 pieces of literature data were obtained for analysis.

2.2. Data Analysis Method

This study used scientometric methods and combined with the CiteSpace visualization tool to conduct multi-dimensional quantitative and qualitative research on the sample data. First, CiteSpace was used for visual processing of the literature, focusing on examining indicators such as high-output countries/regions, core research institutions, main publishing journals, high-frequency keywords, and burst keywords, systematically combing the research status, frontier dynamics, and hot topics in the field of online learning satisfaction, and intuitively presenting the analysis results in the form of a knowledge map [4]. Second, through in-depth interpretation of the literature, the specific contents of each research topic were analyzed in detail, the shortcomings and future development trends in the current research were identified, providing a theoretical basis and practical guidance for further exploration in the field of online education in China.

3. Research Results

3.1. Distribution Characteristics and Research Trends of Literatures

According to the sample literatures, this paper drew a time distribution map of literatures and a keyword burst map. It can be seen from Figure 1 and Figure 2 that the research on college students' online learning satisfaction can be roughly divided into three stages. In the first stage (2010-2014), with the popularization of the Internet and the initial development of online education technology, keywords such as "computer-mediated communication", "interactive learning environment", "teaching/learning strategies", and "participation" had the greatest burst degree in this stage. Among them, "interactive learning environments" had the strongest burst intensity, further proving the important position of the interaction mechanism in online learning satisfaction. Studies have found that student-content interaction (student-content interaction) has a greater impact on students' learning outcomes than interaction with teachers (student-teacher interaction) and other learners (student-student interaction) [5]. When students interact with course content, their learning satisfaction and academic performance are higher. In the second stage (2015-2020), with the continuous advancement of technology and the expansion of the online education market, college students' requirements for online learning satisfaction increased. Keywords such as "environment", "engagement", and "outcm" had the greatest burst degree in this stage. Among them, the keyword "environment" had a long burst time, highlighting the importance of the online learning environment in affecting students' satisfaction. Massive Open Online Courses (MOOCs) have developed rapidly in recent years. For the problem that the lowest satisfaction and loneliness often lead to more dropouts, a solution called MOOC Adaptive Recommendation (ARM) was proposed. In the recorded MOOC data, new recommendation functions were selected to better balance satisfaction [6]. In the third stage (2021-2024), keywords such as "distance learning", "online learning", and "strategy" had the greatest burst degree in this stage. The continuous advancement of technology and the change of educational concepts have also led to changes in teaching models in the online learning process. Affected by the epidemic, live teaching has emerged one after another. This teaching model uses real-time interaction technology to simulate offline classrooms for online teaching. A study adopted two online teaching methods for organic chemistry laboratories. Students gathered with teaching assistants via Zoom to watch pre-recorded laboratory procedure videos, or students gathered on Zoom to watch live broadcasts of teaching assistants conducting experiments in the laboratory [7]. Students' satisfaction with the two teaching methods was compared through surveys and semi-structured interviews. The study showed that the live broadcast part received more positive feedback in all aspects, and students' satisfaction was higher.

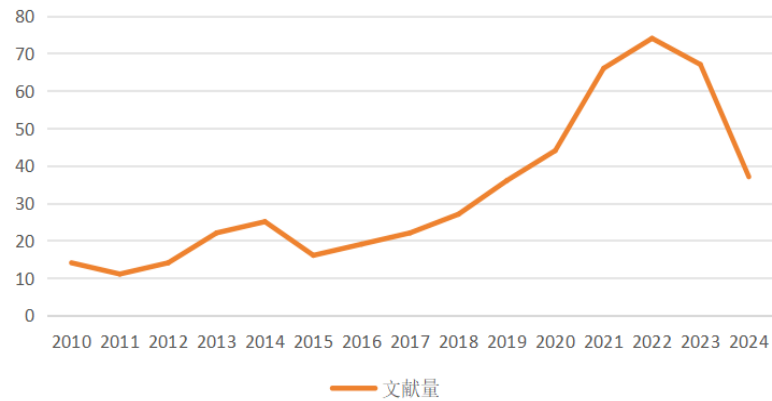


Figure 1. The Time Distribution Chart of the Literatures.

Top 10 Keywords with the Strongest Citation Bursts

Keywords	Year	Strength	Begin	End	2010 - 2024
computer-mediated communication	2012	3.2	2012	2017	
interactive learning environments	2012	2.81	2012	2019	
teaching/learning strategies	2013	3.78	2013	2018	
participation	2014	3.09	2014	2019	
environment	2011	2.74	2015	2017	
outcm	2019	2.85	2019	2021	
engagement	2019	2.47	2019	2020	
distance learning	2017	3.06	2020	2022	
online learning	2013	3.58	2021	2024	
strategy	2022	2.77	2022	2024	

Figure 2. Keyword Emergence Map.

3.2. Analysis of High-Influence Groups

3.2.1. Analysis of High-Output Countries/Regions

To better understand the situation of high-output countries/regions, this paper used CiteSpace to draw a visual map of the geographical distribution of literatures. The larger the node in the map, the more literatures related to the theme of college students' online learning satisfaction were published in that country/region, which not only reveals the activity degree of each country in this research field but also highlights the importance of international academic cooperation and exchanges. As shown in Figure 3, it can be seen that the top three countries/regions in terms of the number of publications are the United States, China, and Australia in turn. As a leader in scientific research and innovation, the United States started early and has a complete system in the research of online learning satisfaction, continuously leading the development direction of this field. Relying on the strong promotion of the education informatization strategy, China has rapidly emerged as an important force in the research of online learning satisfaction, and

continuously improved the quality and influence of research results through the deep integration of theory and practice. Australia, with its excellent performance in higher education and online education technology, has injected new vitality and inspiration into the research on college students' online learning satisfaction.

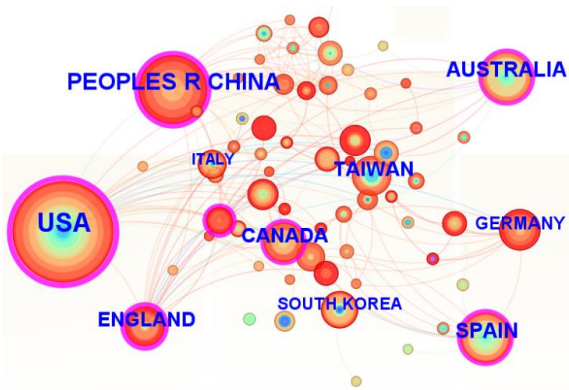


Figure 3. Visual Map of the Geographical Distribution of Literatures.

3.2.2. Analysis of High-Output Institutions

As shown in Figure 4, in the generated visual map of the co-occurrence of high-output institutions' cooperation networks, the more connections between nodes, the higher the cooperation frequency and the closer the cooperation relationship between these institutions. They promote academic exchanges and cooperation in the field of online learning satisfaction through ways such as jointly declaring research projects, sharing research resources, and jointly publishing papers. This cooperation model not only improves research efficiency and quality but also lays a solid foundation for the sustainable development of online learning satisfaction. Among them, the State University System of Florida in the United States has shown a strong network effect in the research of college students' online learning satisfaction. This system has established close cooperative relationships with many domestic and foreign universities, research institutions, and academic journals. These cooperations are not limited to geographically adjacent institutions but also cross national borders, forming a wide range of international cooperation networks [8]. Among them, the "State University System of Florida—University System of Georgia—Ewha Womans University" cooperation network chain found that effective course design can promote self-directed learning, improve students' learning input, and thus enhance their learning satisfaction. The "State University System of Florida—State University of New York System" cooperation network chain found that different teachers showed significant diversity in communication strategies, which were reflected in their linguistic features and functional categories. Teachers' communication strategies have a significant impact on students' learning experience [9].

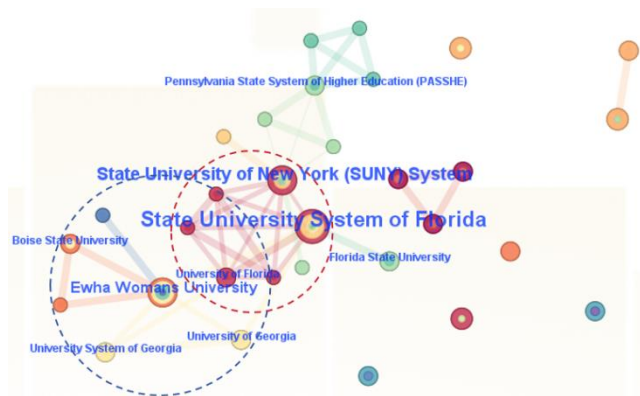


Figure 4. Co-occurrence Map of High-Output Institutions' Cooperation Networks.

3.2.3. Analysis of Cited Journals of Published Literatures

As shown in Figure 5, in the generated visual map of the distribution of cited journals of published literatures, the larger the node, the more cited literatures related to the theme of college students' online learning satisfaction were published in that journal, including journals such as "COMPUT EDUC", "BMC MED EDUC", and "EDUC TECHNOL SOC". These journals

not only cover education but also integrate other professions such as computers and medicine, indicating that the research on college students' online learning satisfaction has crossed the boundaries of a single discipline and involves the intersection and integration of multiple disciplines. This multi-disciplinary research perspective helps to more comprehensively understand and analyze the complex factors of online learning satisfaction. The connections between these nodes are closer, reflecting the hot and focal issues in the current research on online learning satisfaction. The close connection between "EDUC TECHNOL SOC" and "COMPUT HUM BEHAV" may mean that the application of technology in the education field and its impact on students' learning satisfaction are important research directions at present.

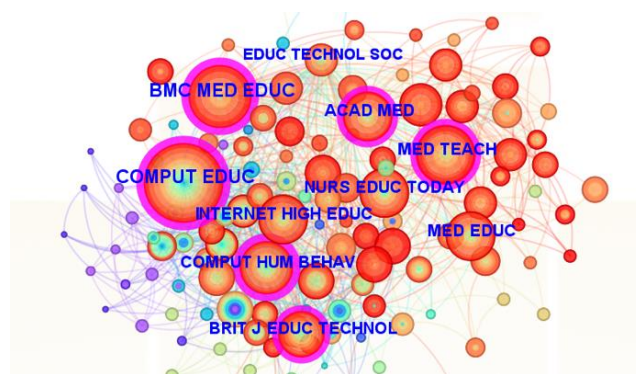


Figure 5. Visualization Map of the Distribution of Journals by Cited Articles.

3.3. Analysis of Research Hotspots

As the summary of the core content of the literature, keywords with high centrality and frequency can reflect the research hotspots in a certain disciplinary field. As shown in Figure 6, by drawing the keyword hotspot map of the research on college students' online learning satisfaction, the research hotspots can be divided into three parts.

3.3.1. Research on Influencing Factors of College Students' Online Learning Satisfaction

This part includes Clusters 2, 3, and 4, and the keywords extracted under these clusters are "interaction learning environment", "cooperative/collaborative learning", "behavior", "motivation", "teaching/learning strategies", "performance", "acceptance", "self-efficacy", "attitude", "participation", etc. This part mainly discusses the influencing factors of college students' online learning satisfaction from the individual level of learners, the teacher level, and the environmental level. At the individual level of learners, self-efficacy and learning style are generally recognized as the core elements affecting online learning satisfaction [10]. Studies have pointed out that students with high Internet self-efficacy are more inclined to enjoy the online learning environment. They are more confident in using Internet resources to solve problems, and this positive learning attitude directly improves their learning satisfaction [11].

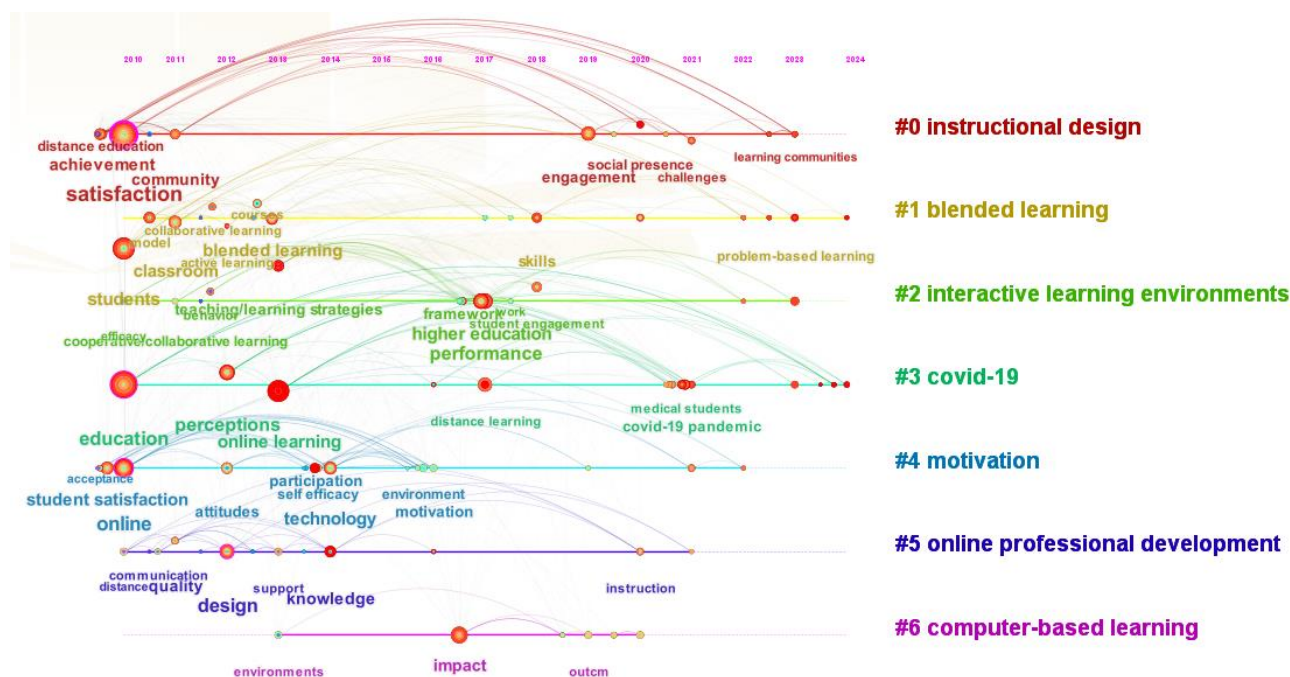


Figure 6. Keyword Clustering Timeline Map.

3.3.2. Research on Strategies to Improve College Students' Online Learning Satisfaction

This part includes Clusters 0 and 5, and the keywords extracted under these clusters are "instructional design", "online professional development", "achievement", "community", "social presence", "design", "support", "quality", etc. This part mainly discusses the strategies to improve college students' online learning satisfaction from the aspects of optimizing online classroom design, improving teachers' online teaching ability, and perfecting online learning support services. In terms of optimizing online classroom design, enhancing teaching interactivity and providing personalized learning experiences can effectively enhance students' learning satisfaction. Some scholars believe that by introducing diversified teaching resources and interactive forms, students' online learning satisfaction and participation can be significantly improved. This diversified design can stimulate students' learning interest and enhance their learning satisfaction [12]. Studies have also shown that providing students with personalized learning paths and resource recommendations according to their learning progress, interests, and abilities helps to meet students' different needs and improve their learning efficiency and satisfaction [13].

3.3.3. Research on Evaluation Methods for College Students' Online Learning Satisfaction

This part includes Clusters 1 and 6, and the keywords extracted under these clusters are "blended learning", "computer-based learning", "problem-based learning", "active learning", "model", "impact", "outcm", etc. This part mainly discusses the evaluation methods for college students' online

learning satisfaction from three aspects: traditional methods, technology-empowered methods, and interdisciplinary integration methods. In terms of traditional evaluation methods, traditional evaluations mostly rely on questionnaires (such as the SERQUAL model and learning satisfaction scale) and structured interviews, focusing on students' subjective evaluations of dimensions such as course design, platform functions, and teacher-student interaction. However, the limitations of static scales are gradually emerging, such as insufficient timeliness and vulnerability to subjective biases. In recent years, studies have begun to introduce iterative qualitative coding (such as grounded theory) and longitudinal tracking designs, dynamically capturing the change trajectory of satisfaction through multi-stage data collection and analysis. In terms of technology-empowered methods, the application of artificial intelligence and big data technologies has provided a new paradigm for satisfaction evaluation. First, learning analysis technology constructs a multi-dimensional satisfaction prediction model by integrating log data from learning management systems (such as video viewing duration, test scores, and forum posting frequency), achieving quantitative tracking of students' learning experiences [7].

4. Conclusions and Prospects

4.1. Research Conclusions

Using the CiteSpace bibliometric software, this study analyzed 494 literatures themed on the research of college students'

online learning satisfaction included in the Web of Science database core collection from 2010 to 2024, and drew a knowledge map of the research on college students' online learning satisfaction. The research reveals the periodic development characteristics of the field of online learning satisfaction: the exploration stage from 2010 to 2014, focusing on interactive learning environments and teaching strategies; the development stage from 2015 to 2020, with the research focus shifting to technology-driven personalized learning and dynamic evaluation; and the deepening stage from 2021 to the present, with the application of artificial intelligence and big data technologies becoming the research frontier. The United States, China, and Australia are the countries with the largest number of publications in this field, and close cooperation networks have been formed among high-output institutions, promoting academic exchanges and collaboration.

4.2. Research Enlightenment

4.2.1. In-depth Analysis and Comprehensive Intervention of Multi-level Influencing Factors

Future research will no longer be limited to single-level analysis but will be committed to constructing a multi-dimensional research framework to deeply explore the interaction mechanisms among students' individual characteristics, teachers' teaching strategies, and online learning environments. In particular, researchers need to focus on how to optimize technical

platforms through technological innovation, and how to significantly improve students' online learning satisfaction by enhancing instant interaction and emotional communication between teachers and students.

4.2.2. Innovation and Optimization of Online Classroom Design and Teaching Strategies

With the wide popularity and continuous development of online education, creating efficient and attractive online classrooms has become a key issue. Future research should focus on exploring the use of diversified teaching resources and interactive forms, such as virtual reality, augmented reality, and gamified learning, to stimulate students' learning interest and improve their participation and immersion.

4.2.3. Intelligence and Personalization of Online Learning Evaluation and Feedback Mechanisms

Evaluation and feedback mechanisms are crucial for improving online learning satisfaction. Future research should make full use of big data analysis and artificial intelligence technologies to develop intelligent, refined, and personalized evaluation tools. These tools should not only track students' learning progress and performance in real time but also provide customized feedback and suggestions according to students' learning styles and needs, providing precise guidance for students and thus enhancing their learning experience and satisfaction.

Abbreviations

SCI	Science Citation Index
SSCI	Social Sciences Citation Index
CPCI-S	Conference Proceedings Citation Index - Science
CPCI-SSH	Conference Proceedings Citation Index - Social Science & Humanities
COMPUT EDUC	Computers & Education
BMC MED EDUC	BMC Medical Education
EDUC TECHNOL SOC	Educational Technology & Society
COMPUT HUM BEHAV	Computers in Human Behavior
SERQUAL	Service Quality

Author Contributions

Liu Xiaohan is the sole author. The author read and approved the final manuscript.

Conflicts of Interest

The authors declare no conflicts of interest.

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