SPSS-Based Analysis of Factors Affecting High School Students' Core Literacy in The Context of The New College Entrance Examination

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Abstract

Core literacy is the centralized embodiment of scientific education, and the "General High School Information Technology Curriculum Standards" clearly state that efforts should be made to develop core literacy at the high school level. This paper investigates the core literacy of information technology courses in high schools and students in two regions under the new college entrance examination, mainly using questionnaires and interviews, and conducting descriptive statistical analysis, correlation analysis, and regression analysis on the obtained data through SPSS software, to investigate the relevant factors affecting the core literacy of information technology of high school students. The data analysis shows that there are more differences in the cultivation of students' IT subject core literacy in schools in different regions of Hubei Province, and the cultivation strategies are proposed for school teaching based on the survey results.

Keywords: *SPSS; Information technology; Discipline core literacy; Cultivation strategy;*

1 INTRODUCTION

In November 2014, the Ministry of Education (MOE) launched the revision of curriculum standards for all subjects in high school, and after three years (2017) the General High School Information Technology Subject Curriculum Standards (2017 Edition), which were prepared according to the psychological development characteristics of high school students and the teaching rules of information technology subjects, were officially released and formally implemented in all levels of general high schools in 2018 (hereinafter referred to as the new standards) [1]. The new curriculum standards fully select contemporary, scientific and developmental teaching contents, further clarify the positioning of high school IT subjects, and highly and concisely condense the core literacy of IT subjects. In 2020, the Ministry of Education in the general high school IT curriculum standards (2017 edition (revised in 2020)) once again emphasizes the importance of improving national information literacy and enhancing students' adaptability to the information society, and the importance of creativity [2]. In the same year (2018) that the new curriculum standards were officially implemented, Hubei Province is also the third batch of provinces in China to adopt the new model of the "3+1+2" college entrance examination. In this paper, we will analyze the results of the survey on students' mastery of IT core literacy under the first implementation of the new curriculum and the new college entrance examination model [3].

2 THE NEW COLLEGE ENTRANCE EXAMINATION PLACES HIGHER DEMANDS ON THE CORE LITERACY OF INFORMATION TECHNOLOGY SUBJECTS IN HIGH SCHOOL

Each province will now enter the rhythm of the new college entrance examination in turn within the last two or three years according to the maturity of their conditions [4]. Therefore, understanding the new college entrance examination is closely related to each of our families and each of our children [6]. In the 21st century, "core literacy" is a magnificent transformation of

B. Fox et al. (Eds.): IC-ICAIE 2022, AHCS 9, pp. 1244-1250, 2023.
https://doi.org/10.2991/978-94-6463-040-4_185

curriculum reform in response to the requirements of information technology and a knowledge-based economy for talent training, and core literacy has gradually become the focus of attention in the field of education in various countries [6]. It is a basic course to help students master basic IT knowledge and skills, enhance information awareness, develop computational thinking, improve digital learning ability, and establish correct values and responsibility in the information society [5].

This research takes the core literacy of information technology subject for high school students in the context of the new college entrance examination as the background and investigates the current situation of high school information technology course teaching from the teachers' perspective to analyze the advantages and shortcomings of classroom teaching in cultivating students' core literacy of information technology subject at the high school level. And according to the existing problems combined with the actual teaching situation to propose a solution strategy.

This study mainly accomplishes the following objectives.

1. To investigate the current situation of high school IT course teaching through questionnaire and interview method, mainly focusing on the cultivation of core literacy of IT subject and the actual situation of students' mastery. Summarize and summarize the urgent problems that exist in the high school IT classroom under the background of the new college entrance examination.

2. To propose countermeasures and suggestions to solve the problems in the teaching of high school information technology courses, focusing on the cultivation of core literacy of information technology subjects and the actual situation of students' mastery.

3 RESEARCH DESIGN OF THE QUESTIONNAIRE SURVEY

3.1 Selection of research subjects

Based on the current situation of the “3+1+2” model of the new college entrance examination implemented in Hubei Province in 2018, this paper conducted a questionnaire survey on the core literacy of computer courses of students in Middle School A in Wuhan City and Middle Schools B and C in Jingmen City, Hubei Province, and interviewed IT, teachers. Because we wanted to investigate the development of students' IT core literacy at the high school level, this study focused on students who had just graduated from senior high school, that is, students who had just experienced the new college entrance examination. The study aims to analyze in detail the students' mastery of IT core literacy under the new college entrance examination model and to promote the improvement of the IT curriculum in schools by adjusting the IT core literacy development of high school students who have taken and will take the “3+1+2” new college entrance examination. At the same time, we used secondary school A as a reference to drive the implementation of the IT curriculum in secondary schools B and C.

3.2 Design of the survey questionnaire

This questionnaire follows the four components of the core qualities of the IT curriculum in the New Curriculum, namely information awareness, computational thinking, digital learning and innovation, and information social responsibility, so the questionnaire will be designed in four dimensions, and the questions about the four dimensions will be in the form of a Likert scale [7], which are fully met, relatively met, met, relatively not met, and not met at all, corresponding to values of 1, 2, 3, 4, and 5, respectively, and the questionnaire will have four parts according to the rules of the New Higher Education Examination of Hubei Province: the first part will be the introduction of the questionnaire, and the second part will be the basic information of the students, which will be used to understand their gender, grade, chosen subjects, and their purpose and attitude towards the chosen subjects. The third section will ask questions about the four core literacies and the fourth section will be the conclusion.

The questions consisted of 37 questions, with two confusing questions designed to ensure the validity of the data analyzed after the questionnaire was returned, namely, question 12 in the “Computational Thinking” section and question 4 in the “Information Society Responsibility” section. The questionnaire was designed to ensure the validity of the data analyzed during the statistical analysis of the data collected after the survey. The remaining 35 questions included 11 questions on “Information Awareness”, 11 questions on “Computational Thinking”, 7 questions on "Digital Learning and Innovation", and 6 questions on “Information Society Responsibility”. The remaining 35 questions included 11 on “information awareness”, 11 on “computational thinking”, 7 on “digital learning and innovation” and 6 on “information society responsibility”. As shown in Figure 1.

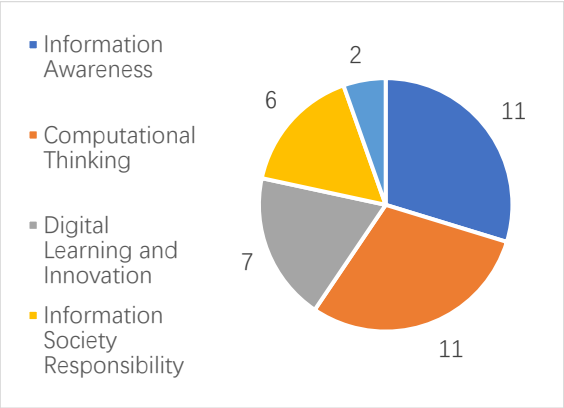

Figure 1: Title Composition

4 STATISTICS AND ANALYSIS OF THE RESULTS OF THE QUESTIONNAIRE SURVEY

4.1 Distribution and collection of questionnaires

The questionnaire was prepared and distributed by questionnaire star, because considering the heavy academic load of high school students, and not many students have cell phones, and the school also has a rule that cell phones are not allowed to be brought into the campus, because of the above two reasons, the freshman and sophomore students will be asked by the IT teacher to distribute the questionnaire link to the students through the computer in the computer room during the IT class, and the senior students who have graduated will be sent the questionnaire link by the class teacher in The questionnaire QR code and link will be sent by class teachers in QQ group and WeChat group. The teachers' interviews were conducted through WeChat, and the teachers sent back the questions after answering them according to their free time.

A total of 203 questionnaires were distributed, and 189 valid questionnaires were collected. 14 of the questionnaires were screened for missing answers or confusing questions (the questionnaire set the confusing questions “I can fully grasp the content of the teacher's lecture” and “The content of the teacher's lecture is obscure and difficult to understand” The questionnaires were not valid because the answers to the two questions were the same. The recovery rate of this questionnaire reached 93.1%. The questionnaire was divided into two groups according to subject preference, in which 96 students (51%) preferred the subject of physics and 93 students (49%) preferred the subject of history.

4.2 Reliability and validity of the questionnaire

4.2.1 Reliability analysis

Reliability analysis is to analyze the reliability of the questionnaire. The reliability analysis using SPSS25.0 measured the reliability value Alpha coefficient of 0.968 (Table 1), when the Alpha value is greater than 0.9, it means that this questionnaire has high internal consistency.

Table 1: Reliability statistics of the questionnaire

Clonbach Alpha	Number of items
.968	189

The Cronbach Alpha coefficient is 0.968, which indicates that the reliability of the questionnaire is more accurate. When the validity test (Table 2) is further conducted for each dimension, the Cronbach Alpha coefficient of information awareness is 0.91, the coefficient of computational thinking is 0.956, the coefficient of digital learning and innovation is 0.853, and the coefficient of information social responsibility is 0.829, which shows that the and computational thinking dimensions are more significant in terms of reliability. The Alpha coefficient of Clonbach did not increase after deleting one of the questions, which indicates that the design of the questions of the four dimensions is reasonable, and further indicates that the questions of this questionnaire are valid, and a valid questionnaire is a prerequisite for the validity testing of the questionnaire.

Table 2: Reliability statistics of each dimension

Dimension	Cronbach Alpha	Number of items
Information awareness	.910	11
Computational thinking	.956	12
Digital learning and innovation	.853	7
Information social responsibility	.829	7

4.2.2 Validity analysis

Using the analysis in SPSS, if the KMO value is greater than 0.8 it indicates high validity, if the KMO value is 0.6-0.8 it indicates acceptable validity, and if it is lower than 0.6 it indicates invalid validity. The validity of this questionnaire was measured as 0.796 KMO

(shown in Table 3), which is in the range of 0.6-0.8, indicating acceptable validity.

Table 3: Questionnaire KMO and Bartlett's test

KMO sampling adequacy measure		0.796
Bartlett's test of sphericity	Approximate chi-square	2424.776
	Degree of freedom	666
	Significance	.000

4.3 Analysis of high school students' IT core literacy results

Since this questionnaire is divided into four dimensions for the survey, the total number of questions adds up to 37 questions. Due to the limitation of space, this paper will analyze 2 questions from each of the four dimensions that can best reflect the problems in the process of developing the core literacy of high school students in information technology subjects.

4.3.1 Information Awareness

In the dimension of information awareness, the first question "I can find a lot of useful information in my daily life" and the seventh question "When doing exercises, I used to consider the intention of the questioner" were selected for analysis.

Table 4: Information Awareness Question 1

	Percentage
Completely met	13.6
Quite satisfied	51.5
Met	24.2
Relatively unconforming	9.1
Not at all	1.5

Table 5: Information Awareness Question 7

	Percentage
Completely met	18.2
Quite satisfied	37.9
Met	18.2
Relatively unconforming	16.7
Not at all	1.5

As shown in Table 4, 10.6% of the students thought they could not find useful information from daily life, indicating that there is still room for improvement in finding useful information among high school students. As shown in Table 5, 18.2% of the students did not consider or even did not consider the questioner's intention at all, indicating that the depth of thinking and digging for information also needs to be improved.

4.3.2 Computational thinking

In the dimension of computational thinking, the sixth question "I can transfer the process of using information technology to solve problems to other related problems" and the eighth question "I can plan my schedule reasonably in the process of using information technology to complete tasks" were selected.

Table 6: Computational Thinking Question 6

	Percentage
Completely met	15.2
Quite satisfied	37.9
Met	30.3
Relatively unconforming	12.1
Not at all	4.5

Table 7: Computational Thinking Question 8

	Percentage
Completely met	12.1
Quite satisfied	30.3
Met	31.8
Relatively unconforming	18.2
Not at all	7.6

As shown in Table 6, 16.6% of students indicated that they were unable to transfer the IT problem-solving process to other problems, indicating that students are unable to transfer knowledge acquired in computational thinking and need to strengthen their ability to transfer knowledge. As shown in Table 7, up to 25.8% of the students indicated that they use IT less or even not to use it to plan their schedules rationally. In this era of information technology explosion, using tools to plan and improve one's schedule is a skill we all must master, and nearly a quarter of the high school students cannot use this, which shows that there is an obvious deficiency in computational thinking, and there is a greater need to train students in computational thinking.

4.3.3 Digital Learning and Innovation

In the dimension of digital learning and innovation, the sixth question was "My school often conducts information technology activities or competitions.

(various information technology clubs, Olympiads, maker competitions, robotics competitions, etc.)"and the seventh question "In IT classes, I can usually create excellent works according to the corresponding learning tasks".

Table 8: Digital Learning and Innovation Question 6

	Percentage
Completely met	16.7
Quite satisfied	31.8
Met	20.2
Relatively unconforming	24.2
Not at all	7.1

Table 9: Digital Learning and Innovation Question 7

	Percentage
Completely met	9.1
Quite satisfied	47.0
Met	21.2
Relatively unconforming	18.5
Not at all	4.2

As shown in Table 8, 48.5% of the students said that their schools often carry out informatization activities or competitions, and most of these students belong to A high school, while B and C high school students have few or no activities and competitions about informatization, which means that schools do not pay attention to the digital learning and innovation cultivation of information technology, and neglect students for This indicates that the schools do not pay attention to digital learning and innovation in IT, and neglect the training of students in digital learning and innovation. As shown in Table 9, 22.7% of the students said that they could not keep up with the learning progress and could not create excellent works according to the corresponding learning tasks. According to the survey, there is a big gap between the hardware of different computer rooms in each school, so the school should allocate the corresponding equipment in the digital learning and innovation training for students.

4.3.4 Information society responsibility

In the dimension of information society responsibility, the second question is "I can correctly understand the relationship between social identity and virtual reality identity, and reasonably use my virtual social identity to carry out information activities" and the sixth question is "I know how to use legal means to solve problems against bad information behavior". The second question was "I can correctly understand the relationship between the realization of social identity and virtual reality identity, and reasonably use virtual social identity to carry out information activities".

Table 10: Information Social Responsibility Question 2

	Percentage
Completely met	21.2
Quite satisfied	48.5
Met	21.2
Relatively unconforming	7.6
Not at all	1.5

Table 11: Information Society Responsibility Question 6

	Percentage
Completely met	27.3
Quite satisfied	42.4
Met	18.2
Relatively unconforming	9.1
Not at all	3.0

As shown in Table 11, 12.1% of the students did not know how to solve their problems by legal means. Although most of the students can solve their problems by legal means, the school should not take it lightly and should still increase the cultivation of legal awareness. As shown in Table 10, 9.1% of the students were unable to correctly understand the relationship between the realization of social identity and virtual reality identity. Therefore, it is found that the majority of students can correctly understand the relationship between the realization of social identity and virtual reality identity, and can reasonably use their virtual social identity to carry out information activities. There is a certain awareness of protection of personal privacy.

5 CONCLUSION

This research study focuses on the four dimensions of the core literacy of information technology subjects in high school and takes a high school in Wuhan and two high schools in Jingmen as the subjects of the study with some graduates who will be sophomores and juniors and just finished the college entrance examination. To ensure the accuracy of the survey, the interview method was used in addition to the questionnaire survey of students. Interviews were conducted with front-line IT teachers in Wuhan to make the results of this survey more objective. The results of this survey of high school students' IT subject core literacy showed that the survey respondents in Wuhan were slightly higher overall than those in Jingmen, but overall at an intermediate level. The basic

information awareness and information social responsibility levels of high school students in Wuhan are slightly higher than the other two core literacies, and the re-information social responsibility levels of high school students in Jingmen are slightly higher than the other three core literacies. Although the test levels in Wuhan are better than those in Jingmen, it still indicates that each high school should pay attention to the cultivation of core literacy in IT subjects. Through research studies with students and interviews with teachers, the reasons that have a greater impact on the development of core literacy in IT subjects in high schools are summarized and suggestions are made for their improvement:

(1) The integration of online materials and offline books in the development of information awareness is not high, and a combination of textbooks and digital materials should be used for teaching;

(2) The traditional classroom in computational thinking cannot meet the needs of daily teaching, exploring new models for teaching, and integrating computational thinking into other disciplines;

(3) Digital learning and innovation literacy: Schools should improve hardware equipment and conduct various digital competitions, as well as increase training for teachers to improve students' innovation skills;

(4) Information society responsibility literacy: hold lectures on information security, organize class discussions, increase the number of teacher-student exchanges, and explore various ways to cultivate information society responsibility literacy among high school students;

ACKNOWLEDGEMENTS

This project is supported by the Hubei Normal University Curriculum Civics Teaching Reform Research Project 2021YJSKCSZY05.

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