DIGITAL LITERACY DEVELOPMENT MODEL FOR CHINESE PRIMARY SCHOOL STUDENT

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A thesis submitted in partial fulfillment of the requirements for Doctor of Philosophy Program in Digital Technology Management for Education
Academic Year 2023

Thesis Title Digital Literacy Development Model for Chinese Primary School Student

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ABSTRACT

This study focuses on constructing a digital literacy development model for Chinese primary school student. The research have three specific objectives: First, to analyze the needs of digital literacy for Chinese primary school student. Second, to construct a digital literacy development model for Chinese primary school student. Third, to validate this model. The research method for Objective 1 adopts the literature survey method, and uses the findings to design an interview form, investigates the opinions and suggestions of 21 interviewees, and consults 5 experts for confirmation. Objective 2 uses the Delphi method combined with feedback from 21 experts to establish a graphical model, and Objective 3 involves 9 experts evaluating the model according to the CIPP evaluation principle.

The results revealed that:

The primary challenges in cultivating digital literacy among Chinese primary school student include deficiencies in technical skills, information search and evaluation, digital creativity, digital ethics and social responsibility, and digital security awareness. Opportunities exist in interdisciplinary integration, practical skills, innovative teaching methods, and data literacy and safety education. The eight key influencing factors: Holistic Curriculum, Cross-disciplinary Design, Diverse Methods, Personalized Experience, Cultivate Thinking, Resource Protection, Teacher Development, and Collaborative Participation—are essential in creating a supportive environment for enhancing these fundamental elements.

The Digital Literacy Development Model emphasizes the dynamic interaction between fundamental elements and key influencing factors, ensuring comprehensive

digital literacy development. Each fundamental element strengthens the core digital literacy, which, in turn, reinforces the fundamental components.

Experts unanimously validated the model's effectiveness and feasibility, confirming that it meets the diverse needs of Chinese primary school student and provides a structured framework for enhancing their digital literacy.

Keywords: Digital Literacy Development Model, Digital Literacy of Primary School student, Chinese Primary School student

Acknowledgments

The experience of getting my PhD is a very important part of my life.I'm so grateful for the experience.

I am very grateful to Asst. Prof. Dr. Kanakorn Sawangcharoen for his encouragement and help throughout the process, despite his particularly heavy administrative workload. I extend my sincere gratitude for his guidance and nurturing on my academic path.

I am deeply grateful to Assoc. Prof. Dr. Pong Horadal, who gave me selfless guidance and tolerant evaluation during the whole process of my thesis writing. His help is of great significance to me and will benefit me for life.

My heartfelt thanks go to Assoc. Prof. Dr. Sombat Teekasap, who has been the most significant part of my learning experience in Thailand. Sombat Teekasap truly taught me what it means to love. Although the people I love and those who love me have given me many emotional experiences, the love that Sombat Teekasap embodies, both as a father and a teacher, has shown me the true essence of love.

Through him, I have learned that love is a capability, and I strive to become someone capable of love, to possess the ability to love and make love possible. Sombat Teekasap is knowledgeable and wise, with a superhuman capacity for love. From him, I understand that love is about giving. Persisting in being someone who knows how to give love endows love with value. Sombat Teekasap's generosity and kindness have profoundly illustrated the principle that love is about giving, and those who give love are the happiest. Thank you, my Sombat Teekasap.

Thanks to my family, especially my mother, husband and daughter. I thank my mother for enduring the longing for me and helping me become a person with more choices. I thank my husband for fulfilling his promise of love, supporting me to be myself, and to live freely and confidently. I thank my daughter, whose cheerfulness and ambition inspire me to be a better mother.

Thanks to my institution, Leshan Normal University, for its strong support in my doctoral studies. Heartfelt thanks to my Alma mater, Bansomdejchaopraya Rajabhat University! I wish the university a brighter future!

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Chapter 1

Introduction

Rationale

Digital literacy is an essential skill for navigating the increasingly digital society, where technologies like big data, cloud computing, and AI are reshaping human activities. Adapting to this digital transformation is crucial for maintaining competitiveness and addressing challenges related to data security and privacy. Globally, enhancing digital literacy has become a priority, with initiatives from the European Union, U.S. Department of Education, and China highlighting its importance.

The development of digital literacy among Chinese primary school students faces several challenges, including gaps in technical skills, information search and evaluation, digital creativity, digital ethics, social responsibility, and digital security awareness. The critical factors like interdisciplinary integration, practical skills, and innovative teaching methods have not been sufficiently emphasized, resulting in suboptimal impact. To effectively address these challenges, it is necessary to construct a dedicated Digital Literacy Development Model for Chinese primary school students. This model emphasizes the dynamic interaction between core elements and key influencing factors, ensuring comprehensive digital literacy development.

Research on improving digital literacy among Chinese primary school students is still in its early stages. There is a need for more focused studies to conceptualize, develop, and test models aimed at enhancing digital literacy. Additionally, comprehensive strategies and systematic programs are required to support the digital literacy development of primary school students in China.

Research Question

How to construct an effective digital literacy development model to improve the digital literacy level of Chinese primary school student?

Objectives

1. To analyze the needs of digital literacy for Chinese primary school student.
2. To construct a digital literacy development model for Chinese primary school student.
3. To validate the digital literacy development model for Chinese primary school student.

Scope of the Research

Content(s)

The objective of this research is to construct a digital literacy development model for Chinese primary school student, aiming to develop their digital literacy. The entire research process comprises three steps: Step 1, To analyze the needs of digital literacy for Chinese primary school student. Step 2, To construct a digital literacy development model for Chinese primary school student. Step 3, To validate the digital literacy development model for Chinese primary school student.

The Variable

Fundamental elements variables for the digital literacy development model for Chinese primary school student

Through literature review, relevant international organizations, representative countries, and scholars commonly agree that there are five main variables in the digital literacy Demands of Chinese primary school student: Weak technical skills and operational ability, Weak ability in information search and evaluation, Weak awareness of digital ethics and social responsibility, and Weak awareness of digital security.

Opportunity variables variables for the digital literacy development model for Chinese primary school student

Through literature review, Emphasizing interdisciplinary integration is a current trend in developing digital literacy in primary student. Focusing on practical operational skills is a trend in developing digital literacy in primary student. Prioritizing innovative teaching methods is a current trend in the development of digital literacy in primary student. Emphasizing the cultivation of awareness and thinking training is the current trend in developing digital literacy in primary school

student. Conducting digital ethics and digital responsibility education is the current trend in developing digital literacy in primary school student. Focusing on digital safety education is a trend in developing digital literacy in primary student. Emphasizing personalized learning is a current trend in the development of digital literacy in primary student. Undertaking multi-faceted collaboration and partnerships is a current trend in enhancing digital literacy in primary education.

key influencing factors Variables for the digital literacy development model for Chinese primary school student

Through literature review, Comprehensive curriculum design, interdisciplinary teaching approaches, offering diversified teaching methods, providing personalized teaching experiences, strengthening consciousness cultivation and thinking training, resource assurance and environment construction, teacher training to promote professional development, multi-party collaboration, and social participation.

Location: China

Time: Research period for this study: August 2023 to June 2024

Advantages

1. This study focuses on the digital literacy of primary school student as its research subject, analyzing the Demands for the development of digital literacy among Chinese primary student. It explores the trends and opportunities in the development of digital literacy among primary student and identifies key factors that influence the development of digital literacy among Chinese primary student.

2. The study constructs and validates a model for enhancing the digital literacy of Chinese primary school student, providing a scientific and effective development plan for the digital literacy of Chinese primary student.

3. This research can offer decision-making references for the development of digital literacy among primary student. It can promote the establishment of a digital literacy cultivation team involving society, schools, and families in a collaborative effort. It can integrate with the digital literacy education for citizens at various stages to form a systematic and comprehensive system, where the cultivation of digital literacy at each stage mutually promotes and collectively develops.

Definition of Terms

Digital Literacy: The ability to effectively and critically navigate, evaluate, and create information using a range of digital technologies. This involves a variety of competencies, including technical skills, information search and evaluation ability, digital creativity, digital ethics and social responsibility, and digital security awareness. Digital literacy is crucial for the development of primary school student, encompassing a range of skills necessary for effective participation in a digitally connected world (Audrin & Audrin, 2022). Developing these skills can help narrow the digital literacy skills gap (Reddy, Chaudhary, & Hussein, 2023).

Chinese Primary School student: Chinese primary School student: Refer to children who receive primary education in China. According to China's education system, primary education typically targets children between the ages of 6 and 12 and represents the first phase of compulsory education. The primary stage is crucial for the growth and development of children. In China, primary education focuses on the holistic development of student, emphasizing a comprehensive educational philosophy that develops morality, intelligence, physique, and aesthetics. With the advancement of society and technology, digital literacy education is also gradually integrated into the primary education system.

Digital Literacy of Chinese primary School student: The digital literacy of Chinese primary school student describes their abilities and competencies in acquiring, evaluating, and applying information within a digital environment. This includes the abilities and awareness of Chinese primary school student in technical skills ability, information search and evaluation ability, digital creativity ability, digital ethics and social responsibility, and digital security awareness.

Technical Skills Ability: refers to the fundamental proficiency of primary school student in using digital tools and technologies, including basic operations, troubleshooting, and effective application of software and hardware to enhance learning and problem-solving. The development of these skills is crucial for student to thrive in the digital age (Dimitrova, 2020), emphasizing the urgency of integrating these competencies into educational frameworks (Yuniawatika & Kurniawan, 2018).

Information Search and Evaluation Ability: refers to the capability of primary school student to efficiently locate digital information, critically assess its credibility, and determine its relevance, which is fundamental for their academic success and personal growth (Aini & Nuro, 2023; Lai & Sun, 2022).

Digital Creativity Ability: refers to primary school student's use of digital tools to create content, solve problems, and express ideas creatively, including activities like digital storytelling and multimedia production (Lazić, Pongrac Pavlina, & Belovic, 2017). Effective digital literacy among teachers and student is crucial for this integration (Naila, Ridlwan, & Haq, 2021), supported by school-based digital literacy strategies (Desi, 2020).

Digital Ethics and Social Responsibility: refer to principles guiding primary school student's ethical use of digital tools, including online privacy, intellectual property respect (Andayani, Harapan, & Tahrun, 2021), character education (Sugiarto & Farid, 2023), and home variables affecting digital literacy (Park & Park, 2023).

Digital Security Awareness: refers to the understanding and practices necessary for primary school student to protect their personal information and online activities, including recognizing online threats and using secure passwords. This term encompasses the role of digital literacy and data security in mitigating online privacy concerns (Mustafa, Durak, Özüdogru, & Uslu, 2024), the influence of digital parenting and literacy on security awareness (Akman, Idil, & Çakır, 2023), and the importance of understanding digital footprints and cyberbullying risks (Subaşı, Korkmaz, & Çakır, 2023).

Delphi Method: The Delphi method is an important predictive research technique that involves soliciting opinions anonymously from experts who are representative and authoritative in their respective fields. It entails multiple rounds of soliciting expert opinions on the issues or questions to be forecasted, through an iterative process of consultation, induction, and modification, until a consensus is reached among the experts. In this study, the Delphi method is utilized to solicit expert opinions over several rounds to construct a model for enhancing the digital literacy of Chinese primary school student, forming more reliable conclusions and building a more scientific model, thus achieving the core objectives of this research.

CIPP Evaluation Model: The CIPP evaluation model is a comprehensive evaluation method widely used in the field of education, proposed by Stufflebeam. It encompasses four elements: Context, Input, Process, and Product. The fundamental premise of the CIPP evaluation model is that the most important purpose of evaluation is not to prove, but to improve. Taking into account the real and societal Demands, the CIPP evaluation model considers the selection and rationality of evaluation objectives, making them more aligned with societal Demands and realities. The CIPP evaluation model is integrated throughout the research process, turning evaluation into an effective tool for continuous improvement. In this study, the CIPP evaluation model provides a theoretical framework for evaluating the development model of digital literacy among Chinese primary school student.

Research Framework

Research on the Development Model of Digital Literacy for Chinese primary School student. The research framework is shown in Table 1.1.

Table 1.1 Objective Framework

Objective	Input	Process	Evaluation	Output
Analyze the needs for the development of digital literacy for Chinese primary school student	1. Analyze 5 fundamental elements and 8 key influencing factors 2. Expert Survey (21 Experts) Expert Evaluation (5 Experts)	1. Literature Review 2. Comprehensive research and analysis 3. Interviews/surveys with the experts	Identification of the fundamental elements and key influencing factors of digital literacy development for Chinese school student	Detailed report on identified needs of digital literacy development for Chinese school student
Construct a digital literacy development model for Chinese primary school student	1. Proposed solutions from Objective 1 2. Best practices for digital literacy development model for Chinese primary school student	1. Work with experts to design workshops. 2. Iterative model development and refinements Propose a model Experts adjust the construct model (Deploy Delphi method with 21 Experts)	Feedback on model's comprehensive ness and relevance	Construct a digital literacy development model for Chinese primary school student
Validate the model	Optimize the model based on Objective 2 2. for training and implementation	1. Continuous monitoring & feedback collection. 2. Adjustments based on feedback	1. Feedback from the experts 2. Evaluate effectiveness, etc.	Refined and finalized online learning evaluation model

The above target framework can be explained by Figure 1.1 Research Framework.

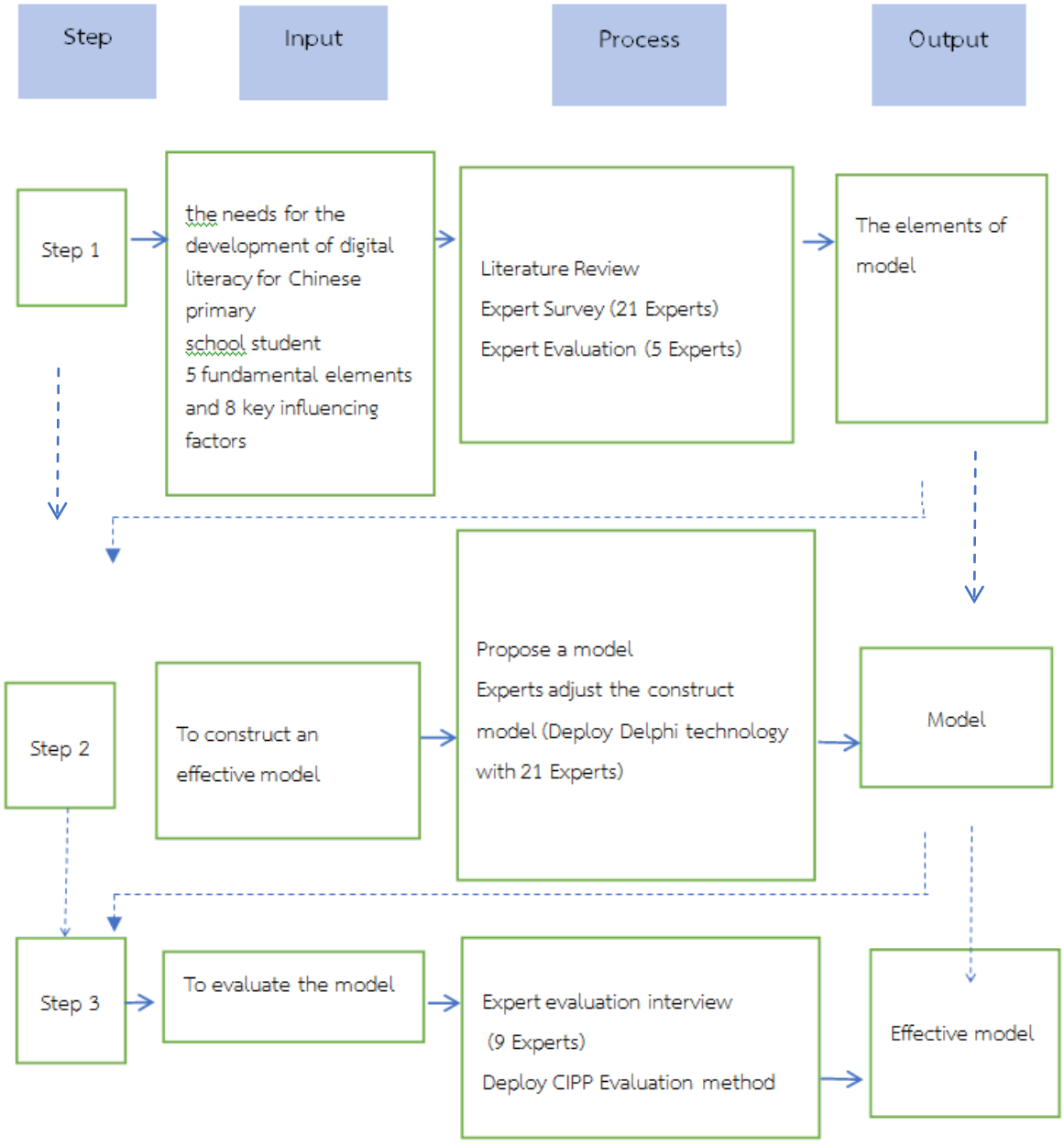


Figure 1.1 Research Framework

Chapter 2
Literature Review

This literature review organizes and analyzes the existing viewpoints and conclusions from numerous studies related to the construction of a digital literacy development model for Chinese primary school student. It helps to further clarify the scope and significance of the research questions, accumulates experience for the subsequent model construction, and provides a solid theoretical foundation for this study. The content of this literature review is as follows:

1. Fundamental elements of the digital literacy development model for Chinese primary school student

2. Opportunities of the digital literacy development model for Chinese primary school student

3. key influencing factors of the digital literacy development model for Chinese primary school student

4. The Theory of Designing a digital literacy development model for Chinese primary school student

5. Construct and evaluation methods for the digital literacy development model for Chinese primary school student

Fundamental elements of the digital literacy development model for Chinese primary school student

Chinese primary school student face several significant challenges in developing digital literacy. First, there are deficiencies in technical skills, with many student struggling with basic technical operations, which hinders their overall digital literacy development. Second, student often lack effective information search and evaluation abilities, which are crucial for discerning credible sources in the vast digital landscape. Third, there is a noticeable gap in digital creativity, as the current educational focus does not adequately equip student with problem-solving skills necessary for creative thinking in digital contexts. Fourth, there is insufficient emphasis on digital ethics and social responsibility, leaving student unprepared to handle online ethical dilemmas. Finally, a lack of digital security awareness among

student highlights the need for educational reforms to better prepare them for safe online interactions. Addressing these issues requires a multifaceted approach that integrates structured frameworks and practical strategies into the education system.

Weak Technical Skills Ability

Develop basic technical skills

The weakness in basic technical skills, a critical component of Technical Skills Ability, significantly impedes the digital literacy of Chinese primary school student (Salganova & Osipova, 2023). This deficiency often results from inadequate access to technology and insufficient training in fundamental digital operations (Audrin & Audrin, 2022), highlighting the need for comprehensive educational reforms to enhance these essential skills (Nangimah & Dharin, 2023).

Integrate the teaching of technical skills into the teaching of all subjects

The weakness in technical skills ability, a fundamental element of digital literacy for Chinese primary school student, is evident in the lack of integration of technical skills into the teaching of all subjects. This deficiency is primarily due to inadequate curriculum design, which fails to embed essential digital competencies across various disciplines. Studies indicate that teachers often lack the necessary digital literacy skills themselves, which hampers effective instruction (Suwarjo et al., 2022). Furthermore, the digital literacy skills of student, particularly in online learning environments, are insufficiently developed, highlighting the need for better educational frameworks and resources (Atmojo et al., 2021).

Conduct teacher training to promote professional development

The lack of teacher training for professional development has resulted in weak technical skills, a fundamental element of digital literacy for Chinese primary school student. Without proper training, teachers struggle to integrate essential digital competencies into their teaching, impeding the development of student' digital literacy. According to Jung, Choi, and Fanguy (2024), teachers' digital literacy experiences significantly influence their ability to effectively use technology in the classroom. Similarly, Marnita, Nurdin, and Prihatin (2023) found that enhancing teachers' digital literacy competence improves their overall learning management capabilities, which is crucial for fostering student' digital literacy.

Develop student's ability to adapt to future technological developments

The lack of developing student' ability to adapt to future technological developments reflects a weakness in the fundamental element of Technical Skills Ability, crucial for Chinese primary school student' digital literacy. This deficiency stems from limited access to advanced technology and insufficient teacher training, hindering student' preparedness for a rapidly evolving digital landscape. Research highlights the need for cognitive flexibility to enhance digital literacy fluency (Caton, Bradshaw-Wardis, Kinshuk, & Savenye, 2022). Moreover, sense-making of digital literacy is essential for future education (Achmad & Utami, 2023).

Multi-party collaboration and community participation

The lack of multi-party collaboration and community participation highlights the weakness in technical skills among Chinese primary school student. These collaborative and participatory elements are essential for enhancing technical skills, fostering practical application, and integrating diverse perspectives and resources, thus supporting the holistic development of digital literacy. Studies show that systematic reviews on digital literacy emphasize the need for improved collaborative practices (Smart Learning Environments, 2021). Additionally, assessments of student' digital competences underscore the importance of community involvement in developing these skills (Education and Information Technologies, 2021). Furthermore, research on augmented reality creation reveals the benefits of practical application and diverse perspectives for developing digital literacy in student (Hsu, Zou, & Hughes, 2018).

Weak Information Search and Evaluation Ability

Supported by diverse educational methods and resources

The lack of support through diverse educational methods and resources weakens Chinese primary school student' Information Search and Evaluation Ability. Laily and Binasdevi (2023) highlight that blended learning can enhance digital literacy skills, but without proper implementation, student miss critical learning opportunities. Similarly, Hamidah, Setiawan, and Mirnawati (2023) emphasize the importance of interactive media in strengthening digital literacy. This deficiency limits their exposure to various search techniques and critical evaluation practices, impeding their ability to effectively locate and assess digital information.

Cultivate student's efficient information retrieval skills

The lack of cultivating student' efficient information retrieval skills significantly weakens Chinese primary school student' Information Search and Evaluation Ability. This deficiency hampers their proficiency in navigating digital resources and critically evaluating information, thereby impeding the development of their overall digital literacy and Technical Skills Ability. Didmanidze et al. (2023) highlight the importance of technological competence through digital educational activities. Additionally, Murtadho et al. (2023) emphasize the role of digital literacy in enhancing student' competencies in the digital era. These studies underscore the need for improved digital literacy education to address current deficiencies.

Improve student' ability to evaluate information

The lack of improvement in student' ability to evaluate information signifies a weakness in the fundamental element of Information Search and Evaluation Ability among Chinese primary school student. This issue arises from insufficient training in critical thinking, limited access to diverse information sources, and inadequate integration of evaluation skills into the curriculum. According to Zamista and Azmi (2023), enhancing student digital literacy through digital learning processes can address some of these challenges. Furthermore, Pan et al. (2023) highlight that web-based inquiry learning modes, supported by collaborative digital reading annotation systems, can significantly improve information literacy learning effectiveness and technology acceptance.

Carry out teacher training to promote professional development

The lack of teacher training to promote professional development weakens the Information Search and Evaluation Ability, a fundamental element of digital literacy for Chinese primary school student. Insufficient teacher training hinders the effective teaching of critical evaluation skills, leading to student' limited ability to assess and utilize diverse information sources proficiently (Jung, Choi, & Fanguy, 2024). The implementation of ICT-based learning media has shown potential in enhancing digital literacy in elementary schools, yet its effectiveness is contingent on the teachers' proficiency and training (Nangimah & Dharin, 2023).

Social collaboration and overall support of the education system

The lack of social collaboration and overall support from the education system weakens the Information Search and Evaluation Ability, a fundamental element of digital literacy for Chinese primary school student. Eden, Chisom, and Adeniyi (2024) highlight the necessity of cohesive educational frameworks to promote digital literacy effectively. Furthermore, Abiddin, Ibrahim, and Abdul Aziz (2022) emphasize community-based strategies that can bridge the gap in social collaboration and support, enabling student to critically evaluate and utilize diverse information sources.

Weak Digital Creativity Ability

Optimize the curriculum to achieve interdisciplinary teaching

The lack of optimizing the curriculum for interdisciplinary teaching undermines the development of Digital Creativity Abilities, a crucial aspect of digital literacy for Chinese primary school student. Dewi (2022) highlights that this deficiency hampers student' ability to integrate and apply knowledge across subjects, stifling innovative thinking and problem-solving skills essential for fostering digital creativity. This shortfall in curriculum design adversely affects the development of crucial digital literacy skills in primary education (Suswandari, 2023).

Provide diversified technical application experience

The lack of providing diversified technical application experiences demonstrates a weakness in the digital creativity abilities of Chinese primary school student. This gap arises from limited access to varied technological tools and applications, hindering their ability to experiment, innovate, and develop comprehensive digital literacy skills essential for the modern digital landscape (Manan et al., 2023). Studies suggest that access to diverse digital resources and platforms, like Instagram, can play a significant role in enhancing digital literacy among elementary school student (Arissaputra et al., 2023).

Encourage practical and exploratory learning

The lack of encouraging practical and exploratory learning signifies a weakness in the digital creativity abilities of Chinese primary school student. This deficiency arises from insufficient opportunities to engage with diverse technological tools, limiting their ability to experiment, innovate, and develop essential digital literacy skills critical for the modern digital landscape. According to Atmojo et al. (2021),

elementary student exhibit significant gaps in digital literacy during online science learning. Additionally, Afriliandhi et al. (2022) emphasize that teachers' digital literacy is crucial for enhancing learning quality, further highlighting the need for improved digital literacy frameworks in primary education.

Promoting innovative thinking and independent learning

The lack of promoting innovative thinking and independent learning highlights a weakness in the digital creativity abilities of Chinese primary school student. This deficiency stems from limited exposure to diverse technological tools and insufficient opportunities for practical experimentation, hindering the development of essential digital literacy skills necessary for the modern digital landscape. Creative thinking abilities in elementary student can be significantly enhanced through appropriate learning models (Smith, Najwa, Kuncoro, & Alfan, 2023). Additionally, the development of critical thinking skills, which are vital for digital literacy, is often limited (Zuryanty, Kenedi, Chandra, Hamimah, & Fitria, 2019).

Providing Necessary Support and Resources

The lack of providing necessary support and resources is a significant weakness in the digital creativity abilities of Chinese primary school student. This shortfall limits student' exposure to diverse technological tools and practical experimentation, crucial for developing digital literacy skills (Larson & Clark, 2021). Consequently, their ability to innovate and think independently in a digital context is severely hindered, undermining a fundamental element of their digital literacy (Manan, Yurfiah, Nuraini, & Verdianto, 2023).

Weak Digital Ethics and Social Responsibility

Integration of digital ethics and social responsibility education into the education system

The lack of integration of digital ethics and social responsibility education into the education system significantly weakens Chinese primary school student' digital ethics and social responsibility. This deficiency impedes the development of essential digital literacy skills, as student are not adequately guided in understanding the ethical use of technology and their roles as responsible digital citizens, crucial for fostering comprehensive digital literacy. According to Pangrazio and Sefton-Green (2021), understanding digital rights, citizenship, and literacy is vital for navigating the digital world. Additionally, Buchholz, DeHart, and Moorman (2020) emphasize that

moving beyond digital literacy to include digital citizenship is essential, particularly highlighted during global challenges such as the pandemic.

Digital social responsibility and digital identity awareness training

The lack of integration of digital ethics and social responsibility education into the education system significantly weakens Chinese primary school student' digital ethics and social responsibility. This deficiency impedes the development of essential digital literacy skills, as student are not adequately guided in understanding the ethical use of technology and their roles as responsible digital citizens, crucial for fostering comprehensive digital literacy. Engeness (2021) emphasizes that developing teachers' digital identity is critical for designing pedagogic principles that enhance student learning. Furthermore, Granic, Morita, and Scholten (2020) highlight the importance of identity development in the digital age, which underscores the need for integrating digital ethics and social responsibility into education.

Interdisciplinary and practical curriculum

The lack of an interdisciplinary and practical curriculum highlights the weakness in Digital Ethics and Social Responsibility, a fundamental aspect of Chinese primary school student' digital literacy. This deficiency stems from the failure to provide integrated, hands-on learning experiences that connect ethical principles with real-world digital interactions, leaving student unprepared to navigate digital environments responsibly (Lee & Kim, 2021).

Construction of social culture and digital culture environment

The lack of construction of social and digital culture environments exemplifies the deficiency in Digital Ethics and Social Responsibility among Chinese primary school student. Insufficient efforts to build a culture integrating ethical principles and responsible digital behavior contribute to this weakness (Levin & Mamlok, 2021). Moreover, the rapid digital acculturation and evolving digital consumer culture exacerbate the challenge, making it crucial to foster a comprehensive digital development framework (Dey, Yen, & Samuel, 2020).

Weak Digital Security Awareness

Integration of digital security and privacy protection education into the curriculum system

The lack of integration of digital security and privacy protection education into the curriculum system is a key weakness in developing Digital Security

Awareness among Chinese primary school student. This gap results from insufficient curricular emphasis on these critical components, hindering student' comprehensive digital literacy development and their ability to navigate the digital landscape safely and responsibly (Elmalı, Tekın, & Polat, 2020). Additionally, the current curriculum does not adequately prepare student to handle digital threats, further limiting their digital competence (Torres-Hernández & Gallego-Arrufat, 2022).

Interdisciplinary and comprehensive curriculum

The lack of an interdisciplinary and comprehensive curriculum significantly undermines the development of Digital Security Awareness, a crucial aspect of digital literacy for Chinese primary school student. This deficiency results from inadequate integration of digital security and privacy topics across different subjects, impeding student' holistic understanding and ability to navigate digital environments safely (Pangrazio & Selwyn, 2021). Furthermore, the absence of focused privacy and trust education in online learning environments exacerbates this issue (Anwar, 2021).

Actual operation and simulation exercises

The lack of actual operation and simulation exercises significantly weakens the development of Digital Security Awareness, a fundamental aspect of digital literacy for Chinese primary school student. This deficiency arises from the insufficient practical application of digital security concepts, limiting student' ability to effectively navigate and respond to real-world digital threats (Maqsood & Chiasson, 2021). Furthermore, empowering student through cognitive defense strategies can enhance their online privacy protection skills (Andrews, Walker, & Kees, 2020). Additionally, game-based learning platforms have proven effective in enhancing cybersecurity education (Khan et al., 2022).

Facility guarantee and environmental construction

The lack of facility guarantee and environmental construction significantly weakens the development of Digital Security Awareness, a fundamental component of digital literacy for Chinese primary school student. Without adequate infrastructure and a conducive learning environment, student cannot effectively engage in practical digital security exercises, limiting their ability to navigate and protect themselves in the digital world (Blažič, 2022). Additionally, the integration of practical cybersecurity education in a blended learning environment has been shown to enhance digital literacy (Fernández-Caramés & Fraga-Lamas, 2020).

Multi-party collaboration and social participation

The lack of multi-party collaboration and social participation significantly weakens the development of Digital Security Awareness, a crucial aspect of digital literacy for Chinese primary school student. This deficiency stems from inadequate engagement between schools, parents, and the community, limiting student' exposure to diverse perspectives and comprehensive digital safety practices (Gabriel et al., 2022). Moreover, effective strategies to improve cyber secure behavior are needed to enhance student' digital security skills (Witsenboer, Sijtsma, & Scheele, 2022).

1. Fundamental element of the digital literacy development model for Chinese primary school student are shown in Table 2.1.

Table 2.1 Fundamental element of the digital literacy development model for Chinese primary school student

Scholar	1	2	3	4	5
Education and Information Technologies. (2021)	●	●	●	●	●
Atmojo et al. (2021)	●	●	●	●	
Pangrazio and Sefton-Green. (2021)		●	●	●	●
Smart Learning Environments. (2021)	●	●	●		●
Jung et al. (2024)	●	●		●	●
Hsu et al. (2018)	●	●	●		●
Abiddin et al. (2022)	●	●		●	●
Hamidah et al. (2023)	●		●		●
Suwarjo et al. (2022)	●	●	●		
Murtadho et al. (2023)	●	●	●		
Smith et al. (2023)	●		●	●	
Buchholz et al. (2020)		●	●	●	●
Total	**10**	**10**	**10**	**7**	**8**

1-Weak Technical Skills Ability (10)

2-Weak Information Search and Evaluation Ability (10)

3-Weak Digital Creativity Ability (10)

4-Weak Digital Ethics and Social Responsibility (7)

5-Weak Digital Security Awareness (8)

Opportunities of the digital literacy development model for Chinese primary school student

Emphasizing interdisciplinary integration is a current trend in developing digital literacy in elementary student.

Emphasizing interdisciplinary integration is a current trend in developing digital literacy in elementary student. This approach is crucial for Chinese primary school student as it enables them to connect digital skills with various subjects, fostering a comprehensive understanding and application of digital literacy. This holistic development is essential for effectively navigating the increasingly digitalized world. Integrating digital literacy in the disciplines facilitates a more comprehensive educational experience (Hays & Kammer, 2023). Understanding key factors in digital literacy supports this approach by enhancing learning and education (Audrin & Audrin, 2022). Moreover, recognizing current trends in e-learning in China highlights the importance of this integration for effective education (Osadcha et al., 2021).

Focusing on practical operational skills is a trend in developing digital literacy in elementary student.

Focusing on practical operational skills is a significant trend in developing digital literacy among elementary student. This approach equips Chinese primary school student with hands-on abilities to effectively use digital tools, fostering their competency in navigating digital environments (Perifanou, Economides, & Nikou, 2022). Emphasizing practical skills is crucial for their overall digital literacy, enabling them to apply theoretical knowledge in real-world contexts, which is essential for their future academic and professional success (Li & Wong, 2023).

Prioritizing innovative teaching methods is a current trend in the development of digital literacy in elementary student.

Prioritizing innovative teaching methods is a current trend in developing digital literacy among elementary student. This approach encourages creative problem-

solving and adaptability, equipping Chinese primary school student with essential skills for the digital age (Liu et al., 2020). Emphasizing innovation in teaching is vital for fostering a dynamic learning environment that prepares student for future technological advancements (Alt & Raichel, 2020).

Emphasizing the cultivation of awareness and thinking training is the current trend in developing digital literacy in primary school student.

Emphasizing the cultivation of awareness and thinking training is a current trend in developing digital literacy among primary school student. This approach enhances critical thinking and digital awareness, equipping Chinese primary school student with the ability to navigate and evaluate digital content effectively (Tekdal, 2021). Such training is crucial for fostering responsible and informed digital citizens, preparing them for the complexities of the digital world (Muhammad Iqbal Murtadho et al., 2023).

Conducting digital ethics and digital responsibility education is the current trend in developing digital literacy in primary school student.

Conducting digital ethics and digital responsibility education is a current trend in developing digital literacy among primary school student. This approach instills a sense of responsibility and ethical understanding in digital interactions, which is crucial for Chinese primary school student. Emphasizing digital ethics helps them navigate online spaces safely and respectfully, preparing them to become conscientious digital citizens in an increasingly digitalized world (Rahmatullah et al., 2022; Safonov, Usyk, & Bazhenkov, 2022).

Focusing on digital safety education is a trend in developing digital literacy in elementary student.

Focusing on digital safety education is a trend in developing digital literacy among elementary student. This approach equips Chinese primary school student with essential skills to navigate online environments securely, protecting their privacy and well-being (Purnama et al., 2021). Emphasizing digital safety is crucial for fostering responsible internet use and preventing cyberbullying, thereby preparing student to become informed and cautious digital citizens in an increasingly connected world (AlDaajeh et al., 2022). This trend aligns with the current state and development of e-learning in China, highlighting the importance of digital safety in the educational context (Osadcha, Osadchyi, & Spirin, 2021).

Emphasizing personalized learning is a current trend in the development of digital literacy in elementary student.

Emphasizing personalized learning is a current trend in the development of digital literacy among elementary student. This approach tailors educational experiences to individual Demands, enhancing engagement and comprehension (Bocconi et al., 2022). For Chinese primary school student, personalized learning is crucial as it addresses diverse learning styles and paces, fostering a deeper and more effective acquisition of digital literacy skills. This trend ensures that each student can thrive in a digitalized educational environment, reducing online risks by enhancing their understanding and application of digital literacy (Purnama et al., 2021).

Undertaking multi-faceted collaboration and partnerships is a current trend in enhancing digital literacy in elementary education.

Undertaking multi-faceted collaboration and partnerships is a current trend in enhancing digital literacy in elementary education. This approach leverages resources and expertise from various stakeholders, enriching the learning experience (Kateryna et al., 2020). For Chinese primary school student, such collaborations are crucial as they provide diverse perspectives and comprehensive support, fostering a more robust development of digital literacy skills (Jannah, Prasojo, & Jerusalem, 2020). This trend ensures student are well-equipped to navigate the complexities of the digital world (Olszewski & Crompton, 2020).

2. Opportunities of the digital literacy development model for Chinese primary school student are shown in Table 2.2.

Table 2.2 Opportunities of the digital literacy development model for Chinese primary school student

Scholar	1	2	3	4	5	6	7	8
Osadcha et al. (2021)	●	●	●	●		●		●
Purnama et al. (2021)		●		●	●	●	●	
Bocconi et al. (2022)			●	●	●	●	●	
Kateryna et al. (2020)	●	●	●				●	●
Safonovet et al. (2022)				●	●	●	●	
Tekdal (2021)	●	●	●				●	●
Rahmatullah et al. (2022)	●			●	●	●	●	
Liu et al. (2020)	●		●	●		●		●
Li et al. (2023)	●	●	●			●	●	
AlDaajeh et al. (2022)		●		●	●	●	●	
Total	**6**	**6**	**6**	**7**	**5**	**8**	**8**	**4**

1-Emphasizing interdisciplinary integration (6)

2-Focusing on practical operational skills (6)

3-Prioritizing innovative teaching methods (6)

4-Emphasizing the cultivation of awareness and thinking training (7)

5-Conducting digital ethics and digital responsibility education (5)

6-Focusing on digital safety education (8)

7-Emphasizing personalized learning (8)

8-Undertaking multi-faceted collaboration and partnerships (4)

Key influencing factors of the digital literacy development model for Chinese primary school student

Holistic Curriculum

Comprehensive curriculum setting is a key element influencing the development of digital literacy in primary school student in China. It ensures systematic integration of digital skills across various subjects, promoting consistent and comprehensive learning experiences (Almethen & Alomair, 2024). This structured

approach is crucial as it provides Chinese primary school student with frequent and diverse opportunities to practice and apply digital skills, thereby fostering essential competencies for navigating the digital world effectively and responsibly (Lo, 2024).

Cross-discipline Design

Interdisciplinary teaching design is a key element influencing the development of digital literacy in primary school student in China. By integrating digital skills across multiple subjects, it enhances critical thinking and problem-solving abilities (Tzafilkou, Perifanou, & Economides, 2023). This approach is crucial as it provides Chinese primary school student with a holistic understanding of digital literacy, allowing them to apply digital skills in diverse contexts, thus fostering comprehensive and practical digital competencies essential for the modern world (Smailova et al., 2023).

Diverse Methods

Providing a variety of teaching methods is a key element influencing the development of digital literacy in primary school student in China. Diverse teaching methods cater to different learning styles, enhancing student engagement and comprehension (Liu et al., 2024). This approach is crucial as it ensures that all student, regardless of their preferred learning style, can develop essential digital literacy skills, fostering a more inclusive and effective learning environment (Chai et al., 2021).

Teacher Development

Teacher training promotes professional development and is a key element influencing the development of digital literacy in primary school student in China. Effective training equips teachers with the necessary digital skills and pedagogical strategies, enhancing their ability to integrate digital literacy into the curriculum (Gu & Ding, 2022). This is crucial for Chinese primary school student as it ensures they receive high-quality, up-to-date digital education, fostering essential skills for navigating the digital world (Deping & Burhanudeen, 2023).

Cultivate Thinking

Strengthening consciousness cultivation and thinking training is a key element influencing the development of digital literacy in primary school student in China. This approach enhances critical thinking and digital awareness, enabling student to navigate digital environments responsibly (Wu, 2023). It is crucial as it helps Chinese

primary school student develop the ability to critically evaluate digital content and make informed decisions, fostering responsible digital citizenship and effective participation in the digital world (Chen et al., 2023).

Personalized Experience

Providing a personalized teaching experience is a key element influencing the development of digital literacy in primary school student in China. This approach tailors instruction to individual learning Demands, enhancing engagement and comprehension (Tzafilkou, Perifanou, & Economides, 2022). Personalized teaching is crucial as it addresses diverse learning paces and styles, ensuring that each student effectively acquires digital literacy skills. This individualized attention helps foster deeper understanding and retention, equipping student with the competencies necessary for navigating the digital world (Sanusi et al., 2022).

Resource Protection

Resource protection and environmental construction are key influencing factor of the digital literacy development model for Chinese primary school student. Sustainable practices ensure the availability of necessary digital resources while fostering a healthy learning environment (Li et al., 2023). This focus is crucial as it teaches Chinese primary school student the importance of responsible resource use and environmental stewardship, integral to their digital literacy. Understanding these principles helps student become conscientious digital citizens, aware of the impact of technology on the environment (Wang et al., 2024).

Collaborative Participation

Multi-party cooperation and social participation are key influencing factor of the digital literacy development model for Chinese primary school student. Collaborative efforts from schools, families, and communities provide diverse resources and perspectives, enriching the learning experience (Jiang et al., 2023). This approach creates a supportive environment that fosters student' digital skills and responsible use of technology (Cao et al., 2023). Engaging multiple stakeholders ensures comprehensive education, addressing various aspects of digital literacy and preparing student to navigate the digital world effectively (Ding & Li, 2023).

Key influencing factors that affect the development of digital literacy of Chinese primary school student are shown in Table 2.1.

Table 2.3 key influencing factors of the digital literacy development model for Chinese primary school student

Scholar	1	2	3	4	5	6	7	8
Almethen & Alomair. (2024)	●	●	●	●	●		●	
Lo. (2024)	●	●		●	●			●
Tzafilkou et al. (2023)		●	●		●	●	●	
Smailova et al. (2023)	●	●	●	●	●		●	●
Liu et al. (2024)	●		●	●	●	●		
Chai et al. (2021)		●	●			●		●
Gu & Ding. (2022)				●	●	●	●	
Deping & Burhanudeen. (2023)	●	●	●	●	●			●
Wu. (2023)			●	●	●	●	●	
Chen et al. (2023)	●	●		●	●		●	●
Sanusi et al. (2022)		●	●		●	●	●	●
Wang et al. (2024)	●			●	●		●	●
Total	**7**	**8**	**8**	**9**	**11**	**6**	**8**	**7**

1-Holistic Curriculum (7)

2-Cross-discipline Design (8)

3-Diverse Methods (8)

4-Teacher Development (9)

5-Cultivate Thinking (11)

6-Personalized Experience (6)

7-Resource Protection (8)

8-Collaborative Participation (7)

The Theory of Designing a Digital Literacy Development Model for Chinese Primary School student

Constructivism Learning Theory

Constructivism learning theory provides a theoretical model for the common development of the main components of digital literacy of Chinese primary school student. Lev Vygotsky and Jerome Bruner are pioneers in using constructivist learning theory to study educational questions.

The origin and development of constructivism learning theory

Jean Piaget, considered the founder of constructivist learning theory, focuses on children's cognitive development. Piaget (1952) proposed that learning is the construction of knowledge by individuals through an active process of exploration and interaction. Lev Vygotsky developed the theory of social constructivism, which emphasizes the key role of social interaction in cognitive development. Vygotsky (1978) proposed the concept of "proximal developmental area" (ZPD), highlighting the influence of social environment on learning. Jerome Bruner has made important contributions to constructivist theory, especially in teaching methodology. Bruner (1961) advocated a discovery learning approach, emphasizing that student construct knowledge through exploration and discovery. Modern researchers have focused on applying these theories to emerging technologies and teaching methods, such as digital learning environments, gamified learning, and the use of social media in education. Emphasize the importance of constructivist theory in designing learning activities and teaching strategies, especially in promoting active learning and in-depth understanding.

Main viewpoints of constructivism learning theory

Constructivism learning theory holds that learning is a process by which learners constantly construct and reconstruct their own knowledge structure through interaction and experience with the surrounding environment, thus forming their own unique cognitive system and personalized learning style. The development of this theory can be traced back to Kant's integration of empiricism and rationalism.

Constructivist theory holds that knowledge is not passively received, but is constructed through the interaction between individuals and their environment. Learners take an active role in the learning process, acquiring new knowledge through exploration, experimentation, and question solving. It emphasizes the role of

social interaction and cultural background in cognitive development, and believes that learning is a social process.

Application of constructivism learning theory

The application forms of constructivist learning theory include situation, collaboration, conversation and meaning construction. Multimedia technology can provide sensory stimulation with sound, light, pictures and pictures, design and produce an interactive learning environment, effectively integrate a variety of information resources and subject knowledge, and create a sense of immersive situation for learners. In terms of teaching mode and teaching design principles, the teaching mode guided by constructivism learning theory is student-centered. In the teaching process, teachers make full use of learning environment elements such as situation, collaboration and conversation to give full play to student' initiative, enthusiasm and initiative. Teachers only play the role of organizers, mentors, helpers and facilitators. The ultimate goal is to enable student to effectively construct the meaning of what they are currently learning.

Over the past decade, research on constructivist learning theory has focused on how to apply its principles to emerging educational technologies and methods, exploring the application of constructivist principles in digital learning environments, online education, and in contexts integrated with social media, and emphasizing the importance of constructivist principles in designing learning activities. In particular, in terms of encouraging active learning and in-depth understanding in student, it explores how constructivist theories can be applied in a multicultural and interdisciplinary educational environment to promote student' critical thinking and creative question solving skills.

Constructivist learning theory emphasizes creating effective learning environments where student actively construct their own understanding through experiences (Zajda & Zajda, 2021). In developing digital literacy among primary school student in China, this theory can be applied by providing hands-on activities and projects with digital tools. This approach allows student to build on prior knowledge, engage in individual exploration, and collaborate on problem-solving, catering to diverse learning Demands. Reflective discussions further deepen understanding, connecting digital activities to real-world applications. Thus,

constructivist principles foster critical thinking and responsible technology use, essential for navigating the digital world effectively.

Constructivist learning theory, which emphasizes cognitive construction through active student engagement, can be effectively applied to cultivate digital literacy in primary school student in China (Retnawati, 2020). By involving student in diverse, hands-on digital activities, educators can foster critical thinking and problem-solving skills essential for digital literacy. This approach ensures that student actively participate in their learning process, making sense of digital tools and resources through exploration and interaction. Consequently, constructivist methods can significantly enhance student' digital competencies, preparing them to navigate and utilize technology responsibly and effectively in their everyday lives.

Constructivist learning theory, which emphasizes that knowledge is constructed by learners through their experiences, is crucial for cultivating digital literacy in primary school student in China (Fatimah, Rosidin, & Hidayat, 2022). Applying constructivist principles in digital literacy education involves student-centered learning, where student actively engage with digital tools and resources to build their understanding. This approach not only enhances critical thinking and problem-solving skills but also aligns with the government's policy on freedom of learning, empowering student to realize their potential and shape their futures. By integrating constructivist methods, educators can produce quality human resources equipped with essential digital competencies.

Social Ecosystem Theory

The social ecosystem theory provides a supporting framework for the development model of Chinese primary school student' digital literacy. Bronfenbrenner, Kellert and Jerome BrunerKahn are important scholars who apply social ecosystem theory to study education issues.

Origin and development of social ecosystem theory

The social ecosystem theory of Bronfenbrenner (1979) emphasizes that individual development is influenced by the interaction of multiple environmental systems (Microsystems, mesosystems, outer systems, and macro systems). Kellert (2002) further developed ecosystem theory, with a special focus on the relationship between children and the natural environment. Kahn (2011) focuses on the influence

of technology and natural environment on children's development, and expands the application of social ecosystem theory in the modern technological environment.

Main viewpoints of social ecosystem theory

Social ecosystem theory is a theory that discusses the interaction between human behavior and social environment, emphasizing the interaction between human and environment systems and their significant impact on human behavior.

Based on the analysis of children's growth process, Bronfenbrenner first proposed the social ecosystem theory, which believes that people will be affected by four systems, from the primary to the secondary: micro system, medium system, external system, macro system. According to Bronfenbrenner, a microsystem refers to a pattern of activities, roles, and interpersonal relationships experienced by individuals in a situation. System refers to the connection or mutual relationship between various Microsystems; External systems are those systems in which individuals are not directly involved but which have an impact on their development; The macro system contains the patterns formed by a culture, subculture, and other social contexts in the preceding three systems.

Application of social ecosystem theory

One of the most famous representatives of modern social ecosystem theory is Charles Zastrow. Charles Zastrow further elaborated the relationship between human growth and social environment, and divided the social ecosystem of individual existence into three basic types: micro system, meso-system and macro system. Micro-system refers to a seemingly single individual in a social ecological environment. Among them, individual is not only a social system type in biological sense, but also a social and psychological social system type. Meso-system refers to small-scale groups related to individuals, such as communities, schools, etc. Macro system refers to a social system larger than a small group, including cultural organizations or institutions, institutions, and customs. There is interaction between the individual and the social ecosystem, and the individual behavior and the environment are connected, restricted and influenced each other.

Scholars have long been concerned with the application of social ecosystem theory to understanding the development of children and adolescents in different Settings, including the family, the school and the wider social environment. The scholars explored how technology and digital media, as new Microsystems or

midsystems, influence the growth of younger generations. These studies highlight the importance of considering multiple environmental factors when fully understanding and supporting student development.

Social ecosystem theory, which examines the interconnectedness and interdependence of various stakeholders within a digital platform, can be effectively applied to cultivate digital literacy in primary school student in China (Gawer, 2022). By understanding the dynamics of digital platforms and ecosystems, educators can create a learning environment that mirrors these real-world interactions. This approach helps student grasp the complexities of digital value creation and capture, fostering critical digital skills and awareness. Moreover, integrating social ecosystem theory into digital literacy education promotes an understanding of responsible digital citizenship, including issues of privacy and ethical use of technology.

Social ecosystem theory can be applied to the cultivation of digital literacy in primary school student in China by leveraging the complexity and interconnections inherent in digital ecosystems (Benbya et al., 2020). By simulating digital ecosystems in the classroom, educators can help student understand the dynamics of digital platforms, social media, and other digitally enabled networks. This approach fosters critical thinking and problem-solving skills as student navigate hyper-connected environments and mutual dependencies. It also prepares them to address complex digital challenges, enhancing their ability to manage and thrive in digital sociotechnical systems.

The Theory of Designing a Digital Literacy Development Model for Chinese Primary School student as show table 2.4.

Table 2.4 The Theory of Designing a Digital Literacy Development Model for Chinese Primary School student

Scholar	Constructivism Learning Theory	Social Ecosystem Theory
Piaget, J. (1952)	●	
Vygotsky, L. (1978)	●	
Bruner, J. (1961)	●	
Zajda, J., & Zajda, R. (2021)	●	
Retnawati, H. (2020)	●	
Fatimah et al. (2022)	●	
Zajda, J., & Zajda, R. (2021)	●	●
Retnawati, H. (2020)	●	●
Fatimah et al. (2022)	●	●
Gawer, A. (2022)	●	●
Benbya, H., et al. (2020)	●	●
Bronfenbrenner, U. (1979)		●
Kellert, S. R. (2002)		●
Kahn, P. H. (2011)		●
Benbya, H., et al. (2020)		●
Total	**11**	**9**

Conclusion:

Constructivism Learning Theory and Social Ecosystem Theory are essential for designing a digital literacy model for Chinese primary school student. Constructivism promotes active, experiential learning, enhancing Technical Skills Ability, Information Search and Evaluation Ability, Digital Creativity Ability, and critical thinking. Social Ecosystem Theory emphasizes the role of family, school, and community, fostering collaborative learning and a supportive environment, which enhances Digital Ethics and Social Responsibility, and Digital Security Awareness. Additionally, the model considers key influencing factors such as comprehensive curriculum design,

interdisciplinary teaching, diversified teaching methods, personalized learning experiences, resource availability, and multi-stakeholder cooperation.

Construct and evaluation methods for the digital literacy development model for Chinese primary school student

Delphi Method

Characteristics of Delphi method

Delphi method is an important method for forecasting research. Representative and authoritative experts in the corresponding fields are selected to consult the experts' opinions on the questions or questionnaires to be predicted for several rounds by means of anonymous comments. Through iterative consultation, induction and modification, the experts finally reach a consensus. In this study, the Delphi method was used to solicit several rounds of expert opinions on the construction of Chinese primary school student' digital literacy improvement model, so as to form more reliable conclusions and build more scientific models to achieve the core objectives of this study.

Expert consensus Building: The Delphi method brings together the views of experts from different fields through a series of questionnaires. This approach helps to build broad consensus on all aspects of digital literacy, such as curriculum content, teaching methods, assessment tools, etc.

Anonymous feedback: Experts in the Delphi method often do not know the identities of other participants, which helps reduce group pressure and ensures that each expert provides an independent opinion, thereby improving the quality and credibility of the survey.

Iterative process: The Delphi method refines and refines expert opinions through multiple rounds of questionnaires, with each round of feedback based on the results of the previous round. This iterative process helps to gradually refine and refine the consensus content.

Data-driven decision making: Delphi emphasizes data-based decision making. By analyzing expert feedback, researchers can identify key factors and best practices regarding digital literacy education.

Application of Delphi method

The Delphi method has been effectively applied in various educational research projects, ensuring the reliability and robustness of findings. Due to its systematic approach, it has been utilized to classify teacher motivational behaviors, resulting in a validated framework for designing and implementing educational interventions (Ahmadi et al., 2023). Additionally, the method has been employed to create and validate questionnaires on digital competence in higher education, confirming their accuracy and applicability for future studies (Mengual-Andrés et al., 2016). These applications highlight the method's capacity to gather and refine expert insights in different educational contexts (Barrett & Heale, 2020).

CIPP evaluation model

Principles of CIPP evaluation model

CIPP evaluation model is a comprehensive evaluation method widely used in the field of education, proposed by Stufflebeam, which mainly includes four elemen ts: Context, Input, Process and Product. The basic point of view of CIPP evaluation m odel is that the most important purpose of evaluation is not to prove, but to improv e. CIPP evaluation model considers the selection and rationality of evaluation objecti ves according to the practical Demands and social Demands, so that the objectives a re more in line with the social Demands and the reality. CIPP evaluation model evalu ation throughout the study, making evaluation an effective tool to continuously impr ove the level.

Key influencing factors of CIPP evaluation model application

Contextual Assessment: Focuses on identifying and understanding the environment, Demands, and conditions that affect the program or project. The purpose of this stage is to ensure that the program addresses relevant Demands and aligns with the broader context. Specifically, it includes: (1) Demands analysis: Identifying the specific Demands of the target population and the context in which the program will operate. (2) Environmental scanning: Assessing external factors such as socioeconomic, cultural, and political conditions that could impact the program. (3) Stakeholder analysis: Understanding the interests, expectations, and influence of different stakeholders to ensure their Demands are considered in the program design.

Input Assessment: Focuses on evaluating the resources, strategies, and plans necessary to achieve the program’s objectives. The purpose of this stage is to ensure

that the program is well-prepared and equipped for implementation. Specifically, it includes: (1) Resource analysis: Assessing the adequacy and availability of financial, human, and material resources required for the program. (2) Strategy assessment: Evaluating the feasibility and appropriateness of the proposed strategies and action plans. (3) Risk assessment: Identifying potential risks and barriers to implementation and planning mitigation strategies to address them.

Process Evaluation: Focuses on monitoring and assessing the implementation of the program or project. The purpose of this stage is to ensure that the program is being executed as planned and to identify any necessary adjustments. Specifically, it includes: (1) Implementation fidelity: Ensuring that the program activities are being conducted according to the plan and maintaining the integrity of the program design. (2) Monitoring progress: Tracking the progress of the program's activities and outputs against the timeline and milestones. (3) Feedback mechanisms: Collecting and analyzing feedback from participants and stakeholders to make real-time improvements and ensure continuous quality enhancement.

Product Evaluation: Focuses on the outcomes and impacts of a project or program, including intended and unintended effects. The purpose of this stage is to evaluate the impact of the project on the target group, including changes in knowledge, skills, and attitudes, and whether the project has achieved the established goals. Specifically, it includes: (1) Effectiveness evaluation: Measuring and evaluating the effect and impact of project results. (2) Cost-benefit analysis: Evaluating the value of project results relative to the resources invested. (3) Continuous improvement: Making improvement suggestions based on the evaluation results to guide future project planning and implementation.

Oktapiani et al. (2022) assert that the CIPP model is essential for evaluating digital literacy programs in elementary schools, focusing on their contextual relevance. Meri et al. (2023) highlight the importance of the input aspect of the CIPP model in assessing resources and strategies for primary school literacy programs. Dizon (2023) emphasizes the historical significance and adaptability of the CIPP model in evaluating digital literacy curricula. Rahman et al. (2023) advocate for the process evaluation of AI-based blended learning's effectiveness in scientific literacy using the CIPP model.

Onwuegbuzie et al. (2010) focus on the product aspect of the CIPP model to assess outcomes and impacts of digital literacy programs in elementary education.Song (2022) suggests the application of the CIPP model for evaluating digital literacy programs, drawing from his research on graduate engineering ethics courses.Huo et al. (2022) recommend using the CIPP model, alongside the Delphi method, for developing early childhood education indicators, applicable to digital literacy evaluation.Zhongjing et al. (2020) underline the CIPP model's role in ensuring equitable digital education in elementary schools, shifting from philosophical to empirical research in education equity.

Application value of CIPP model

Comprehensiveness: The CIPP model provides a thorough evaluation by examining context, input, process, and product, ensuring all aspects of a program are assessed.

Continuity: This model supports continuous evaluation and improvement, allowing for real-time feedback and iterative enhancements throughout the program life cycle.

Decision-making orientation: The CIPP model aids in informed decision-making by offering detailed, actionable insights at each evaluation phase, guiding strategic adjustments.

Adaptability: This model can be applied to program evaluations of various sizes and types, including education, health, social services, and business programs.

Table 2.5 Construct and evaluation methods for the digital literacy development model for Chinese primary school student

Scholar	Delphi method	CIPP model
Ahmadi, et al. (2023)	●	
Mengual-Andrés, et al. (2016)	●	
Barrett, & Heale. (2020)	●	
Oktapiani, et al. (2022)		●
Meri, et al. (2023)		●
Dizon. (2023)		●
Rahman, et al. (2023)		●
Onwuegbuzie, et al. (2010)		●
Song. (2022)		●
Huo, et al. (2022)		●
Zhongjing, et al. (2020)		●
Total	**3**	**8**

Conclusion:

The applicability of Delphi method in this study:

Delphi method provides a systematic and expert-based methodological framework for studying and developing student' digital literacy. This study mainly adopts Delphi method to achieve Goal 2, and establishes the digital literacy development model of Chinese primary school student through three rounds of expert consultation.

The applicability of CIPP evaluation model in this study:

The CIPP evaluation model has the characteristics of process orientation and improvement orientation, and is suitable for evaluating the interaction and social ecosystem among the theoretical curriculum teaching system, multiple practical training platform, autonomous learning stimulation mechanism, multi-party collaborative support system and cultivation level evaluation system in the digital literacy development model of Chinese primary school student. CIPP evaluation model has diagnostic and improvement functions, attaches importance to collecting opinions and suggestions of various evaluation subjects on the development of

Chinese primary school student' digital literacy, provides effective and timely feedback, and provides valuable decision-making information for the improvement of the model. Therefore, CIPP evaluation model provides a theoretical framework for evaluating the digital literacy development model of Chinese primary school student.

Chapter 3

Research Methodology

The purpose of this study is to construct a development model for Chinese primary school student, and its role is to explore an effective strategy for developing digital literacy. In order to solve these problems, this study used interviews, questionnaires and other methods to deeply understand the actual situation and needs of the digital literacy of Chinese primary school student. On this basis, this study adopts the Delphi method, through several rounds of anonymous expert consultation, the digital literacy development model for Chinese primary school student, aiming to provide guidance and practical reference inspiration for the development of the digital literacy ability of Chinese primary school student. The whole research process includes 3 steps:

1. To analyze the needs of digital literacy for Chinese primary school student.
2. To construct a digital literacy development model for Chinese primary school student.
3. To validate the digital literacy development model for Chinese primary school student.

The 3 steps of the research process can be summarized as Figure 3.1

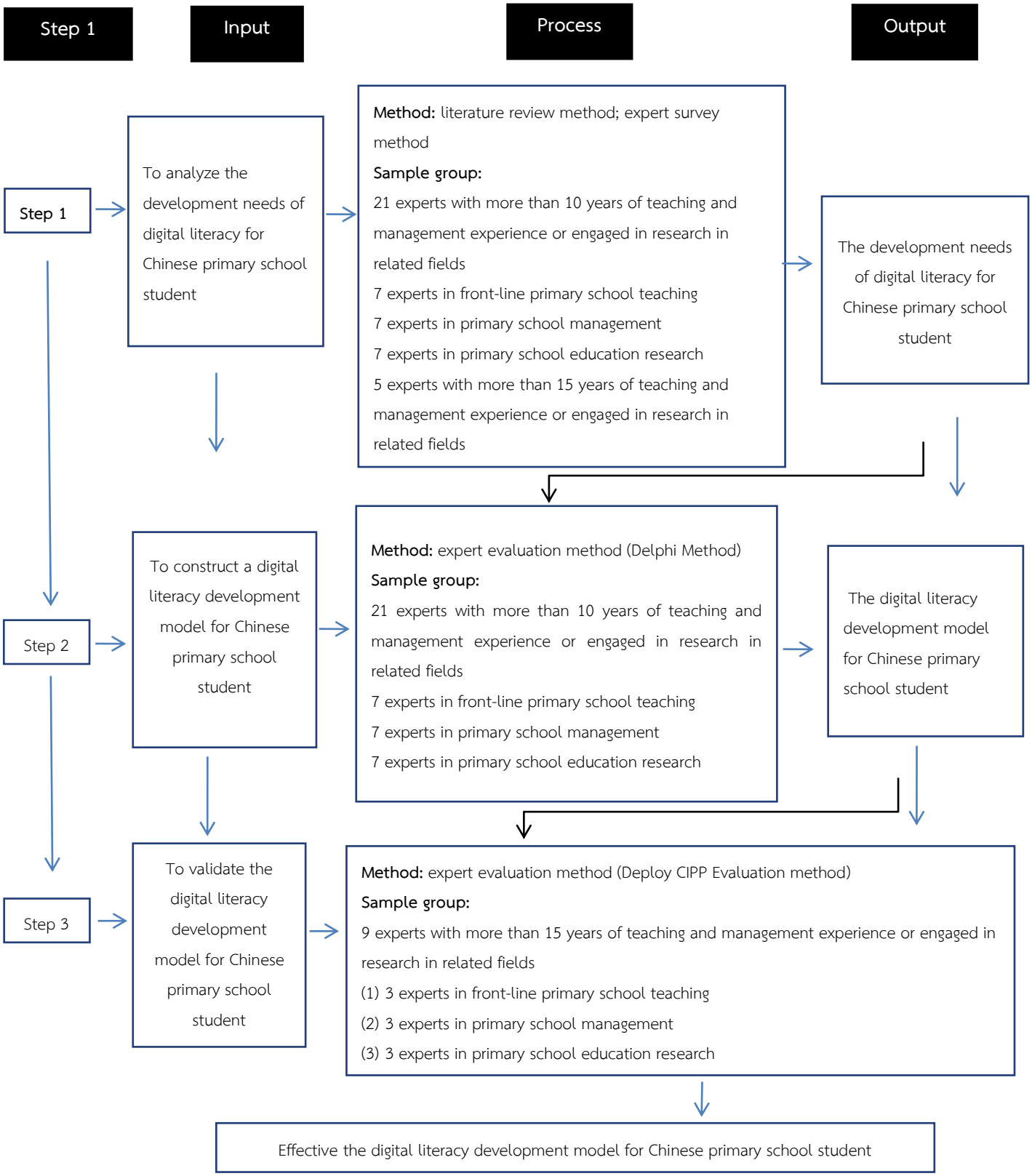
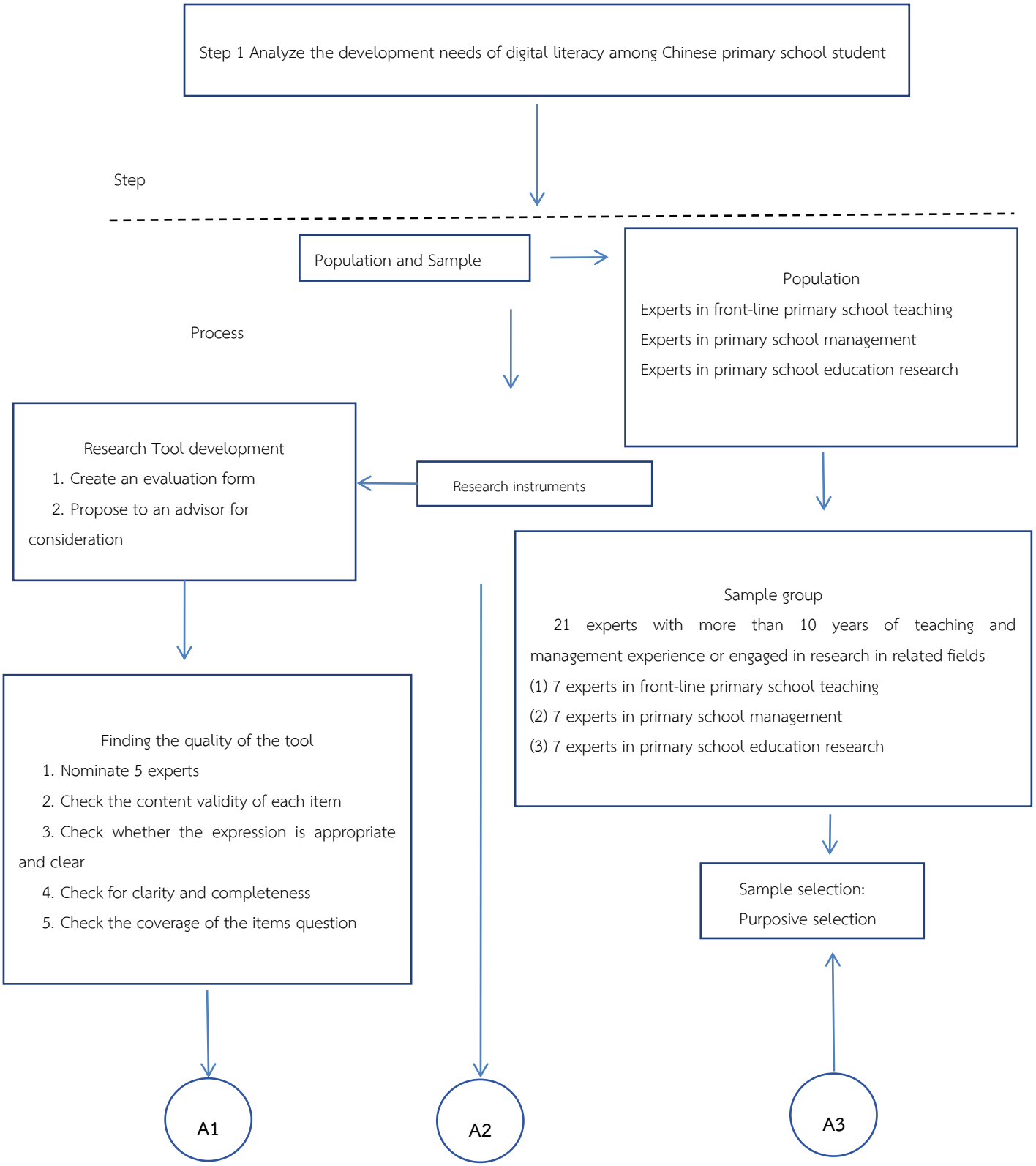


Figure 3.1 Research Process

Step 1 To analyze the needs of digital literacy for Chinese primary school student



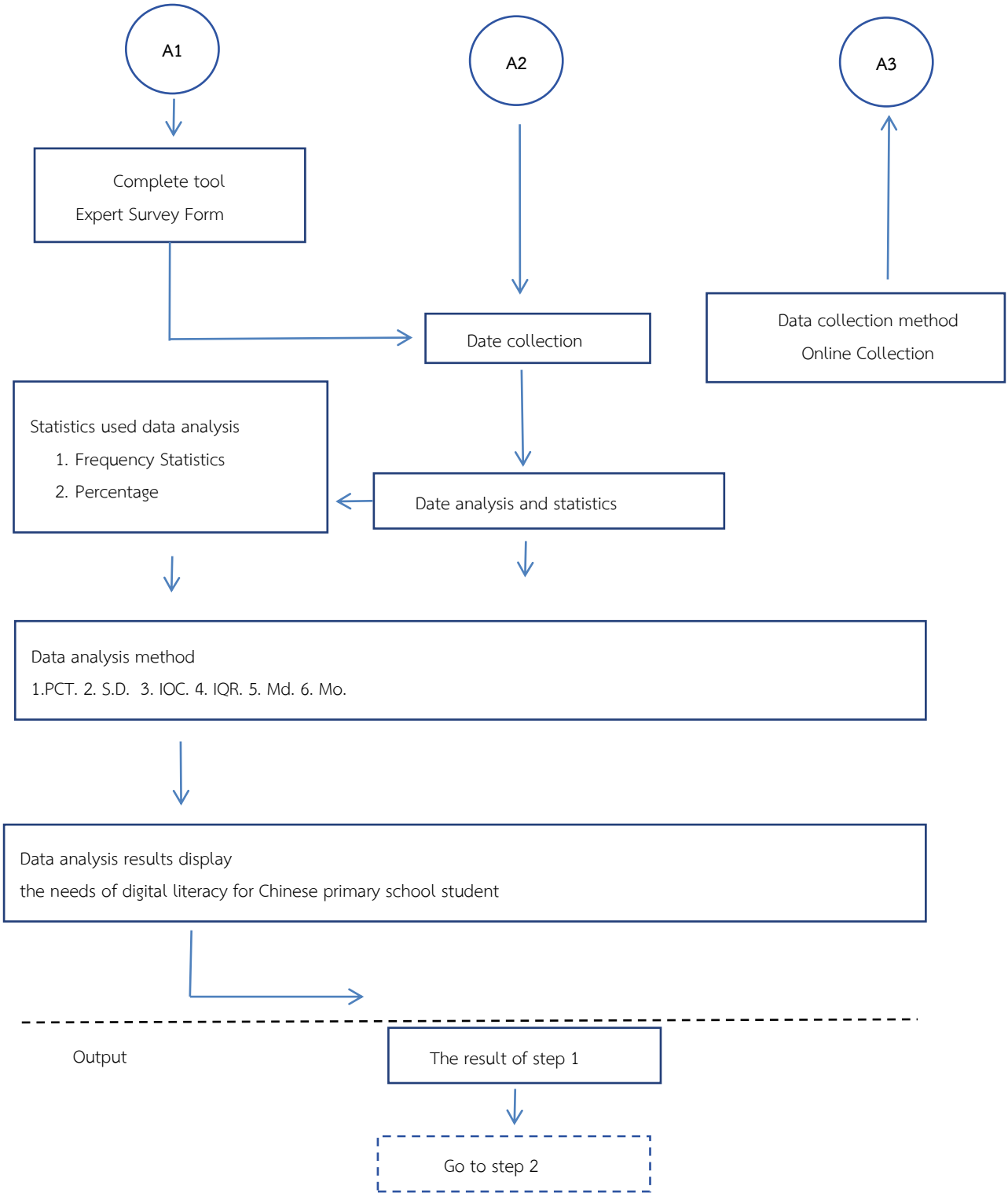


Figure 3.2 Details of the research process step 1

Step 1 is a strong response to objective 1. Specifically, this stage aims to gain an in-depth understanding of current needs of Chinese primary school student's digital literacy. As shown in Figure 3.2, the research implementation details cover 2 main parts: selection of target groups and samples, use of research instruments.

The Population/ Sample Group

The population groups include 21 people including: Experts in front-line primary school teaching, Experts in primary school management, Experts in primary school education research

The Sample Group

21 experts with more than 10 years of teaching and management experience or engaged in research in related fields:

7 experts in front-line primary school teaching

7 experts in primary school management

7 experts in primary school education research

5 experts to assess the survey questionnaire

5 experts with more than 15 years of teaching and management experience or engaged in research in related fields.

Research Instruments

The tool used in this research is evaluation forms.

The process of creating the tool is as follows:

1. Construct questionnaires in advance. On the basis of literature review, the questionnaire is constructed, including the research object, the research purpose, the background of the studied, and the specific questions.

2. Expert assessment. We invited 21 experts to evaluate these problems, put open questions to the experts, and asked them about the "development needs of Chinese primary school student's digital literacy". We hoped that the experts would elaborate on the "development needs of Chinese primary school student's digital literacy" and put forward suggestions for improvement.

3. Revise questions. Revise the evaluation form according to the expert evaluation feedback.

4. Seek expert opinions. Before formally launching the investigation, seek the opinion of 5 experts to evaluate the effectiveness of each item, assess whether it is appropriate and clear, and ensure that the content is comprehensive.

Data Collection

Expert Evaluation. Twenty-one experts with extensive knowledge and experience in the field of digital literacy development for primary school student were able to provide valuable feedback on the issues raised.

Expert Evaluation. The questionnaire was evaluated by 5 experts with extensive knowledge and more than 15 years of experience in the field of digital literacy development for primary school student.

Collect data online, via email, wechat and other platforms.

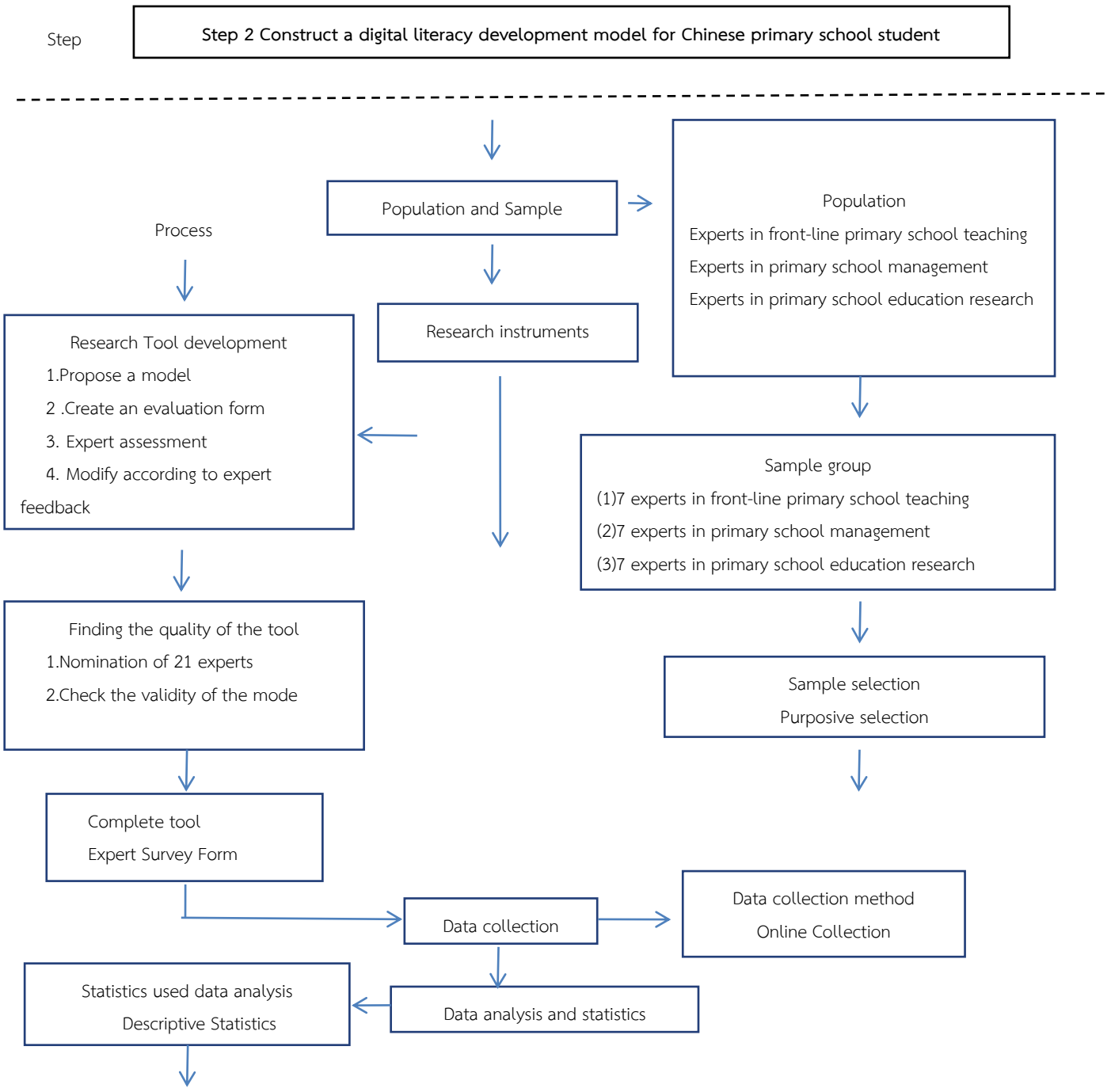
Data analysis

Data analysis and statistics used in data analysis

Conduct descriptive statistical analysis of the evaluation results of 21 experts, and present the agreement of experts in the form of a five-level scale, from excellent, good, medium, pass, poor to understand the distribution and trend of expert opinions.

Mean and standard deviation analysis: Analyze the mean and standard deviation of expert opinions to evaluate the consistency of different expert evaluations in each round, as well as the concentration of expert opinions, whether they diverge or converge.

Step 2 To construct a digital literacy development model for Chinese primary school student



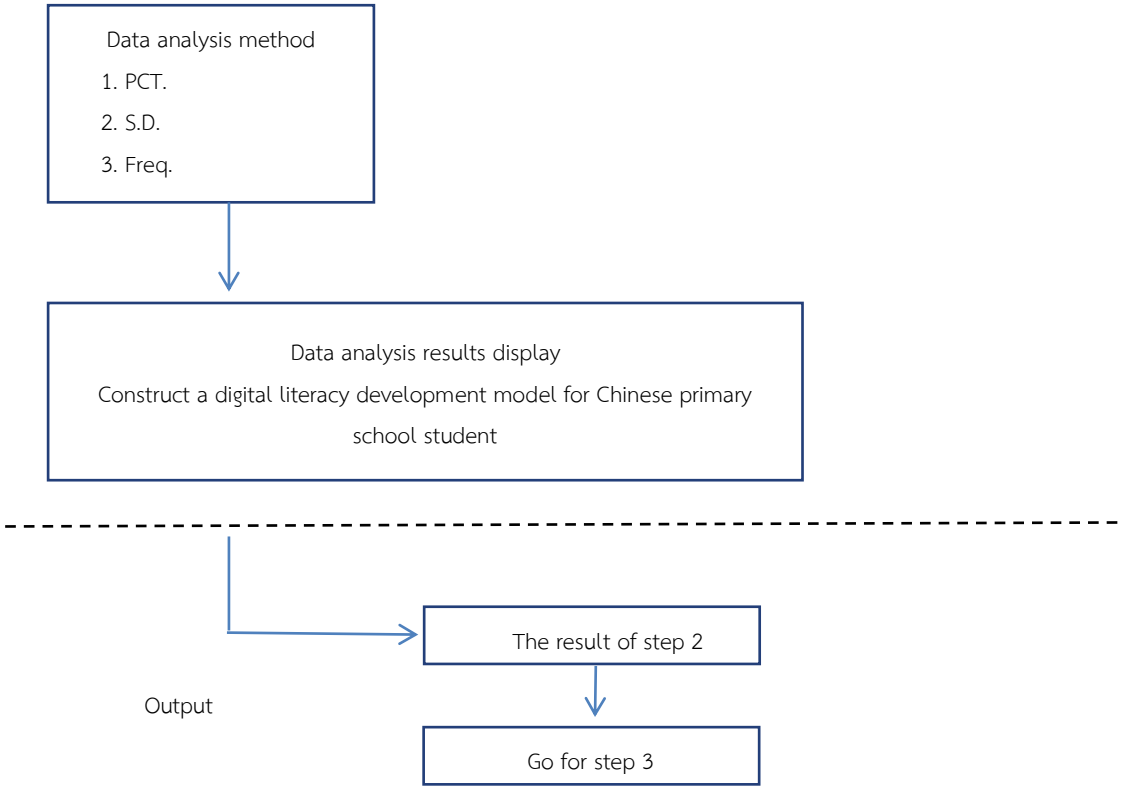


Figure 3.3 Details of the research process step 2

Step 2 the digital literacy development model for Chinese primary school student was constructed, as shown in Figure 3.3.

The population groups include 21 experts with more than 10 years of experience in teaching, management, or research in related fields.

The Sample group

21 experts who have more than 10 years of experience in teaching, management experience or research in relevant fields.

7 first-line primary school teachers,

7 professionals in educational management,

7 professionals in educational research

Research Instruments

The tools used in this study are presented models and evaluation tables

The process of creating the tool is as follows:

1. Send out questionnaires and invitations: Send assessment forms and invitations to experts online. The questionnaire should include research objects, research objectives, specific details and questions.

2. Expert survey: 21 experts were asked to provide feedback and suggestions for improvement.

3. Modify the model: Modify the created model according to the feedback of the expert survey.

Data collection

Use an online platform to collect expert opinions compiled through the Delphi method.

Conduct research. In each round, the experts received feedback on what had happened in the previous round and were asked to reassess the question. After many rounds of discussion, the opinions of the experts converged. Ensure that each round of expert surveys is anonymous to minimize the influence of personal bias on opinions. After each round, the feedback of experts is summarized, personal identification information is excluded, and the summarized results are timely fed back to the participants.

Analyze the results and reach a consensus. Analyze the results of each round to detect changes in expert opinion and trends towards convergence. It usually takes at least two rounds of discussion to reach a consensus and achieve the stability or unity of expert opinions.

Conduct three rounds of surveys. When the opinions are stable or reached, the expert investigation shall be terminated. When summarizing, participants can be provided with the final results and summary.

Summary and application. Interpret the results of expert surveys and construct models based on the findings.

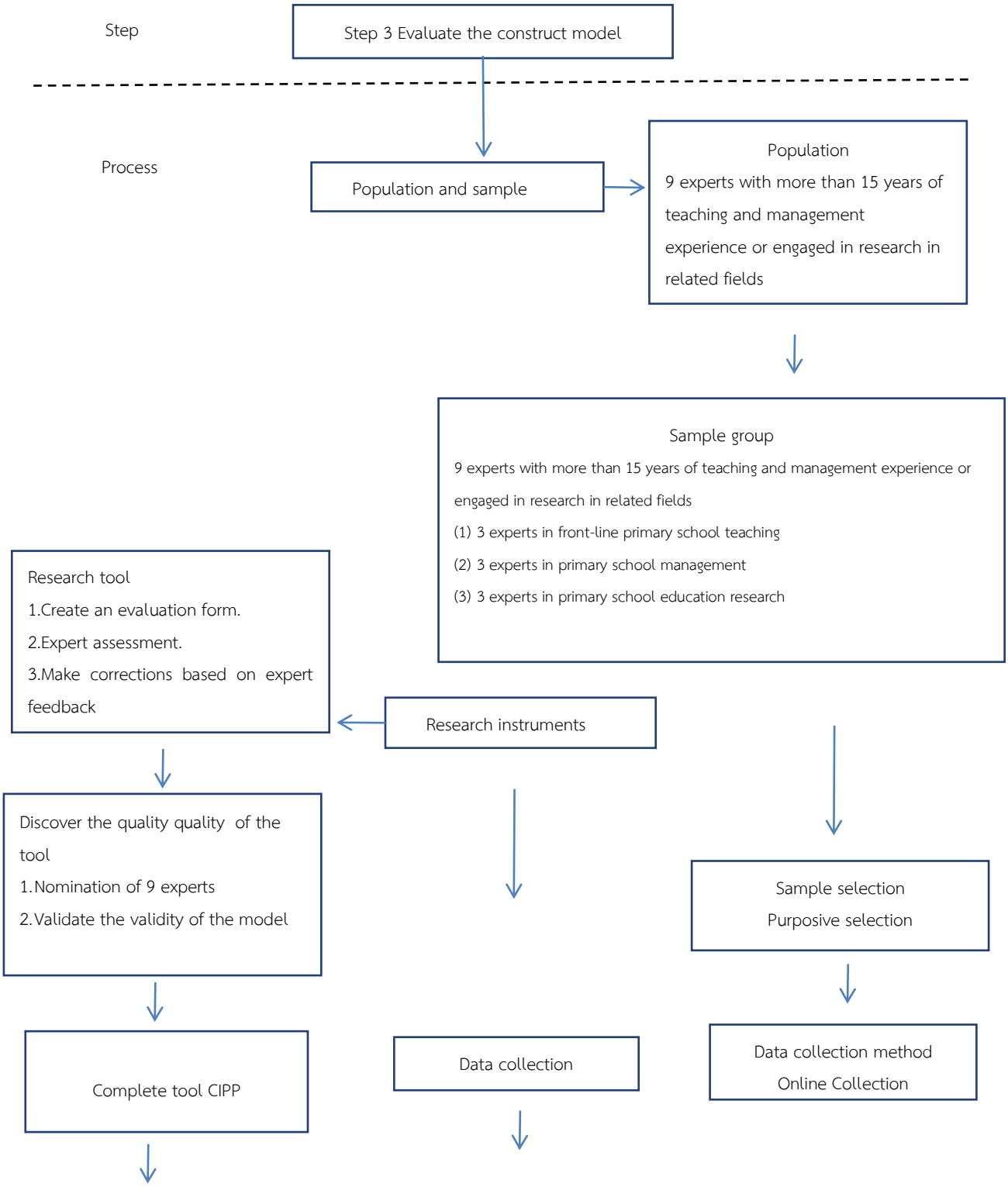
Data analysis and statistics used in data analysis

Analysis of variance: Conduct analysis of variance on the feedback of experts to determine which factors have a significant impact on the difference in results and provide basis for improving the model.

Analysis of IOC: First, we need to determine which indicators are the key to measure the development of digital literacy in primary school student. After issuing the questionnaire, the responses from all the experts were collected. Assuming that

in terms of digital skills, the questionnaire constructs a three-point scoring question, and experts need to score the digital skills level of primary school student. -1 is very dissatisfied, and 1 is very satisfied. Each expert of each expert was entered into a spreadsheet or statistical software using descriptive statistical analysis to process the data. Mean, median, range number and standard deviation were calculated for all experts.

Step 3 To validate the digital literacy development model for Chinese primary school student



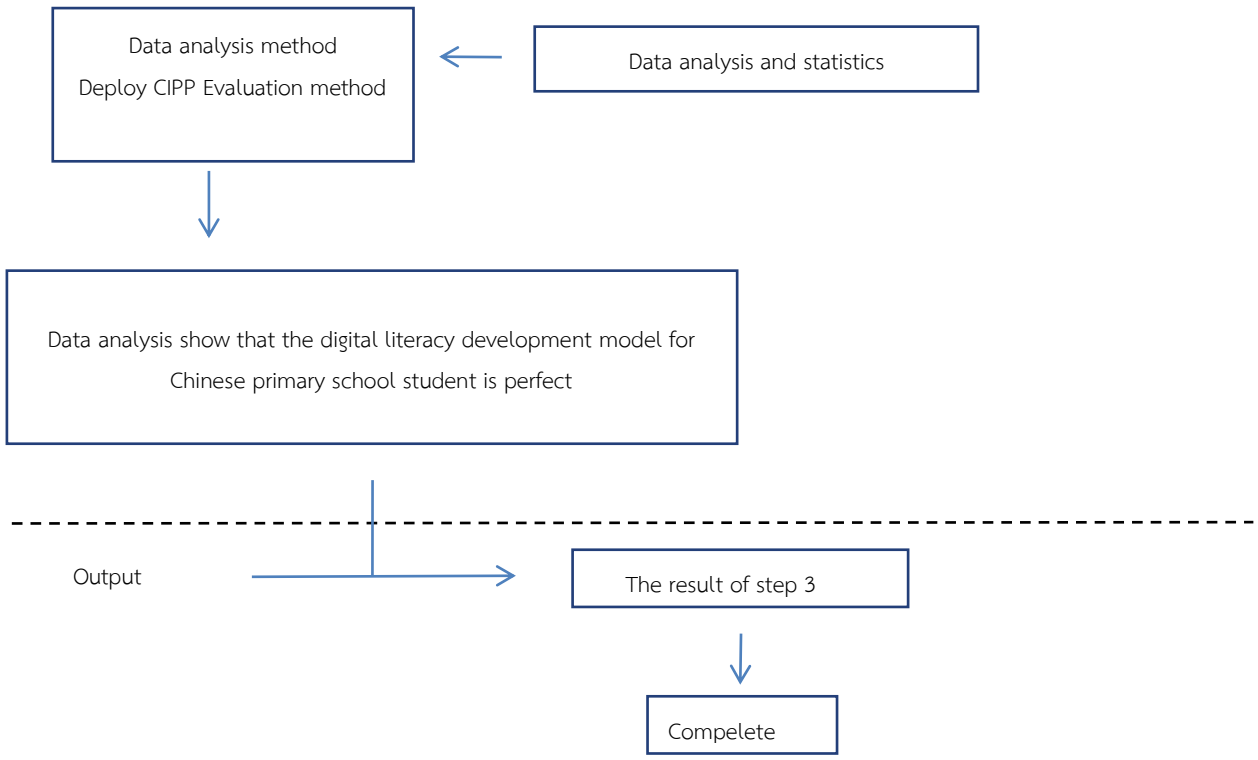


Figure 3.4 Details of the research process step 3

Step 3 To validate the digital literacy development model for Chinese primary school student, as shown in Figure 3.4.

The population groups include construct models.

The Sample group

9 experts with more than 15 years of teaching and management experience or engaged in research in related fields

3 experts in front-line primary school teaching

3 experts in primary school management

3 experts in primary school education research

Research instruments

The tool chosen in this study is the evaluation form.

The process of creating the tool is as follows:

Develop an evaluation interview form, including research objects, research objectives, model construct process, and description of model results.

9 Experts evaluated the model using the "agree", "disagree" and "partially agree" options and provided explanatory opinions for the "disagree" and "partially agree" options.

3. Optimize the model according to expert feedback.

Data collection

Data is collected as CIPP evaluation forms.

Use an online platform to collect the opinions of 9 experts.

2. Expert Evaluation: Expert evaluation model, in each round, experts receive feedback from the previous round and are asked to reevaluate some issues. In doing so, it is necessary to ensure the anonymity of each round of expert surveys, reducing personal bias and influence. The expert survey ends when the experts reach a consensus. In the conclusion section, the final results and summary can be provided to the participants.

3. Summary and application: Interpret the expert survey results, and optimize the model according to the survey results.

Data analysis and statistics used in data analysis

CIPP model was used to conduct frequency statistics and analysis of evaluation data, determine the quality and rationality of model construct, summarize expert suggestions, and optimize the model.

In this study, multiple research instruments were employed to gather comprehensive data and ensure the validity and reliability of the findings. The relevant terms in the study are expressed as follows.

Data Analysis Results

Symbol and Abbreviations

N: Number

Refers to the total number of observations or participants in a dataset.

Md: Median

The median is the middle value in a data set when the values are arranged in ascending or descending order. It represents the 50th percentile of the distribution.

Mo: Mode

The mode is the value that appears most frequently in a data set. It is a measure of central tendency.

IQR: Inter-Quartile Range

The inter-quartile range is the difference between the first quartile (25th percentile) and the third quartile (75th percentile). It measures the spread of the middle 50% of the data.

PCT: Percentage

Percentage refers to the proportion of a part relative to a whole, expressed as a fraction of 100.

D: Standard Deviation

Standard deviation is a measure of the amount of variation or dispersion in a set of values. It indicates how much the values in a dataset typically differ from the mean.

IOC: Index of Item-Objective Congruence

The Index of Item-Objective Congruence is a measure used to assess the degree to which items on a test or survey align with the objectives they are intended to measure.

Freq: Frequency

Frequency refers to the number of times a particular value or category appears in a dataset.

$\overline{x}$: Mean

The mean (often represented by $\overline{x}$ is the average of a set of values, calculated by summing all the values and dividing by the number of observations.

5-point Likert scale:

This tool is utilized to present the Digital Literacy Development Model for Chinese Primary School student. The respondents determine the degree to which each statement reflects the components of effectiveness. Each statement is measured on a 5-point Likert scale, as illustrated by Tanujaya et al. (2022). The scale is defined as follows:

5 = Strongly Agree

4 = Agree

3 = Neutral

2 = Disagree

1 = Strongly Disagree

The details of the statements and their respective ratings are presented in Table 3.1.

Table 3.1 Measurement Scale for Digital Literacy Development Model for Chinese Primary School student

Perception level	Score
Strongly Agree	5
Agree	4
Neutral	3
Disagree	2
Strongly Disagree	1

The Inter-Quartile Range (IQR): This tool analyzes the concentration and distribution of expert opinions regarding the Digital Literacy Development Model for Chinese Primary School student. The the Inter-Quartile Range helps in understanding the consensus among experts. This study adopts the consensus criteria proposed by Xiang and Jermtaisong (2023).

Table 3.2 Consensus Degree Based on Inter-Quartile Range (IQR) in Expert Opinion Surveys

The Inter-Quartile Range	Consensus Degree
$0 \leq IQR \leq 1.8$	High
$1.8 \leq IQR \leq 2.0$	Medium
$IQR \geq 2.0$	Low

Median (Md): The median is the score in the middle of the score data provided by all experts in order. It describes the concentration trend of expert opinions and explains the meaning according to the standards set by the researcher, as described by Ma (2021).

Table 3.3 Median-Based Expert Opinion Classification

Median	The possibility of this item
Md ≥ 4.50	Most likely
3.50 ≤ Md ≤ 4.49	More likely
2.50 ≤ Md ≤ 3.49	Moderate likely
1.50 ≤ Md ≤ 2.49	Less likely
Md ≤ 1.50	Least likely

Chapter 4
Results of Analysis

The research on the "Development of Digital Literacy Model for Chinese Primary School student" analyzed the following objectives and obtained results.

1. Result of Finding Objective1: To analyze the needs of digital literacy for Chinese primary school student.

2. Result of Finding Objective2: To construct a digital literacy development model for Chinese primary school student.

3. Result of Finding Objective3: To validate the digital literacy development model for Chinese primary school student.

The following results can be obtained based on the research design path and methods presented in Chapter3.

Result of Finding Objective1: To analyze the needs of digital literacy for Chinese primary school student

Determining the current digital literacy needs of Chinese primary school student through expert survey methods. The personal information of 21 experts includes gender, organization, position, years of work experience, educational background, and professional title, as shown in Table 4.1.

Table 4.1 Personal Information of 21 Experts

Item	Personal Information	No.of People	Percentage
Gender	Male	17	80.95
	Female	4	19.04
	Total	**21**	**100**
Work Unit	University	9	42.86
	Primary school	12	57.14
	Total	**21**	**100**
Position	Primary education specialist	7	33.33
	Primary management specialist	7	33.33
	University	7	33.33
	Total	**21**	**100**
Work experience	0-5 years	0	0.00
	6-10 years	0	0.00
	11-15 years	4	19.05
	more than 16 years	17	80.95
	Total	**21**	**100**
Professional Title	Senior	10	47.61
	Full Senior	10	47.61
	General	1	4.76
	Total	**21**	**100**

According to Table 4.1, this study involves 21 experts in the field of digital literacy cultivation for Chinese primary school student. Among these 21 experts, 7 are front line primary school teachers in China, 7 are professionals engaged in educational management, and 7 are professionals involved in educational research. Among these experts, male experts outnumber female experts, with males accounting for 80.95%. Among these experts, 7 are engaged in educational research, while 14 are involved in teaching and educational management. All these experts have over 10 years of work experience, and 17 of them have more than 15 years of work experience, accounting for 80.95%.

The questions of primary school student in terms of Technical Skills Ability

Through the questionnaire survey of 21 experts, it is found that the needs of cultivating Chinese primary school student' digital literacy should start from the five fundamental elements, "technical skills ability", "information search and evaluation ability", "digital creativity ability", "digital ethics and social responsibility" and "digital security awareness", and carry out in-depth and detailed analysis, as shown in Table 4.2.

Table 4.2 The questions of primary school student in terms of Technical Skills Ability

Detail Questions	Strongly Agree	Frequency	Agree	Frequency	Neutral	Frequency	Disagree	Frequency	Strongly Disagree	Frequency	Total
1. Conduct basic technical skills training	19	90.48	1	4.76	1	4.76	0	0.00	0	0.00	21
2. Implement practical projects and experimental teaching	12	57.14	8	38.09	1	4.76	0	0.00	0	0.00	21
3. Organically integrate technical skills training into the teaching of various subjects	15	72.43	5	23.81	1	4.76	0	0.00	0	0.00	21
4. Organize comprehensive training to develop teachers' ability to develop student' technical skills	18	85.71	2	9.52	1	4.76	0	0.00	0	0.00	21
5. Strengthen the practice and collaboration in training student' technical skills in teachers' teaching and research	21	100	0	0.00	0	0.00	0	0.00	0	0.00	21

Table 4.2 (Continued)

Detail Questions	Strongly Agree	Frequency	Agree	Frequency	Neutral	Frequency	Disagree	Frequency	Strongly Disagree	Frequency	Total
6. Continuously evaluate the effectiveness of teachers in training student' technical skills and optimize educational strategies accordingly	17	80.96	4	19.05	0	0.00	0	0.00	0	0.00	21
7. Adopt various methods to stimulate student' interest in participating in technological development	19	90.48	2	9.52	0	0.00	0	0.00	0	0.00	21
8. Introduce the latest technologies and tools in training student' technical skills	15	72.43	5	23.81	1	4.76	0	0.00	0	0.00	21
9. Conduct technical skills ability training through practical activities and project promotion involving participation from all sectors of society	15	72.43	5	23.81	1	4.76	0	0.00	0	0.00	21

Table 4.2 reflects expert opinions on primary school student' technical skills abilities. High approval ratings are seen for 'Conduct basic technical skills training' (90.48% Excellent) and 'Strengthen the practice and collaboration in training student' technical skills' (100% Excellent). However, 'Implement practical projects and experimental teaching' received only 57.14% Excellent, and 'Introduce the latest technologies and tools in training student's technical skills' was rated 72.43% Excellent. These lower ratings indicate a need for more practical, hands-on learning opportunities and better integration of the latest technologies in the curriculum.

The questions of primary school student in terms of Information Search and Evaluation Skills

Table 4.3 The questions of primary school student in terms of Information Search and Evaluation Skills

Detail Questions	Strongly Agree	Frequency	Agree	Frequency	Neutral	Frequency	Disagree	Frequency	Strongly Disagree	Frequency	Total
10. Conduct teaching using a variety of educational tools and media	19	90.48	2	9.52	1	4.76	0	0.00	0	0.00	21
11. Adopt interactive and hands-on teaching methods	21	100	0	0.00	0	0.00	0	0.00	0	0.00	21
12. Teach student efficient search techniques and strategies	21	100	0	0.00	0	0.00	0	0.00	0	0.00	21
13. Teach student skills to identify and evaluate information sources	21	100	0	0.00	0	0.00	0	0.00	0	0.00	21
14. Develop student' critical thinking and logical analysis abilities	21	100	0	0.00	0	0.00	0	0.00	0	0.00	21

Table 4.3 (Continued)

Detail Questions	Strongly Agree	Frequency	Agree	Frequency	Neutral	Frequency	Disagree	Frequency	Strongly Disagree	Frequency	Total
15. Organize practical activities for information evaluation, using interactive learning methods to develop student' information evaluation skills	20	95.24	1	4.76	0	0.00	0	0.00	0	0.00	21
16. Provide teachers with online educational resources and continuous learning opportunities	16	76.19	3	14.29	2	9.52	0	0.00	0	0.00	21
17. Strengthen the training of teaching methods and the application of technology in teacher training	21	100	0	00.00	0	0.00	0	0.00	0	0.00	21

Table 4.3 reveals strong approval for teaching strategies enhancing primary school student's information search and evaluation skills. Areas like 'Adopt interactive and hands-on teaching methods', 'Teach student efficient search techniques and strategies', and 'Develop student's critical thinking and logical analysis abilities' received 100% Excellent ratings, indicating effective current practices. However, 'Provide teachers with online educational resources and continuous learning opportunities' received only 76.19% Excellent, suggesting a need for improved professional development and access to up-to-date resources. Addressing these gaps through increased funding and continuous training will develop digital literacy education.

The questions of primary school student in terms of Digital Creativity Ability

Table 4.4 The questions of primary school student in terms of Digital Creativity Abilities

Detail Questions	Strongly Agree	Frequency	Agree	Frequency	Neutral	Frequency	Disagree	Frequency	Strongly Disagree	Frequency	Total
18. Design digital literacy education courses across disciplines to cultivate creativity and innovation	14	66.67	5	23.81	2	9.52	0	0.00	0	0.00	21
19. Implement project-based learning with a focus on teaching practice	17	80.95	3	14.29	1	4.76	0	0.00	0	0.00	21
20. Develop the experience of applying technology through practical operation and application	16	76.19	5	23.81	0	0.00	0	0.00	0	0.00	21
21. Provide student with a variety of technological tools and platforms to develop their application experience	19	90.48	2	9.52	0	0.00	0	0.00	0	0.00	21

Table 4.4 (Continued)

Detail Questions	Strongly Agree	Frequency	Agree	Frequency	Neutral	Frequency	Disagree	Frequency	Strongly Disagree	Frequency	Total
22. Encourage and guide student in project-based practical learning	21	0.00	0	0.00	0	0.00	0	0.00	0	0.00	21
23. Provide opportunities for interdisciplinary collaboration to jointly develop student' skills	21	0.00	0	0.00	0	0.00	0	0.00	0	0.00	21
24. Adopt diverse methods to guide and promote student' self-directed and exploratory learning	13	61.90	5	23.81	3	14.29	0	0.00	0	0.00	21
25. Build and improve digital innovation infrastructure and resource-sharing mechanisms	12	57.14	3	14.29	6	28.57	0	0.00	0	0.00	21
26. Provide continuously optimized educational resources for teachers and student	13	61.90	7	33.33	1	4.76	0	0.00	0	0.00	21

Table 4.4 reflects expert opinions on primary school student's digital creativity abilities. High approval ratings are seen for 'Encourage and guide student in project-based practical learning' and 'Provide opportunities for interdisciplinary collaboration' (both 100% Excellent). However, 'Adopt diverse methods to guide and promote student's self-directed and exploratory learning' (61.90% Excellent) and 'Build and improve digital innovation infrastructure and resource-sharing mechanisms' (57.14% Excellent) received lower ratings. These gaps suggest a need for better infrastructure, resource-sharing, and diverse teaching methods to develop digital literacy and innovation among student.

The questions of primary school student in terms of Digital Ethics and Social Responsible

Table 4.5 The questions of primary school student in terms of Digital Ethics and Social Responsible

Detail Questions	Strongly Agree	Frequency	Agree	Frequency	Neutral	Frequency	Disagree	Frequency	Strongly Disagree	Frequency	Total
27. Integrate digital ethics and social responsibility education into various forms of teaching activities	21	100.00	0	0.00	0	0.00	0	0.00	0	0.00	21
28. Cultivate digital identity awareness and a sense of responsibility among student	17	80.95	3	14.29	1	4.76	0	0.00	0	0.00	21
29. Use comprehensive and interactive educational methods to develop student' digital ethics and digital social responsibility	16	76.19	4	19.05	1	4.76	0	0.00	0	0.00	21
30. Integrate digital ethics and social responsibility awareness into interdisciplinary educational content	17	80.95	3	14.29	1	4.76	0	0.00	0	0.00	21

Table 4.5 (Continued)

Detail Questions	Strongly Agree	Frequency	Agree	Frequency	Neutral	Frequency	Disagree	Frequency	Strongly Disagree	Frequency	Total
31. Design and implement digital culture courses	19	90.48	2	9.52	0	0.00	0	0.00	0	0.00	21
32. Carry out comprehensive digital culture development and education promotion	18	85.71	3	14.29	0	0.00	0	0.00	0	0.00	21
33. Integrate resources to achieve the fusion and innovation of school education content and methods	16	76.19	5	23.81	0	0.00	0	0.00	0	0.00	21

Table 4.5 reflects expert opinions on primary school student's digital ethics and social responsibility. High ratings were given for 'Integrate digital ethics and social responsibility education into various forms of teaching activities' (100% Excellent) and 'Design and implement digital culture courses' (90.48% Excellent). However, areas like 'Use comprehensive and interactive educational methods to develop student's digital ethics and digital social responsibility' (76.19% Excellent) and 'Integrate resources to achieve the fusion and innovation of school education content and methods' (76.19% Excellent) received lower ratings. This indicates a need for improved interactive methods and resource integration to better promote digital ethics and social responsibility.

The questions of primary school student in terms of Digital Security Awareness

Table 4.6 The questions of primary school student in terms of Digital Security Awareness

Detail Questions	Strongly Agree	Frequency	Agree	Frequency	Neutral	Frequency	Disagree	Frequency	Strongly Disagree	Frequency	Total
34. Conduct comprehensive and practical digital security education	20	95.24	0	0.00	1	4.76	0	0.00	0	0.00	21
35. Utilize advanced technologies and methods to improve the effectiveness of digital security education	20	95.24	0	0.00	1	4.76	0	0.00	0	0.00	21
36. Implement comprehensive digital security education strategies	21	100.00	0	0.00	0	0.00	0	0.00	0	0.00	21
37. Adopt practical and interactive digital security teaching methods	18	85.71	2	9.52	1	4.76	0	0.00	0	0.00	21

Table 4.6 (Continued)

Detail Questions	Strongly Agree	Frequency	Agree	Frequency	Neutral	Frequency	Disagree	Frequency	Strongly Disagree	Frequency	Total
38. Emphasize privacy education through practical activities to cultivate student's security awareness	18	85.71	2	9.52	1	4.76	0	0.00	0	0.00	21
39. Develop infrastructure to build a comprehensive digital learning environment	18	85.71	2	9.52	1	4.76	0	0.00	0	0.00	21
40. Conduct digital security awareness education activities and training with multi-party participation	17	80.95	4	19.05	0	0.00	0	0.00	0	0.00	21
41. Integrate diverse resources for digital security awareness education	18	85.71	2	9.52	1	4.76	0	0.00	0	0.00	21

Table 4.6 reflects expert opinions on primary school student's digital security awareness. High approval ratings were given for “Implement comprehensive digital security education strategies” (100% Excellent) and “Conduct comprehensive and practical digital security education” (95.24% Excellent). However, areas like “Adopt practical and interactive digital security teaching methods” and “Emphasize privacy education through practical activities” (both 85.71% Excellent) indicate room for improvement. This suggests a need for more interactive and practical teaching methods to develop digital security awareness among student, ensuring they are better prepared for the digital world.

Based on the consultation results of the 21 experts, questions below 75%, namely questions, 2, 3, 8, 9, 18, 24, 25, 26.

After reviewing the feedback and explanation of each expert, it was found that:

For “Question 2”, nine experts did not rate it as "Excellent," indicating varying access to resources and practical opportunities across schools, which affects the implementation of practical projects and experimental teaching. “Question 3” had six experts not rating it as "Excellent," highlighting the inconsistent integration of technical skills into various subjects and the need for improved cross-curricular strategies.

For “Question 8”, six experts did not consider it “Excellent,” pointing to the differing paces of technology adoption and outdated training resources impacting effectiveness perceptions. “Question 9” saw six experts not rating it as “Excellent,” due to differences in community and industry engagement levels affecting the success of practical activities and project promotion. “Question 18” had seven experts not rating it as “Excellent,” suggesting a lack of uniformity in designing digital literacy courses across disciplines, which impacts creativity and innovation. “Question 24” had eight experts not rating it as "Excellent," reflecting the wide variance in methods to guide self-directed learning, which affects student’s engagement and independence. “Question 25” had nine experts not rating it as “Excellent,” indicating significant differences in digital innovation infrastructure and resource-sharing mechanisms, resulting in varied expert opinions.

“Question 26” had eight experts not rating it as "Excellent," highlighting the need for better resource management and updates due to varying effectiveness in optimizing educational resources for teachers and student. This analysis underscores the need for more consistent strategies and resources to improve digital literacy education.

After further sorting out the explanations of the experts for the above five questions, it was found that there were absolute statements and lack of clarity in the design of the original research questions. Feedback was then individually sought from the expert who had initially chosen either agreement or disagreement. The results of this feedback as shown in Table 4.7.

Table 4.7 The results of the adjusted expressions for the five aspects of the question

Detail Questions	Strongly Agree	Frequency	Agree	Frequency	Neutral	Frequency	Disagree	Frequency	Strongly Disagree	Frequency	Total
1. Implement practical projects and experimental teaching	21	100.00	0	0.00	0	0.00	0	0.00	0	0.00	21
2. Organically integrate technical skills training into the teaching of various subjects	21	100.00	0	0.00	0	0.00	0	0.00	0	0.00	21
3. Introduce the latest technologies and tools in training student's technical skills	20	95.24	1	4.76	0	0.00	0	0.00	0	0.00	21
4. Conduct technical skills ability training through practical activities and project promotion involving participation from all sectors of society	21	100.00	0	0.00	0	0.00	0	0.00	0	0.00	21

Table 4.7 (Continued)

Detail Questions	Strongly Agree	Frequency	Agree	Frequency	Neutral	Frequency	Disagree	Frequency	Strongly Disagree	Frequency	Total
5. Design digital literacy education courses across disciplines to cultivate creativity and innovation	21	100.00	0	0.00	0	0.00	0	0.00	0	0.00	21
6. Adopt diverse methods to guide and promote student's self-directed and exploratory learning	21	100.00	0	0.00	0	0.00	0	0.00	0	0.00	21
7. Build and improve digital innovation infrastructure and resource-sharing mechanisms	20	95.24	1	4.76	0	0.00	0	0.00	0	0.00	21
8. Provide continuously optimized educational resources for teachers and student	21	100.00	0	0.00	0	0.00	0	0.00	0	0.00	21

According to Table 4.7, the results of the expression adjustment of 8 questions were unanimously approved by all experts.

Comparing the expert conclusions, there are some differences in the research expert group, primary school teaching expert group and primary school management expert group on the digital literacy needs of Chinese primary school student, as shown in Table 4.8.

Table 4.8 Comparison of Results from Different Expert Groups

Fundamental Elements	Primary Education Specialist		Primary Management Specialist		Research Institution	
	Mean-Value	Standard Deviation	Mean-Value	Standard Deviation	Mean-Value	Standard Deviation
Technical Skills Ability	0.926	0.256	0.815	0.480	0.889	0.445
Information Search and Evaluation Skills	0.917	0.236	0.778	0.533	1.000	0.000
Digital Creativity Ability	0.889	0.445	0.972	0.156	0.917	0.236
Digital Ethics and Social Responsible	0.836	0.446	1.000	0.000	0.972	0.157
Digital Security Awareness	0.723	0.533	0.612	0.753	0.778	0.521

According to Table 4.8, Primary education specialist and Primary management specialist have the same cognition of these five abilities, among which two abilities are more important to unanimously recognize, namely, the needs of primary school student in terms of technical skills ability, and the needs of primary school student in terms of information search and evaluation skills (S.D=0.000). At the same time, the three groups of experts agreed that the needs of primary school student in terms of digital security awareness was not very important among the five abilities (S.D=0.753). Research institution Unlike the other two groups of experts, Research institution

believes that information search and assessment capabilities are the most important because they believe Information Search and Evaluation Skills foster critical thinking and digital literacy. Digital Ethics and Social Responsibility ensure safe, respectful behavior. Digital Security Awareness protects against cyber threats. Technical Skills enable effective tool use. Creativity and Innovation develop question-solving and future readiness.

Based on the analysis of literature and expert opinions collected through questionnaires, this study identifies technical skills ability, information search and evaluation ability, digital creativity ability, digital ethics and social responsibility, and digital security awareness as the fundamental elements of digital literacy among Chinese primary school students. After determining these fundamental elements, a survey was distributed to 21 experts to gather their opinions on the key influencing factors affecting the digital literacy of Chinese primary school students, considering the trends and opportunities for the development of digital literacy.

Key influencing factors that affect the development of digital literacy of Chinese primary school student

The analysis of the key influencing factors that affect the development of digital literacy of Chinese primary school student

Table 4.9 The analysis of the key influencing factors that affect the development of digital literacy of Chinese primary school student

The Key Influencing Factors	Md	Mo	IQR	Result
Holistic Curriculum	5.0	5	0.0	Pass
Cross-discipline Design	5.0	5	0.0	Pass
Diverse Methods	5.0	5	0.0	Pass
Teacher Development	4.0	5	2.0	Modify
Cultivate Thinking	4.0	5	2.0	Modify
Personalized Experience	4.0	4	2.0	Modify
Resource Protection	4.0	4	2.0	Modify
Collaborative Participation	3.0	3	2.0	Modify

According to Table 2, three of the eight factors affecting the digital literacy of Chinese primary school student are more consistent with the interquartile range (0.0<IQR<1.0) or median (4.0<Md<5.0), indicating that 60% of the influencing factors are more consistent. I very strongly agree with the following view: 1. Holistic Curriculum (Md=5.0, Mo=5, IQR=0), 2. Cross-disciplinary Design (Md=5.0, Mo=5, IQR=0), 3. Diverse Methods (Md=5.0, Mo=5, IQR=0), 4. Teacher Development (Md=4.0, Mo=5, IQR=2.0) show that there are significant differences in opinions among the interviewees.

Specific Analysis of key success elements that affect the development of digital literacy of Chinese primary school student

A total of 24 questions were designed around the 8 the key influencing factors that affect the development of digital literacy of Chinese primary school student, and provided to 21 experts for consultation. The results as shown in Table 4.10

Table 4.10 Specific Analysis of the key influencing factors that affect the development of digital literacy of Chinese primary school student

The key influencing factors	$\overline{x}$	S.D	Detail question	N	Freq	PCT	IOC
Holistic Curriculum	1.000	0.000	Establishes a solid digital foundation from an early age	21	21	100	1.000
			Ensures continuous and progressive learning across grades	21	21	100	1.000
			Integrates digital skills within various subjects.	21	21	100	1.000
Cross-discipline Design	1.000	0.000	Applies digital skills across multiple subjects	21	21	100	1.000
			develops critical thinking and question-solving abilities	21	21	100	1.000
			Encourages creativity and innovative solutions	21	21	100	1.000

Table 4.10 (Continued)

The key influencing factors	$\bar{x}$	S.D	Detail question	N	Freq	PCT	IOC
Diverse Methods	1.000	0.000	Keeps student engaged and motivated with diverse methods	21	21	100	1.000
			Addresses different learning styles effectively	21	21	100	1.000
			Demonstrates real-world applications of digital skills	21	21	100	1.000
Teacher Development	1.000	0.000	Caters to the unique needs of each student	21	21	100	1.000
			Builds student's confidence through personalized learning.	21	21	100	1.000
			Nurtures student's strengths and interests in digital literacy	21	21	100	1.000

Table 4.10 (Continued)

The key influencing factors	$\bar{x}$	S.D	Detail question	N	Freq	PCT	IOC
Cultivate Thinking	0.968	0.174	Fosters a sense of responsible digital citizenship	21	21	100	1.000
			develops student's ability to analyze information critically	21	20	95.24	0.905
			Promotes adaptability to evolving digital technologies	21	20	95.24	0.905
Personalized Experience	0.937	0.237	Provides hands-on experiences with up-to-date technology	21	18	85.71	0.743
			Protects student from online threats and distractions	21	21	100	1.000
			Promotes environmentally sustainable digital practices	21	20	95.24	0.905

Table 4.10 (Continued)

The key influencing factors	$\bar{x}$	S.D	Detail question	N	Freq	PCT	IOC
Resource Protection	0.881	0.387	Updates teachers' digital skills and knowledge	21	19	90.48	0.814
			Improves the effectiveness of digital literacy instruction	21	18	85.71	0.733
			Exemplifies the importance of digital skills to student	21	19	90.48	0.819
Collaborative Participation	0.833	0.530	Engages a supportive learning ecosystem involving the community	21	19	90.48	0.814
			Shares educational resources and expertise	21	19	90.48	0.819
			Provides real-world insights into professional digital applications	21	17	80.95	0.657

According to Table 4.10, the 21 experts have a high degree of agreement on the key influencing factors affecting the development of digital literacy among Chinese primary school student. Among them, there are slight differences in the attitudes towards three questions, “Provides hands-on experiences with up-to-date technology” (PCT=85.71%, IOC=0.743), “Improves the effectiveness of digital literacy instruction” (PCT=85.71%, IOC=0.733), and “Provides real-world insights into professional digital applications” (PCT=80.95%, IOC=0.657). But overall, the experts’ attitudes are very positive, and the general consensus tends to be consistent.

Confirm the key influencing factors that affect the development of digital literacy of Chinese primary school student

Provide the original questionnaire on the need for digital literacy development for Chinese primary school student, and key success factors,as well as the analysis results and the revised questionnaire after qualitative analysis,to5 experts in those fields. The 5 experts will independently check the effectiveness, appropriateness, clarity, and completeness of each question's expression, and evaluate them with full agreement(1point), partial agreement(0 point),or disagreement (-1 point) (Table 4.11).

Table 4.11 Confirm the key influencing factors that affect the development of digital literacy of Chinese primary school student

Aspects Evaluated	Evaluate the Content	N	Freq	PCT	$\overline{x}$	S.D	*IOC*
Clarity of Expression	The expressions are appropriate, clear, and unambiguous	5	5	100	1.000	0.000	1.000
Completeness of Content	The content is relatively comprehensive, covering issues related to industry-education cooperation	5	5	100	1.000	0.000	1.000
Procedural Regularity	The processes of date collection, analysis, and questionnaire revision are standardized	5	5	100	1.000	0.000	1.000
Effectiveness of Conclusions	The conclusions draw regarding the need of for digital literacy development for Chinese primary school student	5	5	100	1.000	0.000	1.000

According to Table 4.11, the need of for digital literacy development for Chinese primary school student, and key success factors in the development of digital literacy of Chinese primary school student have received unanimous approval from all experts (PCT=100%, IOC=1.000), indicating the validity of the conclusion.

Result of Finding Objective2: To Construct a digital literacy development model for Chinese primary school student.

Based on the results of objective 1 and the findings form this section's interviews, a comprehensive analysis of the need for digital literacy development for

Chinese primary school student. Using system thinking, construct a digital literacy development model for Chinese primary school student. (Figure 4.1)

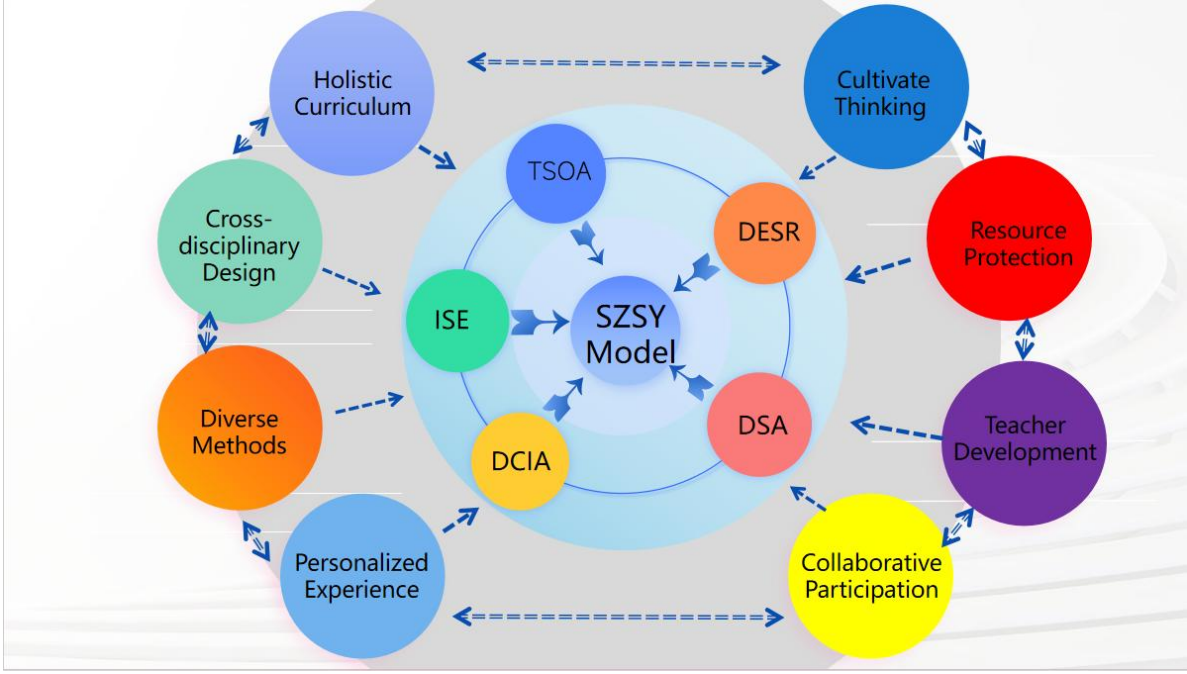


Figure 4.1 The digital literacy development model for Chinese primary school

Student: SZSY Model

Model description:

1. In the model, solid and bidirectional line represent direct interactions, and dotted line represent indirect interactions.

2. In this model, the solidity of the arrows reflects the strength of the influence: solid arrows indicate a strong influence, while dashed arrows indicate a weak influence.

Model Explanation:

Development of Digital Literacy Model for Chinese Primary School student is a relatively fixed and inclusive model formed by the integration of relevant subjects and influencing factors. The Digital Literacy Development Model for Chinese Primary School student provides strategic support and a platform for the development of digital literacy among Chinese primary school student.

1. In this model, all elements interact with each other. Digital literacy among Chinese primary school student is the core element. Technical Skills and Operational Abilities, Information Search and Evaluation Skills, Digital Creativity Abilities, Digital Ethics and Social Responsibility, and Digital Security Awareness are the components of the core element and are considered fundamental elements. Holistic Curriculum, Cross-disciplinary Design, Diverse Methods, Personalized Experience, Cultivate Thinking, Resource Protection, Teacher Development, and Collaborative Participation are influencing elements.

2. Developing the fundamental elements helps to develop the core element, and the development of the core element can also promote the development of each fundamental element. The five fundamental elements represent requirements for specific abilities and qualities, and there are interactions among these five elements. For example, developing Technical Skills and Operational Abilities helps to develop Information Search and Evaluation Skills, and developing Information Search and Evaluation Skills also helps to develop Technical Skills and Operational Abilities.

3. The eight influencing elements impact the core element and the five fundamental elements. Research has found that the eight influencing elements have varying degrees of impact on the five fundamental elements, with some having a strong influence and others having a weak influence. The eight influencing elements ultimately achieve an impact on the core element through their influence on the five fundamental elements, affecting the development of digital literacy among Chinese primary school student.

4. There are also interactions among the eight influencing elements. For example, the element of Teacher Development affects Cross-disciplinary Design, and the element of Collaborative Participation affects Teacher Development. The interactions and roles of the eight influencing elements impact the development of digital literacy among Chinese primary school student.

The Holistic Curriculum, as the most important influencing factor, integrates and develops all fundamental elements of digital literacy. It ensures Technical Skills and Operational Abilities are developed through comprehensive, practical training. Information Search and Evaluation Skills are bolstered by a curriculum that emphasizes critical thinking and research methodologies. Digital Creativity Abilities are fostered through creative projects and question-solving tasks. Digital Ethics and Social

Responsibility are ingrained through consistent, contextual learning experiences. Finally, Digital Security Awareness is reinforced by embedding cybersecurity principles across all subjects, creating a robust, interconnected framework for digital literacy development among Chinese primary school student.

5. The impact of the influencing factors on the fundamental elements and the core element:

Holistic Curriculum:

For the Fundamental Elements:

The Holistic Curriculum develops Technical Skills and Operational Abilities through comprehensive training, improves Information Search and Evaluation Skills with integrated research methods, fosters Digital Creativity and Innovation via interdisciplinary projects, reinforces Digital Ethics and Social Responsibility through consistent ethical education, and strengthens Digital Security Awareness by embedding cybersecurity principles. These collectively elevate digital literacy among Chinese primary school student.

For the core element:

The Holistic Curriculum develops Technical Skills and Operational Abilities through integrated tech training, improves Information Search and Evaluation Skills via comprehensive research methods, fosters Digital Creativity and Innovation with interdisciplinary projects, reinforces Digital Ethics and Social Responsibility through continuous ethical education, and strengthens Digital Security Awareness by embedding cybersecurity principles. These collectively elevate digital literacy among Chinese primary school student.

Cross-disciplinary Design:

For the fundamental elements:

Cross-disciplinary Design develops Technical Skills and Operational Abilities by integrating technology across subjects, improves Information Search and Evaluation Skills through interdisciplinary research, fosters Digital Creativity and Innovation with diverse question-solving activities, reinforces Digital Ethics and Social Responsibility by embedding ethical discussions in various contexts, and strengthens Digital Security Awareness through comprehensive cybersecurity education. These collectively develop digital literacy among Chinese primary school student.

For the core element:

Cross-disciplinary Design develops Technical Skills and Operational Abilities by applying technology across subjects, improves Information Search and Evaluation Skills through interdisciplinary projects, fosters Digital Creativity and Innovation with varied question-solving tasks, reinforces Digital Ethics and Social Responsibility by integrating ethical discussions in diverse contexts, and strengthens Digital Security Awareness by embedding comprehensive cybersecurity education. These processes collectively boost digital literacy among Chinese primary school student.

Diverse Methods:

For the fundamental elements:

Diverse Methods develop Technical Skills and Operational Abilities by using varied teaching techniques, improve Information Search and Evaluation Skills through different research approaches, foster Digital Creativity and Innovation via innovative activities, reinforce Digital Ethics and Social Responsibility with varied ethical scenarios, and strengthen Digital Security Awareness by integrating cybersecurity practices. These collectively boost digital literacy among Chinese primary school student.

For the core element:

Diverse Methods develop Technical Skills and Operational Abilities through varied teaching techniques, improve Information Search and Evaluation Skills via multiple research approaches, foster Digital Creativity and Innovation with innovative activities, reinforce Digital Ethics and Social Responsibility through diverse ethical scenarios, and strengthen Digital Security Awareness by incorporating cybersecurity practices. These collectively boost digital literacy among Chinese primary school student.

Teacher Development:

For the fundamental elements:

Teacher Development develops Technical Skills and Operational Abilities through advanced training, improves Information Search and Evaluation Skills by updating research methodologies, fosters Digital Creativity and Innovation with new teaching strategies, reinforces Digital Ethics and Social Responsibility through ethical education, and strengthens Digital Security Awareness via cybersecurity training. These collectively boost digital literacy among Chinese primary school student.

For the core element:

Teacher Development develops Technical Skills and Operational Abilities through ongoing training, improves Information Search and Evaluation Skills via updated research methods, fosters Digital Creativity and Innovation with innovative teaching strategies, reinforces Digital Ethics and Social Responsibility by promoting ethical teaching practices, and strengthens Digital Security Awareness through specialized cybersecurity training, collectively enhancing digital literacy among Chinese primary school student.

Cultivate Thinking:

For the fundamental elements:

Cultivate Thinking develops Technical Skills and Operational Abilities by promoting question-solving, improves Information Search and Evaluation Skills through critical analysis, fosters Digital Creativity and Innovation with innovative thinking, reinforces Digital Ethics and Social Responsibility by encouraging ethical reasoning, and strengthens Digital Security Awareness through proactive cybersecurity thinking, collectively boosting digital literacy among Chinese primary school student.

For the core element:

Cultivate Thinking develops question-solving, boosting Technical Skills and Operational Abilities. It fosters critical analysis, improving Information Search and Evaluation Skills, encourages innovative thinking, fostering Digital Creativity and Innovation, promotes ethical reasoning, reinforcing Digital Ethics and Social Responsibility, and instills proactive cybersecurity practices, strengthening Digital Security Awareness. These processes collectively elevate digital literacy among Chinese primary school student.

Personalized Experience:

For the fundamental elements:

Personalized Experience tailors training to individual needs, enhancing Technical Skills and Operational Abilities. It customizes research tasks, improving Information Search and Evaluation Skills, encourages unique projects, fostering Digital Creativity and Innovation, addresses personal ethical scenarios, reinforcing Digital Ethics and Social Responsibility, and targets cybersecurity education, strengthening Digital Security Awareness, collectively boosting digital literacy among Chinese primary school student.

For the core element:

Personalized Experience tailors training to individual needs, enhancing Technical Skills and Operational Abilities. It adapts research tasks to improve Information Search and Evaluation Skills, customizes projects to foster Digital Creativity and Innovation, addresses personal ethical scenarios to reinforce Digital Ethics and Social Responsibility, and targets cybersecurity education to strengthen Digital Security Awareness, collectively boosting digital literacy among Chinese primary school student.

Resource Protection:

For the fundamental elements:

Resource Protection develops Technical Skills and Operational Abilities by ensuring access to secure tools, supports Information Search and Evaluation Skills with reliable resources, fosters Digital Creativity and Innovation by safeguarding creative platforms, reinforces Digital Ethics and Social Responsibility by protecting ethical content, and strengthens Digital Security Awareness through robust cybersecurity measures.

For the core element:

Resource Protection ensures access to secure tools, enhancing Technical Skills and Operational Abilities. It provides reliable data, supporting Information Search and Evaluation Skills, safeguards creative platforms, fostering Digital Creativity and Innovation, protects ethical content, reinforcing Digital Ethics and Social Responsibility, and implements robust cybersecurity, strengthening Digital Security Awareness, collectively boosting digital literacy among Chinese primary school student.

Collaborative Participation:

For the fundamental elements:

Collaborative Participation develops Technical Skills and Operational Abilities through peer learning, improves Information Search and Evaluation Skills via collective research efforts, boosts Digital Creativity and Innovation with group brainstorming, reinforces Digital Ethics and Social Responsibility through shared ethical discussions, and strengthens Digital Security Awareness by promoting collective cybersecurity practices.

For the core element:

Collaborative Participation develops Technical Skills and Operational Abilities through peer learning, improves Information Search and Evaluation Skills via cooperative research, fosters Digital Creativity and Innovation through group projects, strengthens Digital Ethics and Social Responsibility by promoting shared ethical standards, and boosts Digital Security Awareness through collective cybersecurity practices, ultimately enriching digital literacy among Chinese primary school student.

This section adopts the Delphi method, 21 experts to evaluate the Development of Digital Literacy Model for Chinese Primary School student. Among them, there are 7 experts are Primary education specialist, 7 Primary management specialist, and 7 from Research institution. 21 expert consultation forms were issued, and all of them were recovered with a recovery rate of 100%. This indicates a highly positive attitude and a high level of participation from the experts.

First Round Expert Evaluation of the Development of Digital Literacy Model for Chinese Primary School student

21 experts were invited to evaluate the model based on their academic expertise and experience. The options were "agree", "partly agree," or "disagree," with scores of 1, 0, and -1 respectively. If choosing "partly agree" or "disagree", please provide explanations or clarifications. Refer to 4.12, and 4.13 for details.

Table 4.12 Results of the First Round Expert Evaluation of the Development of Digital Literacy Model for Chinese Primary School student

Assessment Items	N	Freq	PCT	$\overline{x}$	S.D
The Development of Digital Literacy Model for Chinese Primary School student	21	18	85.71	0.857	0.350

Table 4.13 Detailed results of the first round of expert review of the Development of Digital Literacy Model for Chinese Primary School student

Assessment Items	Expert number	Expert Field	Effective			
			Agree	Partly Agree	Disagree	Expert Explanation
The Development of Digital Literacy Model for Chinese Primary School student	1	education	1			
	2	education	1			
	3	education		0		The model does not indicate the varying influence levels of the 8 factors
	4	education	1			
	5	education	1			
	6	education	1			
	7	education		0		The model does not clearly show how the 8 factors impact the core element
	8	management	1			
	9	management	1			
	10	management	1			
	11	management	1			
	12	management	1			
	13	management		0		The model does not demonstrate the interrelationships among the 8 factors
	14	management	1			
	15	institution	1			
	16	institution	1			
	17	institution	1			
	18	institution	1			
	19	institution	1			
	20	institution	1			
	21	institution	1			

According to Table 4.13, of the 21 experts, two primary education experts and one primary school management expert chose "partial consent" and provided explanations. The institutional expert panel unanimously agreed. This indicates that the overall degree of coordination between expert opinions is relatively high.

Based on the first round of expert opinions, the development strategy model of digital literacy of Chinese primary school student has been revised, optimized and improved. Refer to Figure 4.2 for details。

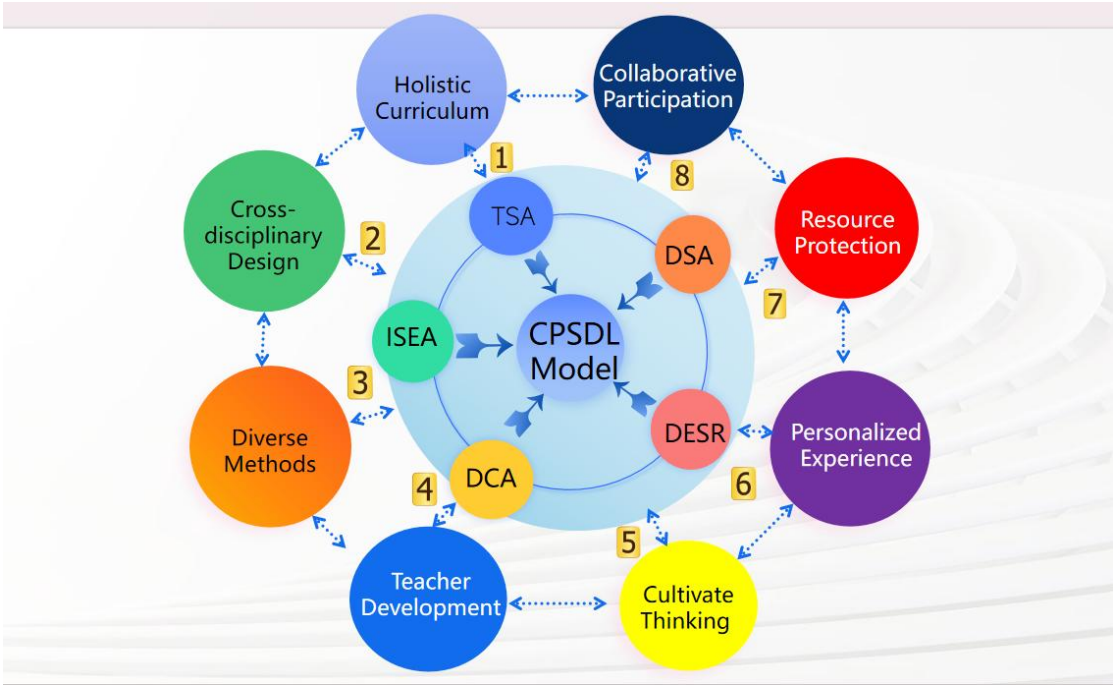


Figure 4.2 The digital literacy development model for Chinese primary school student: CPSDL Model

Model description:

1. In the model, solid and bidirectional line represent direct interactions, and dotted line represent indirect interactions.

2. In the model, arrows and numbers show the relationships and influence among elements. Smaller numbers indicate a greater influence.

3. The strength of the interaction ranged from 1-8,1 being the strongest and 8 the weakest.

4. Specific meaning of the acronyms in the model as following:

TSA: Technical Skills Ability

ISEA: Information Search and Evaluation Ability

DCA: Digital Creativity Ability

DESR: Digital Ethics and Social Responsibility

DSA: Digital Security Awareness

Explanation of the model:

1. In this model, all elements interact with each other. Digital literacy among Chinese primary school student is the core element. Technical Skills and Operational Abilities, Information Search and Evaluation Skills, Digital Creativity Abilities, Digital Ethics and Social Responsibility, and Digital Security Awareness are the components of the core element and are considered fundamental elements. Holistic Curriculum, Cross-disciplinary Design, Diverse Methods, Personalized Experience, Cultivate Thinking, Resource Protection, Teacher Development, and Collaborative Participation are influencing elements.

2. Developing the fundamental elements helps to develop the core element, and the development of the core element can also promote the development of each fundamental element. The five fundamental elements represent requirements for specific abilities and qualities, and there are interactions among these five elements.

3. The eight influencing elements impact the core element and the five fundamental elements. Research has found that the eight influencing elements have varying degrees of impact on the five fundamental elements, with some having a strong influence and others having a weak influence. The eight influencing elements ultimately achieve an impact on the core element through their influence on the five fundamental elements, affecting the development of digital literacy among Chinese primary school student.

4. There are also interactions among the eight influencing elements. For example, the element of Teacher Development affects Cross-disciplinary Design, and the element of Collaborative Participation affects Teacher Development. The interactions and roles of the eight influencing elements impact the development of digital literacy among Chinese primary school student.

5. This model further clarifies the way the eight influencing factors impact the core element, specifically by acting on the five fundamental elements to ultimately affect the core element.

6. This model further emphasizes the interactions among the eight influencing factors.

7. In the model, "Holistic digital learning environment," which previously influenced the fundamental element of Digital Security Awareness, is replaced by the influencing factor "Create digital environment," emphasizing the influence of Collaborative Participation.

8. Upon organizing and analyzing the expert opinions, it was found that among the eight key factors influencing the digital literacy of Chinese primary school student, Holistic Curriculum is the most important. The importance of the other factors is ranked as follows: Cross-disciplinary Design, Diverse Methods, Teacher Development, Cultivate Thinking, Personalized Experience, Resource Protection, Collaborative Participation.

9. The model uses different symbols to indicate the varying degrees of influence, highlighting their differences and emphasizing the extent of each factor's impact.

Table 4.14 Results of the second round of expert evaluation for the Development of Digital Literacy Model for Chinese Primary School student

Assessment Items	N	Freq	PCT	$\overline{x}$	S.D
the Development of Digital Literacy Model for Chinese Primary School student	21	21	100	1.000	0.000

According to Table 4.14, in this round of expert consultations, all experts unanimously agreed that the concentration reached 100%. This indicates that experts highly recognize the Development of Digital Literacy Model for Chinese Primary School student.

Result of Finding Objective3: To Validate the digital literacy development model for Chinese primary school student.

Using the CIPP evaluation model, we invited five experts with extensive experience research in digital literacy of primary school student or expertise in model research to assess the model. The options are "agree" "partly agree" or "disagree," corresponding to scores of 1, 0, and -1, respectively. If choosing "partly agree" or "disagree," provide explanations or clarifications. The list of experts is included in the appendix. Refer to Table 4.15 for the evaluation results.

Table 4.15 CIPP Evaluation Model Expert Evaluation Results

CIPP Evaluation	Evaluation Aspect	Specific Evaluation Contents	Effective			
			Agree	Partially Agree	Disagree	Explanation or Suggestion
Context Evaluation	Background and Purpose	Do you agree that the background and purpose of this model are clear and can effectively develop digital literacy of pupils?	5	0	0	
		Do you agree with the role of comprehensive curriculum in this model?	5	0	0	
	Digital literacy	Do you agree that the design of this model takes full account of the roles of primary education specialist,primary management specialist and research institution?	5	0	0	
		Do you agree that this model takes into account the needs and expectations of all	5	0	0	

Table 4.15 (Continued)

CIPP Evaluation	Evaluation Aspect	Specific Evaluation Contents	Effective			
			Agree	Partially Agree	Disagree	Explanation or Suggestion
Input Evaluation	Questions Analysis	Do you agree that the questions in the digital literacy in primary school student have been fully considered?	5	0	0	
		Do you agree the formulation of the question?	5	0	0	
	the key influencing factors	Do you agree that the key influencing factors fully consider the diversity and complexity of the digital literacy?	5	0	0	
		Do you agree that the eight the key influencing factors play a key role in the success of the ecosystem of industry-education cooperation?	5	0	0	

Table 4.15 (Continued)

CIPP Evaluation	Evaluation Aspect	Specific Evaluation Contents	Effective			
			Agree	Partially Agree	Disagree	Explanation or Suggestion
Process Evaluation	Model	Do you think this model fully considers the actual needs and expectations of primary school?	5	0	0	
		Do you agree that the digital literacy in this model has received sufficient attention?	5	0	0	
	Feasibility of Model Implementation	Do you agree that this model has strong practicality and executability?	5	0	0	
		Do you agree with the design of the relationships between the various elements in the model?	5	0	0	

Table 4.15 (Continued)

CIPP Evaluation	Evaluation Aspect	Specific Evaluation Contents	Effective			
			Agree	Partially Agree	Disagree	Explanation or Suggestion
Product Evaluation	Model Feedback and Improvement	Do you agree that the feedback mechanism designed in this model is flexible and practical enough?	5	0	0	
		Do you agree that the adjustment and improvement design of this model can improve its applicability?	5	0	0	
	Model Effectiveness	Do you agree that the application of this model has the potential to solve the questions in the digital literacy?	5	0	0	
		Do you agree that the application of this model can effectively develop digital literacy of primary school student?	5	0	0	

According to Table 4.15, 5 experts evaluated the digital literacy development model for Chinese primary school student constructed in the study from 8 aspects, and the results were unanimously agreed upon by all experts, with a high degree of consensus and credibility. This indicates that the constructed model is effective and feasible.

Chapter 5
Conclusion Discussion and Recommendations

Conclusion

This study has 3 research objectives

1. To analyze the needs of digital literacy for Chinese primary school student.

2. To construct a digital literacy development model for Chinese primary school student.

3. To validate the digital literacy development model for Chinese primary school student.

Based on the research results in Chapter 4, the following conclusions can be drawn:

Research Objective 1: To analyze the needs of digital literacy for Chinese primary school student

The fundamental elements of the digital literacy development model for Chinese primary school student

The fundamental element of digital literacy among Chinese elementary school student primarily encompass five critical areas: technical skills, information search and evaluation, digital creativity, digital ethics and social responsibility, and digital security awareness. These deficiencies present significant challenges to the overall digital literacy development of student. According to Chen, Zhang, and Wu (2013), many student struggle with basic technical operations, which impedes their ability to navigate and utilize digital tools effectively. Sha et al. (2019) emphasize the lack of effective information search and evaluation skills, which are crucial for discerning credible sources in the vast digital landscape. Fakhrudin (2023) identifies a substantial gap in digital creativity, attributing it to a lack of focus on problem-solving skills, leaving student unprepared for creative thinking in digital contexts. Sulasmi (2022) discusses the insufficient emphasis on digital ethics and social responsibility, leading to student being ill-equipped to handle online ethical dilemmas. Additionally, Sulasmi (2022) highlights the lack of digital security awareness, underscoring the necessity for educational reforms to address these issues. To effectively tackle these challenges, a multifaceted approach that integrates structured frameworks and practical strategies into the education system is essential.

Opportunities for the digital literacy development model for Chinese primary school student

Emphasizing interdisciplinary integration, practical operational skills, and innovative teaching methods are current trends in developing digital literacy among elementary student. Interdisciplinary approaches enhance comprehensive understanding (Hutagalung & Purbani, 2021), while practical skills development equips student to use digital tools effectively (Masyhura, 2022). Innovative pedagogical strategies further engage student in learning (Korkmaz & Akçay, 2024). Additionally, the focus on data literacy, digital ethics, and safety, and digital safety education is crucial for fostering responsible digital behavior. Personalized learning strategies cater to individual needs, improving outcomes. Lastly, multi-faceted collaboration and partnerships enhance program effectiveness. Together, these trends form a comprehensive approach to advancing digital literacy in elementary education.

The key influencing factors of the digital literacy development model for Chinese primary school student

The development of digital literacy in Chinese primary school student is influenced by several key influencing factors. A holistic curriculum integrates digital skills across subjects, providing consistent learning experiences and fostering essential competencies (Almethen & Alomair, 2024). Cross-discipline design enhances digital literacy by promoting critical thinking and problem-solving abilities, helping student apply digital skills in diverse contexts (Tzafilkou, Perifanou, & Economides, 2023). Diverse teaching methods cater to different learning styles, ensuring all student can develop essential digital literacy skills (Liu et al., 2024). Teacher development through professional training equips educators with necessary digital skills and strategies (Gu & Ding, 2022). Cultivating thinking and consciousness enhances critical thinking and digital awareness, fostering responsible digital citizenship (Wu, 2023). Personalized teaching tailors instruction to individual needs, ensuring effective digital literacy acquisition (Tzafilkou, Perifanou, & Economides, 2022). Resource protection promotes sustainable practices and responsible resource use, integral to digital literacy (Li et al., 2023). Collaborative participation involving schools, families, and communities enriches the learning experience and fosters responsible technology use (Jiang et al., 2023).

Research Objective 2: To construct a digital literacy development model for Chinese primary school student

The Digital Literacy Development Model for Chinese Primary School student centers on the core element of digital literacy, comprising five fundamental components: Technical Skills Abilities, Information Search and Evaluation Skills, Digital Creativity Abilities, Digital Ethics and Social Responsibility, and Digital Security Awareness. These fundamental elements represent essential abilities and qualities necessary for digital literacy. Surrounding these core elements are eight influencing elements: Holistic Curriculum, Cross-disciplinary Design, Diverse Methods, Personalized Experience, Cultivate Thinking, Resource Protection, Teacher Development, and Collaborative Participation. These influencing elements interact with and impact the core element and its components, fostering a comprehensive development of digital literacy.

The model operates by emphasizing the interplay between the fundamental and influencing elements. Development of each fundamental element enhances the core element, while the core element's growth further strengthens the fundamental components. Research indicates that the eight influencing elements exert varying degrees of influence on the fundamental elements, collectively shaping the core element. For instance, Teacher Development impacts Cross-disciplinary Design, and Collaborative Participation influences Teacher Development. This interaction underscores the model's holistic approach, where each element plays a crucial role in fostering digital literacy. By emphasizing these interconnected relationships, the model effectively supports the digital literacy development of Chinese primary school student, providing a structured framework that highlights the importance of each element's contribution.

Research Objective 3: To validate the digital literacy development model for Chinese primary school student

Experts have reached a consensus on the digital literacy development model for Chinese elementary school student, so the model is valid and feasible.

To validate the digital literacy development model for Chinese elementary school student, a structured expert evaluation using the CIPP model was conducted. The study involved nine experts: three front-line primary school teachers, three educational management professionals, and three educational research specialists.

These experts assessed the model across eight aspects, including background and purpose, digital literacy, context evaluation, and key elements. Their feedback was gathered through detailed surveys and interviews, ensuring comprehensive insights. Data were analyzed using frequency statistics to determine the quality and rationality of the model design, and to summarize expert suggestions for optimization.

The unanimous agreement among the experts validates the digital literacy development model as effective and feasible for implementation in Chinese elementary schools. The high consensus highlights the model's robustness and its ability to address diverse student needs. By incorporating feedback from teaching, management, and research perspectives, the model ensures a comprehensive approach to fostering essential digital skills. This validation confirms the model's readiness for practical application, emphasizing its potential to significantly enhance digital literacy education for Chinese primary school student.

Discussion

Implementation of the Digital Literacy Development Model for Chinese Primary School Student:

The digital literacy development model for Chinese primary school student optimizes the teaching system of theoretical courses by integrating digital technology-related knowledge and skills. This approach enhances the student's awareness and thinking, helping them establish ethics, responsibility, and security concepts suited to the digital society (Isrokatun et al., 2022). The model's practical application involves integrating digital skills teaching across disciplines, strengthening teachers' digital teaching capabilities, establishing effective evaluation and feedback mechanisms, and encouraging family and social participation to create a comprehensive and diversified digital literacy learning environment (Jiaxin et al., 2022).

Key practices in this model include establishing a multi-practice training platform that integrates theory and practice, offering interdisciplinary learning projects and personalized learning paths to deepen the student's understanding of digital technology (Hui & Chang, 2016). Additionally, a mechanism to motivate independent learning is essential, focusing on stimulating the student's intrinsic motivation and providing resources for autonomous exploration (Simin et al., 2024).

Furthermore, a multi-party collaborative support system ensures interdisciplinary cooperation and integration of educational resources, promoting the practical application of digital technologies (Rong & Jin, 2015). Lastly, improving the assessment system for primary school education systematically evaluates the student's digital literacy, providing feedback for personalized teaching strategies and supporting lifelong learning (Yan et al., 2021).

Recommendations

Further Research Directions:

1. Integrating Emerging Technologies (AI, AR/VR) into the Digital Literacy Curriculum for Chinese Primary School Student

2. Utilizing Data Analytic to Monitor and Adapt the Digital Literacy Development Model for Chinese Primary School Student

3. Identifying Key Success Factors for Implementing a Nationwide Digital Literacy Program in Chinese Primary Schools

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Appendixes

Appendix A

List of Experts to validate and Evaluate Research Instrument

List of experts to validate research instrument
List of experts to validate survey questionnaires and model

Name of Experts	Position/Office
1. XiongWen	Full Senior, University, Educational Research
2. ZhengWenjie	Full Senior, University, Educational Research
3. WangHongye	Full Senior, University, Educational Research
4. SheWanbin	Full Senior, University, Educational Research
5. JiangQiang	Full Senior, University, Educational Research
6. XiaoZhigang	Full Senior, University, Educational Research
7. JiaLiping	Full Senior, University, Educational Research
8. ZhouYusong	Senior, Primary School Leshan City Emei junior School
9. LiYi	Senior, Primary School, Leshan Normal School affiliated primary school
10. YangLiqiong	Senior, Primary School, Leshan experimental primary school
11. ZhangZhiming	Senior, Primary School, Leshan experimental primary school
12. ZhangJun	Senior, Primary School, Leshan experimental primary school
13. ZhangHaixia	Senior, Primary School, Leshan experimental primary school
14. ZhangPing	Senior, Primary School, Leshan Normal School affiliated primary school
15. LuoYi	Full Senior, Primary School, Leshan Normal School affiliated primary

Name of Experts	Position/Office
	school
16. ZhaoQinghua	Senior, Primary School, Leshan experimental primary school
17. HeYulong	Senior, Primary School, Leshan County street primary school
18. XuZeneng	Full Senior, Research Institution, Leshan City education Institute
19. LinBin	Full Senior, Research Institution, Leshan City education Institute
20. CheJinwei	Senior, Primary School, Leshan experimental primary school
21. PengJuan	General, Primary School, Leshan Normal School affiliated primary school

List of experts to evaluate research instrument
List of experts to evaluate the survey questionnaires

Name of Experts	Position/Office
1. XiongWen	Full Senior, University, Educational Research
2. ZhouYusong	Senior, Primary School Leshan City Emei junior School
3. ZhengWenjie	Full Senior, University, Educational Research
4. ZhangPing	Senior, Primary School, Leshan Normal School affiliated primary school
5. XuZeneng	Full Senior, Research Institution, Leshan City education Institute

List of experts to evaluate the industry-education cooperation model

Name of Experts	Position/Office
1. XiongWen	Full Senior, University, Educational Research
2. ZhengWenjie	Full Senior, University, Educational Research
3. WangHongye	Full Senior, University, Educational Research
4. JiangQiang	Full Senior, University, Educational Research
5. ZhouYusong	Senior, Primary School Leshan City Emei junior School
6. ZhangPing	Senior, Primary School, Leshan Normal School affiliated primary school
7. LuoYi	Full Senior, Primary School, Leshan Normal School affiliated primary school
8. XuZeneng	Full Senior, Research Institution, Leshan City education Institute
9. LinBin	Full Senior, Research Institution, Leshan City education Institute

Appendix B

Official Letter

Official Letter

1. Invitation from 7 experts in front-line primary school teaching
2. Invitation from 7 experts in primary school management
3. Invitation from 7 experts in primary school education research

Ref.No. MHESI 0643.14/ 302

Bansomdejchaopraya Rajabhat University
1061 Itsaraparb Hirunrujee
Thonburi Bangkok 10600

27 February 2024

RE: Invitation to validate research instrument

Dear Luo Yi

Mrs. Wu Xiaoyan is a graduate student in Doctor of Philosophy Program in Digital Technology Management for Education of Bansomdejchaopraya Rajabhat University. She is undertaking research entitle "Development of Ditgital Literacy Model for Chinese Primary School Students"

The thesis adversity committee has considered that you are an expert in this topic. Your recommendations would be useful for further improvement of this research instrument.

With your expertise, we would like to ask your permission to validate the attached research instrument. Would like to avail ourselves of this opportunity to express our sincere thanks and appreciation for your help.

Yours sincerely,

(Assistant Professor Akaranun Asavarutpokin)
Vice Dean of Graduate School

Bansomdejchaopraya Rajabhat University
Tel.+662-473-7000
www.bsru.ac.th
E-mail: grad@bsru.ac.th

Ref.No. MHESI 0643.14/ 325

Bansomdejchaopraya Rajabhat University
1061 Itsaraparb Hirunrujee
Thonburi Bangkok 10600

27 February 2024

RE: Invitation to validate research instrument

Dear Professor Jiang Qiang, Leshan Normal University

Mrs. Wu Xiaoyan is a graduate student in Doctor of Philosophy Program in Digital Technology Management for Education of Bansomdejchaopraya Rajabhat University. She is undertaking research entitle "Development of Ditgital Literacy Model for Chinese Primary School Students"

The thesis adversity committee has considered that you are an expert in this topic. Your recommendations would be useful for further improvement of this research instrument.

With your expertise, we would like to ask your permission to validate the attached research instrument. Would like to avail ourselves of this opportunity to express our sincere thanks and appreciation for your help.

Yours sincerely,

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Ref.No. MHESI 0643.14/306

Bansomdejchaopraya Rajabhat University
1061 Itsaraparb Hirunrujee
Thonburi Bangkok 10600

27 February 2024

RE: Invitation to validate research instrument

Dear Lin Bin

Mrs. Wu Xiaoyan is a graduate student in Doctor of Philosophy Program in Digital Technology Management for Education of Bansomdejchaopraya Rajabhat University. She is undertaking research entitle "Development of Ditgital Literacy Model for Chinese Primary School Students"

The thesis adversity committee has considered that you are an expert in this topic. Your recommendations would be useful for further improvement of this research instrument.

With your expertise, we would like to ask your permission to validate the attached research instrument. Would like to avail ourselves of this opportunity to express our sincere thanks and appreciation for your help.

Yours sincerely,

(Assistant Professor Akaranun Asavarutpokin)
Vice Dean of Graduate School

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Appendix C

Research Instruments

Expert Survey Form and Evaluate Form

Objective1: To analyze the needs of digital literacy for Chinese primary school student

Expert survey form

Dear Esteemed Expert,

Greetings!

We are conducting a study on “Development of Digital Literacy Model for Chinese primary school student” and greatly appreciate your judgment based on your attitudes and perspectives on relevant problems. Your insights will serve as valuable references for understanding the current problems, opportunities, and fundamental elements in digital literacy development for Chinese primary school student.

Questionnaire survey will ask for finding the needs of Chinese primary school student on minimum digital literacy knowledge

The purpose of this questionnaire is to understand the digital literacy needs of Chinese primary school student. This questionnaire is primarily aimed at front line primary school teachers in China, professionals in educational management in China, and experts involved in educational research in China. The questionnaire is conducted anonymously. Each question in this questionnaire has no right or wrong answers, and all data will be used for research and comprehensive statistical analysis. Your genuine thoughts and professional opinions are of practical reference value to this research.

Thank you for your support.

Part I: Basic Information

1.Your identity information

☐Primary school teachers engaged in frontline teaching

☐Primary school management position

☐High experience researcher with Ph.D. or advanced academic title

2. The time spent on Chinese primary school student' digital literacy education or research work

☐ Consistently monitoring Student' digital literacy for more than 5 years

☐ more than 15 years in teaching, managing, or researching experience

☐ more than 10 years in teaching or managing practice

☐ more than 10 years in researching experience

Part II: The main needs of Chinese primary school student

“Strongly Agree”= 5 point,

“Agree”= 4 point,

“Neutral”= 3 point,

“Disagree”= 2 point,

“Strongly Disagree”= 1 point.

Part III

In today's world, the digital transformation of the global economy is accelerating, and the development of a number of emerging technologies, such as big data, cloud computing, the Internet of Things and artificial intelligence, has formed a virtual digital social space, and human society has entered a digital society, which has reconstructed the social space of human life in an all-round way, and digital literacy has become a necessary survival ability for citizens to cope with the digital society.

The European Union issued the Digital Skills Declaration, which lists digital literacy as the most important skill for workers and consumers in the 21st century; the U.S. Department of Education issued the Framework for 21st Century Skills, in which digital literacy is listed as an important skill; and in November 2021, China issued the Outline of Action for Enhancing Digital Literacy and Skills for All People, pointing out that it is necessary to take the enhancement of digital literacy and skills of all people as a basic, strategic, and pioneering step in the construction of a strong network country and a digital China. A basic, strategic and pioneering work, efforts should be made to build a digital literacy and skills development and cultivation

system covering the whole population, and the enhancement of digital literacy has become a general consensus and direction of endeavour in the world.

Although China has achieved some results in developing citizens' digital literacy, the level of digital literacy among Chinese primary school student till needs to be developed. In general, the level of digital literacy among Chinese primary school student is uneven, with regional differences. Specifically, Chinese primary school student lack the motivation to actively discover and make use of numbers, and lack the awareness of maintaining data security; the computational thinking of Chinese primary school student has not yet reached the level of forming efficient problem-solving modes; the ability of Chinese primary school student to make use of digital resources, digital tools, and digital platforms to enhance their learning efficiency and sense of access to growth needs to be strengthened; and educational efforts to form correct values, moral values The educational work of forming correct values, morality and rule of law among Chinese primary school student needs to be continued, and the level of digital literacy of Chinese primary school student needs to be improved.

Collating and analyzing Chinese and foreign literature on digital literacy, we can see that at present, some international organizations and countries pay more attention to: Technical Skills Abilities, Information Search and Evaluation Skills, Digital Creativity Abilities, Digital Ethics and Social Responsibility, Digital Security Awareness. Do you think it is scientific and feasible to develop Chinese primary school student' digital literacy from these five variables? Please express your opinion.

Please provide your own opinions on the following issues

Detail Questions	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The questions of primary school student in terms of Technical Skills Ability					
1. Conduct basic technical skills training	☐	☐	☐	☐	☐
2. Implement practical projects and experimental teaching	☐	☐	☐	☐	☐
3. Organically integrate technical skills training into the teaching of various subjects	☐	☐	☐	☐	☐
4. Organize comprehensive training to develop teachers' ability to develop Student' technical skills	☐	☐	☐	☐	☐
5. Strengthen the practice and collaboration in training Student' technical skills in teachers' teaching and research	☐	☐	☐	☐	☐
6. Continuously evaluate the effectiveness of teachers in training Student' technical skills and optimize educational strategies accordingly	☐	☐	☐	☐	☐
7. Adopt various methods to stimulate Student' interest in participating in technological development	☐	☐	☐	☐	☐
8. Introduce the latest technologies and tools in training Student' technical skills	☐	☐	☐	☐	☐

Detail Questions	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
9. Conduct technical skills ability training through practical activities and project promotion involving participation from all sectors of society	☐	☐	☐	☐	☐
The questions of primary school student in terms of Information Search and Evaluation Skills					
10. Conduct teaching using a variety of educational tools and media	☐	☐	☐	☐	☐
11. Adopt interactive and hands-on teaching methods	☐	☐	☐	☐	☐
12. Teach student efficient search techniques and strategies	☐	☐	☐	☐	☐
13. Teach student skills to identify and evaluate information sources	☐	☐	☐	☐	☐
14. Develop student' critical thinking and logical analysis abilities	☐	☐	☐	☐	☐
15. Organize practical activities for information evaluation, using interactive learning methods to develop Student' information evaluation skills	☐	☐	☐	☐	☐
16. Provide teachers with online educational resources and continuous learning opportunities	☐	☐	☐	☐	☐
17. Strengthen the training of teaching methods and the	☐	☐	☐	☐	☐

Detail Questions	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
application of technology in teacher training					
The questions of primary school student in terms of Digital Creativity Abilities					
18. Design digital literacy education courses across disciplines to cultivate creativity and innovation	☐	☐	☐	☐	☐
19. Implement project-based learning with a focus on teaching practice	☐	☐	☐	☐	☐
20. Develop the experience of applying technology through practical operation and application	☐	☐	☐	☐	☐
21. Provide Student with a variety of technological tools and platforms to develop their application experience	☐	☐	☐	☐	☐
22. Encourage and guide Student in project-based practical learning	☐	☐	☐	☐	☐
23. Provide opportunities for interdisciplinary collaboration to jointly develop Student' skills	☐	☐	☐	☐	☐
24. Adopt diverse methods to guide and promote Student' self-directed and exploratory learning	☐	☐	☐	☐	☐
25. Build and improve digital innovation infrastructure and resource-sharing mechanisms	☐	☐	☐	☐	☐

Detail Questions	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
26. Provide continuously optimized educational resources for teachers and Student	☐	☐	☐	☐	☐
The questions of primary school student in terms of Digital Ethics and Social Responsible					
27. Integrate digital ethics and social responsibility education into various forms of teaching activities	☐	☐	☐	☐	☐
28. Cultivate digital identity awareness and a sense of responsibility among Student	☐	☐	☐	☐	☐
29. Use comprehensive and interactive educational methods to develop Student' digital ethics and digital social responsibility	☐	☐	☐	☐	☐
30. Integrate digital ethics and social responsibility awareness into interdisciplinary educational content	☐	☐	☐	☐	☐
31. Design and implement digital culture courses	☐	☐	☐	☐	☐
32. Carry out comprehensive digital culture development and education promotion	☐	☐	☐	☐	☐
33. Integrate resources to achieve the fusion and innovation of school education content and methods	☐	☐	☐	☐	☐

Detail Questions	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The questions of primary school student in terms of Digital Security Awareness					
34. Conduct comprehensive and practical digital security education	☐	☐	☐	☐	☐
35. Utilize advanced technologies and methods to improve the effectiveness of digital security education	☐	☐	☐	☐	☐
36. Implement comprehensive digital security education strategies	☐	☐	☐	☐	☐
37. Adopt practical and interactive digital security teaching methods	☐	☐	☐	☐	☐
38. Emphasize privacy education through practical activities to cultivate Student' security awareness	☐	☐	☐	☐	☐
39. Develop infrastructure to build a comprehensive digital learning environment	☐	☐	☐	☐	☐
40. Conduct digital security awareness education activities and training with multi-party participation	☐	☐	☐	☐	☐
41. Integrate diverse resources for digital security awareness education	☐	☐	☐	☐	☐

Dear Esteemed Expert,

Greetings!

We are conducting a study on “Development of Digital Literacy Model for Chinese primary school student” and greatly appreciate your judgment based on your attitudes and perspectives on relevant problems. Your insights will serve as valuable references for understanding the current problems, opportunities, and fundamental elements in digital literacy development for Chinese primary school student.

Questionnaire survey will ask for finding the needs of Chinese primary school student on minimum digital literacy knowledge

The purpose of this questionnaire is to understand the digital literacy needs of Chinese primary school student. This questionnaire is primarily aimed at front line primary school teachers in China, professionals in educational management in China, and experts involved in educational research in China. The questionnaire is conducted anonymously. Each question in this questionnaire has no right or wrong answers, and all data will be used for research and comprehensive statistical analysis. Your genuine thoughts and professional opinions are of practical reference value to this research.

Thank you for your support.

Part I: Basic Information

1.Your identity information

☐Primary school teachers engaged in frontline teaching

☐Primary school management position

☐High experience researcher with Ph.D. or advanced academic title

3. The time spent on Chinese primary school student' digital literacy education or research work

☐ Consistently monitoring Student' digital literacy for more than 5 years

☐ more than 15 years in teaching, managing, or researching experience

☐ more than 10 years in teaching or managing practice

☐ more than 10 years in researching experience

Part II: The main needs of Chinese primary school student

"Strongly Agree"= 5 point,

"Agree"= 4 point,

"Neutral"= 3 point,

"Disagree"= 2 point,

"Strongly Disagree"= 1 point.

Part III

This is the revised questionnaire based on the first round of expert feedback. Please fill it out again and provide your opinions and suggestions.

Detail questions	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. Implement practical projects and experimental teaching	☐	☐	☐	☐	☐
2. Organically integrate technical skills training into the teaching of various subjects	☐	☐	☐	☐	☐
3. Introduce the latest technologies and tools in training Student' technical skills	☐	☐	☐	☐	☐
4. Conduct technical skills ability training through practical activities and project promotion involving participation from all sectors of society	☐	☐	☐	☐	☐
5. Design digital literacy education courses across disciplines to cultivate creativity and innovation	☐	☐	☐	☐	☐
6. Adopt diverse methods to guide and promote Student' self-directed and exploratory learning	☐	☐	☐	☐	☐
7. Build and improve digital innovation infrastructure and resource-sharing mechanisms	☐	☐	☐	☐	☐
8. Provide continuously optimized educational resources for teachers and Student	☐	☐	☐	☐	☐

Expert Survey Form and Evaluate Form

Expert survey form

Dear Esteemed Expert,

Greetings!

We are conducting a study on “Development of Digital Literacy Model for Chinese primary school student” and greatly appreciate your judgment based on your attitudes and perspectives on relevant problems. Your insights will serve as valuable references for understanding the key influencing factors in digital literacy development for Chinese primary school student.

Please note the following instructions:

1.Options include "Strongly Agree," "Agree," “Neutral” “Disagree” or "Strongly Disagree", corresponding to scores of 5,4,3,2,1, respectively. Kindly mark the appropriate option based on your understanding. If you choose "Neutral" “Disagree” or "Strongly Disagree," please provide explanations or comments to help us make improvements.

2.The results of this survey will be utilized for scientific research, and your participation will not have any negative impact on you personally or on your organization.

3.Your responses are crucial to us, and to ensure the authenticity and effectiveness of the data, we kindly request that you complete each question patiently and thoughtfully.

Thank you for your assistance and support!

Questionnaire survey will ask for finding the needs of Chinese primary school student on minimum digital literacy knowledge

Part I: Personal Information

1. Your gender
   A. Male
   B. Female
2.Your Affiliation
   A. University
   B. Primary School
   C. Research Institution
3. Your Occupation
   A. Full Senior
   B. Senior
4. Duration of Relevant Work Experience
   A.0-5years
   B.6-10 years
   C.11-15 years
   D. Over 16 years
5. Your Academic Degree
   A. None
   B. Bachelor's Degree
   C. Master's Degree
   D. Doctorate Degree
6. Your Professional Title
   A. Professor
   B. Associate Professor
   C. Lecturer
   D. Other

Part II: The main problems of industry-education cooperation

“Strongly Agree”= 5 point,

“Agree”= 4 point,

“Neutral”= 3 point,

“Disagree”= 2 point,

“Strongly Disagree”= 1 point.

key influencing factors	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Comprehensive curriculum setting					
1. Establishes a solid digital foundation from an early age	☐	☐	☐	☐	☐
2. Ensures continuous and progressive learning across grades	☐	☐	☐	☐	☐
3. Integrates digital skills within various subjects	☐	☐	☐	☐	☐
4. Applies digital skills across multiple subjects	☐	☐	☐	☐	☐
5. Develops critical thinking and question-solving abilities	☐	☐	☐	☐	☐
Interdisciplinary teaching design					
6. Encourages creativity and innovative solutions	☐	☐	☐	☐	☐
Provide a variety of teaching methods					
7. Keeps Student engaged and motivated with diverse methods	☐	☐	☐	☐	☐
8. Addresses different learning styles effectively	☐	☐	☐	☐	☐
9. Demonstrates real-world applications of digital skills	☐	☐	☐	☐	☐
Provide a personalized teaching experience					
10. Caters to the unique needs of each student	☐	☐	☐	☐	☐
11. Builds Student' confidence through personalized learning	☐	☐	☐	☐	☐
12. Nurtures Student' strengths and interests in digital literacy	☐	☐	☐	☐	☐

key influencing factors	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Strengthen consciousness cultivation and thinking training					
13. Fosters a sense of responsible digital citizenship	☐	☐	☐	☐	☐
14. Develops Student' ability to analyze information critically	☐	☐	☐	☐	☐
15. Promotes adaptability to evolving digital technologies	☐	☐	☐	☐	☐
Resource protection and environmental construction					
16. Provides hands-on experiences with up-to-date technology	☐	☐	☐	☐	☐
17. Protects Student from online threats and distractions	☐	☐	☐	☐	☐
18. Promotes environmentally sustainable digital practices	☐	☐	☐	☐	☐
Teacher training promotes professional development					
19. Updates teachers' digital skills and knowledge	☐	☐	☐	☐	☐
20. Improves the effectiveness of digital literacy instruction	☐	☐	☐	☐	☐
21. Exemplifies the importance of digital skills to Student	☐	☐	☐	☐	☐
Multi-party cooperation and social participation					
22. Engages a supportive learning ecosystem involving the community	☐	☐	☐	☐	☐
23. Shares educational resources and expertise	☐	☐	☐	☐	☐
24. Provides real-world insights into professional digital applications	☐	☐	☐	☐	☐

Expert evaluation form

Dear Esteemed Expert,

Greetings!

We are doing a study on “Development of Digital Literacy Model for Chinese primary school student ”. In the early stage, we conducted a questionnaire survey on the needs of development of digital literacy model for Chinese primary school student . Now we invite you to evaluate the questionnaire and the survey results of 21 experts. (For details of the questionnaire and evaluation results, please see the attachment provided)

1. Options include "Agree," "Partly Agree," or "Disagree," corresponding to scores of 1, 0, and -1, respectively. Please check the appropriate options based on your opinion. If you choose "Partly Agree" or "Disagree," please provide explanations or comments to help us make improvements.

2. The results of this survey will be utilized for scientific research, and your participation will not have any negative impact on you personally or on your organization.

Thank you for your assistance and support!

Part I: Personal Information

1. Your gender
   A. Male
   B. Female
2. Duration of Relevant Work Experience
   A.0-5 years
   B.6-10 years
   C.11-15 years
   D. Over 16 years
3. Your Academic Degree
   A. None
   B. Bachelor's Degree
   C. Master's Degree
   D. Doctorate Degree
4.Your Professional Title
   A. Professor
   B. Associate Professor
   C. Lecturer
   D. Other

Part II: Expert evaluation form

Question validity	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The questions are closely aligned with the research objectives, and the quantity is reasonable.	☐	☐	☐	☐	☐
Clarity of Expression					
The expressions are appropriate, clear, and unambiguous.	☐	☐	☐	☐	☐
Completeness of Content					
The content is relatively comprehensive, covering issues related to industry-education cooperation.	☐	☐	☐	☐	☐
Procedural regularity					
The processes of data collection, analysis, and questionnaire revision are standardized.	☐	☐	☐	☐	☐
Effectiveness of conclusions					
The conclusions drawn regarding the current problems in industry-education cooperation are effective.	☐	☐	☐	☐	☐

Digital literacy development model for Chinese primary school student Expert Survey Form

Objective 2: To Construct a digital literacy development model for Chinese primary school student.

Dear Esteemed Expert,

Greetings!

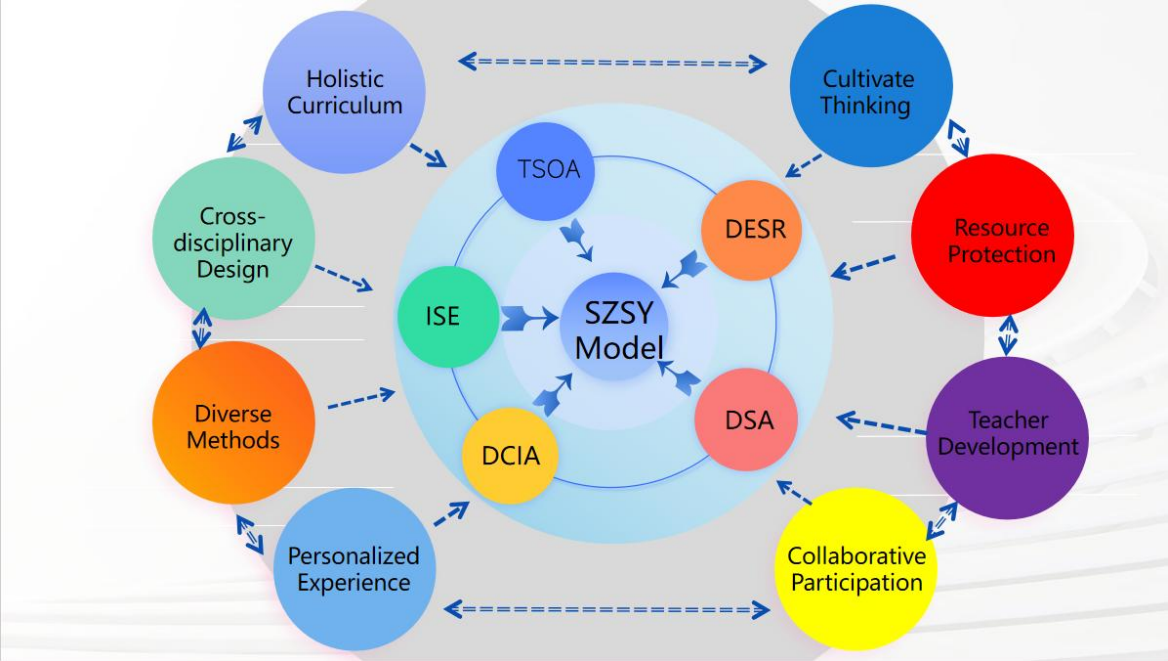
We are doing a study on “Development of Digital Literacy Model for Chinese primary school student”. In the preliminary stages, we conducted literature reviews, expert interviews, and expert assessments to understand the current questions, opportunities, and key success elements in development of digital literacy model for Chinese primary school student. Based on this, we have constructed a digital literacy model for Chinese primary school student, and we would like to invite you to evaluate it.

Here are some instructions:

1.The options are "Agree," "Partly Agree," or "Disagree," corresponding to 1 point, 0 points, and -1 point, respectively. Please mark the appropriate option with a checkmark ("✓") based on your understanding. If you choose "Partly Agree" or "Disagree," please provide explanations or comments for our improvement.

2.The results of this survey will be used for scientific research, and our investigation will not have any negative impact on you personally or your organization.

We appreciate your assistance and support!



Model Explanation:

Development of Digital Literacy Model for Chinese primary school student is a relatively fixed and inclusive model formed by the integration of relevant subjects and influencing factors.The Digital Literacy Development Model for Chinese primary school student provides strategic support and a platform for the development of digital literacy among Chinese primary school student.

1. In this model, all elements interact with each other. Digital literacy among Chinese primary school student is the core element. Technical Skills and Operational Abilities, Information Search and Evaluation Skills, Digital Creativity Abilities, Digital Ethics and Social Responsibility, and Digital Security Awareness are the components of the core element and are considered fundamental elements. Holistic Curriculum, Cross-disciplinary Design, Diverse Methods, Personalized Experience, Cultivate Thinking, Resource Protection, Teacher Development, and Collaborative Participation are influencing elements.

2. Developing the fundamental elements helps to develop the core element, and the development of the core element can also promote the development of each fundamental element. The five fundamental elements represent requirements for specific abilities and qualities, and there are interactions

among these five elements. For example, developing Technical Skills and Operational Abilities helps to develop Information Search and Evaluation Skills, and developing Information Search and Evaluation Skills also helps to develop Technical Skills and Operational Abilities.

3. The eight influencing elements impact the core element and the five fundamental elements. Research has found that the eight influencing elements have varying degrees of impact on the five fundamental elements, with some having a strong influence and others having a weak influence. The eight influencing elements ultimately achieve an impact on the core element through their influence on the five fundamental elements, affecting the development of digital literacy among Chinese primary school student.

4. There are also interactions among the eight influencing elements. For example, the element of Teacher Development affects Cross-disciplinary Design, and the element of Collaborative Participation affects Teacher Development. The interactions and roles of the eight influencing elements impact the development of digital literacy among Chinese primary school student.

Project	Score	Opinion	Choice	needs improvement
Development of Digital Literacy Model for Chinese primary school student	+1	Agree		
	0	Partly Agree		
	-1	Disagree		

Digital literacy development model for Chinese primary school student
Expert Survey Form

Dear Esteemed Expert,

Greetings!

We are doing a study on “Development of Digital Literacy Model for Chinese primary school student ”. In the preliminary stages, we conducted literature reviews, expert interviews, and expert assessments to understand the current questions, opportunities, and key success elements in development of digital literacy model for Chinese primary school student. Based on this, we have constructed a digital literacy model for Chinese primary school student, and we would like to invite you to evaluate it.

This is the revised model based on the first round of expert feedback. Please evaluate the model again and provide your opinions and suggestions.

Here are some instructions:

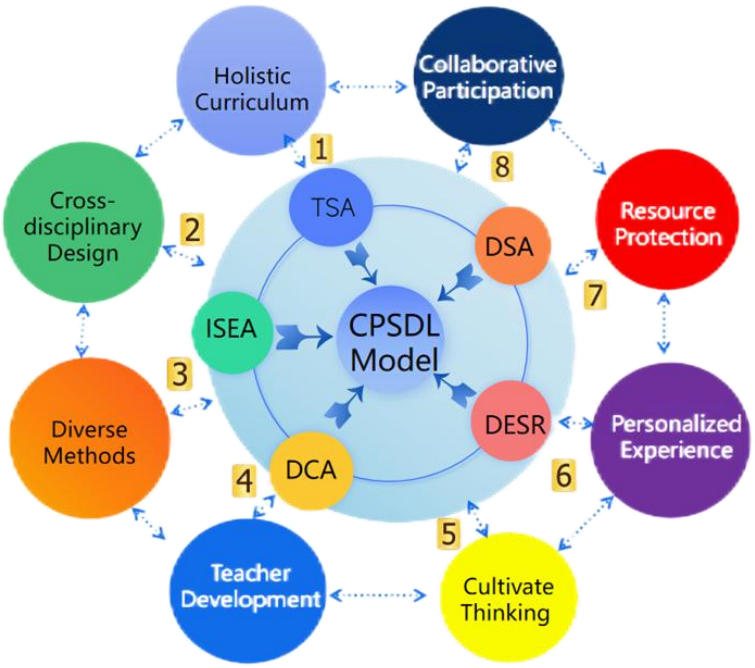
1.The options are "Agree," "Partly Agree," or "Disagree," corresponding to 1 point, 0 points, and -1 point, respectively. Please mark the appropriate option with a checkmark ("✓") based on your understanding. If you choose "Partly Agree" or "Disagree," please provide explanations or comments for our improvement.

2.The results of this survey will be used for scientific research, and our investigation will not have any negative impact on you personally or your organization.

We appreciate your assistance and support!

Here are some instructions:

1. The option are “Agree”, “Partly agree” or “Disagree”, corresponding to 1 point, 0 point, and -1 point, respectively. Please remark.



Model description:

1. In the model, solid and bidirectional line represent direct interactions, and dotted line represent indirect interactions.

2. In the model, arrows and numbers show the relationships and influence among elements. Smaller numbers indicate a greater influence.

3. The strength of the interaction ranged from 1-8,1 being the strongest and 8 the weakest.

4. Specific meaning of the acronyms in the model as following:

TSA: Technical Skills Ability

ISEA: Information Search and Evaluation Ability

DCA: Digital Creativity Ability

DESR: Digital Ethics and Social Responsibility

DSA: Digital Security Awareness

Explanation of the model:

1. In this model, all elements interact with each other. Digital literacy among Chinese primary school student is the core element. Technical Skills and Operational Abilities, Information Search and Evaluation Skills, Digital Creativity Abilities, Digital Ethics and Social Responsibility, and Digital Security Awareness are the components of the core element and are considered fundamental elements. Holistic Curriculum, Cross-disciplinary Design, Diverse Methods, Personalized Experience, Cultivate Thinking, Resource Protection, Teacher Development, and Collaborative Participation are influencing elements.

2. Developing the fundamental elements helps to develop the core element, and the development of the core element can also promote the development of each fundamental element. The five fundamental elements represent requirements for specific abilities and qualities, and there are interactions among these five elements.

3. The eight influencing elements impact the core element and the five fundamental elements. Research has found that the eight influencing elements have varying degrees of impact on the five fundamental elements, with some having a strong influence and others having a weak influence. The eight influencing elements ultimately achieve an impact on the core element through their influence on the five fundamental elements, affecting the development of digital literacy among Chinese primary school student.

4. There are also interactions among the eight influencing elements. For example, the element of Teacher Development affects Cross-disciplinary Design, and the element of Collaborative Participation affects Teacher Development. The interactions and roles of the eight influencing elements impact the development of digital literacy among Chinese primary school student.

5. This model further clarifies the way the eight influencing factors impact the core element, specifically by acting on the five fundamental elements to ultimately affect the core element.

6. This model further emphasizes the interactions among the eight influencing factors.

7. In the model, "Holistic digital learning environment," which previously influenced the fundamental element of Digital Security Awareness, is replaced by the influencing factor "Create digital environment," emphasizing the influence of Collaborative Participation.

8. Upon organizing and analyzing the expert opinions, it was found that among the eight key factors influencing the digital literacy of Chinese primary school student, Holistic Curriculum is the most important. The importance of the other factors is ranked as follows: Cross-disciplinary Design, Diverse Methods, Teacher Development, Cultivate Thinking, Personalized Experience, Resource Protection, Collaborative Participation.

9. The model uses different symbols to indicate the varying degrees of influence, highlighting their differences and emphasizing the extent of each factor's impact.

Project	Score	Opinion	Choice	needs improvement
Industry-Education Cooperation Ecosystem Model	+1	Agree		
	0	Partly Agree		
	-1	Disagree		

CIPP Expert Evaluation Form

Objective 3: To Validate the digital literacy development model for Chinese primary school student.

Dear esteemed expert,

Greetings!

We are doing a study on “Development of Digital Literacy Model for Chinese primary school student ” In the early stage, through literature research, expert interviews and evaluations, we mastered the current questions, opportunities and key success elements in development of digital literacy model for Chinese primary school student , and based on this, we built a development of digital literacy model for Chinese primary school student, now we invite you to evaluate.

The relevant instructions are as follows:

1. Options include "Agree," "Partly Agree," or "Disagree," corresponding to scores of 1, 0, and -1, respectively. Please mark the appropriate option with a checkmark ("✓") based on your opinion. If you choose "Partly Agree" or "Disagree," please provide explanations or comments to help us make improvements.

2. The results of this survey will be utilized for scientific research, and your participation will not have any negative impact on you personally or on your organization.

Thank you for your assistance and support!

Before you evaluate, please allow me to introduce the process of this research:

Step 1: To Analyse the needs for digital literacy development for Chinese primary school student.

A comprehensive survey was conducted to analyze the development needs of digital literacy among Chinese primary school student. The sample included 21 experts with over 10 years of experience in teaching, educational management, or educational research. These experts were divided into three groups: seven frontline primary school teachers, seven educational management professionals, and seven educational researchers. An evaluation form was developed based on literature review and expert feedback, and data were collected online. The analysis focused on the frequency and distribution of expert opinions, using descriptive statistics and the Inter-Quartile Range (IQR) to measure consensus.

Step 2: To Construct a digital literacy development model for Chinese primary school student.

1. To construct the model, the same 21 experts were consulted using the Delphi method. An initial model was proposed and refined through several rounds of expert feedback. The evaluation included aspects such as background, digital literacy components, and model feasibility. Experts provided their assessments through detailed surveys, and data were collected online. Descriptive statistics, including the median (Md) and IQR, were used to analyze the data and ensure consensus among experts. This process ensured the model's validity and alignment with the identified needs of Chinese primary school student.

2. Based on systems thinking and combined with the above research conclusions, designed an industry-education cooperation ecosystem model. See Figure 1.

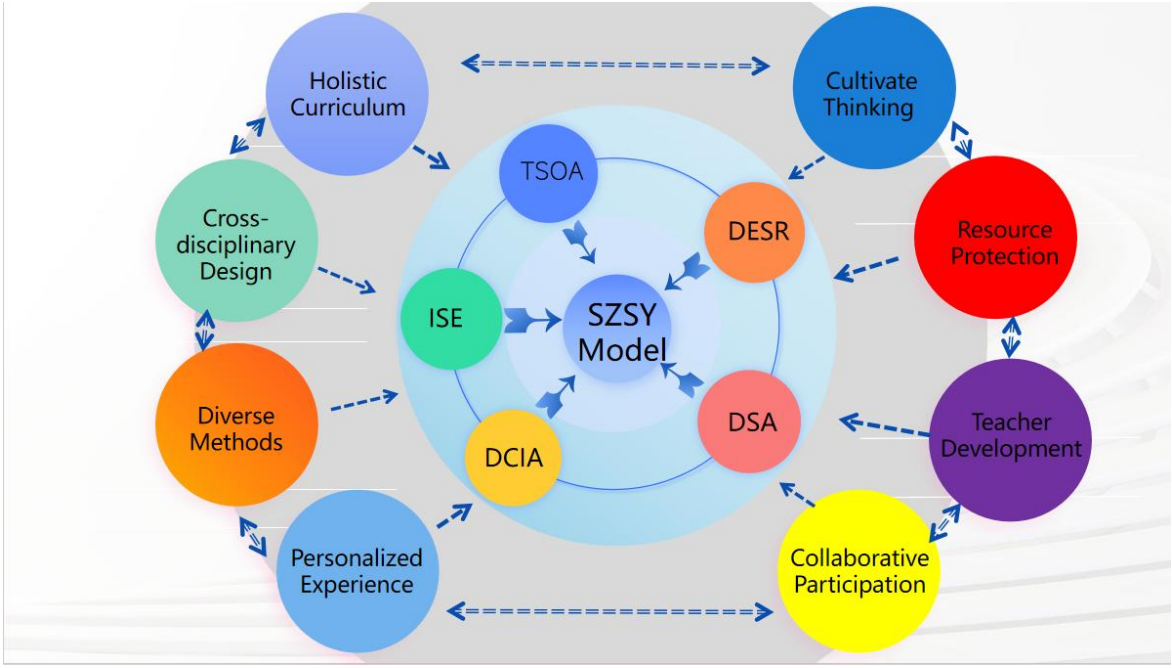


Figure1 Development of Digital Literacy Model for Chinese primary school student

The revised model was sent to 21 experts again, and the results showed that all experts agreed with the revised model.

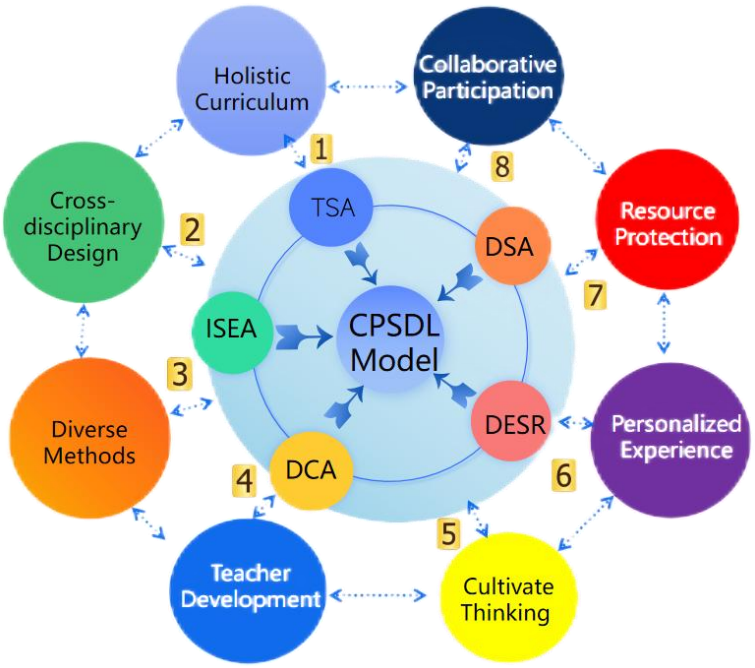


Figure 2 Revised Development of Digital Literacy Model for Chinese primary school student

Now we invite you to evaluate the model, Options include "Agree," "Partly Agree," or "Disagree," corresponding to scores of 1, 0, and -1, respectively. Please check the appropriate options based on your opinion. If you choose "Partly Agree" or "Disagree," please provide explanations or comments to help us make improvements.

Step 3: To Validate the digital literacy development model for Chinese primary school student.

The validation phase involved nine experts with over 15 years of experience in teaching, educational management, and educational research. These experts were asked to evaluate the final model using a CIPP evaluation form. Data were collected online, and experts' feedback was analyzed to assess the model's quality and feasibility. The evaluation results demonstrated unanimous agreement among the experts, confirming the model's robustness and readiness for implementation. The consensus highlighted the model's comprehensive approach to enhancing digital literacy among Chinese primary school student.

CIPP Evaluation	Evaluation Aspect	Specific Evaluation Contents	Effective			
			Agree	Partially Agree	Disagree	Explanation or Suggestion
Context Evaluation	Background and Purpose	Do you agree that the background and purpose of this model are clear and can effectively develop digital literacy of pupils?				
		Do you agree with the role of comprehensive curriculum in this model?				
	Digital literacy	Do you agree that the design of this model takes full account of the roles of primary education specialist,primary management specialist and research				
		Do you agree that this model takes into account the needs and expectations of all in digital literacy of pupils??				

CIPP Evaluation	Evaluation Aspect	Specific Evaluation Contents	Effective			
			Agree	Partially Agree	Disagree	Explanation or Suggestion
Input Evaluation	Questions Analysis	Do you agree that the questions in the digital literacy in primary school Student have been fully considered?				
		Do you agree the formulation of the question?				
	Key elements	Do you agree that the key elements fully consider the diversity and complexity of the digital literacy?				
		Do you agree that the eight key elements play a key role in the success of the ecosystem of industry-education cooperation?				

CIPP Evaluation	Evaluation Aspect	Specific Evaluation Contents	Effective			
			Agree	Partially Agree	Disagree	Explanation or Suggestion
Process Evaluation	Model	Do you think this model fully considers the actual needs and expectations of primary school?				
		Do you agree that the digital literacy in this model has received sufficient attention?				
	Feasibility of Model Implementation	Do you agree that this model has strong practicality and executability?				
		Do you agree with the design of the relationships between the various elements in the model?				

CIPP Evaluation	Evaluation Aspect	Specific Evaluation Contents	Effective			
			Agree	Partially Agree	Disagree	Explanation or Suggestion
Product Evaluation	Model Feedback and Improvement	Do you agree that the feedback mechanism designed in this model is flexible and practical enough?				
		Do you agree that the adjustment and improvement design of this model can improve its applicability?				
	Model Effectiveness	Do you agree that the application of this model has the potential to solve the questions in the digital literacy?				
		Do you agree that the application of this model can effectively develop digital literacy of primary school Student?				

Appendix D

The Results of the Quality Analysis of Research Instruments

Evaluation Results of IOC for the Expert Survey Form

Part I The current the needs for digital literacy for Chinese primary school student

The needs for digital literacy		EXPERTS																					Total	Mean	Result
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
No.	Technical Skills Ability																								
1	Conduct basic technical skills training	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21	1.00	Valid
2	Implement practical projects and experimental teaching	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21	1.0	
3	Organically integrate technical skills training into the teaching of various subjects	1	1	1	1	-1	-1	1	1	0	1	1	1	1	1	1	1	1	1	0	1	1	21	1.0	
4	Organize comprehensive training to develop teachers' ability to develop Student' technical skills	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21	1.00	Valid
5	Strengthen the practice and collaboration in training Student'	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21	1.0	

The needs for digital literacy		EXPERTS																					Total	Mean	Result
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
	technical skills in teachers' teaching and research																								
6	Continuously evaluate the effectiveness of teachers in training Student' technical skills and optimize educational strategies accordingly	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21	1.0	
7	Adopt various methods to stimulate Student' interest in participating in technological development	1	-1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	21	0.81	
8	Introduce the latest technologies and tools in training Student' technical skills	1	-1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	-1	1	1	1	1	15	0.71	
9	Conduct technical skills ability training through practical activities and project promotion involving participation	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21	1.00	

The needs for digital literacy		EXPERTS																					Total	Mean	Result
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
	from all sectors of society																								
No.	**Information Search and Evaluation Skills**																								
10	Conduct teaching using a variety of educational tools and media	1	-1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	0	1	16	0.76	
11	Adopt interactive and hands-on teaching methods	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21	1.00	
12	Teach Student efficient search techniques and strategies	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21	1.00	
13	Teach studentkills to identify and evaluate information sources	1	-1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	18	0.86	
14	Develop Student' critical thinking and logical analysis abilities	1	-1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	17	0.81	
15	Organize practical activities for information evaluation, using interactive learning	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	19	0.91	

The needs for digital literacy		EXPERTS																					Total	Mean	Result
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
	methods to develop Student' information evaluation skills																								
16	Provide teachers with online educational resources and continuous learning opportunities	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	20	0.95	
17	Strengthen the training of teaching methods and the application of technology in teacher training	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	19	0.91	
No.	**Digital Creativity Abilities**																								
18	Design digital literacy education courses across disciplines to cultivate creativity and innovation	1	1	1	1	1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	19	0.91	
19	Implement project-based learning with a focus on teaching practice	1	1	1	1	0	1	1	1	1	1	-1	1	1	1	1	1	1	1	1	1	1	18	0.86	

The needs for digital literacy		EXPERTS																					Total	Mean	Result
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
20	Develop the experience of applying technology through practical operation and application	1	1	1	1	1	-1	1	1	1	1	1	1	1	1	1	1	-1	1	1	1	1	17	0. 81	
21	Provide Student with a variety of technological tools and platforms to develop their application	1	1	1	1	0	-1	1	1	1	1	1	1	1	1	1	1	1	1	0	-1	1	15	0.71	
22	Encourage and guide Student in project-based practical learning	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0		1	1	20	0.95	

The needs for digital literacy		EXPERTS																					Total	Mean	Result
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
No.	**Strong policy support**																								
23	Provide opportunities for interdisciplinary collaboration to jointly develop Student' skills	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	20	0.95	
24	Adopt diverse methods to guide and promote Student' self-directed and exploratory learning	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21	1.00	Valid
25	Build and improve digital innovation infrastructure and resource-sharing mechanisms	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21	1.00	Valid
26	Provide continuously optimized educational resources for teachers and Student	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21	1.00	Valid
No.	**Digital Ethics and Social Responsible**																								

The needs for digital literacy		EXPERTS																					Total	Mean	Result
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
27	ntegrate digital ethics and social responsibility education into various forms of teaching activities	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21	1.00	Valid
28	Cultivate digital identity awareness and a sense of responsibility among Student	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21	1.00	Valid

The needs for digital literacy		EXPERTS																					Total	Mean	Result
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
29	Use comprehensive and interactive educational methods to develop Student' digital ethics and digital social responsibility	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21	1.00	Valid
30	Integrate digital ethics and social responsibility awareness into interdisciplinary educational content	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21	1.00	Valid
31	Design and implement digital culture courses	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21	1.00	Valid
32	Carry out comprehensive digital culture development and education promotion	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21	1.00	Valid
33	Integrate resources to achieve the fusion and innovation of school education content and methods	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	1	1	1	1	1	18	0.86	

The needs for digital literacy		EXPERTS																					Total	Mean	Result
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
No.	**Digital Security Awareness**																								
34	Conduct comprehensive and practical digital security education	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21	1.00	Valid
35	Utilize advanced technologies and methods to improve the effectiveness of digital security education	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	20	0.95	
36	Implement comprehensive digital security education strategies	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21	1.00	Valid
37	Adopt practical and interactive digital security teaching methods	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21	1.00	Valid
38	Emphasize privacy education through practical activities to cultivate Student'	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21	1.00	Valid

The needs for digital literacy		EXPERTS																					Total	Mean	Result
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
	security awareness																								
39	Develop infrastructure to build a comprehensive digital learning environment	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21	1.00	Valid
40	Conduct digital security awareness education activities and training with multi-party participation	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21	1.00	Valid
41	Integrate diverse resources for digital security awareness education	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21	1.00	Valid

Evaluation Results of IOC for the Expert Evaluate Form

Expert evaluation form	EXPERTS					Total	Mean	Result
	1	2	3	4	5			
Question validity								
The questions are closely aligned with the research objectives, and the quantity is reasonable.	1	1	1	1	1	5	1	Valid
Clarity of Expression								
The expressions are appropriate, clear, and unambiguous.	1	1	1	1	1	5	1	Valid
Completeness of Content								
The content is relatively comprehensive, covering issues related to industry-education cooperation.	1	1	1	1	1	5	1	Valid
Procedural Regularity								
The processes of data collection, analysis, and questionnaire revision are standardized.	1	1	1	1	1	5	1	Valid
Effectiveness Of Conclusions								
The conclusions drawn regarding the current problems in industry-education cooperation are effective.	1	1	1	1	1	5	1	Valid

Evaluation Results of IOC for the CIPP Expert Evaluate Form

CIPP evaluate	Evaluation indicators	Specific evaluate content	EXPERTS					Total	Mean	Result
			1	2	3	4	5			
Context Evaluation	Background and Purpose	Do you agree that the background and purpose of this model are clear and can effectively develop digital literacy of pupils?	1	1	1	1	1	5	1	Valid
		Do you agree with the role of comprehensive curriculum in this model?	1	1	1	1	1	5	1	Valid
	Digital literacy	Do you agree that the design of this model takes full account of the roles of primary education specialist,primary management specialist and research institution?	1	1	1	1	1	5	1	Valid
		Do you agree that this model takes into account the needs and expectations of all in digital literacy of pupils??	1	1	1	1	1	5	1	Valid

CIPP evaluate	Evaluation indicators	Specific evaluate content	EXPERTS					Total	Mean	Result
			1	2	3	4	5			
Input Evaluation	Questions Analysis	Do you agree that the questions in the digital literacy in primary school Student have been fully considered?	1	1	1	1	1	5	1	Valid
		Do you agree the formulation of the question?	1	1	1	1	1	5	1	Valid
	Key elements	Do you agree that the key elements fully consider the diversity and complexity of the digital literacy?	1	1	1	1	1	5	1	Valid
		Do you agree that the eight key elements play a key role in the success of the ecosystem of industry-education cooperation?	1	1	1	1	1	5	1	Valid
Process Evaluation	Model	Do you think this model fully considers the actual needs and expectations of primary school?	1	1	1	1	1	5	1	Valid
		Do you agree that the digital literacy in this model has received sufficient	1	1	1	1	1	5	1	Valid

CIPP evaluate	Evaluation indicators	Specific evaluate content	EXPERTS					Total	Mean	Result
			1	2	3	4	5			
		attention?								
	Feasibility of Model Implementation	Do you agree that this model has strong practicality and executability?	1	1	1	1	1	5	1	Valid
		Do you agree with the design of the relationships between the various elements in the model?	1	1	1	1	1	5	1	Valid
Product Evaluation	Model Feedback and Improvement	Do you agree that the feedback mechanism designed in this model is flexible and practical enough?	1	1	1	1	1	5	1	Valid
		Do you agree that the adjustment and improvement design of this model can improve its applicability?	1	1	1	1	1	5	1	Valid
	Model Effectiveness	Do you agree that the application of this model has the potential to solve the questions in the digital literacy?	1	1	1	1	1	5	1	Valid
		Do you agree that the application of this model can	1	1	1	1	1	5	1	Valid

CIPP evaluate	Evaluation indicators	Specific evaluate content	EXPERTS					Total	Mean	Result
			1	2	3	4	5			
		effectively develop digital literacy of primary school Student?								

Appendix E

Certificate of English

BANSOMDEJCHAOPRAYA
RAJABHAT UNIVERSITY

This is to certify that

Mrs. Wu Xiaoyan

Achieved BSRU English Proficiency Test (BSRU-TEP) level

C2

Given on 22nd August 2021

(Assistant Professor Dr Kulsirin Aphiratvoradej)

Director

Appendix F

The Document for Acceptance Research

ที่ 124/2567

กองบรรณาธิการวารสารมหาจุฬาคชสาร
มหาวิทยาลัยมหาจุฬาลงกรณราชวิทยาลัย
วิทยาเขตสุรินทร์ 305 ม. 8 ต. นอกเมือง
อ. เมืองสุรินทร์ จ. สุรินทร์ 32000

31 กรกฎาคม 2567

เรื่อง ตอบรับการลงตีพิมพ์บทความในวารสารมหาจุฬาคชสาร Mahachulagajasara Journal

เจริญพร คุณ Wu XiaoYan, Kanakorn Sawangcharoen, Pong Horadal, Sombat Teekasap

ตามที่ท่านได้ส่งบทความวิจัย เรื่อง **" Digital Literacy Development Model for Chinese Primary School Student "** เพื่อพิจารณาลง ตีพิมพ์ในวารสารมหาจุฬาคชสาร มหาวิทยาลัยมหาจุฬาลงกรณราชวิทยาลัย วิทยาเขตสุรินทร์ ซึ่งเป็นวารสารที่ผ่านการรับรองคุณภาพจากศูนย์ดัชนีการอ้างอิงวารสารไทย (TCI) โดยถูกจัดคุณภาพให้เป็นวารสารกลุ่มที่ 2 นั้น

บัดนี้ กองบรรณาธิการได้รับบทความของท่าน และผู้ทรงคุณวุฒิในสาขาวิชาที่เกี่ยวข้องได้พิจารณากลั่นกรองเป็นที่เรียบร้อยแล้ว จึงเห็นสมควรให้นำไปลงตีพิมพ์เผยแพร่ใน "วารสารมหาจุฬาคชสาร Mahachulagajasara Journal" ปีที่ 16 ฉบับที่ 1 (มกราคม - มิถุนายน 2568)

จึงเจริญพรมาเพื่อทราบ

เจริญพร

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