Investigating information literacy levels among primary and secondary school students: A survey-based study

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ABSTRACT

In the rapidly evolving digital society, information literacy has emerged as a critical competency for primary and secondary school students, directly influencing their academic performance and future development. This study investigates the information literacy of students in grades 4 to 9 across five nine-year compulsory education schools in Zigong City, aiming to provide insights for developing scientific and effective training programs. The research combines questionnaires with interviews to collect data from 2,000 students, with statistical analysis conducted using SPSS22.0 software.Key findings indicate that students' information literacy is generally at a moderate level, with significant correlations observed among four dimensions. Students demonstrate relatively balanced performance across these dimensions, though information ethics scores are slightly lower compared to others.It means their information literacy exsits several challenges, including insufficient information awareness, gaps in information knowledge depth, uneven development of information abilities, and deficiencies in information ethics practices. To address these challenges,including optimizing information technology curricula, enhancing teacher training, improving parental involvement, and purifying the social information environment. Future research could further explore the specific mechanisms influencing students' information literacy and adapt to emerging technological trends to better support educational practices. This study contributes to the understanding of information literacy development among primary and secondary school students and offers practical recommendations for educators and policymakers to foster digital-age competencies.

Keywords: *Information literacy, Primary and secondary school students.*

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Highlights of this paper

- This study investigates the information literacy of students in grades 4 to 9 in Zigong City, aiming to provide basis for developing scientific and effective training programs.
- This study found that primary and secondary school students ' information literacy encompasses information awareness, information knowledge, information skills, and information ethics, indicating that information literacy is a complex system driven by the synergistic interaction of multiple factors.
- The study found that students' overall information literacy keeps a middle level, with insufficient sensitivity in information awareness, a lack of depth in information knowledge, unskilled application of information abilities, and a disconnect between cognition and practice in information ethics.

1. INTRODUCTION

In the era of digitalization, networking and intelligence, information technology has profoundly affected all aspects of society (Fangwei, 2024). As the main user group in the digital age, the level of information literacy of primary and secondary school students directly affects their learning, life and future development (Zu, 2021). However, the current research on the information literacy of primary and secondary school students at home and abroad is still in the development stage, and its influencing factors and improvement strategies still need to be further explored.

In recent years, the country has proposed the development strategy of "information literacy education" to improve students' information processing ability, innovation ability and information ethics cognition. However, due to the differences in educational resources in different regions, the different levels of support for information technology in family backgrounds, and the uneven teaching quality of schools in information technology courses, the development of information literacy among primary and secondary school students shows great differences. At the same time, the rapid development of emerging technologies such as social media, artificial intelligence, and virtual reality has also put forward higher requirements for students' information acquisition, analysis and application capabilities (Cui, Liu, & Yu, 2018).

Foreign research has focused on the cultivation of information literacy earlier, especially in Europe and the United States. Information literacy education has become an important part of the K-12 curriculum system. The US information literacy standards clearly point out that primary and secondary school students need to have the ability to acquire, evaluate, manage and use information innovatively, and cultivate their critical thinking and autonomous learning abilities. In contrast, my country's information literacy education is still in its infancy and has not yet formed a unified national training framework and evaluation standards. In addition, information literacy not only affects students' academic performance, but also has a profound impact on the broader social level. Students with high levels of information literacy are more able to use information technology to promote knowledge learning, improve their independent learning ability, and show stronger information security awareness and moral judgment in the online world.

2. RESEARCH DESIGN

2.1. Research Subjects

This paper takes the students from grades four to nine in five nine-year compulsory education schools in Zigong City, Sichuan Province, China as the research subjects. The five selected schools were randomly distributed in three different districts of Zigong City. A total of 2,010 questionnaires were issued, and 2,000 valid ones were retrieved. The distribution of sample size was relatively even. Furthermore, these schools possess relatively complete systems in aspects such as disciplinary professional goals, training models, curriculum arrangements, and

teaching methods. They also have a certain information environment atmosphere and information guarantee mechanism, providing sample support for this research.

2.2. Research Content

Based on the information literacy goal structure theory and teacher development theory, this paper uses questionnaire and interview methods to investigate the information literacy status of students in grades 4 to 9 in five nine-year compulsory schools, and analyzes the overall level of information literacy and the levels of information awareness, information knowledge, information ability, and information ethics. It summarizes the problems and causes of students' information literacy, and proposes strategies to optimize information literacy from both student factors and external factors.

2.3. Research Questions

1. What is the current status of information literacy of students in grades 4 to 9 in nine-year compulsory schools ?
2. What are the problems and causes of information literacy of students in grades 4 to 9 in nine-year compulsory schools ?
3. What are the strategies to improve students' information literacy in response to the problems and causes?

2.4. Research Methods

This study adopts the following research methods.

2.4.1. Literature Research Method

Through academic databases such as CNKI and Wanfang Data, we searched with keywords such as "information literacy of primary and secondary school students", "information literacy cultivation", and "information literacy evaluation", and widely collected relevant academic papers, research reports, dissertations and other literature materials at home and abroad.

These documents were systematically sorted out and analyzed to understand the research status, development trends, existing research results and deficiencies of information literacy of primary and secondary school students, and provide a solid theoretical basis and research ideas for this study to ensure the scientificity and cutting-edge nature of the research. For example, referring to the research of predecessors on the connotation and evaluation standards of information literacy, the dimensional division and measurement methods of information literacy in this study were clarified; the methods and conclusions of existing studies were used to provide a theoretical basis for analyzing the problems and causes of information literacy of primary and secondary school students.

2.4.2. Questionnaire Survey Method

This questionnaire was designed based on the questionnaire in Dr. Jiang Longyan's thesis "Research on Factors Influencing Information Literacy of Middle School Students" and other related mature questionnaires, combined with the actual situation of students from grades 4 to 9 in the nine-year compulsory school in Zigong City.

The questionnaire consists of two parts: basic personal information and information literacy scale. Basic personal information includes the student's gender, grade, place of residence, monthly family income, parents' education level, whether they own a personal computer, whether they have taken information technology courses,

etc., which is used to analyze the impact of different background factors on students' information literacy. The information literacy scale adopts the Likert five-point scoring method, Table 1 shows the questionaire contains four dimensions: information awareness, information knowledge, information ability, and information ethics.

Table 1. Dimensions and corresponding items.

Information awareness	**Information perception awareness**	**3-6**
	Information application awareness	7-10
	Information security awareness	11-14
Information knowledge	Information background knowledge	15-18
	Information principle knowledge	19-22
	Information skills knowledge	23-26
Information ability	Information application ability	27-30
	Information fusion ability	31-34
	Information innovation ability	35-38
Information ethics	Information ethics	39-42
	Information law	43-46

According to statistical requirements, when the Cronbach's Alpha coefficient is greater than 0.8, it indicates that the reliability of the research tool is high. This study used SPSS22.0 software to test the reliability and validity of the research tool. The results are shown in Table 2 and Table 3. The Cronbach's Alpha coefficient value is 0.934, the KMO value is 0.984, and the Bartlrtts sphericity test value is 19941.706, sig=0.000, indicating that the questionnaire has high reliability and validity, and the research tool is scientific and applicable.

Table 2. Overall reliability of the questionnaire.

Reliability statistics		
Cronbach alpha	**Cronbach's alpha based on standardized items**	**Number of items**
0.930	0.934	44

Table 3. KMO and Bartlett test.

KMO sampling suitability measure		**0.984**
Bartlett's test of sphericity	Approximate chi-square	19941.706
	Degrees of freedom	946
	Significance	0.000

3. SURVEY ON THE CURRENT STATUS OF INFORMATION LITERACY OF PRIMARY AND SECONDARY SCHOOL STUDENTS

3.1. Basic Situation of the Survey

The survey was conducted by distributing questionnaires and interviewing students and teachers to deeply analyze students' information literacy and make up for the limitations of the questionnaire survey. A total of 2010 questionnaires were distributed in this survey, and 2000 valid questionnaires were collected, with an effective recovery rate of 99.5%. The basic situation of the students in the nine-year compulsory schools involved in the questionnaire survey is shown in Table 4.

Table 4. Basic information of primary and secondary school students.

Project	Category	Number of people	Percentage
Gender	Male	868	43.4
	Female	1132	56.6
Grade	Grade 4	314	15.7
	Grade 5	390	19.5
	Grade 6	353	17.7
	Grade 7	282	14.1
	Grade 8	316	15.8
	Grade 9	345	17.3
Place of residence	Urban	886	44.3
	Rural	1114	55.7

3.1.1. Analysis of the Current Status of Information Literacy

Before in-depth analysis of students' information literacy, based on research needs, we first explore the correlation between the dimensions of information literacy and between each dimension and information literacy as a whole. According to statistical standards, a correlation coefficient r value greater than 0.8 indicates that the two variables are extremely correlated, and an r value between 0.60.8 indicates a strong correlation. At the same time, the correlation is significant when the p value is less than 0.01.

Table 5 shows that information awareness, information knowledge, information ability and information ethics are all strongly correlated with information literacy, and the correlation between each dimension and information literacy is significant. This means that any changes in the four dimensions of information awareness, information knowledge, information ability and information ethics will have a significant impact on the overall level of information literacy. They are interrelated and interact with each other, and together constitute the key factors that determine students' information literacy level.

Table 5. Correlation between each dimension of information literacy and information literacy.

Project	Information literacy	
	r	p
Information awareness	0.907**	0.000
Information knowledge	0.908**	0.000
Information ability	0.912**	0.000
Information ethics	0.900**	0.000

Note: **Correlation is significant at the 0.01 level (Two-tailed).

3.1.2. Correlation Analysis of Each Dimension of Information Literacy

Table 6 presents that the correlation coefficient r value between information awareness and information knowledge is 0.762, which is between 0.60.8, and is strongly correlated; the correlation coefficient r value between information awareness and information ability is 0.781, which is also in this range, and is strongly correlated; the correlation coefficient r value between information knowledge and information ability is 0.777, which is also strongly correlated; the correlation coefficient r value between information awareness and information ethics is 0.749, the correlation coefficient r value between information knowledge and information ethics is 0.756, and the correlation coefficient r value between information ability and information ethics is 0.756, all within the range of 0.60.8, which is strongly correlated, and all p values are less than 0.01, and the correlation is significant.

This shows that the dimensions of information literacy do not exist in isolation, but are interrelated and interact with each other. The improvement of information awareness may promote the accumulation of information knowledge and the development of information ability, and the enrichment of information knowledge is also helpful

to enhance information ability and cultivate good information ethics (Xie, 2021). Students' information literacy is a complex system composed of multiple factors. The coordinated development of various dimensions can promote the improvement of overall information literacy.

Table 6. Correlation of various dimensions of information literacy.

Item	Information awareness	Information knowledge	Information ability
Information awareness	1		
Information knowledge	0.762**	1	
Information ability	0.781**	0.777**	1
Information ethics	0.749**	0.756**	0.756**

Note: **Correlation is significant at the 0.01 level (Two-tailed).

3.1.3. Correlation Analysis of Each Dimension of Information Literacy

Table 7 shows the correlation coefficient r value between information awareness and information literacy is 0.907, the correlation coefficient r value between information knowledge and information literacy is 0.908, the correlation coefficient r value between information ability and information literacy is 0.912, and the correlation coefficient r value between information ethics and information literacy is 0.793, and the p value is 0.000. This shows that information awareness, information knowledge, information ability and information literacy are strongly correlated, information ethics and information literacy are strongly correlated, and each dimension has a significant impact on the overall level of information literacy.

Table 7. Correlation of various dimensions of information literacy.

Project	Information literacy	
	r	p
Information awareness	0.907**	0.000
Information knowledge	0.908**	0.000
Information ability	0.912**	0.000
Information ethics	0.793**	0.000

Note: **Correlation is significant at the 0.01 level (Two-tailed).

In summary, the dimensions of information literacy are interrelated and interact with each other. The improvement or change of information awareness may affect the acquisition of information knowledge and the development of information ability, and the reserve of information knowledge will have an effect on information ability and information ethics. Students' information literacy is a complex system with multiple factors working together. The coordinated development of various dimensions can effectively improve the overall information literacy level.

3.1.4. Analysis of the Dimensions and Overall Level of Information Literacy

Table 8 shows that the mean (M) of the information awareness dimension is 2.51 and the standard deviation (SD) is 0.555; the mean of the information knowledge dimension is 2.51 and the standard deviation is 0.557; the mean of the information ability dimension is 2.51 and the standard deviation is 0.542; the mean of the information ethics dimension is 2.49 and the standard deviation is 0.568; the overall mean of information literacy is 2.5 and the standard deviation is 0.504. In general, the overall level of students' information literacy is in a certain state. The mean values of information awareness, information knowledge and information ability dimensions are the same, indicating that students' performance in these three aspects is relatively balanced. The mean value of the information ethics dimension is slightly lower, but it is not much different from other dimensions. Further analysis

of the scores of each dimension shows that students have advantages and disadvantages in different aspects. The standard deviation of each dimension shows that there is a certain degree of dispersion in the performance of students in each dimension. Overall, the various dimensions and overall levels of students' information literacy provide a data basis for the formulation of subsequent strategies to improve students' information literacy. Targeted educational and teaching activities can then be carried out based on the characteristics and differences of each dimension.

Table 8. Dimensions and overall level of information literacy.

Dimensions	M	SD
Information awareness	2.51	0.555
Information knowledge	2.51	0.557
Information competence	2.51	0.542
Information ethics	2.49	0.568
Information literacy	2.50	0.504

3.2. Correlation Analysis of Information Awareness Dimensions

Table 9 show that the correlation coefficient r value between information perception awareness and information awareness is 0.825, the correlation coefficient r value between information application awareness and information awareness is 0.835, and the correlation coefficient r value between information security awareness and information awareness is 0.884, and the p value is 0.000. This shows that in this study, information perception awareness, information application awareness, information security awareness and information awareness are all strongly correlated, and the correlation is significant at the 0.01 level (two-tailed).

This result fully shows that the impact of each dimension of information awareness on overall information awareness is extremely significant. Information perception awareness enables students to keenly capture valuable information and is the basis for the formation of information awareness; information application awareness reflects the initiative of students to apply information to actual learning and life, and plays a role in promoting the deepening of information awareness; information security awareness ensures the safety and standardization of students in information activities, and is an indispensable and important part of information awareness. The three are interrelated and mutually reinforcing, and together constitute the information awareness system of students. The development or change of any aspect may have an important impact on the overall level of information awareness. This also provides a clear direction for the subsequent formulation of educational and teaching strategies to enhance students' information awareness, namely, it is necessary to comprehensively consider the coordinated development of various dimensions of information awareness in order to comprehensively improve students' information awareness level.

Table 9. Correlation between information awareness and each dimension of information awareness.

Project	Information awareness	
	r	p
Information perception awareness	0.825**	0.000
Information application awareness	0.835**	0.000
Information security awareness	0.884**	0.000

Note: **Correlation is significant at the 0.01 level (Two-tailed).

From the data in Table 10, we can see that the correlation coefficient r value between information perception awareness and information application awareness is 0.559, the correlation coefficient r value between information perception awareness and information security awareness is 0.563, and the correlation coefficient r value between

information application awareness and information security awareness is 0.660. The p values are all less than 0.01, and the correlation is significant at the 0.01 level (two-tailed).

This shows that the dimensions of information awareness are not independent of each other, but closely related. Information perception awareness, as a foundation, enables students to be sensitive to information, and its development level will affect information application awareness and information security awareness. For example, students with strong information perception awareness can more actively apply the information they obtain to learning and life, and will pay more attention to information security during the application process (Wang, 2021). The improvement of information application awareness means that students will have higher requirements for information security when actually using information, thereby promoting the strengthening of information security awareness. Information security awareness provides protection for information perception and application, prompting students to follow safety standards when perceiving and applying information.

These dimensions influence each other and develop in a coordinated manner, jointly building a student's information awareness system. In the subsequent educational practice of improving students' information awareness, the correlation between the dimensions should be fully considered, and a comprehensive and targeted strategy should be formulated to promote the coordinated improvement of the dimensions, so as to achieve the overall improvement of students' information awareness.

Table 10. Correlation of various dimensions of information awareness.

Item	Information perception awareness	Information application awareness	Information security awareness
Information perception awareness	1		
Information application awareness	0.559**	1	
Information security awareness	0.563**	0.660**	1

Note: **Correlation is significant at the 0.01 level (Two-tailed).

In terms of information perception awareness, the mean value of "I can quickly notice the information I am interested in when browsing the web, watching TV or reading newspapers" is 2.52, indicating that students have a certain ability to capture information of interest in daily information contact, but their sensitivity needs to be improved. The mean value of "I can quickly judge whether the information I see is related to what I am doing" is 2.49, indicating that students have a certain foundation in judging the relevance of information, but their reaction speed and accuracy can be improved. The mean value of "I can always find some hidden useful information in a pile of messy information" is 2.52, showing that students have a certain awareness of digging out valuable information from complex information, but their ability has not yet reached a high level. The mean value of "When encountering problems, I will think of obtaining relevant information from multiple channels" is 2.49, reflecting that students have a certain concept of diversity in the cognition of information acquisition channels, but the awareness of actively expanding channels in actual actions may be insufficient.

In terms of information application awareness, "When encountering difficulties in learning, I will actively think of using software on computers or mobile phones to help solve them" is 2.52, reflecting that students have a certain awareness of using information technology tools when facing learning difficulties. The mean value of "thinking about how to use information technology to organize the knowledge learned in a more organized way" is 2.51, indicating that students have begun to pay attention to the application of information technology in knowledge organization, but the depth of thinking and the frequency of practice may not be enough. "I think that using

information technology can not only help me learn, but also contribute to protecting the environment and saving resources" is 2.51, indicating that students have a certain understanding of the versatility of information technology, but the ability to transform this understanding into practical actions needs to be strengthened. "Often actively explore new information technology tools to help me complete tasks in study or life" is 2.51, indicating that students have a certain awareness of exploring new tools, but the enthusiasm and persistence of active exploration may need to be improved.

In terms of information security awareness, "knowing not to disclose private information of oneself and family members, such as name, home address, etc., on the Internet at will" is 2.5, indicating that students have a basic understanding of privacy protection. "Seeing some bad or harmful information, I will actively stay away from it and not spread it" is 2.49, indicating that students have a certain self-protection and moral awareness when facing bad information, but their ability to cope with complex situations may be limited. The mean value of "When downloading software or using applications, I will check whether it is safe and reliable" is 2.5, indicating that students have a certain awareness of security checks before using the software. The mean value of "Knowing how to set some simple privacy protection measures, such as passwords, etc." is 2.53, reflecting that students have mastered some basic privacy protection skills, but may still lack more advanced security settings.

Overall, the overall mean value of information awareness is 2.51, and the standard deviation is 0.555, which shows that students have a relatively balanced performance in all aspects of information awareness, but the overall level is still medium. In the future, targeted educational activities can be carried out to enhance students' awareness and ability in information perception, application and security, so as to promote the comprehensive development of students' information awareness.

Table 11 presents descriptive statistics (Table 11) for information awareness, comprising 14 measurement items and the overall construct. The analysis includes mean scores and standard deviations (SD).

Individual item means range narrowly from 2.49 to 2.53, indicating moderate levels of self-reported information awareness across all dimensions.

The overall construct mean (2.51) further confirms a neutral-to-moderate orientation, slightly below the theoretical midpoint (3.0).Minimal variability between item means (maximum difference: 0.04) suggests respondents perceived these competencies as relatively homogeneous.At the item level, SD values span 0.952 to 1.520, reflecting moderate-to-high inter-individual variability. Notably, Item 14 ("setting up simple privacy protection measures") exhibits an exceptionally high SD (1.520), potentially signaling divergent skill levels or measurement anomalies (e.g., outliers).

The low SD for the overall construct (0.555) implies a concentrated distribution of information awareness scores within the sample.Focused on detecting relevant information, judging contextual relevance, and identifying hidden insights (means: 2.49–2.52).

These scores suggest respondents demonstrate basic but inconsistent proficiency in active information filtering and synthesis.Addresses multi-channel information retrieval, technology-aided learning, and organizational use of IT tools (means: 2.49–2.52). The moderate scores reflect limited proactive engagement with technology-driven solutions in academic or daily tasks.Covers privacy protection, avoidance of harmful content, and software safety verification. While Items 11–13 show stable means (2.49–2.50), the outlier SD for Item 14 (1.520) raises concerns about measurement validity or heterogeneous respondent capabilities in implementing privacy measures.

Table 11. Overall descriptive statistics of information awareness.

Item	Mean	Standard deviation
3. When you browse the web, watch TV or read newspapers, you can quickly notice the information you are interested in.	2.52	0.956
4. For the information you see, you can quickly judge whether it is related to what you are doing.	2.49	0.952
5. You can always find some hidden useful information in a pile of messy information.	2.52	0.962
6. When you encounter a problem, you will think of obtaining relevant information from multiple channels.	2.49	0.970
7. When you encounter difficulties in learning, you will take the initiative to think of using software on your computer or mobile phone to help solve it.	2.52	0.974
8. You will think about how to use information technology to organize the knowledge you have learned in a more organized way.	2.51	0.987
9. You think that using information technology can not only help you learn, but also contribute to protecting the environment and saving resources.	2.51	0.988
10. You often take the initiative to explore new information technology tools to help you complete tasks in study or life.	2.51	0.956
11. You know not to disclose your own and your family's private information on the Internet, such as name, home address, etc.	2.50	0.99
12. When you see some bad or harmful information, you will take the initiative to stay away from it and not spread it.	2.49	0.978
13. When downloading software or using applications, you will pay attention to whether it is safe and reliable.	2.5	0.967
14. You know how to set up some simple privacy protection measures, such as passwords, etc.	2.53	1.520
Information awareness	2.51	0.555

Table 12 shows the average scores for fourth graders were 2.52, fifth graders were 2.51, sixth graders were 2.51, seventh graders were 2.48, eighth graders were 2.51, and ninth graders were 2.52. The F value was 0.241, which indicates that there was no significant difference in information awareness scores between grades.

Overall, in this survey of students in nine-year compulsory schools, there was no significant difference in information awareness scores among grades; for students in nine-year compulsory schools, further research can be conducted to explore why grade differences were not significantly reflected in information awareness scores, and how to learn from effective experiences in other educational scenarios to improve students' information awareness. For the experience of preschool education majors in vocational secondary schools, it is possible to consider exploring similar education and teaching, guidance methods, and measures such as creating an information-based cultural atmosphere in nine-year compulsory schools to promote the development of students' information awareness.

Table 12. Analysis of grade differences in information awareness.

Project	Grade	Number of cases	Average value	Standard deviation	F
Information awareness	Grade 4	314	2.52	0.545	0.241
	Grade 5	390	2.51	0.548	
	Grade 6	353	2.51	0.528	
	Grade 7	282	2.48	0.531	
	Grade 8	316	2.51	0.630	
	Grade 9	345	2.52	0.546	

Table 13 shows there are 886 urban students and 1,114 rural students. The average information awareness of urban students is 2.5, with a standard deviation of 0.571; the average information awareness of rural students is 2.51, with a standard deviation of 0.541, and the F value is 0.393, indicating that in this survey, there is no significant difference in information awareness scores between urban and rural students.

Generally speaking, urban students are exposed to information early, urban families have a strong information atmosphere, parents have a high level of education, advanced information ideas, and are influenced by the surrounding environment. The level of information awareness of urban students is high. However, the family background of rural students is relatively ordinary, the parents have low education and cultural level, backward information ideas, low information technology use behavior and information participation, and cannot provide effective guidance and support to students, resulting in a gap in information literacy between rural and urban students.

In contrast, in this survey of students in nine-year compulsory schools, the difference in information awareness between urban and rural students was not significantly reflected, which may be related to various factors such as sample characteristics and balanced school education.

Table 13. Analysis of differences in information awareness by region of origin.

Item	Place of residence	Number of cases	Average value	Standard deviation	F
Information awareness	City	886	2.50	0.571	0.393
	Rural	1114	2.51	0.541	

3.3. Correlation Analysis of Information Knowledge Dimensions

Table 14 presents that the correlation coefficient r value between information background knowledge and information knowledge is 0.831, the correlation coefficient r value between information principle knowledge and information knowledge is 0.824, and the correlation coefficient r value between information skill knowledge and information knowledge is 0.836, and the p value is 0.000. This shows that in this study, information background knowledge, information principle knowledge, information skill knowledge and information knowledge are all strongly correlated, and the correlation is significant at the 0.01 level (two-tailed).

Information background knowledge provides students with knowledge of the basic concepts, development history and social impact of information technology, and is the cornerstone of building an information knowledge system. Its strong correlation with information knowledge shows that solid background knowledge helps students better understand and master other information knowledge. For example, understanding the development history of information technology can enable students to understand the evolution logic of current technology, so that they are more likely to accept new information principles and skills.

Information principle knowledge covers the basic principles of information dissemination, retrieval and processing, and it connects background knowledge and skill knowledge. The close correlation with information knowledge shows that mastering information principle knowledge can help students understand the information operation mechanism and provide theoretical support for the learning and application of information skills. For example, by understanding the working principle of search engines, students can use search skills more efficiently to obtain the required information.

Information skill knowledge is the key for students to apply information knowledge to practice, including operational skills such as word processing and graphic image processing. Its strong correlation with information knowledge shows that proficient information skills are an important manifestation of the practice of information knowledge and an important part of students' information literacy.

In summary, the various dimensions of information knowledge are interrelated and mutually reinforcing, and together constitute the students' information knowledge system. In education and teaching, we should focus on the coordinated development of various dimensions to comprehensively improve students' information knowledge level.

Table 14. Correlation between each dimension of information knowledge and information knowledge.

Item	Information knowledge	
	r	p
Information background knowledge	0.831**	0.000
Information principle knowledge	0.824**	0.000
Information skill knowledge	0.836**	0.000

Note: **Correlation is significant at the 0.01 level (Two-tailed).

Table 15 shows the correlation coefficient r value between information background knowledge and information principle knowledge is 0.508, the correlation coefficient r value between information background knowledge and information skill knowledge is 0.535, and the correlation coefficient r value between information principle knowledge and information skill knowledge is 0.563. The p values are all less than 0.01, and the correlation is significant at the 0.01 level (two-tailed).

Information background knowledge builds a framework for students to have a macroscopic understanding of information technology, including its concepts, development context, and social effects. Its moderate correlation with information principle knowledge shows that having certain background knowledge helps students understand the principles of information dissemination and retrieval; and its correlation with information skill knowledge shows that background knowledge can provide basic cognition for students to master skills such as software operation. For example, knowing the development history of information technology can enable students to better understand the evolution of current software functions.

Information principle knowledge focuses on the internal logic of information activities, and its correlation with information skill knowledge reflects the guiding role of principles in practical operations. Students who master information retrieval principles can use search skills more efficiently; understanding information processing principles can help improve text, graphics, and image processing skills.

These dimensions are not isolated, but intertwined. Information background knowledge lays the foundation for the learning of principles and skills knowledge, information principle knowledge builds a bridge from background knowledge to skill practice, and information skill knowledge is the application of background and principle knowledge. In the process of improving students' information knowledge literacy, we need to pay attention to the coordinated development of various dimensions and promote the improvement of students' information knowledge system to adapt to the requirements of information literacy in the digital age.

Table 15. Correlation of various dimensions of information knowledge.

Item	Information background knowledge	Knowledge of information principles	Information skills knowledge
Information background knowledge	1		
Information principle knowledge	0.508**	1	
Information skill knowledge	0.535**	0.563**	1

Note: **Correlation is significant at the 0.01 level (Two-tailed).

For "knowing information technology (Such as computer and mobile phone related technologies)", the mean score of students was 2.51, indicating that most students have a certain understanding of the basic concepts of information technology, but their understanding needs to be deepened.

The mean score of "understanding the impact of information technology on life and society (such as convenient communication and changes in shopping methods)" was 2.55, indicating that students can generally perceive the role of information technology in life, but their understanding of its deep-level impact may not be enough.

The mean score of "knowing the development and changes of information technology (such as the evolution of mobile phones from buttons to touch screens)" was 2.54, reflecting that students have a certain understanding of the development process of information technology, but may lack systematicity.

The mean score of "being able to talk about the new development of information technology in the future" was 2.56, indicating that students have a certain imagination and forward-looking thinking, but their judgment on future development may not be accurate and in-depth enough.

In terms of information principle cognition:

The mean score of "clearly understanding the basic process of search engines to find information (such as inputting keywords and displaying search results)" was 2.52, which means that students have a certain grasp of common information retrieval principles, but may lack proficiency in actual operations.

The mean value of "understanding the way of information dissemination (such as through the Internet and television)" is 2.48, which shows that students have a certain understanding of the information dissemination channels, but may not have a thorough understanding of the details and principles of the dissemination process.

The mean value of "knowing how to classify and organize the collected information" is 2.52, which shows that students have a preliminary awareness of information processing, but there may be room for improvement in the efficiency and scientificity of processing.

The mean value of "understanding the methods of information reuse (such as making reports from collected materials)" is 2.54, which shows that students have a certain concept of the secondary use of information, but may not be flexible enough in practical application.

In the dimension of information skills mastery:

The mean value of "knowing how to use word processing software (such as Word) for typing and typesetting" is 2.51, which shows that students have a certain practice in basic word processing skills, but may not be proficient in the use of complex typesetting and advanced functions.

The mean value of "knowing how to search for accurate information on the Internet and judge the quality of information" is 2.48, which reflects that students' ability to screen and judge online information needs to be strengthened.

The mean value of "can classify and store their own files and materials" is 2.54, which shows that students have a certain awareness of information management, but the rationality and standardization of classification may need to be improved.

The mean value of "can use simple graphic image processing software (such as Meitu Xiuxiu) to process pictures" is 2.49, indicating that students have a certain foundation in image information processing skills, but may still lack professionalism and creativity in processing.

Overall, the mean value of information knowledge is 2.51 and the standard deviation is 0.557, which shows that students have a relatively balanced performance in all aspects of information knowledge, but the overall level is at a medium level. Whether in the depth or breadth of knowledge, there is potential for further improvement.

Subsequent teaching work can formulate more targeted training programs based on these specific situations to improve students' information knowledge level.

Table 16. Overall descriptive statistics on information literacy.

Item	N	Mean	Standard deviation
15. You know what information technology is, such as the technology related to computers, mobile phones and other devices.	2000	2.51	0.958
16. You understand the impact of information technology on our lives and society, such as facilitating communication and changing the way of shopping.	2000	2.55	0.964
17. You know some of the developments and changes in information technology from the past to the present, such as the change from buttons to touch screens on mobile phones.	2000	2.5	0.998
18. You can name some new developments in information technology that you think may occur in the future.	2000	2.56	1.56
19. You know the basic process of finding information through search engines, such as entering keywords and presenting search results.	2000	2.52	0.978
20. You understand how information is spread from one place to another, such as through the Internet and television.	2000	2.48	0.967
21. You know that the collected information can be classified, organized, and processed to make it more useful.	2000	2.52	0.975
22. You know some ways to reuse information, such as making reports from collected materials.	2000	2.5	0.968
23. You can use word processing software (Such as Word) to type and layout articles.	2000	2.51	0.967
24. You know how to search for the accurate information you want on the Internet and judge whether the information is good or not.	2000	2.48	0.96
25. You can classify and store your own files and materials for easy search.	2000	2.5	0.998
26. You can use some simple graphics and image processing software (Such as Meitu Xiuxiu) to process images.	2000	2.49	0.98
Information knowledge	2000	2.51	0.557
Number of valid cases (In columns)	2000		

Table 16 shows the scores of information knowledge, the average of fourth-grade students is 2.55, which is relatively high among all grades, with a standard deviation of 0.582. The data dispersion is relatively large, indicating that the individual differences in the information knowledge level of students in this grade are relatively obvious. The average of fifth-grade students is 2.48, with a standard deviation of 0.557; the average of sixth-grade students is 2.52, with a standard deviation of 0.545; the average of seventh-grade students is 2.49, with a standard deviation of 0.548; the average of eighth-grade students is also 2.49, with a standard deviation of 0.557; the average of ninth-grade students is 2.53, with a standard deviation of 0.554. The averages of these grades are relatively close, and the standard deviations are relatively small, indicating that the information knowledge levels of students are not much different among these grades, and are relatively stable overall.

Through the F test, the F value is 0.893, which shows that in this study, there is no significant difference in the information knowledge scores of students in each grade. Although the opportunities and depth of students' exposure to information knowledge may increase with the increase of grade, from the data results, there is no obvious grade gradient change in the average level of information knowledge.

Based on the above analysis, although there is no significant difference in the average level of information knowledge among students of different grades, the individual differences among fourth-grade students are worthy of attention. In subsequent teaching, stratified teaching strategies can be formulated for students of different levels. At the same time, in order to improve the overall level of students' information knowledge, it is possible to consider

exploring a more targeted and coherent curriculum system to meet the cognitive development needs of students of different grades.

Table 17 presents an analysis of grade-level differences in information knowledge among students from Grades 4 to 9 (total N = 2,000). The sample sizes across grades are uneven, ranging from 282 (Grade 7) to 390 (Grade 5). Mean scores show minimal variability (2.48–2.55), with the highest mean in Grade 4 (2.55) and the lowest in Grade 5 (2.48), yielding a trivial maximum difference of 0.07 and an overall mean of 2.51. Standard deviations are tightly clustered (0.545–0.582), indicating homogeneous dispersion of individual scores within each grade. An F-value of 0.893 is listed under Grade 4, but its placement and incomplete reporting (missing for other grades) deviate from standard ANOVA conventions. If this represents the overall test result, an $F < 1$ typically implies no statistically significant differences between grades.

Table 17. Analysis of grade differences in information knowledge.

Items	Number of cases	Average value	Standard deviation	F
Grade 4	314	2.55	0.582	0.893
Grade 5	390	2.48	0.557	
Grade 6	353	2.52	0.545	
Grade 7	282	2.49	0.548	
Grade 8	316	2.49	0.557	
Grade 9	345	2.53	0.554	
Total	2000	2.51	0.557	

In terms of sample size, Table 18 shows 1,114 students from rural areas and 886 students from urban areas. In terms of information knowledge scores, the average score for rural students is 2.5, the average score for urban students is 2.52, and the overall average score is 2.51. The average score of information knowledge of urban students is slightly higher than that of rural students, but the difference between the two is very small.

In terms of standard deviation, the standard deviation of rural students is 0.546, the standard deviation of urban students is 0.566, and the overall standard deviation is 0.557. This shows that the degree of dispersion of information knowledge scores of the two types of students is relatively close, that is, whether it is rural or urban students, the degree of difference in information knowledge levels between individuals is similar.

Comprehensive analysis shows that although the average score of information knowledge of urban students is slightly higher, from the data, the influence of the place of origin on the level of students' information knowledge is not significant. This may be due to the balanced development of educational resources and the widespread popularization of information technology, which has narrowed the gap between rural and urban students in the opportunities and degree of obtaining information knowledge. However, further attention can be paid to whether there are differences in the specific content and application ability of information knowledge between rural and urban students, so as to formulate more targeted teaching strategies and promote the improvement of information knowledge levels of all students.

Table 18. Analysis of differences in information knowledge by region of origin.

Information knowledge	Number of cases	Average value	Average value
Rural	1114	2.5	0.546
Urban	886	2.52	0.566
Total	2000	2.51	0.557

3.4. Correlation Analysis Between Each Dimension of Information Ability and Information Ability

Table 19 shows the correlation coefficient r value between information application ability and information ability is 0.831, the correlation coefficient r value between information fusion ability and information ability is 0.839, and the correlation coefficient r value between information innovation ability and information ability is 0.845, and the p value is 0.000. This shows that in this study, information application ability, information fusion ability, information innovation ability and information ability are all strongly correlated, and the correlation is significant at the 0.01 level (two-tailed).

Information application ability is the ability of students to apply the information knowledge they have mastered to practical scenarios. Its strong correlation with information ability shows that having good information application ability is a key link in improving overall information ability. For example, students can skillfully use information technology to solve problems in learning and life, which directly reflects the level of information ability.

Information fusion ability emphasizes students' integration and coordinated use of information from different sources and types. Its close correlation with information ability shows that in the era of information explosion, being able to effectively integrate information and extract valuable content is crucial to improving information ability. For example, when conducting research, students need to integrate information from multiple channels such as the Internet, books, and documents. This process is the embodiment of information integration ability.

Information innovation ability is the ability of students to generate new ideas, new methods, and new results in information activities. Its strong correlation with information ability shows that innovation ability is the driving force for the continuous development of information ability. Students with high information innovation ability can show unique insights and advantages in the acquisition, processing, and application of information.

In summary, the various dimensions of information ability are interrelated and mutually reinforcing, and together constitute the student's information ability system. In education and teaching, we should focus on cultivating students' abilities in information application, integration, and innovation, so as to comprehensively improve students' information ability level and enable them to better adapt to the development needs of the digital age.

Table 19. Correlation between each dimension of information capability and information capability.

Item	Information capabilities	
	r	p
Information application ability	0.831**	0.000
Information fusion ability	0.839**	0.000
Information innovation ability	0.845**	0.000

Note: **Correlation is significant at the 0.01 level (Two-tailed).

Table 20 presents the correlation coefficient *r* value between information application ability and information fusion ability is 0.537, the correlation coefficient r value between information application ability and information innovation ability is 0.541, and the correlation coefficient *r* value between information fusion ability and information innovation ability is 0.585. The p values are all less than 0.01, and the correlation is significant at the 0.01 level (Two-tailed).

Information application ability focuses on transforming information knowledge into practical actions and is the basic practical dimension of information ability. Its correlation with information fusion ability shows that when students have certain information application ability, they can better integrate different information. For example,

when completing project assignments, the ability to apply information technology tools will affect the fusion processing of multi-source information.

Information fusion ability emphasizes the comprehensive processing and coordinated use of various types of information. Its high correlation with information innovation ability shows that effective information fusion can provide rich materials and ideas for innovation. After integrating multiple types of information, students may generate new insights and methods, thereby promoting the development of information innovation ability.

As a high-level manifestation of information ability, the association between information innovation ability and information application ability means that innovation is often based on the effective application of information. In the process of applying information in practice, students may discover new problems and needs, thus stimulating innovative thinking.

In general, the dimensions of information capabilities are interdependent and mutually reinforcing. Information application ability is the cornerstone, information integration ability is the bridge, and information innovation ability is the sublimation. In the process of improving students' information capabilities, we should focus on the coordinated development of various dimensions to build a comprehensive and solid information capability system to help students better obtain, process and use information in the digital age.

Table 20. Correlation of various dimensions of information capability.

Item	Information application ability	Information fusion capability	Information innovation capabilities
Information application ability	1		
Information fusion ability	0.537**	1	0.585**
Information innovation ability	0.541**	0.585**	1

Note: **Correlation is significant at the 0.01 level (Two-tailed).

Table 21 show the item "knowing information technology (Such as computer and mobile phone related technologies)", the mean of students is 2.51, which shows that most students have a certain understanding of the basic concepts of information technology, but their understanding needs to be deepened. The mean of "understanding the impact of information technology on life and society (such as convenient communication and changes in shopping methods)" is 2.55, indicating that students can generally perceive the role of information technology in life, but their understanding of its deep-level impact may not be enough. The mean of "knowing the development and changes of information technology (such as the evolution of mobile phones from buttons to touch screens)" is 2.54, reflecting that students have a certain understanding of the development process of information technology, but may lack systematicity. The mean of "being able to talk about the new development of information technology in the future" is 2.56, indicating that students have a certain imagination and forward-looking thinking, but their judgment on future development may not be accurate and in-depth enough.

In terms of information principle cognition: "clearly understand the basic process of search engines to find information (such as input keywords, search results presentation)" has a mean of 2.52, which means that students have a certain grasp of common information retrieval principles, but may lack proficiency in actual operations. The mean value of "understanding the ways of information dissemination (such as through the Internet and television)" is 2.48, which shows that students have a certain understanding of the channels of information dissemination, but may not have a thorough understanding of the details and principles of the dissemination process. The mean value of "knowing how to classify and organize the collected information" is 2.52, which shows that students have a preliminary awareness of information processing, but there may be room for improvement in the efficiency and scientificity of processing. The mean value of "understanding the methods of information reuse (such as making

reports from collected materials)" is 2.54, which shows that students have a certain concept of the secondary use of information, but may not be flexible enough in practical application.

In the dimension of information skills mastery: "knowing how to use word processing software (such as Word) for typing and typesetting" has a mean value of 2.51, which shows that students have a certain practice in basic word processing skills, but may not be proficient in the use of complex typesetting and advanced functions. The mean value of "knowing how to search for accurate information on the Internet and judge the quality of information" is 2.48, which reflects that students' ability to screen and judge online information needs to be strengthened. The mean value of "can classify and store their own files and materials" is 2.54, which shows that students have a certain awareness of information management, but the rationality and standardization of classification may need to be improved. The mean value of "can use simple graphic image processing software (such as Meitu Xiuxiu) to process pictures" is 2.49, indicating that students have a certain foundation in image information processing skills, but may still lack professionalism and creativity in processing.

Overall, the mean value of information knowledge is 2.51 and the standard deviation is 0.557, which shows that students have a relatively balanced performance in all aspects of information knowledge, but the overall level is at a medium level. Whether in the depth or breadth of knowledge, there is potential for further improvement. Subsequent teaching work can formulate more targeted training programs based on these specific situations to improve students' information knowledge level.

Table 21. Overall descriptive statistics of information capabilities.

Item	M	SD
27. When you need to find information, you can skillfully use search engines to find relevant information.	2.54	1.336
28. You can accurately extract the useful parts from the information you find and apply them to study or life.	2.5	0.969
29. You will communicate with your classmates about the information you find and give your own opinions on the information shared by others.	2.51	0.95
30. For the information you see, you can judge whether it is true or false, and whether it is useful.	2.49	0.948
31. You will use information technology to make interesting works, such as PPT, hand-copied newspapers, etc., with the knowledge you have learned.	2.5	0.972
32. In group learning, you can use information technology to complete tasks with your classmates, such as co-editing online documents.	2.52	0.972
33. When encountering problems in life, you will think of using information technology tools to help solve them, such as using map software to find the way.	2.5	0.957
34. You can integrate information from different sources to form a complete content.	2.48	0.951
35. You will use the information technology knowledge you have learned to create something new, such as designing a small game.	2.48	0.969
36. When using information technology tools, you often have some new ideas and creativity.	2.51	0.962
37. You can transform existing information to make it more valuable.	2.53	0.977
38. You will try to use information technology in new ways to solve problems.	2.53	0.975
Information skills	2.51	0.542

Table 22 shows there are 314 in the fourth grade, 390 in the fifth grade, 353 in the sixth grade, 282 in the seventh grade, 316 in the eighth grade, and 345 in the ninth grade.

In terms of information ability scores, the average value of the fourth grade is 2.54, which is relatively high, which may indicate that students in this grade have a good acceptance of information ability-related knowledge and skills, but the standard deviation is 0.548, indicating that individual differences are relatively large. The average value of the fifth grade is 2.49, with a standard deviation of 0.523; the average value of the sixth grade is 2.51, with a standard deviation of 0.536; the average value of the seventh grade is 2.47, with a standard deviation of 0.551; the

average value of the eighth grade is 2.5, with a standard deviation of 0.529; the average value of the ninth grade is 2.53, with a standard deviation of 0.57. The average values of these grades are relatively close, reflecting that the level of students' information ability does not change significantly among grades.

The F test results show that the F value is 0.637, which indicates that in this study, there is no significant difference in the information ability scores of students in different grades. Although students are exposed to more information knowledge and skills as they grow older, the data shows that there is no obvious grade progression relationship in the average level of information ability.

In summary, although the average information ability of fourth-grade students is relatively outstanding and individual differences are obvious, the overall difference in information ability between grades is not significant. Subsequent teaching can further focus on the specific performance of information ability of students in each grade, formulate stratified teaching strategies, and focus on overall improvement to promote the balanced development of students' information ability.

Table 22. Analysis of grade differences in information knowledge.

Item	Information capabilities			
	Number of cases	Average value	Standard deviation	F
Grade 4	314	2.54	0.548	0.637
Grade 5	390	2.49	0.523	
Grade 6	353	2.51	0.536	
Grade 7	282	2.47	0.551	
Grade 8	316	2.5	0.529	
Grade 9	345	2.53	0.570	
Total	2000	2.51	0.542	

Table 23 presents there are 1,114 students from rural areas and 886 students from urban areas. In terms of information ability scores, the average value of rural students is 2.5, the average value of urban students is 2.51, and the overall average value is 2.51. The average value of urban students is slightly higher than that of rural students, but the gap is extremely small.

In terms of standard deviation, the standard deviation of rural and urban students is 0.542, which means that the degree of dispersion of information ability scores of the two types of students is the same, that is, the difference in information ability levels between individuals in rural and urban students is consistent.

The F test results show that the F value is 0.584, indicating that in this study, there is no significant difference in information ability scores between rural and urban students. This may be attributed to the balanced promotion of educational resources and the widespread popularization of information technology in urban and rural areas, which has narrowed the gap in information ability development between rural and urban students. However, it is still necessary to further investigate whether there are potential differences in the specific dimensions of information ability between urban and rural students, such as information application, integration and innovation capabilities, so as to implement precise policies and further improve the information ability level of all students.

Table 23. Analysis of differences in information knowledge by region of origin.

Item	Information capabilities			
	Number of cases	Average value	Standard deviation	F
Rural	1114	2.50	0.542	0.584
Urban	886	2.51	0.542	
Total	2000	2.51	0.542	

3.5. Study on the Correlation Between Each Dimension of Information Ethics and Information Knowledge

As shown in Table 24, the correlation coefficient r value between information ethics and information knowledge is 0.880, the correlation coefficient r value between information law and information knowledge is 0.893, and the p value is 0.000. This shows that information ethics, information law and information knowledge are highly correlated at the 0.01 level (two-tailed).

As an important part of information ethics, information ethics is related to students' value judgments and behavioral norms in information activities. Its high correlation with information knowledge means that the more information knowledge students have, the more likely they are to form good information ethics concepts. For example, after understanding the widespread application of information technology and its impact, students are more aware of the importance of information ethics norms such as respecting others' intellectual property rights and protecting privacy.

Information law provides a legal framework and guarantee for information activities. Its close connection with information knowledge shows that students with rich information knowledge tend to understand and abide by information legal provisions. For example, after knowing the principles and characteristics of online information dissemination, students will have a deeper understanding of online rumors, infringements and other illegal acts, and thus consciously abide by relevant laws.

In summary, the information ethics and information law dimensions of information ethics are interrelated and mutually reinforcing with information knowledge. In the process of education and teaching, we should focus on combining the imparting of information knowledge with information ethics education, not only to improve students' information knowledge level, but also to cultivate their good information ethics and legal awareness, so as to promote students to carry out information activities in a healthy and legal manner in the information society.

Table 24. Correlation between each dimension of information ethics and information knowledge.

Project	Information ethics	
	r	p
Information ethics	0.880**	0.000
Information law	0.893**	0.000

Note: **Correlation is significant at the 0.01 level (Two-tailed).

As shown in Table 25, the Pearson correlation coefficient between information ethics and information law is 0.571, and the p value is less than 0.01, which is significant at the 0.01 level (two-tailed).

Information ethics refers to the values and behavioral norms that students should follow in information activities, covering aspects such as respecting the privacy of others and protecting intellectual property rights. Information law regulates the rights and obligations in information activities in the form of legal provisions, such as the Cybersecurity Law, the Copyright Law and other relevant legal provisions.

The significant correlation between the two shows that information ethics and information law do not exist in isolation in the information ethics system of students, but are interrelated and influence each other. On the one hand, good information ethics concepts help students better understand and abide by information law provisions. When students recognize the moral code of protecting the intellectual property rights of others from the heart, they will be more consciously abide by copyright-related laws. On the other hand, the existence of information law also provides strong support and guarantee for information ethics. The coercive force of the law can prompt students to practice moral norms in information activities. For example, legal sanctions against online rumors help maintain the moral order in information dissemination.

In information literacy education, we should fully realize the close connection between information ethics and information law, and organically combine the two for training and guidance. By strengthening information ethics education, we can enhance students' moral self-discipline awareness; at the same time, we can popularize information legal knowledge and enhance students' legal awareness, so as to comprehensively improve students' information ethics literacy and enable them to conduct information activities in a standardized and responsible manner in the information society.

Table 25. Correlation of various dimensions of information ethics.

Project	Information ethics	Information law
Information ethics	1	
Information law	0.571**	1

Note: **Correlation is significant at the 0.01 level (Two-tailed).

Table 26 refers information ethic,it shows "Even in an anonymous online environment, I think that I should not publish comments that hurt others' feelings or defame others' reputations" has a mean of 2.5, which shows that students have a certain foundation in online speech ethics, but there is still room for improvement. "I think that when communicating online, I should be polite and friendly like in real life, and not say bad words" has a mean of 2.5, which shows that students generally recognize the principle of politeness in online communication. "I think that when discussing online, I should respect different opinions and not maliciously attack others" has a mean of 2.5, which reflects that students have a good sense of tolerance in online interaction.

In terms of information legal cognition: "I understand that the information posted on the Internet must be true, and I should not deliberately fabricate false information to mislead others" has a mean of 2.51, which shows that students have a certain understanding of the legal requirements for the authenticity of online information. "I know that I can't plagiarize other people's works on the Internet at will, because it may violate moral or even legal provisions" has a mean of 2.49, which reflects that students' understanding of laws and ethics related to intellectual property rights needs to be strengthened. The mean value of "understand that it is wrong to use unauthorized pirated software, games or materials, and support genuine products" is 2.48, indicating that students still have room for improvement in their legal awareness of software and material use. The mean value of "know that when discovering that website content may infringe on the intellectual property rights of others, you should not continue to browse or spread it" is 2.51, reflecting that students have a good legal awareness of handling infringing information. The mean value of "know that when citing online information for study or work, you should indicate the source of information" is 2.45, indicating that students' awareness of information citation norms needs to be improved.

Overall, the mean value of information ethics is 2.49, and the standard deviation is 0.568. Students' performance in all aspects of information ethics is relatively balanced, but the overall level is medium. This shows that although students have a certain awareness of information ethics, there is still much room for improvement in the comprehensive cognition and practice of information ethics and law. Subsequent teaching can carry out targeted information ethics education activities to strengthen students' information ethics literacy so that they can consciously abide by moral and legal norms in network and information activities. Through case analysis, thematic discussion and other methods, students can have a deep understanding of the importance of information ethics and be guided to practice correct information behavior in real life.

Table 26. Overall descriptive statistics of information ethics.

Item	M	SD
39. Even in an anonymous online environment, you believe that you should not publish remarks that hurt others' feelings or defame others' reputation.	2.5	0.957
40. You believe that when communicating with others on the Internet, you should be as polite and friendly as in real life, and you should not use bad words.	2.5	0.947
41. You think that when participating in discussions on the Internet, you should respect different opinions and not maliciously attack others just because of disagreements.	2.5	0.947
42. You understand that the information posted on the Internet must be true, and you cannot deliberately fabricate false information to mislead others.	2.51	0.946
43. You know that you cannot plagiarize other people's works on the Internet at will, because this may violate moral or even legal regulations.	2.49	0.967
44. You understand that it is wrong to use unauthorized pirated software, games or materials, and you should support the use of genuine products.	2.48	0.971
45. When you find that the content provided by a website may infringe on the intellectual property rights of others, you know that you should not continue to browse or spread the relevant content.	2.51	0.989
46. You know that when citing information on the Internet for your own study or work, you should indicate the source of the information.	2.45	0.959
Information Ethics	2.49	0.568
Number of valid cases (In columns)		

Table 27 presents 314 in the fourth grade, 390 in the fifth grade, 353 in the sixth grade, 282 in the seventh grade, 316 in the eighth grade, and 345 in the ninth grade.

In terms of information ethics scores, the average value of the fourth grade is 2.52, which is at a relatively high level among all grades, and the standard deviation is 0.555, indicating that the dispersion of information ethics scores of students in this grade is relatively moderate. The average value of the fifth grade is 2.45, which is relatively low, with a standard deviation of 0.561; the average value of the sixth grade is 2.51, with a standard deviation of 0.588; the average value of the seventh grade is 2.47, with a standard deviation of 0.566; the average value of the eighth grade is 2.52, the same as the fourth grade, with a standard deviation of 0.571; the average value of the ninth grade is 2.5, with a standard deviation of 0.567. The average values of each grade are relatively close, indicating that the changes in students' information ethics levels between grades are not significant.

The results of the F test show that the F value is 0.914, which indicates that in this study, there is no significant difference in information ethics scores among students of different grades. Although the educational content and social environment that students are exposed to change with the increase of grade, the data shows that there is no obvious grade gradient difference in the average level of information ethics.

Based on the above analysis, although the fourth and eighth grades are relatively prominent in the mean, the overall difference in the information ethics level of students in each grade is not obvious. In the subsequent education process, we can further pay attention to the characteristics of students in different grades in specific cognition and behavior of information ethics, and formulate more targeted information ethics education programs to promote the comprehensive improvement of students' information ethics literacy.

Table 27. Analysis of grade differences in information ethics.

Item	N	M	SD	F
Grade 4	314	2.52	0.555	0.914
Grade 5	390	2.45	0.561	
Grade 6	353	2.51	0.588	
Grade 7	282	2.47	0.566	
Grade 8	316	2.52	0.571	
Grade 9	345	2.5	0.567	
Total	2000	2.49	0.568	

Table 28 shows 886 students from urban areas and 1114 students from rural areas. In terms of information ethics scores, the average score of urban students is 2.48, the average score of rural students is 2.5, and the overall average score is 2.49. The average score of rural students is slightly higher than that of urban students, but the difference is very small.

From the standard deviation, the standard deviation of urban students is 0.569, and the standard deviation of rural students is 0.568, which are almost equal, indicating that the degree of dispersion of urban and rural students in information ethics scores is similar, that is, the difference in information ethics levels between individuals in the two groups of students is comparable.

Through the F test, the F value is 0.603, which shows that in this study, there is no significant difference in information ethics scores between urban and rural students. Although there may be certain differences between urban and rural areas in terms of educational resources, family environment, and information atmosphere, from the data results, these differences have not yet shown obvious differentiation in the average level of students' information ethics.

In summary, although the average score of information ethics of students from rural areas is slightly higher, the overall difference between urban and rural students in information ethics is not significant. In the future, we can further explore whether there are potential differences between urban and rural students in specific dimensions of information ethics (such as information morality, information legal cognition, etc.), so as to carry out information ethics education more targetedly and improve the information ethics literacy of all students.

Table 28. Analysis of differences in information knowledge by region of origin.

Item	N	M	SD	F
Urban	886	2.48	0.569	0.603
Rural	1114	2.5	0.568	
Total	2000	2.49	0.568	

4. CONCLUSION

4.1. Information Awareness

Although students have a certain foundation in information awareness, it is generally at a medium level. In terms of information perception awareness, they lack sensitivity and insight into information, and it is difficult to quickly capture key content in a large amount of information. The value judgment of information is not accurate enough, and they cannot fully realize the importance of information to learning and life. The awareness of information application is weak. When encountering problems, they are not very motivated to actively use information technology to obtain information and solve problems. The use of information technology tools only stays on the surface, and they lack the awareness of in-depth exploration and innovative application.

4.2. Information Knowledge

The level of students' information knowledge is medium, and there are deficiencies in the depth and breadth of knowledge. The understanding of the basic concepts of information technology is not deep enough, the understanding of the development trends and frontier dynamics of information technology is insufficient, and the knowledge of information principles is not solid enough, which affects the effective processing and utilization of information. In terms of information skills and knowledge, although they have some basic operating capabilities, they are not proficient in the use of complex operations and advanced functions, and cannot meet actual needs.

4.3. Information Ability

The overall information ability is at a medium level, and the development of each dimension is uneven. The ability to apply information needs to be improved. When applying information knowledge to solve practical problems, there are problems such as unskilled application and improper methods. The ability to integrate information is insufficient, making it difficult to effectively integrate information from different sources and types, which limits the ability to analyze and solve complex problems. The ability to innovate information is relatively lacking, lacking innovative thinking and methods, and it is difficult to generate new ideas and results in information activities.

4.4. Information Ethics

Although students have a certain awareness of information ethics, they are deficient in comprehensive cognition and practice. Some students do not have a deep understanding of information ethics and legal provisions. In actual information activities, they are prone to violations of information ethics, such as irregular online speech and weak awareness of intellectual property protection. When faced with complex information ethics issues, there is a lack of clear judgment criteria and correct handling methods.

5. RESEARCH SUMMARY

This study investigated the information literacy of students from grades 4 to 9 in five nine-year compulsory education schools, comprehensively analyzed the current situation, existing problems and causes of students' information literacy, and proposed corresponding improvement strategies. The study found that students' information literacy is generally at a medium level, and the dimensions of information awareness, information knowledge, information ability and information ethics are interrelated and mutually influential. There are certain differences in students' information literacy in different grades and places of residence, but some differences are not significant. Students' own factors, school education, family education and social environment jointly affect the development of students' information literacy.

6. RESEARCH PROSPECTS

Although this study has achieved certain results, it still has limitations. Future research can further expand the sample range to cover students from more regions and schools to improve the universality of the research results. In-depth exploration of the specific mechanisms of the impact of different factors on students' information literacy provides theoretical support for the formulation of more precise improvement strategies. In addition, with the continuous development of information technology, the connotation and requirements of information literacy are also constantly changing. Subsequent research should focus on the new characteristics and new problems of students' information literacy under the background of new technologies, and adjust the research direction and methods in a timely manner.

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