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The Influence of Computer Information Activities of Middle School Students on Reading Literacy Based on Interactive Behavior Theory

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Abstract

Based on the survey data of 103 middle schools in the western China, this paper empirically studies the role of computer information activities and their influencing factors in reading literacy. Research and analysis found that computer information activities are predicting students' reading literacy, and the urban-rural school type has an adjustment effect on the computer information-reading literacy path. Basic computer skills have a positive predictive effect on reading literacy, and regulate the influence of computer information activities on reading literacy. Advanced computer skills have a negative predictive effect on reading literacy. The mechanism of computer information activity on reading literacy is its use as a cognitive tool to promote the deepening of students' knowledge construction and cognition. This requires ensuring the coordinated efforts to advance the urban and rural integration in education and informatization, creating independent and cooperative information learning activities to enhance students' information literacy, providing information technology courses based on cognitive science to improve students' computer skills, clarifying the goal orientation of programming education, taking into account both computational thinking and humanistic qualities.

Keywords

Computer Information Activities, Computer Skills, Reading Literacy, Programming Education

1. Introduction

As information technology use continues its steady growth among middle school students, its effect on academic performance becomes an increasingly important

question to address. However, study conclusions of information technology use on students' academic performance are quite different. Some researchers have found that information technology use is associated with higher grades (Dalton, Hannafin, & Hooper, 1989; Subrahmanyam, Kraut, Greenfield, & Gross, 2000; O'Dwyer, Russell, Bebell, & Tucker-Seeley, 2005; Casey, Layte, Lyons, & Silles, 2012), while others have found little to no effects on academic performance (Angrist & Lavy, 2002; Hunley et al., 2005; OECD, 2015), and even some researchers have found a negative effect on academic performance (Malamud & Pop-Eleches, 2011; Belo, Ferreira, & Telang, 2014; Vigdor, Ladd, & Martinez, 2014). Surveying the literature suggests that there is no clear current agreement on the effects of information technology use on academic performance.

The purpose of this study was to focus on the relationship between students' activities of using computer technology to obtain, integrate and exchange information and their reading literacy, with further exploring the moderating effects of related influencing factors on the relationship between them.

With the popularization and application of information technology, computer information activities to achieve autonomous learning and develop interest have become the norm in students' daily lives. For middle school students, reading literacy is the basis for their further learning of knowledge, skills and even lifelong learning in the future. Exploring the effects of student computer information activities and their influencing factors on reading literacy is of great significance for optimizing the use of information technology, improving information technology courses, and giving full play to the positive role of information technology in education.

2. Theoretical Basis and Research Hypothesis

2.1. Theoretical Basis

To further explore the relationship between information technology use and academic performance, education, psychology, society, technology and other factors are included in the analysis of the impact of information technology on academic performance. According to the different centers of causality, influencing factors can be divided into three categories: body center, environmental center and social center. The body center refers to that the center that affects the use of information technology is the individual user, including the individual's gender, age, race (Battle, 1999), cognitive cultural level (Nævdal, 2007), computer preference (Bussière & Gluszynski, 2004: p. 17), and subjective initiative (Wittwer & Senkbeil, 2008). The environmental center refers to the use of information technology is mainly shaped by the environment, including information technology investment (Chen & Gu, 2017), family background (Battle, 1999), places where information technology is used (OECD, 2009), time (OECD, 2006) and technically supported online learning space (Zhang & Qin, 2018), Operating environment (Jonassen, Carr, & Yueh, 1998), etc. The Social Center believes that the essence of information technology to promote academic per-

formance is to promote the social and cognitive development of users. Yan and Fischer's theory of interaction between information technology and human development based on social culturalism and constructivism believes that on the one hand, information technology serves as an information medium and promotes cognitive development by transmitting social culture; on the other hand, information technology is a product of social culture, Learning information technology itself is the internalization of the way of thinking and culture contained in technology (Yan & Fischer, 2004). Existing studies have shown that the mechanism of information technology on student performance is complex, affected by many factors, and there is no center of causality. Therefore, It is an innovative idea to explore the influence of computer information technology on students' academic performance, from the perspective of non-centrism or contextual interaction theory.

The interactive behavior theory created by Kanter is a typical representative of non-centrism. The theory believes that the interaction between the individual and the world constitutes the place of psychological events, and a series of interdependent events constitute the interactive behavior field. Psychological events are composed of five components: stimulus function, response function, background factor, contact medium and interaction history (Smith, 2001: p. 248). The stimulus function is the meaning or function of the stimulus as the "object" of the reaction in a specific situation; the reaction function is the functional feature of the body's response activity to the stimulus. Corresponding to computer information activities, the stimulus function is the function of the information technology system, and the response function is the purposeful response of the user to the different functions of the information technology system. Zhu Zhiting (1999) believes that the information technology system is functionally universal in terms of its basic structure level, which is nothing more than supporting the storage, processing and transmission of information. Based on this, the use of information technology to find, process, and exchange information is the basic response function of the body in the interactive behavior field to the information transmitted by the computer Internet as a stimulus. The interactive behavior theory believes that the interaction field between the individual and the object has functions and principles corresponding to its level, and cannot be reduced to any participation condition that constitutes this interaction field (Smith, 2001: p. 283). Therefore, the use of information technology can be regarded as a collection of interactive behaviors based on a specific context, and can be broadly divided into acquisition, processing, and communication of computer information activities according to the nature of the context.

2.2. Research Hypothesis

Based on the cognitive perspective, the essence of reading is the interaction between the reader and the text, and the essence of understanding is that the reader uses existing knowledge and social culture to construct meaning with the help of

text and contextual clues (Dong, 2009). The PISA reading literacy test carried out by the Organization for Economic Cooperation and Development (OECD) focuses on examining students' ability to explain, reflect and evaluate based on their existing knowledge and experience, as well as the social and cultural background of the text. The 2015 PISA survey data shows that moderate web browsing or email use can improve students' reading skills and reading participation. In the use of computer entertainment, text-based entertainment has a more positive impact on digital reading performance than audio and video entertainment (OECD, 2015). Jackson et al. (2006) recorded the computer usage of 130 13-year-old students in the United States for 16 months through the Home Net Too project, including the time and frequency of surfing the Internet, the number of times they visited the web and sent and received e-mail; they used the Michigan Educational Assessment Program to test the students' reading and math scores before, during and after the project. The results of regression analysis show that computer activities such as visiting web pages, sending and receiving emails can positively predict the performance of students in standardized reading tests, but they are not significantly correlated with mathematics scores. Gil-Flores et al. (2012) used PISA data from Spain in 2009 to analyze the impact of different Internet activities on reading ability, and to study the relationship between students' extracurricular Internet activities and PISA digital reading performance. Data analysis found that compared with online social activities, students' online search for information activities are more related to reading performance. It can be inferred from existing research that there is a correlation between students' computer information activities and reading performance. **Research hypothesis 1: computer information activities have a significant impact on reading literacy.**

The background factor in the psychological event may be a feature of the body, or it may be the environment outside the body. The background factors that affect the effects of computer information activities include internal factors such as the student's gender and ethnicity, as well as external factors such as school characteristics and family background. Battle (1999) found that families with high socioeconomic status benefit more from computer use, because parents with high education levels can better guide their children to use computers for learning. Studies have shown that school characteristics have a greater impact on students' reading literacy than family background (Lu, 2012), but there is currently a lack of empirical research on the effects of school characteristics on students' computer use. Under the urban-rural dual structure of China, rural middle schools and urban middle schools present significant characteristics of heterogeneity. Therefore, this study selects urban and rural school indicators as the difference between external background factors in the interactive behavior field, and incorporates other background factors as control variables into the research model, and proposes **Research hypothesis 2: The type of urban-rural schools is a moderating factor that affects the relationship between com-**

puter information activities and reading literacy.

In computer information activities, computer hardware and software systems constitute the contact medium in interactive behavior. It is the premise and foundation for students to master the skills of operating computer software and hardware to carry out information activities smoothly, which in turn affects the interaction between the individual and the stimulus. International Computer and Information Literacy Study (ICILS) proposes that the ability to use computers and software proficiently and effectively is the foundation of computer information literacy (IEA, 2013). It is inferred that students with high computer skills can better use computer information technology to acquire and utilize information resources. **Research hypothesis 3: Computer skills are a moderating factor that affects the relationship between computer information activities and reading literacy.**

The experience of facing a specific thing or situation will affect the individual's subsequent behavior, and the interaction between people and their surrounding environment is interdependent with its history. Corresponding to computer information activities, the history of interaction can be understood as the number of years students have been exposed to computers. An empirical study shows that computer usingyears can effectively predict the self-efficacy of student information and communication (ICT) activities, and it is speculated that computer experience can enhance students' experience of how and when to use computers (Hatlevik, Throndsen, & Gudmundsdottir, 2018). **Research hypothesis 4: computer service life is a moderating factor that affects the relationship between computer information activities and reading literacy.**

3. Research Methods

3.1. Data Source

This study was part of a large research project on junior high school students' quality initiated and funded by the education authorities of 6 districts and counties in western China. The research team was authorized by the Department of Education to conduct the project in 103 junior high schools during 2017. One Grade 9 class was randomly sampled from each school, and finally, 103 participating classes were selected. All students in the sampled class were invited to participate in the research project. After data collection, a total of 5564 valid samples were obtained. The basic sample distribution is shown in **Table 1**.

3.2. Research Tools and Variables

3.2.1. Independent Variable

Computer information activities. ICILS pointed out that to meet the needs of future economic and social development, citizens in the digital age need to use computers for investigation, creation and communication to effectively participate in family, school, work and social life (IEA, 2013). ICILS divides the computer and information literacy of ninth-grade students into two dimensions:

Table 1. Sample distribution.

Variable	Sample classification	Frequency N	Frequency%
Gender	Male	2568	46.15%
	Female	2996	53.85%
Ethnicity	Han	4826	86.74%
	Minorities	738	13.26%
School type	Urban school	1127	22.05%
	Country school	4337	77.95%

searching and managing information, manufacturing and exchanging information. The former refers to the operation of computers, the collection and classification of information by individuals, and belongs to general intelligence; the latter refers to the conversion, creation, sharing and safe use of information by individuals, which belong to higher intelligence (Tan, 2015). The computer information activity questionnaire is selected from the ICILS questionnaire, which is divided into three dimensions of acquisition, processing and exchange of information activities, with a total of 9 items. acquiring information refers to understanding the information needs of a problem or task, and effectively searching for and obtaining the required information from the massive amount of information provided on the Internet. Processing information means that students understand, process and transform information so that it can be clearly presented to others. Information exchange means that students publish and exchange information through communication software, forum websites, etc. The questionnaire uses a 5-point scoring, 1 = "never", 2 = "less than once a month", 3 = "at least once a month, but not every week", 4 = "at least once a week, but not every day", 5 = "every day". Confirmatory factor analysis: x2/df = 4.56; RMSEA = 0.08; CFI = 0.97; TLI = 0.96, Cronbach's alpha of the three dimensions are 0.82, 0.84 and 0.89, indicating that the questionnaire high reliability and validity. The weighted average is used to transform the latent variables of computer information activities into explicit variables.

Types of urban-rural schools. In accordance with the "Division Codes for Statistics and Urban-Rural Divisions" issued by the National Bureau of Statistics in 2017, this study uses the urban-rural category of the district and county where the school is located as the primary proxy variable for the type of urban-rural school. Cities and counties are classified as towns and count as 1, and villages are counted as 0.

Computer using years. This part uses a question in the ICILS questionnaire to measure: How long have you used the computer? Five-point scoring is used: 0.5 = "less than one year", 1 = "at least one year but less than three years", 3 = "at least three years but less than five years", 5 = "at least five years but less than seven years", 7 = "seven years or more".

Computer skills. The computer skills questionnaire is selected from the

ICILS questionnaire, and is divided into basic computer operation skills and advanced computer operation skills according to the "Instruction Outline of Information Technology Courses for Primary and Secondary Schools" issued by the Ministry of Education. The former includes searching for files on a computer, searching for information through the Internet, creating or modifying documents, and word processing skills; the latter includes higher-level computer skills in computer programming and web page production. This part uses 2-point scoring, 1 = "can't do it", 2 = "know how to do it", 2 = "able to do it". The Cronbach's alpha of the two dimensions is 0.82 and 0.86, respectively.

3.2.2. Control Variables

Domestic and foreign studies have shown that the gender and ethnicity of students are the individual characteristic factors that affect reading performance. Therefore, this study converts gender and ethnicity into dummy variables into the regression analysis model: 0 = "female", 1 = "male"; 0 = "Minorities", 1 = "Han".

Family background is one of the important factors affecting students' academic performance. This study refers to the PISA evaluation standard and uses a multi-index comprehensive evaluation method to synthesize parent education, parent occupation and family wealth into family socioeconomic status (SES) (Mo et al., 2018).

3.2.3. Dependent Variable

The participants' Chinese reading literacy was evaluated using the publicly released Chinese version of the Program for International Student Assessment (PISA) exam. Its Chinese version was first applied to 15-year-old children in Shanghai in 2009, and later released online for public use (http://pisa.nutn.edu.tw/sample_tw.htm). PISA examines the reading literacy of students from multiple aspects of cognition, text form and context. The test has 7 units, 22 test questions, and the test time is 60 minutes. Students' reading literacy is calculated using item response theory and converted into standardized scores (z scores) with an average of 500 and a standard deviation of 100.

4. Research Results

4.1. Descriptive Statistics and Correlation Analysis

Descriptive statistics and correlation analysis were performed on the respective variables and dependent variables. The analysis results are shown in **Table 2**. The analysis results show that computer information activities, school types, basic computer skills and computer using years are all significantly positively correlated with reading literacy ($p < 0.001$); advanced computer skills are significantly negatively correlated with reading literacy ($p < 0.001$). The variance expansion factor method was used to diagnose the multiple collinearities of the independent variables. The variance expansion factors were all less than 2, and the tolerance was greater than 0.5, indicating that there was no serious collinearities between the independent variables.

Table 2. Correlation analysis of various variables.

	1	2	3	4	5	6
Mean	2.567	0.747	0.509	2.332	——	521.145
Standard deviation	1.150	0.321	0.377	2.390	——	71.076
Computer information activity	1.000					
Computer basic skills	0.318***	1.000				
Computer advanced skills	0.243***	0.575***	1.000			
Using years	0.257***	0.181***	0.226***	1.000		
Types of urban-rural schools	0.141***	0.128***	0.087***	0.222***	1.000	
Reading literacy	0.100***	0.102***	−0.097***	0.045***	0.190***	1.000

Note: ***means $P < 0.001$; **means $P < 0.01$; *means $P < 0.05$.

4.2. Regression Analysis

4.2.1. Analysis of the Influence of Computer Information Activities on Reading Literacy and the Moderating Effect of Urban-Rural School Types

Before data analysis, standardize the independent variables and moderator variables, and then multiply the obtained Z scores as interaction terms. Using a hierarchical linear regression method, first analyze the influence of computer information activities on reading literacy after controlling gender, ethnicity, and family socioeconomic status. Secondly, analyze the main effects and interaction effects of urban-rural school types, and incorporate other moderating variables into the model as control variables. The analysis results are shown in **Table 3**. The results of model 1 regression analysis showed that computer information activities had a significant positive impact on reading literacy (B = 5.407, $p < 0.001$), which verified research hypothesis 1. The results of the regression analysis of Model 2 showed that the main effect of urban and rural school types was 33.79 ($p < 0.001$); the interaction term between computer information activities and urban and rural school types significantly predicted reading literacy (B = 6.636, $p < 0.001$). The analysis results show that the types of urban-rural schools regulate the relationship between computer information activities and reading literacy, verifying research hypothesis 2.

To further clarify the essence of the moderating effect of urban-rural school types, based on the data type where the moderating variable is dichotomous, a simple slope test is performed using group regression (point selection method) (Fang et al., 2015). The analysis results show that when the computer information activities of rural students increase, their reading literacy shows a significant upward trend (B = 2.346, $p < 0.001$). For every additional unit of computer information activities, reading literacy will increase by 2.35 points. When the computer information activities of urban students increase, their reading literacy also shows a significant upward trend (B = 4.820, $p < 0.001$). For every additional unit of computer information activities, reading literacy would increase by 4.82 points. In other words, urban students benefit more from computer information activities.

Table 3. Analysis of the influence of computer information activities on reading literacy and the moderating effect of urban and rural school types.

Mean	Model 1		Model 2	
	B	SE	B	SE
Gender	−13.370***	1.903	−13.353***	1.904
Ethnicity	16.138***	2.792	15.939***	2.797
Family socioeconomic status	10.099***	1.243	5.665***	1.402
Computer information activity (CIA)	5.407***	1.235	2.369*	1.150
Types of urban-rural schools			33.785	2.524
CIA *Types of Urban-Rural Schools			6.636**	2.393
Computer basic skills			15.324***	1.220
Computer advanced skills			−17.420***	1.19
Using years			1.751	1.03
R2	0.041***		0.121***	
F	48.15		52.18	

Note: ***means $P < 0.001$; **means $P < 0.01$; *means $P < 0.05$.

4.2.2. Analysis of the Moderating Effect of Computer Skills and Computer Using Years

First, analyze the main effects of computer skills and their interaction effects, and incorporate other moderating variables into the model as control variables. The analysis results are shown in Table 4. The results of the regression analysis of Model 3 show that the main effects of basic computer skills and advanced computer skills are 18.38 ($p < 0.001$) and −17.45 ($p < 0.001$); the interaction term of computer information activities and basic computer skills predicts reading literacy significantly (B = 6.580, $p < 0.001$), the interaction terms with advanced computer skills did not significantly predict reading literacy (B = 1.779, $p > 0.01$). The analysis results show that basic computer skills regulate the relationship between computer information activities and reading literacy, while advanced computer skills fail to regulate the relationship between computer information activities and reading literacy. Hypothesis 3 is verified.

Secondly, analyze the main effects of the computer using years and their interaction effects, and incorporate other moderating variables into the model as control variables. The analysis results are shown in Table 4. The regression analysis results of Model 4 showed that the main effect of computer using years was 1.60 ($p > 0.001$), and the interaction term between computer information activities and computer using years did not significantly predict reading literacy (B = 2.710, $p > 0.01$). The analysis results show that computer using years fails to adjust the relationship between computer information activities and reading literacy. Hypothesis 4 is verified.

Table 4. Analysis of the moderating effect of computer skills and computer using years.

Variable	Model 3		Model 4	
	B	SE	B	SE
Gender	−13.8821***	1.914	−12.1143***	1.9206
Ethnicity	15.6237***	2.783	14.9642***	2.7718
Family socioeconomic status	8.4694***	1.571	8.2421***	1.5872
Types of urban-rural schools	34.085***	2.453	34.575***	2.472
Computer information activity (CIA)	3.199**	1.035	3.685***	1.038
Computer basic skills	18.384***	1.275	15.591***	1.224
Computer advanced skills	−17.450***	1.190	−17.423***	1.193
Using years	2.091*	1.019	1.604	1.560
CIA *Basic skills	6.580***	1.230		
CIA *Advanced skills	1.779	1.218		
CIA * using years			2.710*	1.214
R2	0.132***		0.122***	
F	51.55		53.21	

Note: ***means $P < 0.001$; **means $P < 0.01$; *means $P < 0.05$.

5. Discussion

5.1. The Direct Effect of Computer Information Activities on Reading Literacy

According to the theory of distributed cognition, cognition not only exists in the cognition individual, but is also distributed among factors such as individuals, cognitive objects, cognitive media, and cognitive situations. It is the interactive process of various elements participating in cognitive processing (Zhou & Fu, 2002). In the process of students using computers to find and process information, computers as a cognitive tool play an auxiliary and supportive role in the cognitive process of students, prompting students to examine the problems they are facing, reorganize the existing knowledge system, and classify, integrate and present the acquired information. When students use computers as a communication tool, they recognize the differences in their cognition in the process of understanding the opinions of others and participating in the creation of a common cognition, and then improve their existing understanding. This process effectively enhances the comprehensiveness and depth of students' understanding of knowledge. Computer information activities promote students' knowledge construction and information processing level to improve reading literacy.

5.2. The Moderating Effect of Urban-Rural School Types

The effect of computer information activities is affected by the adjustment fac-

tors of the types of urban-rural schools. Urban school students benefit more from the process of computer information activities than rural school students. This research result shows that urban school education can improve the effectiveness of students' acquisition, processing and exchange of information from the massive information on the Internet. It may be that urban schools have concentrated more high-quality educational resources. Compared with rural students, urban students have a broader range of knowledge, a deeper understanding of problem, and a stronger level of information integration. This will enable urban students to better identify information needs, and then use computers to find information, identify the true validity of information, incorporate new information into the original cognitive diagram, and effectively expand knowledge construction; integrate and transform information according to a specific purpose to present it to a specific group, and conduct effective communication around a certain issue or topic to enhance mutual understanding. These abilities not only need to be cultivated by opening information technology courses, but also based on the knowledge and cognitive level of students.

5.3. The Moderating Effect of Computer Skills

Basic computer skills regulate the influence of computer information activities on reading literacy, indicating that students with high skills in using computers to acquire and process information have smoother interactions with information technology contact media, and benefit more from the process of using information technology to acquire, process and exchange information. This research result confirms the view of the seven-pillar information literacy model, that computer skills are the basis for information activities (SCONUL, 1999).

5.4. The Direct Effect of Computer Skills on Reading Literacy

For 15-year-old junior high school students, the direct effect of computer skills on reading literacy is inconsistent. Basic computer skills significantly positively predict reading literacy, while advanced computer skills significantly negatively predict reading literacy. The latter is consistent with the research conclusions of Falck and Wittwer, that is, programming and other advanced computer operations have a negative predictive effect on academic performance. Falck et al. (2018) use the perspective of opportunity cost in economics to explain the impact of computer activities on academic performance. He believes that students' activity time is a certain amount. If computer activities are more effective than traditional activities at the same time, it will have a positive impact on academics. On the contrary, it will have a negative effect on studies. Wittwer and Senkbeil (2008) believe that computer skills such as programming only improve students' ability to apply theoretical rules in practice and simple cognitive skills, but do not develop advanced cognitions such as student conceptual understanding. Bunge and Carpenter divide technical knowledge into four types: unconscious sensorimotor skills in the process of using technology; manufacturing and using

rules of technology; generalized descriptive laws based on experience; systematic or scientific-technical theories (Wu, 2008). According to this classification, computer information technology embodies systematic computer science theories, but programming technology is more focused on the rules of technology use, reflecting students' explicit procedural thinking that follows specific procedural representations and symbol systems. Its essence is abstract ability. Reading literacy reflects the ability of students to understand phenomena and knowledge in a specific field by the ability of their existing social and cultural experience. It exists mutual exclusion in intention structure between them. At the same time, advanced computer skills are reflections of students' computing thinking. In this field of interaction, stimuli are symbols with abstract meanings such as defined patterns and generalized parameters, which are different from the social phenomena and knowledge represented by words. Basic computer skills emphasize general knowledge of descriptive laws, which reflects the students' ability to understand, analyze and evaluate digital social symbols. Therefore, it is positively related to reading literacy.

6. Recommendation and Suggestions

6.1. Ensure Coordinated Advancement between Urban-Rural Education Balanced Development and Educational Information Construction

In recent years, breakthroughs have been made in the work of education informatization with the "three links and two platforms" as the main symbol. The school network teaching environment has been greatly improved. However, this study found that the benefits of students in computer information activities are different due to the differences in education levels between urban and rural schools. This shows that the quality of teaching and education informatization are two types of factors that influence each other: Information technology realizes the sharing of high-quality educational resources and promotes the quality of education through innovative education and teaching; high-quality education can in turn promote students to make better use of information technology to achieve their development. Therefore, the government education department should coordinate school information construction with the balanced development of urban-rural education, to promote education fairness from a higher level and improve the quality of education.

6.2. Increase Empirical Research on Education Informatization and Offer Information Technology Courses Based On the Results of the Research

The ways, methods and functions of information technology to improve students' academic performance and promote educational equity need to be further explored. However, researches have shown that the influence of students' computer Internet use on academic performance is complex and inconsistent, and is

affected by many factors. Therefore, it is necessary to increase the research and analysis of informatization education, innovate informatization education and teaching methods based on the results of empirical research, and scientifically develop information technology-related courses. The results of this study show that students' computer information activities significantly improve students' reading literacy. Therefore, teachers should increase the activities of students using information technology to acquire, process, and exchange information, expand knowledge construction, and enhance high-level thinking skills such as integration, generalization, criticism, and reflection. This study also found that basic computer skills can not only positively predict reading literacy, but also promote the benefits of computer information activities. Therefore, schools and teachers should raise their awareness of the importance of information technology education, and strictly follow the provisions of the "Information Technology Curriculum Guidelines for Primary and Secondary Schools" to provide computer information technology courses to ensure the number of class hours and improve the quality of the courses.

6.3. Clarify the Goal Orientation OF Programming Education, Taking into Account both Computing Thinking and Humanistic Literacy

The "Education Informatization 2.0 Action Plan" proposes to improve the information technology curriculum plan and curriculum standards, and enrich the artificial intelligence and programming curriculum content that meets the development needs of the information age and the intelligent age. This is a requirement for education in the era of artificial intelligence, but this research has found that for ninth-grade students, advanced computer skills significantly negatively predict reading literacy. The goal of programming courses in the compulsory education phase should be to cultivate students' computing thinking, understand the operating principles and ways of thinking of artificial intelligence, to better adapt to the artificial intelligence society (Wang et al., 2018), rather than the training of programming skills. Therefore, the junior high school information technology programming course should balance the tension between the intelligent society and the students' psychological cognitive characteristics, and design appropriate course goals, content and forms. Besides, with the advent of the artificial intelligence era, the field of stylization and standardization will be replaced by machines, and the value of human subjective understanding and meaning construction based on social knowledge and experience will be highlighted. Therefore, artificial intelligence education needs to cultivate computational thinking at the explicit level, while taking into account the ultimate qualities of human beings that are different from machines.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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