

The Empirical Study on the Information Retrieval Behavior of College Students based on the Theory of Reasoned Action

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Abstract. Exploring the information retrieval ability of college students will increase their initiative in information retrieval, improve their ability to review, evaluate, analyze and use information, and improve the information quality of college students. According to the theory of reasoned action, this paper discusses the four aspects of information demand, information perception, information application ability and information evaluation to construct a model of college students' information retrieval ability, and uses structural equations to detect it. The results show that information perception and evaluation have positive effects on undergraduate information retrieval intention, information retrieval intention has a positive effect on information retrieval ability, and information demand and application ability have no obvious effect on information retrieval intention.

Keywords: Information Retrieval Behavior; The Theory of Reasoned Action; Structural Equation Modeling.

1. Introduction

In the information age, the information retrieval behavior of college students is particularly important, especially in learning and work. Information retrieval is the process of finding the required information from the information set [1]. Information retrieval ability can be defined as the ability to seek knowledge, accurately locate and control knowledge, and be better at using retrieval techniques such as keywords and key sentences in the information retrieval process. People with strong information retrieval abilities have rich experience in retrieving information and are more knowledgeable about information retrieval tools than others. Therefore, based on the theory of reasoned action, this article conducts a study on the influencing factors of information retrieval behavior among college students, with the support of subjective aspects such as cognitive ability, behavioral style, individual characteristics, and objective theories such as social practice and information retrieval channel methods.

2. Literature Review

2.1 Analysis of Paper Data on Information Retrieval for College Students

2.1.1 Data Sources for Papers on Information Retrieval for College Students

Based on CNKI, the author set the search keyword as college students' information retrieval behavior, and set the data source as academic journals and thesis. A total of 816 articles were obtained. Excluding cluttered information, the author obtained 758 valid literature, including 626 academic journals and 132 thesis papers.

2.1.2 Publication Status of Papers on Information Retrieval for College Students

The research on college students' information retrieval is divided into three periods. The first period was the initial period, from 1997 to 2001, when a total of 14 papers were published. The second period was the rising period, from 2002 to 2014, when 502 papers were published. The third period was the declining period, from 2015 to 2023, when 282 papers were published. According to Figure 1, it can be seen that the number of published papers is declining, indicating that the cultivation of college students' information retrieval ability is gradually improving.

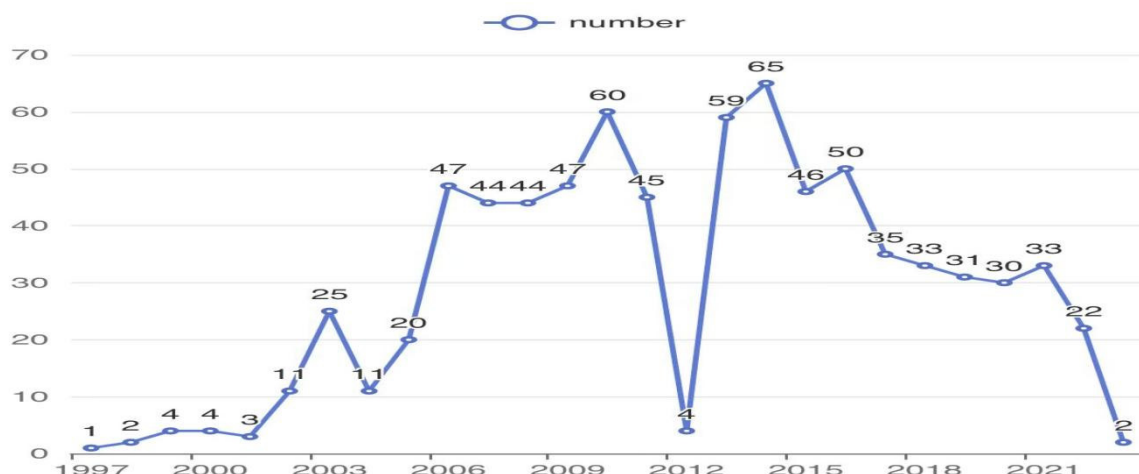


Figure 1. The publication of college students' information retrieval papers

In 2010, Maosheng Lai took undergraduate students as the research object and investigated their use of tools in information retrieval and the judgment basis of search results to explore the current state of undergraduates' information literacy and the means to improve it [2]. In 2013, based on the fact that undergraduate students use search engines extensively to obtain information, and based on sample measurement data, Jian Zhou concluded that undergraduate students' information retrieval ability is worrying [1]. In the same year, Xiaomin Du believed that most college students showed a low level of information retrieval ability and provided some construction for information literacy education courses[3]. In 2016, Lijia Wang adopted the literature research method to clarify relevant concepts such as information retrieval behavior, define online academic information retrieval behavior and analyze its differences from general information retrieval[4]. In 2017, Jing Xie believed that college information retrieval courses play an important role in college students' graduation thesis writing[5]. In 2020, Yafei Gan believed the importance of cultivating college students' information retrieval ability under the background of the information age and proposed corresponding training strategies[6].

2.1.3 Fund Project Support for Papers on Information Retrieval for College Students

The top 8 funding projects for university student information retrieval papers are the National Social Science Foundation, National Natural Science Foundation, Hunan Provincial Philosophy and Social Science Foundation, Henan Provincial Key Research Projects for Higher Education Institutions, Jiangsu Provincial Department of Education Philosophy and Social Science Fund for Higher Education Institutions, Ministry of Education Humanities and Social Sciences Research Project, Hainan Provincial Higher Education Science Research Project, and Jiangsu Provincial Education Science Planning Project. The number of papers they support for information retrieval for college students is 7, 6, 3, 2, 2, 2, 2, and 2, respectively. This indicates that scholars in social sciences place greater emphasis on the research of information retrieval abilities among college students than those in natural sciences.

2.1.4 Analysis of the Issuing Institutions of Papers on Information Retrieval for College Students

According to CNKI, the author uses university student information retrieval as the keyword for search. The top ten universities with the highest number of published papers are Anhui University, Wuhan University, Jilin University, Northeast Normal University, Southwest University, Tianjin Normal University, Shenyang Normal University, Jilin Institute of Chemical Technology, East China Normal University and Zhengzhou University. Anhui University published 12 research papers on information retrieval for college students. Wuhan University published 12 research papers on information retrieval for college students. Jilin University published 10 research papers on information retrieval for college students. Northeast Normal University published 9 college student

information retrieval research papers. Southwest University published 9 research papers on information retrieval for college students. Tianjin Normal University published 8 research papers on information retrieval for college students. Shenyang Normal University published 8 college student information retrieval research papers. Jilin Institute of Chemical Technology published 7 research papers on information retrieval for college students. East China Normal University published 7 research papers on information retrieval for college students. Zhengzhou University published 7 research papers on information retrieval for college students.

The college student information retrieval research papers published by Anhui University mainly involve obstacle analysis, retrieval behavior, innovation ability, cultivation strategy, digital literacy education, information environment and other research fields. The university student information retrieval research papers published by Wuhan University mainly involve teaching reform, personnel training, network information resources, library marketing and other research fields. The research papers of college students' information retrieval published by Jilin University mainly involve information ecology, dynamic evolution, cognitive needs, information anxiety, Solomon's four sets of design, innovative thinking and other research fields. The college student information retrieval research papers published by Northeast Normal University mainly involve MOOC courses, information ethics, public courses of modern educational technology, literature retrieval courses and other research fields. The research papers on college students' information retrieval published by Southwest University mainly involve the research fields of collaborative information searching behavior, group size, group information behavior, ability evaluation, obsessive symptoms and so on. Tianjin Normal University published college student information retrieval research papers, mainly related to online job hunting, stress disorder, multifunctional model, network label, cognitive view and other research fields. The research papers of college students' information retrieval published by Shenyang Normal University mainly involve academic postgraduate students, micro video, gamification, electronic reading room and other research fields. The research papers of college students' information retrieval published by Jilin Institute of Chemical Technology mainly involve the research fields of big data algorithm, information cocoon, search engine, minimum effort law, retrieval system and so on. The research papers of information retrieval for college students published by East China Normal University mainly involve the research fields of dependency parsing, language network, complex network, critical thinking, resource construction, behavioral science and so on. The college student information retrieval research papers published by Zhengzhou University mainly involve the research fields of document data retrieval, electronic information, high-frequency retrieval behavior, current situation investigation, qualitative research, service strategy and so on.

2.1.5 Analysis of the Authors of Papers on the Research of Information Retrieval for College Students

Based on CNKI, the top 5 authors with the largest number of published papers were Yue Hong from Shenyang Normal University, Chun Hu from East China University of Technology, Yanan Yu from Southern Medical University, Zhaochang Wu from Guangzhou University, and Liying Xuan from Jilin Institute of Chemical Technology. The five authors have each published three research papers on information retrieval for college students.

2.2 Review of Existing Literature

At present, many scholars have noticed the importance of cultivating college students' information retrieval ability, and conducted in-depth analysis on how to cultivate college students' information retrieval ability. They believe that it is necessary to gradually cultivate college students' information retrieval ability in daily teaching, develop good habits, and utilize the existing teaching environment to stimulate college students' initiative in information retrieval. However, few scholars analyze college students' retrieval ability from the perspective of their overall information needs. Therefore, it is very necessary to explore college students' information retrieval ability and put forward optimization measures.

3. Research Model Assumptions Hypothesis

3.1 TRA Theoretical Model

TRA is theory of reasoned action. In theory, behavior is caused by intention, and intention is determined by individual attitudes and subjective standards[7]. Based on the TRA theoretical model, individual behavior is subject to management intervention and external environmental constraints. In order to meet the needs of research, the author replaced the external variables of the original model from four aspects and established a hypothetical model after certain adjustments, as shown in Figure 2.

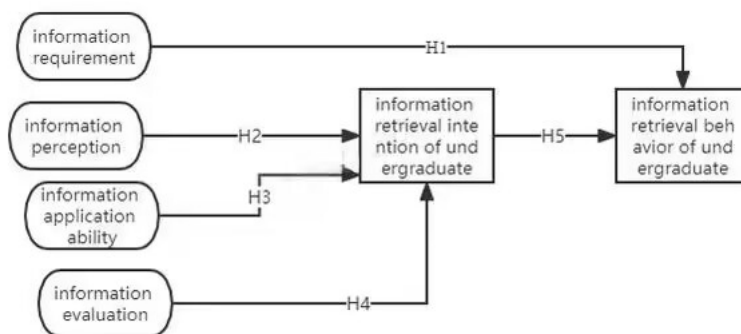


Figure 2. Research model

3.2 Research Hypothesis

3.2.1 The Influence of Information Demand on Information Retrieval Behavior of College Students

In the online environment, the information needs of college students include indirect retrieval needs to obtain information clues and direct needs to obtain original information [8]. The information needs of college students are also related to their learning content and subject characteristics. Based on the learning content and subject characteristics, college students first select information sources and presentation forms, and then conduct detailed content retrieval. Based on the above theory, the article proposes the following assumptions.

H1: Information demand has positive influence on information retrieval behavior of college students.

3.2.2 The Influence of Information Perception on Information Retrieval Intention of College Students

The most basic form of information perception is data collection, which aims to obtain information that users are interested in [9]. Information perception refers to the sensitivity of college students to their professional knowledge during their learning period. Through their own sensory organs, they can sensitively sense the true accuracy of information, giving them a strong willingness to conduct information retrieval and effectively obtain information value. Based on the above theory, the article proposes the following assumptions.

H2: Information perception has a positive effect on college students' information retrieval intention.

3.2.3 The Influence of Information Application Ability on Information Retrieval Intention of College Students

Information application ability refers to the ability of college students to screen, judge, analyze, and apply the obtained information, in order to maximize the available information. The ability to apply information is an important foundation for the willingness to search for information. The proficiency level of network retrieval experience and information retrieval skills directly affects students' retrieval behavior [10]. Based on the above theory, the article proposes the following assumptions.

H3: Information application ability has positive influence on information retrieval intention of college students.

3.2.4 The Influence of Information Evaluation on Information Retrieval Intention of College Students

Information evaluation refers to the ability of college students to evaluate the acquired information in a real and reliable way, and to find out the errors and inaccuracies of the acquired information by other means. The penultimate process in Ellis's model of information-seeking behavior is verification, which means checking the accuracy of the information obtained[11]. Based on the above theory, the article proposes the following assumptions.

H4: Information evaluation has a positive effect on college students' information retrieval intention.

3.2.5 The Influence of Information Retrieval Intention on Information Retrieval Action of College Students

In fact, Carol Collier Kuhlthau's information search process model mainly studies the emotional factors of information retrieval and information retrieval behavior. One of his important conclusions is that information search is a comprehensive process of meaning construction, rather than a simple question answering activity[12]. It can be understood that the emotional intention of information retrieval plays a key role in information retrieval behavior. Strong information retrieval intention plays a positive role in information retrieval behavior and provides strong confidence for information retrieval behavior. Based on the above theory, the article proposes the following assumptions.

H5: Information retrieval intention has positive influence on information retrieval behavior.

3.3 Questionnaire Design

This chapter discusses the impact of information literacy on college students' information retrieval ability from different perspectives. In order to improve the reliability of the results, this paper is based on the Likert five level scale. The author records the five options of strongly agree, agree, disagree, disagree, and strongly disagree as 5, 4, 3, 2, and 1, respectively.

4. Empirical Study

4.1 Data Collection

The formal questionnaire will be distributed to college students through online means. 200 people participated in the questionnaire survey, with 178 valid questionnaires and an effective response rate of 89%.

4.2 Data Inspection

4.2.1 Reliability Test

Table 1. Reliability test of college students' information retrieval ability scale

Dimension	Item	Cronbach's
Total schedule	18	0.967
Information demand	3	0.891
Information perception	3	0.875
Information application ability	3	0.874
Information evaluation	3	0.923
Information retrieval intention	3	0.903
Information retrieval behavior	3	0.86

In order to ensure the internal consistency of the scale, the reliability of the scale should be tested first. SPSS24.0 was used to analyze the reliability of 178 valid questionnaires. It can be seen from

Table 1 that the reliability coefficient of the total volume table is 0.967, so it can be judged that the reliability of this scale is good and has very high reliability. The reliability coefficients of information evaluation and information retrieval intention are both significantly greater than 0.9, indicating high reliability. Information demand, information perception, information application ability and information retrieval behavior are all significantly greater than 0.8, indicating good reliability. Therefore, it can be considered that the scale has good internal consistency, stability and reliability.

4.2.2 Validity Test

At the same time, in order to ensure the effectiveness of the questionnaire measurement, validity testing should be conducted on the questionnaire to ensure that the observed variables can truly and effectively reflect the latent variables, as shown in Table 2.

Table 2. Validity test of college students' information retrieval ability scale

KMO sampling appropriateness measure		0.943
Bartlett test of sphericity	Approximate chi-square	3157.661
	Degree of freedom	153
	significance	.000

SPSS24.0 was used for factor analysis. It can be seen from the table that $KMO=0.943>0.7$, and the result of Bartlett test of sphericity was significant and less than 0.05.

Amos was used to conduct confirmatory factor analysis on the above 6 latent variables, and the results were shown in Figure 3.

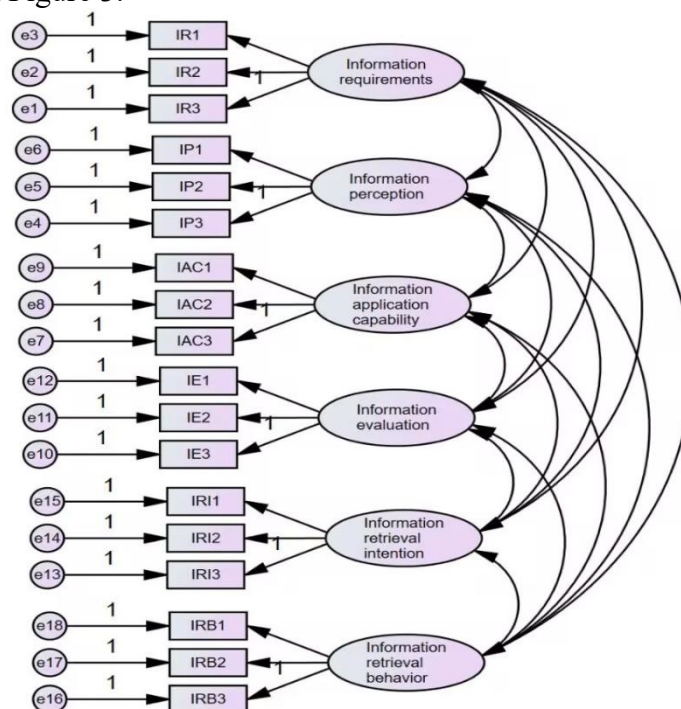


Figure 3. Confirmatory factor analysis of college students' information retrieval ability

Table 3. Goodness of fit of college students' information retrieval ability model

CMIN/DF	GFI	NFI	IFI	TLI	CFL	RMSEA
3.057	0.813	0.888	0.922	0.900	0.921	0.108

As can be seen from Table 3, the ratio of chi-square to freedom of freedom is 3.057, between 3 and 5, and the values of absolute fitting index, Tucker Lewis index and comparative fitting index are all greater than 0.9, indicating good results. The value of goodness of fit index is 0.813, the value of

normative fitting index is 0.888, and the approximate root-mean-square error is 0.108. The result is acceptable, so the result of model fit degree is accepted.

Convergence validity and discrimination validity are mainly used as the content of confirmatory factor analysis, and convergence validity is tested by combination reliability and mean variance extraction value. Combination reliability mainly evaluates the internal consistency of variables, and higher combination reliability indicates higher internal consistency and convergence of observed variables. The extraction value of mean variance reflects the convergence validity of the scale, and can directly show how much of the variance explained by the latent variable is caused by the measurement error. The extraction value of mean variance is directly proportional to the percentage of the variance explained by the latent variable, and inversely proportional to the relative measurement error, as shown in Table 4.

Table 4. Convergence validity of college students' information retrieval ability

Latent variable	Observed variable	Factor load	AVE>0.5	CR>0.7
Information demand	XX1	0.797	0.739	0.894
	XX2	0.884		
	XX3	0.894		
Information perception	XG1	0.873	0.702	0.876
	XG2	0.821		
	XG3	0.819		
Information application ability	XY1	0.803	0.706	0.878
	XY2	0.869		
	XY3	0.847		
Information evaluation	XP1	0.912	0.808	0.926
	XP2	0.947		
	XP3	0.833		
Information retrieval intention	JY1	0.882	0.758	0.904
	JY2	0.857		
	JY3	0.872		
Information retrieval behavior	JX1	0.871	0.682	0.865
	JX2	0.794		
	JX3	0.810		

According to Table 4, the factor loading coefficients of all observed variables are significantly greater than 0.5, so there is no need to adjust observed variables. The CR value of the 6 latent variables is significantly greater than 0.7 and the AVE value is significantly greater than 0.5, indicating that the observed variables of each dimension have good convergent validity.

Table 5. Discriminative validity of college students' information retrieval ability

NO.	Model	CMIIN	DF	CMIN/DF	RMSEA	NFI	IFI	RFI	TLI	CFI
1	Original model	366.787	120	3.057	0.108	0.888	0.922	0.858	0.900	0.921
2	Five-factor model	454.785	125	3.638	0.122	0.862	0.896	0.831	0.871	0.895
3	Four-factor model	487.833	129	3.782	0.125	0.851	0.886	0.824	0.864	0.885
4	Three-factor model	583.385	132	4.420	0.139	0.822	0.857	0.794	0.833	0.856
5	Two-factor model	735.967	134	5.492	0.159	0.776	0.809	0.744	0.781	0.808
6	Single factor model	755.850	135	5.599	0.161	0.770	0.803	0.739	0.770	0.802

According to Table 5, when compared with the original model, all fitting indexes of other models become worse, indicating that this model has good discrimination validity.

4.2.3 Hypothesis Testing

All the collected data are substituted into the structural equation, resulting in a standardized diagram, as shown in Figure 4.

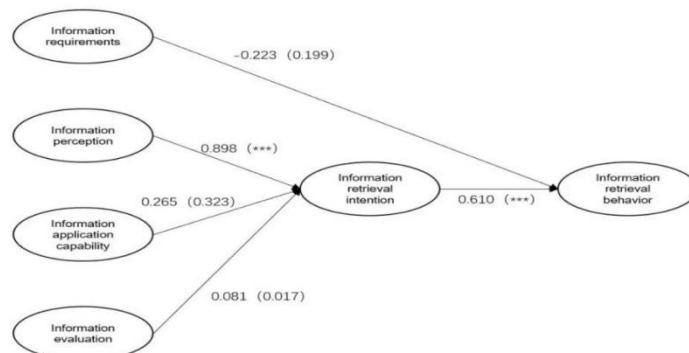


Figure 4. Standardized structural equation model diagram

The fit index of the model is shown in Table 6, where the ratio of chi-square to freedom is 2.857 and less than 3, and the values of absolute fit index, Tucker Lewis index and comparative fit index are all greater than 0.9, showing good results in the end. The value of goodness-of-fit index is 0.823, and the value of canonical fit index is 0.896. The approximate root-mean-square error value is 0.102, and the final result is accepted, so the result of model fitting degree is accepted.

Table 6. Test results of structural equation model

CMIN/DF	GFI	NFI	IFI	TLI	CFL	RMSEA
2.857	0.823	0.896	0.93	0.909	0.929	0.102

On the basis of the above analysis results, the proposed H2, H4 and H5 can be established. The results show that information perception and evaluation have a positive impact on college students' information retrieval intention, information retrieval intention has a positive impact on information retrieval ability, and the impact of information demand and information application ability on college students' information retrieval intention is unclear.

5. Optimization Measures

5.1 Optimization Measures at the Individual Level

5.1.1 Improve College Students' Demand for Information Retrieval

During the learning process, college students still need to maintain their information needs, stimulate their desire to acquire knowledge, and maintain a sense of freshness towards knowledge and information. Communicate more information and express your information needs in order to obtain information resources that are beneficial to you. The demand for information among college students mainly depends on the quality and value of the information, the majors, skills learned by each college student, and the environment they are exposed to. As the knowledge and skills accumulated by college students become increasingly specialized, the quality and value of information always affect the selection of information needs in the process of information retrieval. Therefore, college students need to improve the quality and content of their information, meet the universality, novelty, and professionalism of their information needs.

In the graduation work stage, college students need more information retrieval needs from multiple perspectives. In the project planning, college students need to collect various information, analyze the pros and cons, facilitate the information exchange with others, and ensure the efficient completion of the project. So, college students look at the problem from multiple angles to in-depth understanding, to improve our information retrieval needs.

5.1.2 Improve College Students' Perception of Information

In the process of learning, college students need to keep their sensitivity to information and improve their perception of information, so that the intention of information retrieval can be deeply imprinted in our minds. In the network world, there are abundant information resources. When the massive information surges in, college students should grasp the key information accurately and obtain the information they want effectively, truly and concretely.

In the graduation work stage, what college students need more is to have a keen insight into information, to have a timely and accurate grasp of their own work information, customer information, national policies and other information, and to have a strong executive power in the process of information retrieval, so as to play their own advantages in their work and make contributions to the enterprise, the society and even the country. Therefore, college students should always observe the current development trend, and correctly view the positive and negative effects of the retrieved information.

5.1.3 Strengthen College Students' Information Application Ability

In the process of learning, college students should not only exercise their ability to use information, but also to play their ability to use information to help students around to learn, so as to improve the willingness of information retrieval has a great help. In the process of practice, college students can not only understand the objective law of information retrieval, but also use the law to help students in need. Therefore, college students should constantly expand their knowledge, improve their information retrieval ability and skills, and skillfully use various information retrieval software during their study in college. With the increasingly harsh employment environment, college students need to have a strong knowledge and skills to stand out among many job seekers. College students can learn how to conduct reasonable and effective information retrieval on CNKI, and apply what they have learned to practical study and life, and even to their future jobs.

During the graduation work stage, the information application ability of college students has a positive promoting effect on their work efficiency. When conducting a job interview, personal information application ability can be one of the key skills and abilities for joining the company. Therefore, college students should learn more about information retrieval channels, proficiently screen, judge, and master various retrieval methods to improve their information application abilities.

5.2 Optimization Measures at the School Level

5.2.1 Leveraging the Functionality of School Libraries

The library has multiple functions, providing good information retrieval channels for college students, continuously integrating and optimizing literature information, maintaining the latest scientific research paper collection results, and providing the best guarantee for college students to obtain the latest academic information. Libraries should regularly hold competitions related to information retrieval for college students, create a strong learning atmosphere of "promoting learning through competitions and practicing through learning", and continuously improve the skills of college students in learning information retrieval. Libraries should regularly hold lectures and training courses on information retrieval, so that college students can learn useful information retrieval knowledge. The library will increase the construction of electronic information reading equipment and classrooms, invest in information-based smart classrooms and intelligent robots, provide excellent learning resources and equipment for college students, help them improve their initiative in learning information retrieval, and create a strong learning environment.

5.2.2 Improve the Quality of Teachers

In terms of teaching methods, teachers should constantly innovate and focus on combining theory and practice. Teachers should first demonstrate and operate relevant information retrieval, and then form a group of students to discuss and research. This can improve the information thinking

awareness of college students and maximize their autonomy in learning and judging the effectiveness and invalidity of information.

In terms of teaching content, teachers should clearly emphasize the importance of information retrieval, optimize the courses related to learning retrieval, equip corresponding learning materials, carry out effective practical training activities, and carry out necessary examinations.

During after-school tutoring, teachers should communicate with students in a timely manner, understand students' information needs, provide valuable reference information and channel methods for college students, point out the key points of information retrieval methods, improve college students' information searching ability, and lay a good foundation for their future study, life and work.

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