Research on the Construction of Digital Literacy Framework for Citizens—Comparative Analysis Based on Five International Digital Literacy Frameworks

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Abstract: The rapid development of digital technology has led to the widespread use of digital technologies, such as the Internet, cloud computing, artificial intelligence, and blockchain, in people's daily lives and social production. This usage has increased the demand for digital literacy among citizens. This paper comparative analysis of the five frameworks in the international arena, and establishes a preliminary set of digital literacy frameworks for our citizens. The framework consists of 7 main areas and 27 specific literacies, covering digital operation skills, information and digital content, digital communication, problem-solving, security, digital rights, and digital creation. It has been developed considering the current state and requirements of China's digital development, with the aim of fostering digital talents aligned with China's social progress, enhancing the overall level of digital literacy in society, and driving digital transformation and innovation.

Keywords: Digital technology; citizens; Comparative analysis of the five frameworks; The digital literacy framework for citizens

1. Introduction

In November 2021, the Central Cyberspace Affairs Commission issued the "Outline for Action to Enhance Digital Literacy and Skills of the Whole Population" (hereinafter referred to as the "Outline"). The Outline proposes a comprehensive definition of digital literacy and skills, encompassing qualities and abilities required by citizens in a digital society for learning, working, and living. These include digital access, production, usage, evaluation, interaction, sharing, innovation, safety and security, ethics, and morals. The Outline elevates the enhancement of digital literacy and skills to a national strategy[1]. In the digital era, where digital technology is increasingly fundamental to people's lives and work, digital literacy has become an essential skill for citizens. Enhancing the digital literacy and skills of the entire population has become an urgent and important task for the development of society, enabling citizens to adapt effectively, benefit from the opportunities of the digital era, and engage in work, study, leisure, and daily life efficiently in a digital society.

Numerous scholars, countries, and international organizations have conducted research on digital literacy. Overseas research in this field is relatively advanced, yielding substantial results. The European Union, UNESCO, and Israel scholar Yoram Eshet-Alkalai have provided comprehensive research on digital literacy, proposing concepts and frameworks applicable to all citizens, which are highly authoritative and recognized by multiple parties. However, China's research in this area started relatively late, and only a limited number of scholars have conducted relevant studies. Jiang Minjuan and Zhai Yun proposed the "five forces" model of digital literacy, establishing an initial content framework[2]. Bao Xiaofeng developed a digital literacy framework suitable for China's national conditions, considering knowledge cognition, practical participation, and emotional value[3]. Ren Youqun, Sui Xiaoxiao, and Liu Xinyang studied the European Union's digital literacy framework and suggested implications for China[4]. Yang Wenjian examined digital literacy education in the United Kingdom and the United States, offering recommendations for promoting digital literacy education in China[5]. It was not until 2019 that China's Central Cyberspace Affairs Commission introduced a more comprehensive and authoritative definition of digital literacy and skills in the Outline.

This paper presents a comparative analysis of the digital literacy frameworks for the entire population, with a focus on international perspectives. Taking into account China's national conditions, a preliminary framework for enhancing the digital literacy of Chinese citizens is proposed, aiming to contribute to the advancement of digital development in China.

2. Introduction to the Five International Digital Literacy Frameworks

2.1 A Conceptual Framework for Survival Skills in the Digital Era (Alkalai Six Concepts Framework)

In 1994, Israel scholar Yoram Eshet-Alkalai first introduced the concept of digital literacy. He argued that digital literacy goes beyond basic software usage or operating digital devices. Instead, it encompasses a wide range of complex cognitive, motor, sociological, and affective skills that users must possess to function effectively in a digital environment. In 2004, he introduced the first digital literacy framework, titled "Digital Literacy: A Conceptual Framework for Survival Skills in the Digital Era", which includes five key literacies: Photo-Visual Literacy (understanding information presented through graphics), Reproduction Literacy (creating new and meaningful content using digital reproduction of existing material), Branching Literacy (constructing knowledge through non-linear, hypertextual navigation), Information Literacy (critically assessing information quality and validity), and Socio-emotional Literacy (understanding and applying the "rules" of cyberspace to virtual communication)[6]. In 2012, Alkalai further refined the framework by including Real-time Digital Skills, which refers to the ability to process a large volume of information stimuli simultaneously. This addition expanded the digital literacy framework to encompass a total of six metrics[7].In this paper, the framework is referred to as the Alkalai Six Concepts Framework. Alkalai perceives digital literacy as an extension of media literacy, emphasizing critical and multidimensionalthinking about media content, the ability to critically analyze the language and presentation rules of media information, and the capacity to generate and communicate digital media information creatively.

2.2 DigComp2.2: The Digital Competence Framework for Citizens - With new examples of knowledge, skills and attitudes (DigComp2.2 Framework)

The Digital Literacy Project was implemented by the European Commission's Institute for Future Technologies (IFT) of the Joint Research Centre (JRC) from January 2011 to December 2012. Its objective was to promote citizens' understanding and development of digital literacy among citizens in Europe. Digital literacy can be defined as the ability to confidently, critically, and innovatively utilize information technology in various domains such as work, employment, learning, leisure, and social engagement[4]. As a result of this project, the framework known as DIGCOMP: A Framework for Developing and Understanding Digital Competence in Europe[8] (DigComp1.0) was proposed in 2013. This framework aimed to assess individuals' skills and competencies in a digital society. Over time, the European Union (EU) has been dedicated to enhancing the development of the digital literacy framework, which has undergone three updates to date. Firstly, DigComp2.0: The Digital Competence Framework for Citizens was proposed in 2016. Secondly, DigComp2.1: The Digital Competence Framework for Citizens was proposed in 2017. Finally, DigComp2.2: The Digital Competence Framework for Citizens - With new examples of knowledge, skills, and attitudes was proposed in 2022. These updates have aimed to refine and expand upon the previous versions. Further details regarding the development of these four versions can be found in a comprehensive introduction provided by scholar Wang Qingyi[9]. The DigComp2.2 framework, proposed by the European Union in March 2022, is the latest digital competence framework introduced by the European Commission. The DigComp2.2 framework comprises 5 main areas and 21 competences, namely Information and Data Literacy (clarifying the need for information and locating and retrieving digital data, information, and content; judging the source of information and its relevance of content; being able to store, manage, and organize digital data, information, and content), Communication and Collaboration Literacy(interacting, communicating, and collaborating through digital technologies while being aware of cultural and generational diversity; engaging in society through public and private digital services and participatory citizenship; and being able to manage one's digital identity and reputation), Digital Content Creation Literacy (creating and editing digital content; enhancing and integrate information and content into existing bodies of knowledge while understanding how to apply copyright and licensing; be aware of how to provide comprehensible instructions for computer systems), Safety Literacy(protect devices, content, personal data, and privacy in the digital environment; protect physical and mental health and understand digital technologies that promote social well-being and social inclusion; understand the impact of digital

technologies and their use on the environment), and Problem Solving Literacy (being able to identify needs and problems and solve conceptual problems and problematic situations in the digital environment; using digital tools to innovate processes and products; keeping up to date with the digital age). The framework provides guidance for citizens to carry out digital literacy assessments[10]. The EU's research on digital literacy has gained widespread recognition, serving as a valuable reference for the development of various frameworks around the world.

2.3 Digital Literacy Global Framework (DLGF)

UNESCO has launched the Digital Literacy Global Framework (DLGF) project with the aim to significantly increase the number of young people and adults who possess proficient digital literacy skills by 2030. These skills are essential in securing employment, pursuing decent work, and establishing businesses. In 2018, UNESCO conducted extensive research and proposed that digital literacy encompasses the ability to access, manage, understand, integrate, communicate, evaluate, and create information safely and appropriately through digital technologies for employment, decent jobs, and entrepreneurship. It includes competences that are referred to in various ways, such as computer literacy, ICT literacy, information literacy and media literacy[11]. UNESCO developed the DLGF based on the initial reference framework of DigComp2.0. The DLGF covers seven main areas, which include the five main areas identified by the European Union. These areas were identified through framework mapping, application mapping, in-depth consultation, and online consultation. The main areas are: Devices and Software Operations (identifying and using hardware tools and technologies; identifying data, information, and digital content required to operate software tools and technologies), Information and Data Literacy, Communication and Collaboration, Digital Content Creation, Safety, Problem Solving, and Career-related Competences (operating specialized digital technologies; understanding, analyzing, and evaluating domain-specific specialized data, information, and digital content). The DLGF consists of 7 main areas and 26 specific literacies[11]. The framework directly incorporates Bloom's goal categorization verbs and offers detailed descriptions of main areas and their subordinate specific literacies. This approach ensures the framework's progressiveness and comprehensiveness. The framework is highly inclusive and comprehensive, covering a wide range of literacy domains. It encompasses basic skills needed for using software and hardware in daily life, as well as professional skills relevant to various occupations. The framework is the result of a comprehensive study of digital literacy frameworks from different countries and enterprises at the global level. Its purpose is to propose a digital literacy framework that can be adapted to countries at varying levels of development.

2.4 Essential Digital Skills Framework

The UK government published the Essential Digital Skills Framework (EDSF) in 2018 for all adults in the UK who are enhancing their basic digital skills. The framework comprises six competencies: Digital Foundation Skills (the ability to use electronic devices to connect to the internet, open a browser, find and utilize websites, and ensure the security of passwords and personal information), Communicating (including email and other social media usage for information exchange, as well as document creation and sharing), Handling Information and Content (involving the assessment of information reliability, searching, retrieving, saving, and accessing information, using cloud accounts for storage and access, and legally accessing entertainment content), Transacting (the ability to create accounts, use applications for purchasing goods or services, sign up for online services, buy and sell goods and services, and securely manage transactions and funds), and Problem Solving (utilizing the Internet to find problem-solving information, employing appropriate software or spreadsheets for data processing and analysis, and utilizing various digital tools to enhance efficiency), and Being Safe and Legal Online (awareness of safe online practices, understanding of internet risks and threats, effective identification of secure websites, protection of privacy and information security, and respect for others' privacy and copyrights)[12].

2.5 Digital Intelligence Framework (DQ Framework)

In 2019, the Coalition for Digital Intelligence (CDI) released the *DQ Global Standards Report 2019* at the 7th Annual Global Education and Skills Forum. The report defines the Digital Intelligence Quotient (DQ) as a comprehensive collection of technical, cognitive, metacognitive, and socio-emotional competencies rooted in universal ethical values. These competencies empower individuals to confront challenges and adapt to the demands of digital life. Consequently, individuals possessing DQ skills will emerge as knowledgeable, competent, and future-ready digital citizens who can effectively utilize,

govern, and innovate technology for the betterment of humanity[13]. The CDI has conducted extensive research on the advancement of digital literacy and competence within the realm of education and technology. Building upon their original DQ framework, they have amalgamated digital literacy frameworks suggested by various countries and organizations, including the European Union and the United Nations. This amalgamation has resulted in the formation of a globally applicable standard and the proposal of a new comprehensive framework known as the Digital Intelligence Framework (DQ Framework). The DQ Framework is a set of standards that combines technical, cognitive, metacognitive, and socio-emotional competencies. It classifies digital literacy competencies into eight domains: Digital Identity, Digital Use, Digital Safety, Digital Security, Digital Emotional Intelligence, Digital Communication, Digital Literacy, and Digital Rights. These domains are further organized into three levels: Digital Citizenship, Digital Creativity, and Digital Competitiveness. As a result, the framework encompasses a total of 24 distinct digital literacy competencies. The DQ Framework offers a comprehensive structural system for digital literacy and competencies. Its ultimate objective is to steer digital practices, allowing organizations to embrace and customize the framework based on their specific requirements. This customization aims to foster personal and societal well-being across all domains of life. Consequently, the DQ Framework exhibits attributes of extensive applicability, sustainability, and practicality [14].

3. Comparative Analysis of the Five Frameworks

Table 1: Comparative of the five frameworks.

main areas and specific literacies / Framework name		DLGF	DigComp 2.2 Framework	DQ Frame-work	Essential Digital Skills Framewor-k	ALKALAI Six Concepts Framework
Digital Operation	Physical Functional Use of Digital Tools	√			√	
	Technical use of digital tools software	√		√		
	Occupation-specific digital technology use	√				
Information and Data Literacy	Search for information and digital content	√	√	√	√	√
	Access to information and digital content	√	√			√
	Assess information and digital content	√	√	√	√	√
	Analyze information and digital content	√	√	√		√
	Manage information and digital content	√	√	√	√	
Digital Communication and Collaboration	Interaction through digital technology	√	√		√	
	Share through digital technology	√	√	√	√	√
	Communicate through digital technology	√	√	√	√	
	Collaboration through digital technology	√	√	√	√	√
Digital Creation	Develop digital content	√	√	√		
	Integrate and generate digital content	√	√	√		√
Problem Solving	Address technical issues	√	√			
	Identification of needs and technical responses	√	√		√	
	Creative use of technology	√	√			
	Digital literacy gap	√	√			
	Computational thinking	√				
Digital Safety	Protect network safety	√	√	√	√	
	Protect equipment safety	√	√	√	√	
	Personal privacy protection	√	√	√	√	
	Protect the environment	√		√		
Digital Citizen Participation	Manage digital identities	√	√	√		
	Participation in digital citizenship	√	√	√		
Digital Rights	Intellectual Property Management	√	√	√	√	
	Management of participatory rights	√	√	√		

While the main areas covered by these five frameworks differ, there is a significant degree of similarity among the specific literacies they encompass. This study compares and analyzes the specific literacies from the aforementioned five frameworks. Those literacies with similar meanings or hierarchical relationships are reorganized. As a result, a total of 8 main areas and 27 specific literacies are identified, namely Digital Operation, Information and Data Literacy, Digital Communication and Collaboration, Digital Creation, Problem Solving, Digital Safety, Digital Citizen Participation, and Digital Rights. These findings are summarized in *Table 1*.

It is clear that all five frameworks strongly emphasize four specific digital literacies: information and digital content search and assessment, as well as sharing and collaboration using digital technologies.A comprehensive analysis reveals that citizens should be able to search for and access the information and digital content they require in the digital environment, engaging in non-linear and non-sequential information browsing and retrieval. Spatial and multidimensional orientation is crucial, enabling citizens to navigate complex knowledge domains and avoid becoming disoriented in virtual environments. Additionally, citizens should demonstrate critical thinking skills, enabling them to assess the information and digital content they acquire critically, analyze its value and reliability, and effectively organize and manage the information and digital content they need. They should possess the ability to store information and digital content using digital technologies, ensuring accessibility and efficient processing.Furthermore, citizens should be proficient in using digital technology to facilitate sharing and collaboration with others. Effective communication skills are also essential, encompassing awareness of cultural, generational, and cyber normative requirements when interacting in digital environments. Citizens should be capable of recognizing and expressing emotions, utilizing diverse digital tools and technologies to communicate proficiently, sharing information and digital content through various means, and collaborating with colleagues, friends, and family in digital environments.

The emphasis on Digital Safety, Digital Rights, and Digital Citizen Participation is crucial. It highlights the importance of citizens being aware of cybersecurity, understanding the risks and threats present in the digital environment, and responsibly managing their networks using digital technologies in a legal and safe manner. Citizens should possess the ability to recognize and avoid cyber risks and threats such as cyberbullying and cyber fraud, in order to safeguard their physical and mental well-being, as well as the security of their devices, property, personal data, and privacy. Moreover, citizens should be conscious of the impact of digital technology usage on the real-world environment. They should understand the nature and implications of their digital footprint, demonstrating responsible digital citizenship and effectively manage their digital identity. They should also actively build their digital reputation and utilize digital technologies to engage in online activities. Additionally, Citizens should also comprehend and defend their intellectual property rights when using or creating digital content or technologies, actively protecting and managing their rights to participate online.

The DLGF provides a comprehensive description of the Digital Operation aspect. A digital divide is present in many economically underdeveloped regions and has two dimensions. The first dimension is the disparity between individuals who have access to digital facilities and those who do not, while the second dimension is the discrepancy between individuals with varying levels of proficiency in utilizing digital technology. Therefore, it is important for citizens to not only have access to hardware tools and technologies but also to understand and master the software tools and technologies required for operation. It is also essential for professionals in specific fields such as teachers and doctors to possess digital skills relevant to their respective professions, enhancing their efficiency in the workplace. The DQ Framework emphasizes the responsible use of digital technologies, considering the impact on time and the environment. It encompasses understanding the effects of technology on physical and mental health, managing dependence on digital technologies, achieving a balanced use of digital technologies, and leveraging them for development and well-being at local, national, and global scales. Regarding Digital Creation, it is crucial for citizens to have the capability to develop and generate digital content in various formats. This encompasses not only text, images, audio, and video, but also programming languages employed for coding. Additionally, it involves the skill to create novel information by reprocessing, integrating, and providing fresh interpretations of distinct and independent digital data. Citizens are encouraged to be proactive in anticipating and addressing technical challenges that may arise during the problem-solving process. To achieve this objective, they need to identify the underlying needs associated with the problem, determine the digital tools and technologies required for resolution, and creatively employ these resources. Furthermore, it is important to reflect upon the digital literacy gap and identify areas for personal improvement and updating. Additionally, developing the ability to assist others in building and enhancing their digital literacy skills is also significant. Computational thinking involves transforming a solvable problem into a series of sequential and logical steps, enabling both humans and computer systems to identify suitable solutions. This approach necessitates individuals to possess the capacity to formulate problems as a sequence of logical steps that can be understood and executed by computer systems.

4. The Construction of a Digital Literacy Framework for Our Citizens

This paper conducts a comparative analysis of five digital literacy frameworks using reduction and merger methods. It aims to streamline and combine relevant indicators from each framework, with a

particular focus on commonly occurring specific literacies. We revisited these frameworks multiple times and, considering the specific context of their country, proposed a set of digital literacy frameworks for citizens. This framework, outlined in Table 2, serves as a reference for future scholars and policymakers. The proposed framework comprises seven main areas: Digital Operation Skills, Information and Digital Content Literacy, Digital Communication, Problem Solving, Safety, Digital Rights, and Digital Creation. These main areas are further divided into 27 specific literacies. The development of this framework takes into account the cognitive, skill, thinking, and ethical requirements of individuals with digital literacy.

The Digital Operation Skills Literacy. It is crucial for China's rapidly developing informatization industry, which is utilizing digital technologies in diverse fields. However, China still faces the challenge of a digital divide due to its diverse population, which includes a significant number of elderly and other groups unfamiliar with digital tools and devices. Consequently, establishing a domain that focuses on digital operation skills literacy can guide individuals in acquiring proficiency in digital technologies, improving efficiency and convenience in their daily work and life. Furthermore, such a domain can enhance the public's overall digital adaptability and facilitate China's digital transformation.

Information and Digital Content Literacy: It is critical in today's information-rich society, where individuals are constantly exposed to vast amounts of information and digital content on a daily basis. This literacy empowers people to enhance their skills in searching, evaluating, analyzing, and managing information in the digital age. It is a focal point in most frameworks,By developing this literacy, individuals can effectively search for, evaluate the relevance of, and analyze information, distinguish its authenticity, and filter valuable content. They are also able to manage and process both information and digital content independently.

Digital Communication Literacy: It is of paramount importance in China due to the vast number of Internet users and widespread adoption of social media and online collaboration tools. By integrating the existing digital literacy framework and introducing Digital Communication literacy, individuals can be guided to actively participate in digital social interaction and collaboration, thereby fostering information sharing and collaborative innovation.

Problem Solving Literacy: As we continue to progress in the digital era individuals are encountering an increasing number of digital challenges and problems. It is crucial to nurture individuals' problem-solving skills in this dynamic landscape, as it aligns with the requirements of modern society, educational reform, and national development. By cultivating individuals' capacity to define problems and needs, identify solutions, Use digital technologies creatively, and engage in continuous learning and adaptation, they will be better equipped to address the challenges posed by the digital environment. This, in turn, will enable them to contribute to societal development and progress, while also facilitating the country's digital transformation and competitiveness.

Safety Literacy: Given the significant number of Internet users in China, there is an urgent need to address the risks associated with cybersecurity and personal information leakage. Enhancing people's capacity to safeguard their own and others' safety in the digital environment is crucial. Establishing Safety literacy will heighten individuals' awareness of cybersecurity, mitigate the risks of cyberattacks and information leakage, and uphold the digital security of both individuals and society.

Digital Rights Literacy: Recognizing the importance of safeguarding the digital rights and interests of individuals, China has strengthened its legislation and regulations in the digital sphere. Establishing a Digital Rights literacy domain can enhance people's awareness of and capacity to protect their digital rights and interests, thereby ensuring the preservation of individual digital rights and fostering a fair and lawful digital environment.

Digital Creation Literacy: China is actively pursuing a strategy of innovation-driven development, which has led to a thriving digital economy. Digital creation plays a crucial role in promoting citizens' innovation and creativity. Through digital creation, individuals can utilize their imagination and ingenuity to generate fresh perspectives, ideas, and solutions, thereby propelling society and the economy towards innovative growth. Consequently, it is essential to foster people's capacity to create and produce within the digital environment, while also enhancing their innovation and entrepreneurial skills. Establishing a domain that focuses on digital creativity literacy will contribute to the development of the digital economy and facilitate the cultivation of individuals with a spirit of innovation and creative aptitude.

This framework has been established by considering China's national conditions and synthesizing five prominent international digital literacy frameworks. It takes into account the current situation and needs of China's digital development, with the aim of cultivating digital talents that align with the

country's societal progress and drive digital transformation and innovation. Moreover, these literacies are in line with China's objective of advancing digital China and constructing a robust networked nation, thereby enhancing the overall digital literacy level of society.

Table 2: Digital Literacy Framework for All

main areas	specific literacies	Specific literacy definitions
Digital Operation Skills	Fundamental utilization of digital tools and technology	Possess the capability to identify the fundamental functions and features of digital equipment, and effectively utilize the basic functionalities of digital tools and techniques.
	Proficient utilization of digital tools and technology	Proficiency in comprehending and applying the fundamental principles and concepts of digital tools and technologies (e.g., computer fundamentals, network fundamentals, etc.), adeptness in selecting suitable digital tools and technologies based on specific requirements, mastery in operating digital equipment, including a wide range of relevant functions of digital devices pertinent to the occupation.
	Optimal utilization of digital tools and technology	Possess the competence to maintain a balanced approach in using and relying on digital devices, and exhibit appropriate, healthy, and civilized utilization of digital tools and technologies.
Information and Digital Content Literacy	Search information and digital content	Clearly identify information needs, possess the ability to effectively utilize a diverse range of digital devices to search for information and digital content in digital environments using both linear and non-linear search strategies, access and browse them, navigate between them, create and update personal search strategies, as well as access and download information and digital content as required.
	Evaluate information and digital content	Possess critical thinking skills, capable of maintaining a skeptical attitude towards acquired information and digital content, able to evaluate the reliability and credibility of information and digital content, and able to discern valuable and authentic information and digital content.
	Analyze information and digital Content	Possess the ability to organize and process acquired information and digital content, analyze and reflect upon it to derive meaningful conclusions. Utilize these conclusions to obtain valuable and meaningful insights, and apply this information effectively in practical applications.
	Manage information and digital content	Possess the capability to organize, store, and retrieve information and digital content in a digital environment to avoid information and digital content loss.
Digital Communication	Interact and communicate through digital technology	Demonstrate the ability to choose suitable digital communication methods based on the specific context.Proficiently engage in proactive interaction and communication using diverse digital technologies (e.g., social media platforms, instant messaging applications, videoconferencing, email, social forums, blogs, etc.). Demonstrate empathy in recognizing the emotions and needs of others during interactions and communication.
	Share and collaborate through digital technologies	Possess the ability to choose suitable digital technologies for sharing information and digital content with others. Utilize digital tools and technologies (e.g., remote collaboration tools) to collaborate with others in the joint construction and creation of resources and knowledge.
	Manage digital identities	Demonstrate the capability to securely and efficiently manage personal identity information and digital footprint in the digital environment. Exhibit responsible management of digital footprints to safeguard one's reputation.
	Digital expression	Demonstrate the ability to express personal interests, talents, and emotions by sharing work through blogs, videos, and audio. Express thoughts and feelings through email, instant messaging, chats, comments on social media platforms , images, and emojis.
	Digital etiquette	Demonstrate the ability to respect others' opinions, refrain from making malicious comments and insults, and adhere to platform rules and social media etiquette. Show awareness of cultural differences and sensitivities when engaging in digital interactions with individuals from diverse cultural backgrounds, and respect each other's cultural practices and values to foster effective communication and collaboration.
Problem	Identify problems and	Demonstrates an understanding of the problem's nature, identifies its

Solving	needs	scope and key factors, and possesses the capability to conduct problem analysis.Possesses the ability to assess one's own needs in terms of resources, tools, and technologies.
	Ensure solutions to problems	Utilize digital devices to search for information or utilize online tutorials to identify problem solutions. Seek assistance from others and engage in discussions through chat tools or online advice forums to identify solutions to problems.Choose potential solution paths and suitable solutions based on the requirements of the problem, and possess the ability to evaluate the feasibility and effectiveness of the solutions.
	Creative use of digital technologies	Possesses the capability to flexibly utilize digital technologies, employ imagination and creativity, and merge innovative thinking and problem-solving skills to generate novel and innovative solutions for problems or challenges. Demonstrates the ability to integrate digital technologies with real-world problems, creating creative and practical solutions.
	Continuous learning and adaptability	Demonstrates the ability to engage in continuous learning and adapt to changes. Possesses the capability to rapidly learn and adapt to new technologies, tools, and environments in a dynamic and innovative digital landscape.
Safety	Safeguard devices and ensure secure Internet access	Recognize the existence of risks and threats in the digital environment and possess knowledge of safety precautions in this context.Possess the ability to recognize and address risks and threats in the digital environment. Demonstrate the capacity to manage the usage of digital devices and regulate one's own digital behavior.Comprehend various types of cyber threats and attacks, as well as the risks associated with phishing and malware. Demonstrate the ability to implement suitable protective measures to safeguard personal and organizational network devices.
	Protection of personal privacy	Safeguard personal data and privacy within the digital environment. Demonstrate the ability to appropriately utilize and share personally identifiable information while ensuring protection against unauthorized disclosure for oneself and others. Implement suitable security measures to prevent unauthorized access, disclosure, or misuse of personal data.
	Safeguard personal health	Demonstrate the ability to steer clear of digital content that poses health risks and jeopardizes physical and mental well-being. Protect oneself and others from perils encountered in the digital realm (e.g., cyberbullying, online fraud, etc.). Exercise caution to avoid internet addiction and maintain self-control over gaming and short videos to prevent personal dependency.
Digital Rights	Right to privacy	Individuals possess the right to safeguard their information and privacy against unauthorized collection and use. This includes protection of personal data, control over data usage, selective sharing of personal information, and a reasonable expectation of privacy.
	Right of participation	Individuals have the right to lawfully express opinions, share viewpoints, and participate in public affairs and social issues in the digital environment through the use of digital technology and online platforms. This includes activities such as online voting and elections, digital government participation, online citizen forums, and discussion groups, which enable them to exert influence on societal matters.
	Right to intellectual property	Individuals possess the right to safeguard their intellectual property, which includes copyrights, trademarks, and patents. This encompasses suitable protection for the creation, sharing, and utilization of digital content, as well as prevention of unauthorized use of their intellectual property by others.
	Right to digital use	Individuals possess the right to access publicly available digital services and content. Moreover, they have the right to lawfully utilize copyrighted works of others within the appropriate legal framework, while respecting the principles of fair and reasonable use. This encompasses activities such as academic research, commentary, journalism, education, and personal purposes.
Digital Creation	Expression of creativity	Possess innovative thinking and the ability to express oneself creatively through digital tools and technologies, while considering social values, ethical norms, laws and regulations, and other

		requirements in the creative process.
	Integration and reformation of digital content	The ability to modify, refine, improve, and integrate legally acquired information and digital content within the permissible extent, resulting in the creation of information and digital content with new meaning.
	Development of digital content	Ability to use digital technologies and tools for creative production and the creation of valuable digital content. This includes creating and editing original digital content (text, audio, video, images, animations, games, etc.) in various formats to express one's thoughts, ideas, and creativity.
	Entrepreneurship in the digital realm	Possess fundamental knowledge of digital entrepreneurship and innovation, as well as the awareness and spirit of entrepreneurship and innovation. Additionally, have the ability to identify and seize opportunities in the digital era, and contribute to the advancement of innovation and entrepreneurship.

5. Conclusion

Digital technology has become an indispensable part of people's lives,with mobile phones being commonly used for various purposes such as travel, ticket purchases, entertainment, and communication. The rapid and constant evolution of digital technologies necessitates continuous learning and staying updated with new trends and tools. By focusing on personal lifelong learning, individuals can continually enhance their digital literacy skills. As digital development in China accelerates, the country requires an increased number of digital innovative talents to bolster its scientific and technological strength. Consequently, more attention will be given to improving the digital literacy of citizens. The digital literacy framework proposed in this paper can serve as a valuable reference for future researchers and scholars. It is essential to acknowledge that the digital literacy framework proposed in this paper for the entire population requires further improvement. Given the rapid development of the times, the increasing prevalence of artificial intelligence technology, and the evolving nature of digital advancements, the elements of the citizens' digital literacy framework are not fixed. They are subject to revision and updating to align with the changing times. Achieving comprehensive improvement in digital literacy among Chinese citizens requires collaborative efforts and cooperation among educational institutions, government entities, businesses, and all sectors of society. By doing so, individuals can effectively adapt to and address the challenges posed by the digital era.

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